

III Conferência Científica do LBA

Anais de Trabalhos Completos

27 a 29 de julho de 2004

Academia de Tênis Resort

Brasília, Brasil



III LBA Scientific Conference

Abstract Book

July 27-29, 2004

Academia de Tênis

Brasília, Brazil

Prefácio

O Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia (LBA) está em operação desde 1998 e vem agora apresentar o conhecimento científico sobre as funções da Amazônia no sistema terrestre. Esta Terceira Conferência Científica do LBA demonstra a maturidade do projeto LBA e seus extraordinários resultados científicos. O LBA cresceu enormemente durante a década de sua existência, primeiro como atividade de planejamento e depois como programa formal do Governo do Brasil. Uma indicação desse crescimento e dinamismo do LBA é o crescimento da Conferência do LBA. Quando da primeira Conferência Científica do LBA em Belém, Pará, em julho de 2000, 282 foram apresentados. Esta Terceira Conferência Científica é mais do que duas vezes maior: 611 resumos compõem o programa final. Indiscutivelmente, esta é a maior reunião científica que contempla, exclusivamente, as condições passadas, presentes e futuras da Amazônia.

O LBA cresceu e amadureceu; acreditamos que não apenas a quantidade de resumos aumentou, mas cresceu também a qualidade do nosso entendimento. O conhecimento gerado pelo LBA fornecerá subsídios para as políticas projetadas para o gerenciamento dos vastos recursos naturais da Amazônia no futuro. As centenas de estudantes formados no programa LBA irão contribuir para as pesquisas futuras, elaboração de políticas públicas e para o gerenciamento dos recursos da Amazônia.

Somos gratos às centenas de cientistas, estudantes e funcionários do LBA que tornaram essa iniciativa uma realidade. Agradecemos às lideranças do Ministério da Ciência e Tecnologia (MCT) do Brasil, à atual instituição implementadora do LBA - o Instituto Nacional de Pesquisas da Amazônia (INPA), bem como à instituição anterior - o Instituto Nacional de Pesquisas Espaciais (INPE). Inúmeras instituições, nas quais incluem-se o MCT, CNPq, CAPES, FINEP e FAPESP, apoiaram as pesquisas do LBA. Somos gratos também às agências dos Estados Unidos da América, em especial à Administração Nacional de Aeronáutica e Espaço (NASA), Departamento de Agricultura (USDA), Serviço Florestal (USFS) e à Fundação Nacional da Ciência (NSF) pelo apoio aos projetos do LBA. A Comissão Europeia e várias agências nacionais de fomento na Europa também contribuíram substancialmente para as pesquisas do LBA.

Muitas pessoas trabalharam para tornar esta Terceira Conferência Científica do LBA uma realidade. Não há espaço suficiente aqui para agradecer a cada um individualmente, mas chamamos a atenção do leitor para a longa lista de organizadores da Conferência, coordenadores de sessões, editores e outros que contribuíram generosamente com seu tempo e esforços para tornar esta Conferência uma realidade.

Queremos dedicar este volume à memória de Wim Sombroek, autor do clássico estudo *Amazon Soils*, que resultou de sua tese de Doutorado. Wim acompanhou a abertura da Rodovia Belém-Brasília e estudou os solos da região no início do mais recente pulsar de desenvolvimento da Amazônia. Wim dedicou toda a sua carreira aos estudos da Amazônia, fornecendo-nos conhecimento e inspiração.

Paulo Artaxo

Mercedes Bustamante

Michael Keller

Coordenadores do Comitê do Programa da Conferência

Preface

The Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) has been operational since 1998 and is now revealing new scientific knowledge of the functions of Amazonia in the Earth system. This Third LBA Science Conference demonstrates the maturity of the LBA project and its outstanding scientific results.

LBA has grown enormously over the decade of its existence, first as a planning activity and then as a formal program of the Government of Brazil. One indication of the growth and dynamism of LBA is the growth in the LBA Conference itself. When we held the first LBA Scientific Conference in Belem, Pará in July 2000, 282 abstracts were presented. This Third Scientific Conference is more than twice as large with 611 abstracts in the final program. Undoubtedly, this is the largest scientific meeting to consider exclusively the past, present, and future condition of Amazonia.

As LBA has grown and matured; we believe that not only the quantity of abstracts has grown but also the quality of our understanding. Knowledge generated by LBA will provide a subsidy for policies designed to manage the vast natural resources of Amazonia in the future. The hundreds of students educated in the LBA program will contribute to future research, policy-making, and governance of Amazonia's resources.

We are grateful to the hundreds of scientists, students, and staff of LBA who have made this enterprise a reality. We acknowledge the leadership of Brazil's Ministry of Science and Technology (MCT) and LBA's current implementing institution, the National Institute for Amazon Research (INPA) as well as the past implementing agency, the National Institute for Space Research (INPE). Numerous Brazilian institutions including MCT, CNPq, CAPES, FINEP, and FAPESP have supported LBA research. We are also grateful to agencies in the United States of America, especially the National Aeronautics and Space Administration (NASA), and also the U.S. Department of Agriculture (USDA), Forest Service (USFS), and the National Science Foundation (NSF) for their support of LBA projects. The European Commission and several national funding agencies in Europe have also contributed substantially towards LBA research.

Many people have worked to make this Third LBA Science Conference a reality. There is insufficient space here to thank each one individually, but we direct the reader's attention to the long lists of conference organizers, session chairs, editors and others who gave generously of their time and efforts to make this conference a reality.

We dedicate this conference volume to the memory of Wim Sombroek, author of the classic study *Amazon Soils* that resulted from his Ph.D. thesis. Wim followed the opening of the Belem-Brasilia Highway studying the region's soils at the start of the most recent pulse in the development of the Amazon. Wim remained a dedicated student of Amazonia throughout his career who provided us with knowledge and inspiration.

Paulo Artaxo

Mercedes Bustamante

Michael Keller

Conference Program Committee Co-Chairs

Índice

(Table of Contents)

- Nome dos Apresentadores em itálico. (Names in *italics* are Presenters.)

Plenária II (Plenary II)

Coordenador (Chair): **Paulo Artaxo**

- [1.1](#) **Interações entre Clima e Vegetação na Amazonia: Do Último Período Glacial até o Clima do Futuro** (Overview of Climate-Vegetation Interactions in Amazonia: From the Last Glacial Maximum to the Climates of the Future) (*Carlos Afonso Nobre*)
- [1.2](#) **Desmatamento e Queimadas como os forçantes da Mudança Regional Climática na Amazônia** (Deforestation and Biomass Burning as Drivers of Regional Climate Change in Amazônia) (*Maria Assução Faus da Silva Dias*)
- [1.3](#) **Fumaça, Aerossóis, Nuvens, Chuva e Clima na Amazonia** (Smoke Aerosols, Clouds, Rain and Climate) (*Meinrat O. Andreae, Paulo Artaxo, Daniel Rosenfeld, Maria Assução Faus da Silva Dias, Alexandre Araújo Costa, José Carlos Parente Oliveira, Willy Maenhaut, Magda Claeys, Sandro Fuzzi, Erik Swietlick, Olga L. Mayol-Bracero, Luciana Vanni Gatti, Karla M Longo, Yínon Rudich*)

Sessões Paralelas I (Parallel Sessions I)

Sessões Paralelas III - Pesquisas em Destaque (RH) e Sessões Especiais (S) (Parallel Sessions III - Research Highlights (RH) and Special Sessions (S))

RH3: Pesquisas em Destaque - Usos da Terra e Dimensões Humanas (Research Highlights: Land Use and Human Dimensions)

Coordenadores (Chairs): **Diogenes Alves, Emilio Moran**

- [2.1](#) **Human Dimensions in LBA** (*Bertha K Becker, Diogenes S Alves, Eustaquio J Reis, Ima C Vieira, Mateus Batistella*)
- [2.2](#) **A dimensão humana nos programas de pesquisa em Mudanças Gloabais: o caso LBA.** (*Tatiana Schor*)
- [2.3](#) **Patterns of land cover change and land use intensification** (*Diogenes S Alves*)
- [2.4](#) **Population Dynamics in the Amazonian Frontier: Scarcity of Labor and Fertility** (*Emilio F. Moran, Leah VanWey*)
- [2.5](#) **Reconstructing landscape histories and land use trajectories in Eastern Amazônia: Social, demographic, and economic dimensions of deforestation in comparative, multi-level perspective** (*Eduardo Sonnewend Brondizio*)
- [2.6](#) **Determinantes da Expansão da Pecuária Bovina na Região do Alto Rio Acre** (*Fabiano Toni*)
- [2.7](#) **Why such a tremendous expansion of cattle ranching in the Amazon ? Discussion from a new research methodology** (*Jonas Bastos da Veiga, Marie Gabrielle Piketty, Jean François Tourrand, Pablo Pacheco*)
- [2.8](#) **Landscape Fragmentation and Conservation in Rondônia: The Role of Settlers, Loggers, and Forest Peoples** (*Mateus Batistella*)
- [2.9](#) **Agents of Deforestation** (*Eustáquio J. Reis, Diana Weinhold*)
- [2.10](#) **Transportation Logistics and Endogenous Development in the Amazon** (*Bertha K Becker*)

S6: Sessões Especiais - Variação dos Processos nos Ecossistemas Florestais da Amazônia (Variation of Forest Ecosystem Processes Across Amazonia)

Coordenadores (Chairs): **Oliver Phillips, Yadvinder Malhi**

- [3.1](#) **Compositional Changes in Undisturbed Neotropical Forests and Their Implications for**

- Carbon Dynamics** (*William F. Laurance, Richard Condit*)
- [3.2](#) **Concerted Changes in Amazon Forest Dynamics** (*Oliver L. Phillips, Simon L Lewis, Timothy R. Baker, and 31 others*)
- [3.3](#) **Spatial Variation of Forest Structure and Aboveground Biomass in Jaru Reserve, Rondonia, Brazil** (*Sassan S. Saatchi, Regina Célia dos Santos Alvalá*)
- [3.4](#) **Scaling Up Above Ground Live Biomass from Plot Data to Landscape in Amazon Basin** (*Sassan S. Saatchi*)
- [3.5](#) **Carbon stocks and sequestration in above-ground wood biomass of Central Amazonian white-water floodplain forests** (*Jochen Schöngart, Florian Wittmann, Maria Teresa Fernandez Piedade, Martin Worbes, Wolfgang Johannes Junk*)
- [3.6](#) **Old paradigms grow up: tree species composition and forest productivity across Amazonia** (*Timothy R. Baker, Oliver L. Phillips, Yadvinder Singh Malhi, Samuel Soares Almeida, Luzmilla Arroyo, Antony Di Fiore, Terry Erwin, Niro Higuchi, Timothy Killeen, Susan Laurance, William F. Laurance, Abel Monteagudo, David Neill, Percy Núñez Vargas, Nigel Pitman, José Natalino Macedo Silva, Jonathan James Lloyd*)
- [3.7](#) **Separating Genetic versus Environmental Effects on Amazon Forest Growth and Nutrient Uptake Characteristics** (*Jonathan James Lloyd, Timothy R. Baker, Oliver L. Phillips, Samuel Soares Almeida, Luzmilla Arroyo, Niro Higuchi, Timothy Killeen, Susan Laurance, William F. Laurance, Abel Monteagudo, David Neill, Percy Núñez Vargas, Nigel Pitman, Rafael Salomão, José Natalino Macedo Silva, Rodolfo Vásquez Martínez, Claudia Czimczik, Lina Maria Mercado, Carlos Alberto Quesada, Sandra Patiño, Yadvinder Singh Malhi*)
- [3.8](#) **Modelling Spatial Patterns of Gross Primary Productivity in the Tapajós Region** (*Luiz Eduardo Oliveira Cruz de Aragão, Yosio Edemir Shimabukuro, Mathew Williams*)
- [3.9](#) **Canopy structure and nutrient productivity across the western Amazon** (*Sandra Patiño, Romilda Maria Quintino Paiva, Mercado Lina, Horna Viviana, Schmerler Jens, Quesada Beto, Timothy R. Baker, Phillips Oliver, Malhi Yadvinder, Lloyd Jon*)
- [3.10](#) **Spatial patterns and temporal dynamics of photosynthesis and transpiration in Amazon basin** (*Xiangming Xiao, Qingyuan Zhang, Stephen Boles, Matthew Fearon, Berrien Moore III*)

S9: Sessões Especiais - Balanços de Água e Energia da Bacia Amazônica (*Water and Energy and Balances of the Amazon Basin*)

Coordenadores (Chairs): Edson Rocha, Jose Marengo

- [4.1](#) **The evapotranspiration of the Amazon basin** (*David Werth, Natalia Hasler, Roni Avissar*)
- [4.2](#) **Water and energy variation associated with the wet season onset over the Amazon** (*Wenhong Li, Rong Fu, Kátia Fernandes*)
- [4.3](#) **Activities of the GEWEX Hydrometeorology Panel (GHP)** (*John Roads, José A. Marengo*)
- [4.4](#) **Radiation Budgets in Support of LBA Hydrological Modeling** (*Rachel T Pinker, Banglin Zhang, Hiroko Kato, Juan C. Ceballos, Enio B. Pereira*)
- [4.5](#) **Estimativas das Perdas por Interceptação Mediante Novo Método de Medição Desenvolvido e Aplicado em Floresta Não Perturbada na Amazonia Central** (*Luz Adriana Cuartas, Antonio Donato Nobre, Javier Tomasella, Martin George Hodnett, Maarten Waterloo, Juan Camilo Múnera-Estrada*)
- [4.6](#) **Impact of Precipitation Assimilation on Climate Simulations over Brazil** (*Ana Nunes, John Roads, Masao Kanamitsu*)
- [4.7](#) **Insights on modeling the hydrometeorology of the Amazon** (*Renato Ramos da Silva, Roni Avissar*)
- [4.8](#) **Síntese de Quatro Anos de Medidas de Trocas de Energia e de gás Carbônico Acima de Floresta e Pastagem em Rondônia** (*Antonio Ocimar Manzi*)
- [4.9](#) **The Isotopic Records of Andean Ice Cores, a Response of Precipitation Variability Over the Amazon Basin** (*Edson Ramirez*)
- [4.10](#) **Integration Novelties: new thinking for Earth System modelling and climate adaptation and mitigation.** (*Sarah Cornell, John Schellnhuber*)

S10: Sessões Especiais - Respostas Ecofisiológicas e Bioquímicas das Plantas Tropicais à Elevação da Concentração de CO₂ (*Ecophysiological and Biochemical Responses of Tropical Plants to Elevated CO₂*)

Coordenadores (Chairs): Carlos Prado, Marcos Buckeridge

- [5.1](#) **Photosynthesis and water use efficiency in twenty tropical tree species of differing successional status in a Brazilian reforestation** (*Carlos Alberto Martinez, Anselmo Nogueira, Leonnardo Lopes Ferreira, Carlos Henrique Prado*)
- [5.2](#) **Effects of air temperature and transitory CO₂ availability on carbon assimilation in tropical woody species *Swietenia macrophylla* King, and *Copaifera langsdorffi* Desf.** (*Carlos Henrique Prado, Zhang Chengjun, Leonnardo Lopes Ferreira*)
- [5.3](#) **Ecophysiology of Tree Species of the Tropical Rain Forest Under Enriched CO₂ Atmosphere: A Successional Approach Using Different Functional Groups Among the Leguminosae** (*João R.L. Godoy, Marcos P.M. Aidar, Mauro Marabesi, Marcos Silveira Buckeridge*)
- [5.4](#) **Effects of the High Concentration of Atmospheric CO₂ on Growth and Development of Sugar Cane (*Saccharum Officinarum*)** (*Marília Gaspar, Amanda Pereira Souza, Mauro Marabesi, João R.L. Godoy, Marcos P.M. Aidar, Marcos Silveira Buckeridge*)
- [5.5](#) **The photosynthetic response to elevated CO₂ in high altitude potato species (*Solanum curtilobum*)** (*Carlos Alberto Martinez, Natalia Olivo, Marco Antonio Oliva*)
- [5.6](#) **Seasonal changes of ecophysiological responses of *Hymenaea courbaril* L.** (*Madeleine Barriga Puente de la Vega, Antonio Mauro Saraiva, Marcos Silveira Buckeridge, Henrique Pessoa Santos, Isis Santos Costa*)
- [5.7](#) **Modeling photosynthesis of the tropical tree *Hymenaea courbaril* L. using artificial neural networks** (*Madeleine Barriga Puente de la Vega, Antonio Mauro Saraiva, Hernán Prieto Schmidt, Marcos Silveira Buckeridge*)
- [5.8](#) ***Hymenaea Courbaril* I. (leguminosae): A Model Tree to Understand Pathways for Carbon Sequestration Into Cellulose in the Rain Forest** (*Marcos Silveira Buckeridge, Marcos P.M. Aidar, Marília Gaspar, Solange C.M. Viveiros, Carlos Alberto Martinez, Paula M.F. Costa, Marco A.S. Tiné, Sonia M.C. Dietrich, Beatriz J. Lopes*)
- [5.9](#) **Mixed Cover of C₃ and CAM Species in a Tropical Coastal Vegetation: a Unique Situation for Efficient Carbon Sequestration** (*Eduardo Arcoverde de Mattos, F. R. Scarano*)

S14: Sessões Especiais - Trocas de Carbono Entre os Ambientes Aquáticos, a Terra e a Atmosfera (*Carbon Exchanges Between Aquatic Environments, Land, and Atmosphere*)

Coordenadores (Chairs): Jeffrey Richey, John Melack

- [6.1](#) **Examining the results from the Asu catchment in a wider Amazonian context** (*Martin George Hodnett, Javier Tomasella, Waterloo Maarten, Luz Adriana Cuartas, Antonio Donato Nobre*)
- [6.2](#) **ENSO-Orchestrated Carbon Supply and Sequestration in Amazonian River Basins by Erosion-Sedimentation Processes** (*Rolf Aalto, Anthony K Aufdenkampe, Laurence Maurice-Bourgoin*)
- [6.3](#) **Suspended sediment Yield in the Amazon basin. An assessment using the Brazilian national data set** (*Naziano Filizola, Jean Loup Guyot, Frédérique Seyler, Gérard Cochonneau, Eurides Oliveira*)
- [6.4](#) **Role of Floodplains in Suspended Sediment Transfer and Storage Along the Amazon River** (*Laurence Maurice-Bourgoin, Pascal Kosuth, Jean-Michel Martinez, Eurides Oliveira*)
- [6.5](#) **Isotopic Constraints on Organic and Inorganic Carbon Cycling in the Amazon River System** (*Emilio Mayorga, Anthony K Aufdenkampe, Alex V Krusche, Caroline A Masiello, Paul D Quay, Jeffrey E. Richey*)
- [6.6](#) **Pilot Experiments on Air-Water Exchange of Carbon Dioxide in the Amazon Basin** (*Simone R. Alin, Scott Dennis Miller, Alex Vladimir Krusche, Jeffrey E. Richey*)
- [6.7](#) **Detection of carbon dioxide efflux from the rivers in the atmosphere.** (*Joe Berry, Jean Pierre Ometto, Jim Ehleringer, Jon Wells*)
- [6.8](#) **Evidence of nocturnal horizontal transport of CO₂ at an Amazon pasture/agricultural site** (*Otávio C Acevedo, Osvaldo Luiz Leal de Moraes, Rodrigo da Silva, David Roy Fitzjarrald, Ricardo K Sakai, Matthew J. Czikowsky*)

- [6.9](#) **Intraseasonal Variability of the Surface Fluxes in Santarém** (Pedro Leite Silva Dias, Maria Isabel Vitorino, Humberto Ribeiro da Rocha, Scott Dennis Miller, Michael L. Goulden)
- [6.10](#) **Explicit Calculation of Surface Carbon Flux on the Flona Tapajos using SiB-RAMS** (Ian T Baker, Lixin Lu, Saulo Ribeiro de Freitas, Scott A. Denning)

S5: Sessões Especiais - Dados e Produtos Terra/Aqua MODIS Para a Ciência do LBA: Resultados Atuais e Oportunidades Para Integração de Dados e Sínteses. (*Terra / Aqua MODIS Data and Products for LBA Science: Current Results and Opportunities for Data Integration and Synthesis*)

Coordenadores (Chairs): Alfredo Huete, Laerte Ferreira

- [7.1](#) **Use of MODIS and MERIS data for the water quality monitoring of Amazonian rivers and floodplain lakes** (Jean-Michel Martinez, Laurence Maurice-Bourgoin, Patricia Moreira-Turcq, Jean Loup Guyot)
- [7.2](#) **Análise Sazonal dos Produtos MOD13A2 (NDVI/EVI) e MOD15A2 (LAI/fAPAR) Para o Bioma Cerrado** (Manuel Eduardo Ferreira, Alfredo R Huete, Laerte Guimarães Ferreira, Alejandro Alvarado Peccinini)
- [7.3](#) **Combining Landsat ETM+ and Terrain Data for Scaling Up Leaf Area Index (LAI) in Eastern Amazon: an Intercomparison With MODIS Product** (Luiz Eduardo Oliveira Cruz de Aragão, Yosio Edemir Shimabukuro, Mathew Williams, Fernando Del Bom Espírito Santo)
- [7.4](#) **Phenological shifts and variations in vegetation along Amazon eco-climatic transect using MODIS VI time series** (Piyachat Ratana, Alfredo Ramon Huete, Kamel Didan)
- [7.5](#) **Spatiotemporal Shifts in Biologic Activity Across Amazonia Forest-Cerrado Transitions and Land Conversions: an Analysis with MODIS Biophysical Products** (Alfredo Ramon Huete, Kamel Didan, Yosio Edemir Shimabukuro, Piyachat Ratana, Laerte Guimaraes Ferreira)
- [7.6](#) **Mapping Expansion of Soybean Cultivation with MODIS data** (Ruth DeFries, Douglas Morton, Matthew Hansen, Yosio Shimabukuro, Liana Anderson, Ellen Jasinski)
- [7.7](#) **Combining Land Cover Data with MODIS Active Fire Detections to Establish Fire Type and Estimate Burned Area** (Douglas Morton, Jeffrey Thomas Morissette, Ivan Csizar, Wilfrid Schroeder, Ruth DeFries, João Antonio Raposo Pereira, Christopher O. Justice)
- [7.8](#) **Análise espacial dos padrões de desmatamento na região Amazônica através de dados PRODES e MODIS** (Nilson Clementino Ferreira, Laerte Guimaraes Ferreira, Alfredo R. Huete, Manuel Eduardo Ferreira)
- [7.9](#) **Avaliação dos índices de vegetação MODIS para a detecção de mudanças na cobertura vegetal do Cerrado.** (Eristelma Teixeira Jesus, Laerte Guimarães Ferreira, Manuel Eduardo Ferreira, Nilson Clementino Ferreira, Alfredo Huete, Edson Eyji Sano)
- [7.10](#) **Sistema para Visualização e Análise da Qualidade das imagens MOD13** (Fábio Lobo, Nilson Clementino Ferreira, Laerte Guimaraes Ferreira, Tomoaki Miura, Kamel Didan)

Plenária III (Plenary III)

Coordenador (Chair): Michael Keller

- [8.1](#) **Desvendando as Complexidades do Ciclo do Carbono na Amazônia** (*Unraveling the Complexities of the Carbon Cycle in the Amazon*) (Antonio Nobre)
- [8.2](#) **Padrões Espaciais da Dinâmica do Carbono na Floresta, Biomassa e Mudanças da Biomassa ao longo de diferentes regiões da Bacia Amazônica** (*Spatial Patterns in Forest Carbon Dynamics, Biomass and Biomass Change Across the Amazon Basin.*) (Yadvinder Singh Malhi, Oliver L. Phillips, Timothy R. Baker, Sandra Patiño, Jonathan James Lloyd)
- [8.3](#) **Floresta Primária do Tapajós: Comparação dos dados de Tapajós para Carbono, Forçantes Climáticas e Demografia Florestal através da Amazônia** (*Tapajos Primary Forest Study in Context: Comparison of Tapajos Data for Carbon Budgets, Climatic Forcing and Forest Demography Across Amazonia.*) (Steven C. Wofsy, Scott R. Saleska, James William Munger, Lucy Hutyrá, Gregory W. Santoni, Victoria Y. Chow, Bruce C. Daube, John W. Budney, Alfram V. Bright, Michael M. Keller, Michael William Palace, Patrick Michael Crill, Hudson Silva, Michael L. Goulden, Scott Dennis Miller, Humberto Ribeiro da Rocha, Plínio Barbosa de Camargo, Simone Aparecida Vieira, Volker Kirchhoff, David Roy Fitzjarrald, Ricardo Sakai, Osvaldo Luiz Leal de Moraes)

Plenária IV (Plenary IV)

Coordenador (Chair): Flavio Luizao

- [9.1](#) **Processos do Sistema Terrestre e Saúde Humana: Articulações na Amazônia** (*Earth System Processes and Human Health: Linkages in the Amazon*)
(Ulisses E.C. Confalonieri)
- [9.2](#) **A Escala Regional e Planetária das "Mercadorias e Serviços" fornecidos pela Floresta Amazônica: Analisando os compromissos entre as necessidades humanas e a Funções Ambientais** (*Regional- and Planetary-scale "Goods and Services" Provided by the Amazon Basin: Examining Trade-Offs Between Human Needs and Environmental Function*)
(Jonathan A. Foley)
- [9.3](#) **A relevância para políticas públicas das "Ciências das Dimensões Humanas" do LBA: Uma Revisão das Realizações e Oportunidades** (*Policy Relevance of LBA "Human Dimensions" Science: A Review of Accomplishments and Opportunities*)
(Daniel Curtis Nepstad)

Sessões Paralelas II (Parallel Sessions II)

Sessões Paralelas III - Pesquisas em Destaque (RH) e Sessões Especiais (S) (*Parallel Sessions III - Research Highlights (RH) and Special Sessions (S)*)

RH2: Pesquisas em Destaque - Carbono, Biogeoquímica, e Hidrologia (*Research Highlights: Carbon, Biogeochemistry, and Hydrology*)

Coordenadores (Chairs): Humberto Rocha, Jeffrey Richey

- [10.1](#) **The Biological Control of Carbon Pathways Inside the Plant as a Response to Changing Environment: a Learning Experience** (*Marcos Silveira Buckeridge*)
- [10.2](#) **Stable isotopes: integrators and tracers of processes from the leaf and microbe to the atmosphere and basin.** (*Joe Berry, Luiz Antonio Martinelli, Jim Ehleringer*)
- [10.3](#) **The water balance of a forested tropical basin near Manaus: Impacts of the interannual variability of climate on the hydrological cycle.** (*Javier Tomasella, Martin George Hodnett, Luz A. Cuartas, Antônio D. Nobre, Maarten Waterloo, Sylvia Mota de Oliveira*)
- [10.4](#) **Seasonal and interannual variability of Amazon carbon and water vapour exchange in response to the environment** (*Bart Kruijt, Antonio Donato Nobre, Antonio Ocimar Manzi, Celso Von Randow, Alessandro Carioca de Araujo, Yadvinder Singh Malhi, Paulo Jorge Oliveira, John Grace, Fernando Cardoso, Nicolau Priante Filho, George Luiz Vourlitis, Yves-Marie Gardette, Leonardo Deane de Abreu Sá, John H. C. Gash, Eddy Moors*)
- [10.5](#) **Controls on tropical forest CO₂ and energy exchange** (*Michael L. Goulden, Scott Dennis Miller, Humberto Ribeiro da Rocha, Christopher E Doughty, Adelaine Michela e Silva Figueira, Helber Custódio de Freitas, Cleilim Albert Dias de Sousa*)
- [10.6](#) **From dry to flooded, from Cerrado to Forest : scaling the CO₂ and H₂O atmospheric fluxes across tropical ecosystems** (*Humberto Ribeiro da Rocha*)
- [10.7](#) **Carbon, biogeochemistry, and hydrology: from terrestrial to aquatic systems** (*Johannes Lehmann, Mark S. Johnson, Eduardo Couto, Susan Riha, Luiz Carlos Mattos Rodrigues, Mara Abdo, Evandro C. Selva, Erick C.M. Fernandes*)
- [10.8](#) **Coupling of Carbon, Biogeochemical, and Hydrological Cycles: A Fluvial Perspective** (*Jeffrey E. Richey, Reynaldo Luiz Victória*)
- [10.9](#) **Multi-scale analyses of inundation and wetland vegetation dynamics: Applications to measurements and modeling of carbon fluxes** (*John Melack, Evlyn Novo, Laura Hess, Maycira Costa, Bruce Forsberg*)
- [10.10](#) **Tropical forests and the global nitrous oxide budget** (*Jerry M. Melillo, Carlos Clemente Cerri, Paul A. Steudler, Diana C. Garcia-Montiel, Christopher Neill, Brigitte J. Feigl*)

S3: Sessões Especiais - O Papel do Ecossistema Amazônico na Determinação das Variabilidades Climáticas Regional e Global. (*Role of Amazon Ecosystem in Determining Regional and Global Climate Variabilities*)

Coordenadores (Chairs): Rong Fu, Tercio Ambrizzi

- [11.1](#) **How are Land Properties in a Climate Model Coupled through the Boundary Layer to Affect the Amazon Hydrological Cycle?** (*Robert Earl Dickinson*)
- [11.2](#) **Oceanic Influence on Brazilian Rainfall** (*W. Timothy Liu, Wenqing Tang, Rong Fu*)
- [11.3](#) **The influence of land surface on the wet season onset over the Amazonia** (*Wenhong Li, Rong Fu*)
- [11.4](#) **Seasonal variations in C and H₂O cycling of a tropical transitional forest** (*George Louis Vourlitis, Nicolau Priante Filho, José de Souza Nogueira, Luciana Sanches, Fernando Raiter, Wander Hoeger, Eduardo Jacusiel Miranda, George Sanches Suli, Carla Valentini*)
- [11.5](#) **The atmospheric boundary layer characteristics over forest and pasture in the Amazon region** (*Gilberto Fisch*)
- [11.6](#) **Hydraulic redistribution in amazonian trees** (*Rafael S Oliveira, Todd E Dawson, Stephen O Burgess, Daniel Curtis Nepstad*)
- [11.7](#) **Is the Amazon Heat Source Relevant for Higher Latitude Climate Anomalies?** (*Pedro Leite Silva Dias, Jose Aravequia, Carlos F.M. Raupp*)
- [11.8](#) **Can Amazon Rainfall influence the Winter Weather over Europe and North America?** (*Rong Fu, Robert E. Dickinson, Mingxuan Chen, Hui Wang*)
- [11.9](#) **Teleconnection between tree growth in the Amazonian floodplains and the El Niño-Southern Oscillation effect** (*Jochen Schoengart, Maria Teresa Fernandez Piedade, Wolfgang Johannes Junk, Martin Worbes*)
- [11.10](#) **Tree ring studies related to carbon uptake in Amazon lowland forests: Tree Growth and Climate** (*Marco Sack, Wolfgang Johannes Junk, Maria Teresa Piedade, Jochen Schöngart, Martin Worbes*)

S15: Sessões Especiais - Efeitos da Estiagem na Dinâmica do Carbono da Floresta: Resultados de Experimentos de Manipulação de Chuvas (*Drought Effects on Forest Carbon Dynamics: Results From Rainfall Manipulation Experiments.*)

Coordenadores (Chairs): Patrick Meir, Paulo Moutinho

- [12.1](#) **Large carbon emissions from Amazon forests through drought-induced tree mortality and suppression of wood production** (*Daniel Curtis Nepstad, David Ray, Paulo Roberto Moutinho, Ingrid Marisa Tohver, Gina Knust Cardinot*)
- [12.2](#) **Changes in carbon cycling by Brazilian rain forest: effects of soil moisture reduction on soil, leaves and canopy** (*Patrick Meir, Antônio Carlos Lôla da Costa, Samuel Almeida, Fisher Alice Rosie, Raquel Lobo do Vale, Raquel Medeiros, Sotta Doff Eleneide, Rafael Ferreira Costa, Jose Maria Nogueira da Costa, Cláudio José Reis de Carvalho, Lou Ruivo, Edso Veldkamp, Manuela Chaves, Mathew Williams, Yadvinder Singh Malhi, John Grace*)
- [12.3](#) **Dry-season irrigation alters carbon dynamics in tropical forest regrowth** (*Daniel Jacob Zarin, Débora Veiga Aragão, Maristela Machado Araújo, Cláudio José Reis de Carvalho, Lucas Fortini, Izildinha Miranda, Stephen S. Mulkey, Francisco Assis Oliveira, Patricia Delamonica Sampaio, Joanna Tucker, Steel Silva Vasconcelos*)
- [12.4](#) **Drought tolerance of Amazon trees reflects a low vulnerability to cavitation: results from a large scale rainfall exclusion experiment.** (*Gina Knust Cardinot, N. Michele Holbrook, Daniel Curtis Nepstad*)
- [12.5](#) **Soil CO₂ production and transport in the drought experiment in Caxiua National Forest, Para, Brazil.** (*Eleneide Doff Sotta, Rosiene Keila da Paixao, Brenda Rocha Guimaraes, Alessandro Rosario, Antônio Carlos Lôla da Costa, Edzo Veldkamp, Patrick Meir, Maria de Lourdes Pinheiro Ruivo, Luitgard Schwendenmann*)
- [12.6](#) **Moisture availability constrains soil trace gas fluxes in an eastern Amazonian regrowth forest** (*Steel Vasconcelos, Daniel Zarin, Eric Davidson, Françoise Ishida, Elisana Santos, Maristela Machado Araújo, Débora Veiga Aragão, Lívia Rangel-Vasconcelos, Francisco Assis Oliveira, William McDowell, Cláudio José Reis de Carvalho*)
- [12.7](#) **Stable isotope analyses provide evidence of drought stress impacting plant function at the Seca Floresta** (*James R Ehleringer, Jean P Ometto, Françoise Y Ishida, Luiz Antonio Martinelli, Joseph A Berry, Tomas Domingues, Haroldo Jackson Silva, Edmar Mazzi, Daniel Curtis Nepstad*)
- [12.8](#) **Correlation but no causation between leaf nitrogen and maximum assimilation: the role of drought and reproduction in gas exchange in an understory tropical plant *Miconia ciliata* (Melastomataceae)** (*Débora Veiga Aragão, Lucas B Fortini, Stephen S. Mulkey, Daniel J Zarin, Maristela Machado Araújo, Cláudio José Reis de Carvalho*)

[12.9](#) **Coupling soil hydraulics to stomatal conductance; a mechanism for modelling the impacts of drought on forest gas exchange.** (Rosie Alice Fisher, Mathew Williams, Antônio Carlos Lôla da Costa, Maria de Lourdes Pinheiro Ruivo, *Patrick Meir*)

S7: Sessões Especiais - Estradas e Mudanças no Uso da Terra e Desflorestamento na Amazônia Brasileira. (Roads, Land-Cover and Land-Use Changes in Brazilian Amazon)

Coordenadores (Chairs): Eustáquio Reis, Marcellus Caldas

[13.1](#) **Understanding the Function of Roads in Land Cover Change** (Robert Walker, *Marcellus Caldas*, Stephen G Perz, Eugenio Arima)

[13.2](#) **Determinantes e Tendências da Ocupação da Amazônia** (Eustáquio J Reis, *Ajax B Moreira*)

[13.3](#) **Amazon Soybean Transport Costs** (*Maria del Carmen Vera-Diaz*, Robert Kaufmann, Daniel Curtis Nepstad)

[13.4](#) **Land Use and Transportation Costs in the Brazilian Amazon** (*Diana Weinhold*, Eustaquio Reis)

[13.5](#) **As mudanças sócio-ambientais na Amazônia Sul-Occidental: Avaliação pelas populações ao longo da Estrada Interoceânica no Estado do Acre, Brasil e no Departamento de Madre de Dios, Peru.** (*Elsa Huamán Mendoza*, Irving Foster Brown, Daniel Curtis Nepstad, Armando Muñante, Rodrigo Serrano, Denise Temporim Furtado, Sumaia Vasconcelos, Mercedes Peralta, Jessica Swansson, Socorro Pea)

[13.6](#) **Roads: A Proximate or Underlying Cause of Deforestation?** (*Marie Scouvert*, Eric Lambin)

[13.7](#) **Heterogeneity in Road-building Processes and Road Network Architecture: A Comparison of Two Amazonian Arenas and Implications for Projecting Future Land Cover** (*Stephen G Perz*, Marcellus M Caldas, Robert T Walker)

[13.8](#) **Logging roads in the Amazon basin and forest fragmentation: modeling challenges** (*Eugenio Arima*)

[13.9](#) **Basin-Scale Econometric Modeling I: road endogeneity and road impacts** (*Alexander Pfaff*, Eustaquio Reis, Claudio Bohrer, Juan Robalino)

[13.10](#) **Basin-Scale Econometric Modeling II: spatial disaggregation and spatial impacts** (*Alexander Pfaff*, Eustaquio Reis, Claudio Bohrer, Juan Robalino)

S19: Sessões Especiais - Avaliações de Precisão e Suas Implicações Para o Monitoramento de Fogo e Desflorestamento (Accuracy Assessments and their Implications for Fire and Deforestation Monitoring)

Coordenadores (Chairs): I. Foster Brown, Jeffrey Morisette

[14.1](#) **Números de Desflorestamento Devem Incorporar Fundamentos de Medidas** (*Alberto W Setzer*)

[14.2](#) **Public policy implications of accuracy assessment for fire and deforestation monitoring: Don't forget the error bars** (*Irving Foster Brown*)

[14.3](#) **Incorporating the use of MODIS data into INPE deforestation mapping** (*Yosio Shimabukuro*, Ruth DeFries, Douglas Morton, Liana Anderson, Marcelo Lopes Latorre, Matthew Hansen, Ellen Jasinski)

[14.4](#) **Representatividade e limitações dos dados da detecção orbital de queimadas do INPE** (*Alberto W Setzer*)

[14.5](#) **Characterizing Vegetation Fire Regimes in Brazil Through Adjusted Satellite Fire Detection Data** (*Wilfrid Schroeder*, *Jeffrey Thomas Morisette*, Louis Giglio, Ivan Csiszar, Douglas Morton, Christopher O. Justice, João Antonio Raposo Pereira)

[14.6](#) **Validation and comparison of Terra/MODIS active fire detections from INPE and NASA/UMd algorithms** (*Jeffrey Thomas Morisette*, Ivan Csiszar, Louis Giglio, Wilfrid Schroeder, Douglas Morton, João Antonio Raposo Pereira, Christopher O. Justice)

[14.7](#) **Dinâmica das queimadas no Estado do Mato Grosso** (*Alexandre Camargo Coutinho*)

[14.8](#) **Passive ground-based analyses for interpreting satellite fire data - Applications to AVHRR and MODIS active fire detections in Amazonia** (*Manoel Cardoso*, George Hurtt, Berrien Moore III, Carlos Afonso Nobre, Heather Bain)

- [14.9](#) **Remote Sensing Database for the LBA Project** (*Dalton M. Valeriano, Yosio E. Shimabukuro, Laura Hess, John Melack, Evlyn Novo, Claudio F. Barbosa, Egidio Arai, Fernando D. B. Espirito-Santo, Adriana G. Affonso*)

S21: Sessões Especiais - Impacto de Partículas de Aerossol no Clima da Amazônia (*Impact of Aerosol Particles on the Amazonian Climate*)

Coordenadores (Chairs): Meinrat O. Andreae, Vanderlei Martins

- [15.1](#) **CCN Variability During LBA-SMOCC-EMfin! 2002 and Its Role on Precipitation Initiation Over the Amazon Basin** (*Alexandre Araújo Costa, Antonio Charles Silvério, Gerson Almeida Paiva*)
- [15.2](#) **Cloud Condensation Nuclei concentrations in the Amazon Basin** (*Göran Frank, Greg Roberts, Erik Swietlicki, Paulo Artaxo, Luciana Varanda Rizzo, Pascal Guyon, Olga L. Mayol-Bracero, Anders Erik Vestin, Jenny Rissler, Jingchuan Zhou, Meinrat O. Andreae*)
- [15.3](#) **Role of aerosol chemical composition on the formation of cloud condensation nuclei during biomass burning periods** (*Swen Metzger, Ivonne Trebs, Laurens Ganzeveld, Jos Lelieveld, Philip Stier, Franz X. Meixner, Meinrat O. Andreae, Paulo Artaxo*)
- [15.4](#) **Airborne Measurements of Trace Gases and Aerosol Particles Emission Ratios From Biomass Burning in Amazonia** (*Pascal Guyon, Göran Frank, Michael Welling, Paulo Artaxo, Gilberto Nishioka, Jonathan James Lloyd, Olaf Kolle, Maria Assução Faus da Silva Dias, Luciana Vanni Gatti, Ana Maria Leal Cordova, Meinrat O. Andreae*)
- [15.5](#) **Comments on "Smoking Rain Clouds over the Amazon" by M.O. Andreae, D. Rosenfeld, P. Artaxo, A.A. Costa, G.P. Frank, K.M. Longo and M.A.F. Silva-Dias** (*Earle Williams*)
- [15.6](#) **Characteristics of the Precipitating Systems during the 2002 Dry-to-Wet Field Campaign in the Amazon Region.** (*Carlos Augusto Morales, Luiz Augusto Toledo Machado, Maria Assução Faus da Silva Dias, Wando Amorim, Maria E. Frediani, Rachel Albrech*)
- [15.7](#) **Airborne and Ground Based Measurement of the Vertical Structure of Cloud Properties** (*J. Vanderlei Martins, Yoram J. Kaufman, Paulo Artaxo, Lorraine A. Remer, Daniel Rosenfeld, Ilan Koren*)
- [15.8](#) **O contexto "Green Ocean" visto através da distribuição de gotículas de nuvem e sua representatividade por uma função gama generalizada.** (*Jorge A. Martins, Fábio L. T. Gonçalves, Maria Assução Faus da Silva Dias*)
- [15.9](#) **Global Simulation of the Indirect Aerosol Effect With the ECHAM5 GCM** (*P Stier, J Feichter, S Kinne, U Lohmann, J Zhang*)
- [15.10](#) **Biomass burning and implications for the pattern of nitrogen deposition in the Amazon Basin** (*Luciene Lorandi Lara, Paulo Artaxo, Elisabeth A. Holland, Theotonio Pauliquevis*)

Plenária V (Plenary V)

Coordenador (Chair): Mercedes Bustamante

- [16.1](#) **Entendendo a Hidrologia de Superfície da Amazônia: Uma Visão Biogeoquímica** (*Understanding the Surface Hydrology of Amazônia: A Biogeochemical View*) (*Reynaldo Victória*)
- [16.2](#) **Degradação de Pastagem, Desenvolvimento da Floresta Secundária, e Produtividade da Floresta Madura: Os Nutrientes são Importantes?** (*Pasture Degradation, Secondary Forest Regrowth, and Mature Forest Productivity: Do Nutrients Matter?*) (*Eric A Davidson*)
- [16.3](#) **Aproveitando a Biogeoquímica e o Conhecimento Tradicional para a Regeneração de áreas desmatadas e degradadas na Amazônia** (*Harnessing Biogeochemistry and Traditional Knowledge For Regenerating Deforested and Degraded Lands in the Amazon*) (*Erick C. M. Fernandes*)

Plenária VI (Plenary VI)

Coordenador (Chair): Regina Luizao

- [17.1](#) **Como as Descobertas do LBA podem ser Úteis para a Agricultura na Amazônia?** (*How can LBA Achievements be Useful to Agriculture in Amazônia?*) (*Tatiana Deane de Abreu Sá*)

- [17.2](#) **Sensoriamento Remoto do Corte Seletivo de Madeira: Desafios, Sucessos e o Futuro** (*Remote Sensing of Selective Logging: Challenges, Successes, and the Future*)
(Gregory Paul Asner, Carlos Moreira de Souza Jr.)
- [17.3](#) **Uma Análise Integrada da Ecologia, Uso da Terra e Dinâmica da Cobertura Florestal na Amazônia Oriental** (*An Integrated Analysis of Ecology and Land Use and Land Cover Dynamics in Eastern Amazonia*)
(Ima Célia Guimarães Vieira)

Sessões Paralelas III (*Parallel Sessions III*)

Sessões Paralelas III - Pesquisas em Destaque (RH) e Sessões Especiais (S) (*Parallel Sessions III - Research Highlights (RH) and Special Sessions (S)*)

RH1: Pesquisas em Destaque - Física do Clima e Química da Atmosfera (*Research Highlights: Physical Climate and Atmospheric Chemistry*)

Coordenador (Chair): Saulo Freitas

- [18.1](#) **Hydroelectric Dams in Amazônia as Contributors to Global Warming: The Controversy Heats Up** (*Philip M. Fearnside*)
- [18.2](#) **Mesoclimate of the LBA-ECO Santarém Study Area** (*David Roy Fitzjarrald, Ricardo Kendi Sakai, Osvaldo Luiz Leal de Moraes, Matthew J. Czikowsky, Acevedo Otavio C., Raimundo Cosme de Oliveira Jr.*)
- [18.3](#) **Observations and Simulations of the Water and Energy balances in the Amazon Basin** (*José A. Marengo, Carlos Afonso Nobre, Helio Camargo, Candido Luiz, Castro A Christopher*)
- [18.4](#) **Hydroclimatological Teleconnections due to land-cover change in Amazonia** (*Roni Avissar, David Werth*)
- [18.5](#) **Comparisons of the Amazon and Congo River Basins: Hydrology, Fire, Thermodynamics and Lightning** (*Earle Williams, Gabriella Satori*)
- [18.6](#) **The relationship between biomass burning aerosols, cloud condensation nuclei and cloud structure in Amazonia** (*Paulo Artaxo, Meinrat O. Andreae, Daniel Rosenfeld, Göran Frank, Pascal Guyon, Luciana Varanda Rizzo, Theotonio Pauliquevis, Maria Assução Faus da Silva Dias*)
- [18.7](#) **Trace Gases Concentrations during Dry and Wet Seasons in the Amazon Basin** (*Luciana Vanni Gatti, Ana Maria Leal Cordova, Amelia Yamazaki, Angelica Pretto, James William Munger, Paulo Artaxo, Carlos Augusto Bauer Aquino, Lizia Murbach, Williams Castro Martins, Meinrat O. Andreae, Franz Meixner, Duli Chand, Ivonne Trebs*)
- [18.8](#) **Impact of Amazonian deforestation on the oxidizing capacity of the atmosphere** (*Laurens Ganzeveld, Lex Bouwman, Bas Eickhout, Patrick Joeckel, Jos Lelieveld, Swen Metzger, Rolf Sander, Meryem Tanarhte*)
- [18.9](#) **Testing interactions between radiation, carbon and water cycles using the LBA data** (*Yongkang Xue, Fernando Henrique De Sales, Jim Collatz, Xiwu Zhan*)

S2: Sessões Especiais - Uma Década de Progresso na Modelagem de Produtividade de Ciclagem de Carbono e Hidrologia de Superfície na Bacia Amazônica. (*A Decade of Progress in Modeling Productivity, Carbon Cycling and Surface Hydrology Across the Amazon Basin*)

Coordenadores (Chairs): Chris Potter, Marcos Costa

- [19.1](#) **A Decade of Progress in Modeling the Hydroclimatology of the Amazon System** (*Marcos Heil Costa*)
- [19.2](#) **Recent Progress in Modeling Biome-Climatic Interactions in Amazonia** (*Carlos Afonso Nobre*)
- [19.3](#) **Advances in Modeling Land Surface Hydrology in Amazonia** (*Michael T Coe*)
- [19.4](#) **Recent Progress in Mesoscale Atmospheric Modeling** (*Maria Assução Faus da Silva Dias*)
- [19.5](#) **Recent progress in modeling surface hydrology across the Amazon Basin using a Variable Infiltration Capacity approach** (*Daniel de Castro Victoria, Jeffrey E. Richey, Mariza C. Costa-Cabral, Alailson Venceslau Santiago, Antonio Roberto Pereira, Emilio Mayorga, Reynaldo Luiz Victória, Maria Victoria Ramos Ballester*)
- [19.6](#) **Recent progress in estimating suspended sediment yield variability in the Amazon River** (*Jean Loup Guyot, Naziano Filizola, Alain Laraque*)

- [19.7](#) **Advances in Understanding Land Cover/Land Use Changes for Biogeochemical and Hydrological Modeling** (*Diogenes S Alves*)
- [19.8](#) **Recent Progress in Measuring and Modeling Patterns of Biomass and Soil Carbon Pools Across the Amazon Basin** (*Christopher Potter, Yadvinder Singh Malhi*)
- [19.9](#) **Recent Progress in Understanding Terrestrial Carbon Cycles in the Amazon Basin** (*Susan E. Trumbore, Plínio Barbosa de Camargo, Simone Aparecida Vieira, Jeffrey Q Chambers, Niro Higuchi, Diogo Selhorst, Everaldo Telles*)
- [19.10](#) **Towards a Model of Carbon Mobilization, Advection, and Reaction in the Amazon River** (*Jeffrey E. Richey, Anthony A Aufdenkampe, Alex K Krusche, Daniel Victoria, Maria Ballester*)

S4: Sessões Especiais - Controle do Solo na Biogeoquímica dos Rios. (*Soil Control on Stream Biogeochemistry*)

Coordenadores (Chairs): Alex Krusche, Johannes Lehmann

- [20.1](#) **A hydrological framework for biogeochemical studies** (*Helmut Elsenbeer, Jorge Marcos de Moraes*)
- [20.2](#) **Hydrological Processes in Small Forest and Pasture Catchments of the Eastern Amazonia** (*Marysol A. E. Schuler, Jorge Marcos de Moraes, Thommas Dunne, Ricardo de O. Figueiredo, Daniel Markewitz, Eric A. Davidson, Reynaldo L. Victória*)
- [20.3](#) **Physical and Anthropogenic Controls of the Biogeochemistry of the Ji-Paraná River Basin (Western Amazônia)** (*Victoria R. Ballester, Alex V. Krusche, Nei Leite Kavaguishi, Beatriz Machado Gomes, Daniel de Castro Victoria, Alexandra Ayres Montebelo, Christopher Neill, Linda Deegan, Jeffrey E. Richey, Reynaldo Luiz Victória*)
- [20.4](#) **Stream water chemistry in three meso-scale hydrologic basins in Eastern Amazonia** (*Ricardo de O. Figueiredo, Daniel Markewitz, Eric A. Davidson, Ewerton da S. Cunha, Marysol A. E. Schuler, Patrício de S. Silva*)
- [20.5](#) **The chemistry of two streams draining kaolinitic soils** (*Daniel Markewitz, Ricardo de O Figueiredo, Eric A Davidson, Mercedes Maria Cunha Bustamante, Lucilia Parron, Julio Resende*)
- [20.6](#) **Significant seasonal and event-driven changes of carbon and nutrient fluxes to first-order streams of an Amazon forest** (*Mark S. Johnson, Johannes Lehmann, Evandro Carlos Selva, Eduardo Guimarães Couto, Mara Abdo, Erick C.M. Fernandes, Susan Riha*)
- [20.7](#) **The role of sorption in retention of dissolved organic carbon in soils of the lowland Amazon basin** (*Sonya M Remington, Vania Neu, Jeffrey E. Richey, Erin Ellis*)
- [20.8](#) **Hydrologic nitrogen losses from tropical forest soils -- patterns and implications.** (*Lars O Hedin, Megan McGroddy, Ben Houlton, Emilio F. Moran, Mateus Battisella*)
- [20.9](#) **Key Connections in Amazon Stream Corridors: Using ¹⁵N to Trace N Transformations and Transport** (*Linda A. Deegan, Christopher Neill, Reynaldo L. Victória, Christie L. Hauptert, Victoria Ballester, Alex V. Krusche, Suzanne M. Thomas*)
- [20.10](#) **Controls of land-water nitrogen movement through small lowland Amazonian forest and pasture drainage basins in Rondônia** (*Christopher Neill, Linda A. Deegan, Alex V. Krusche, Victoria R. Ballester, Helmut Elsenbeer, Jorge Marcos de Moraes, Reynaldo L. Victória, Suzanne M. Thomas, Christie L. Hauptert, Marisa Cássia Piccolo*)

S12: Sessões Especiais - Eventos de Perturbações na Ecologia e Biogeoquímica de Florestas Tropicais (*Disturbance Events and Tropical Forest Ecology and Biogeochemistry*)

Coordenadores (Chairs): Carlos Souza, Scott Saleska

- [21.1](#) **Amazon-wide Forest Gap Fraction and Selective Logging from Satellite Analyses** (*Gregory Paul Asner, José Natalino Macedo Silva, Mercedes Maria Cunha Bustamante, Michael M. Keller, Amanda Naslund Cooper, Lydia Olander, David E. Knapp*)
- [21.2](#) **Micrometeorology, CO₂ and H₂O Exchange of a Tropical Rainforest Before and After Selective Logging** (*Scott Dennis Miller, Michael L. Goulden, Humberto Ribeiro da Rocha, Mary Catherine Menton, Adelaine Michela e Silva Figueira, Cleilim Albert Dias de Sousa, Augusto Rodrigues Maia, Helber Custódio de Freitas, Ed Read*)
- [21.3](#) **Selective Logging Effects on Carbon Budgets at Three Sites in the Brazilian Amazon** (*Michael M. Keller, Michael William Palace, José Natalino Macedo Silva, Gregory Paul Asner*)
- [21.4](#) **Biomass and Necromass in Three Undisturbed Forests in the Brazilian Amazon** (*Michael William Palace, Michael M. Keller, Gregory Paul Asner, José Natalino Macedo Silva*)

- [21.5](#) **Canopy structure and radiation environment metrics indicate forest developmental stage, disturbance, and certain ecosystem functions** (*Geoffrey Parker, David Roy Fitzjarrald*)
- [21.6](#) **Natural disturbance regimes and tropical forest carbon balance: integrating canopy structure, flux measurements, and modeling across the landscape** (*Scott R. Saleska, Paul R. Moorcroft, David Roy Fitzjarrald, Geoffrey G. Parker, Plínio Barbosa de Camargo, Steven C. Wofsy*)
- [21.7](#) **What's driving regional changes in old-growth tropical forests?** (*Jeffrey Q Chambers, Niro Higuchi, Joaquim dos Santos, Liliane Martins Teixeira, Susan E. Trumbore*)
- [21.8](#) **Quantifying the effect of sporadic forest disturbances on measured biomass change in forest plots** (*Yadvinder Singh Malhi*)
- [21.9](#) **Variation in ages and growth rates of trees in Amazonian tropical forests: consequences for carbon and forest management** (*Simone Aparecida Vieira, Plínio Barbosa de Camargo, Diogo Selhorst, Niro Higuchi, Luiz Antonio Martinelli, Susan E. Trumbore*)
- [21.10](#) **Seasonal dynamics of soil, litter, and ecosystem respiratory carbon dioxide fluxes as indicated by stable isotope analyses** (*Jean Pierre Ometto, James R Ehleringer, Luiz Antonio Martinelli, Joseph Berry, Françoise Yoko Ishida, Tomas Ferreira Domingues, Haroldo Jackson Silva, Edmar Mazzi*)

S13: Sessões Especiais - Integrando Mudanças dos Usos da Terra, Respostas do Ecossistema e Sistemas Climáticos na Bacia Amazônica (*Integrating Land Use Change, Ecosystem Responses, and Climate Systems in the Amazon Basin.*)

Coordenadores (Chairs): Britaldo Soares, Daniel Nepstad

- [22.1](#) **Amazon scenarios: modeling the interactions of ecosystems, climate, and land use** (*Daniel Curtis Nepstad, Britaldo Silveira Soares Filho, Ane Auxiliadora Alencar*)
- [22.2](#) **Integrated Ecological Economics Modeling of Ecosystem Services from Brazil's Amazon Rainforest** (*Rosimeiry Portela*)
- [22.3](#) **A spatially explicit simulation model of deforestation for the Amazon Basin** (*Britaldo Silveira Soares Filho, Daniel Curtis Nepstad, Gustavo Coutinho Cerqueira, Ane Alencar, Eliane Voll, Paul A. Lefebvre*)
- [22.4](#) **Analysis of the influence of spatial variables on the location of deforestation in the Brazilian Amazon** (*Britaldo Silveira Soares Filho, Hermann O. Rodrigues, Daniel Curtis Nepstad, Gustavo Coutinho Cerqueira, Eliane Voll, Ane Alencar*)
- [22.5](#) **Reconciling competing land uses along the BR-163 highway: steps towards science-based, participatory land use zoning** (*Ane A.C. Alencar, Daniel Curtis Nepstad, Oriana T. Almeida, Maria Del Carmen V. Diaz*)
- [22.6](#) **Amazon Soybean Expansion: Yield and Rent Models** (*Maria del Carmen Vera-Diaz, Robert Kaufmann, Peter Schlesinger, Daniel Curtis Nepstad*)
- [22.7](#) **A Demographic Dynamics System for the Brazilian Amazon's Municipalities.** (*Ricardo Alexandrino Garcia, Britaldo Silveira Soares Filho, Daniel Curtis Nepstad*)
- [22.8](#) **Estimating Amazonian forest fire probability based on edaphic and climatic factors and proximity to land-use and infrastructure.** (*Paul A. Lefebvre, Daniel Curtis Nepstad, Ane A. Alencar*)
- [22.9](#) **Effects of Land Use Change on Vertebrate Populations in a Dynamic Frontier in Amazonia** (*Claudia Azevedo-Ramos, Lisa M. Curran, Alice MacDonald, Ana Cristina M. Oliveira, Oswaldo de Carvalho Jr*)
- [22.10](#) **Biomass of Amazonian Forest and Greenhouse Gas Emissions: New Data and Controversies** (*Philip M. Fearnside, Euler Melo Nogueira, Bruce W. Nelson*)

S18: Sessões Especiais - Florestas Secundárias na Paisagem Amazônica: Estudos de Campo e de Sensoriamento Remoto que Aprimorem Nossa Compreensão da Dinâmica Espacial, Temporal e Biogeoquímica das Florestas Secundárias (*Secondary Forests in the Amazonian Landscape: Field Studies and Remote Sensing Studies That Advance our Understanding of the Spatial, Temporal, and Biogeochemical Dynamics of Secondary Forests*)

Coordenadores (Chairs): Eric Davidson, Mateus Batistella

- [23.1](#) **Changing enzymatic activities and mycorrhizal infections in a chronosequence of secondary and mature forests of eastern Amazonia** (Cláudio José Reis de Carvalho, Eric Atlas Davidson, Tereza Primo dos Santos, Fábio Carneiro Dutra, Bruno de Oliveira Serrão)
- [23.2](#) **Caracterização de Estádios Sucessionais na Amazônia: Resultado do Mapeamento no Sítio Experimental da Floresta Nacional do Tapajós** (Fernando Del Bon Espírito-Santo, Yosio Edemir Shimabukuro, João Roberto dos Santos, Tatiana Mora Kuplich)
- [23.3](#) **O desmatamento na região de Roraima e sua relação com áreas de regeneração da floresta: Um indicador do uso da terra** (Alexandre Junqueira Homem de Mello)
- [23.4](#) **Integrating field data and remote sensing to study secondary forests in Amazonian rural settlements** (Mateus Batistella, Dengsheng Lu)
- [23.5](#) **A Survey of Remote Sensing Methods for Mapping Second Growth Forests in Amazônia** (Dar Alexander Roberts, William Salas)
- [23.6](#) **Responses to fertilization of secondary forest growth following pasture abandonment in central Amazônia, Brazil** (Ted R. Feldpausch, Susan J. Riha, Erick C.M. Fernandes, Elisa V. Wandelli)
- [23.7](#) **Carbon budget estimation in Central Amazonia: successional forest modelling from remote sensing data** (Till Neeff, Paulo M Graça, Luciano V Dutra, Corina C Freitas, Liana O Anderson)
- [23.8](#) **Legacy of Fire Slows Carbon Sequestration in Amazonian Forest Regrowth** (Daniel Jacob Zarin, Ima Vieira, Patricia Delamonica Sampaio, Rita Guimarães Mesquita, Ted Feldspach, Mark Ducey, Eric Davidson, Eduardo Sonnewend Brondizio)

Sessão de Postêres (Poster Session)

AC (Química da Atmosfera) / AC (Atmospheric Chemistry)

AC_Aerossóis (AC_Aerosols)

- [24.1-P](#) **CCN Closure Study for Amazonian Dry Season Biomass Burning Aerosol** (Anders Erik Vestin, Erik Swietlicki, Jenny Rissler, Jingchuan Zhou, Göran Frank, Meinrat O. Andreae)
- [24.2-P](#) **Long-Term Monitoring of Atmospheric Aerosols in the Amazon Basin: Balbina and Santarem - aerosol source identification and apportionment** (Maria Lucia Antunes, Paulo Artaxo)
- [24.3-P](#) **Long-Term Monitoring of Atmospheric Aerosols in the Amazon Basin: Alta Floresta and Rondônia - aerosol source identification and apportionment** (Maria Lúcia Antunes, Paulo Artaxo)
- [24.4-P](#) **Historical record of trace elements in aerosols from Western Amazon Basin during 20th century (1919-1999) from Illimani ice core, Bolivian Andes** (Alexandre Correia, Robert J Delmas, Remi Freydier, Jean-Denis Taupin, Paulo Artaxo, Bernard Dupre)
- [24.5-P](#) **Deposition fluxes of trace elements in Western Amazon Basin during 20th century inferred from Illimani ice core, Bolivian Andes** (Alexandre Correia, Robert J Delmas, Remi Freydier, Jean-Denis Taupin, Paulo Artaxo, Bernard Dupre)
- [24.6-P](#) **O Monitoramento Atmosférico em Rio Branco - AC, uma Contribuição do LBA** (Alejandro Fonseca Duarte, Eduardo Vieira Guedes, Renato Mesquita da Cunha)
- [24.7-P](#) **The Coupled Aerosol and Tracer Transport model to the Brazilian developments on the Regional Atmospheric Modeling System: model description and validation** (Saulo Ribeiro de Freitas, Karla Maria Longo, Maria Assução Faus da Silva Dias, Pedro Leite Silva Dias, Robert Chatfield, Paulo Artaxo)
- [24.8-P](#) **Numerical Simulation of the Influence of the CCN Variability on the Cloud Microphysical Properties in Amazonia Basin During LBA/SMOCC 2002** (João Bosco Verçosa Leal Jr., Gerson Paiva Almeida, Carlos Jacinto Oliveira, Emerson Mariano Silva, Francisco Geraldo de Melo Pinheiro)
- [24.9-P](#) **Análise Conjunta de Perfis Verticais de Concentração de Partículas de Aerossol de Queimadas e de Variáveis Meteorológicas na Amazônia** (Franscielly Aparecida Marquardt, Márcia Akemi Yamasoe)
- [24.10-P](#) **Carbonaceous aerosol in La Gran Sabana, Canaima National Park, Venezuela** (Miléxi Pacheco, Eugenio Sanhueza)
- [24.11-P](#) **Soluble Organic Nitrogen in Airborne Particles and Rains of La Gran Sabana, Canaima National Park, Venezuela.** (Miléxi Pacheco, Loreto Donoso, Eugenio Sanhueza)

- [24.12-P](#) **Aerosol Optical Properties over Amazon Basin** (*Melina Andrade Paixão, Paulo Artaxo, Brent Holben, Joel Schafer*)
- [24.13-P](#) **Modelling the dynamic behavior of Cloud Condensation Nuclei: case study comparing clean (LBA/CLAIRE 2001) and polluted (LBA/SMOCC 2002) conditions in Amazonia** (*Theotonio Pauliquevis, Luciana Varanda Rizzo, Paulo Artaxo, Meinrat O. Andreae, Göran Frank, Olga L. Mayol-Bracero, Susimar Gonzalez*)
- [24.14-P](#) **Large-scale measurements of particle size distribution and cloud condensation nuclei during the LBA/SMOCC-2002 experiment in Rondônia** (*Luciana Varanda Rizzo, Theotonio Mendes Pauliquevis Junior, Paulo Artaxo, Meinrat O. Andreae, Göran Frank, Pascal Guyon*)
- [24.15-P](#) **Estudo numérico do efeito das partículas de aerossol de queimada sobre as taxas de aquecimento/resfriamento da atmosfera** (*Ricardo Almeida de Siqueira*)

AC_Aerossóis_Radiação (*AC_Aerosols_Radiation*)

- [25.1-P](#) **The impact of the direct radiative effect of the aerosol particles on the calculation of the photolysis rates: a case study for an Amazon site during the biomass burning season** (*Leila Maria Mercê Albuquerque, Karla Longo, Saulo Ribeiro de Freitas, Tatiana Tarasova, Carlos Afonso Nobre, Aline S. Procopio, Luciana Vanni Gatti, Paulo Artaxo*)
- [25.2-P](#) **Long term measurements of aerosol radiative forcing in Amazonia** (*Paulo Artaxo, Aline S. Procopio, Carlos Pires, Melina M. A. Paixão, Alejandro Duarte, Brent Holben, Joel Schaefer*)
- [25.3-P](#) **Desempenho de Modelos Radiativos na Avaliação de Irradiâncias em Presença de Aerossol de Queimadas** (*Artemio Plana Fattori, Márcia Akemi Yamasoe, Karla Maria Longo*)
- [25.4-P](#) **Estudo da evolução temporal da estrutura vertical da atmosfera - efeito do aerossol de queimadas em Alta Floresta** (*Edson Roberto Francischinelli, Márcia Akemi Yamasoe*)
- [25.5-P](#) **Resultados de um Estudo Estatístico das Propriedades Ópticas das Partículas de Aerossol de Queimadas via AERONET** (*Marcelo Pinheiro Garcia, Márcia Akemi Yamasoe, Paulo Artaxo*)
- [25.6-P](#) **Impact of aerosols on the Amazon shortwave surface and atmospheric radiation balance** (*Hongqing Liu, Rachel T. Pinker, Hiroko Kato*)
- [25.7-P](#) **Numerical modelling of the biomass-burning aerosol direct radiative effects on the thermodynamic structure of the atmosphere and convective precipitation** (*Karla Longo, Saulo Ribeiro de Freitas, Maria Assução Faus da Silva Dias, Robert Chatfield, Pedro Leite Silva Dias, Paulo Artaxo*)
- [25.8-P](#) **Spectral Absorption properties of Aerosols in Amazonia during the Wet and Dry Seasons** (*J. Vanderlei Martins, Paulo Artaxo, Yoram J. Kaufman*)
- [25.9-P](#) **Effect of Smoke Aerosols over the CO₂ flux in the Amazonia** (*Paulo Henrique Fernandes de Oliveira, Paulo Artaxo*)
- [25.10-P](#) **Seasonal aspects of atmospheric aerosol optical properties over South America from AERONET measurements** (*Carlos Alberto Pires Jr, Paulo Artaxo, Brent Holben, Joel Schafer*)
- [25.11-P](#) **Case studies of high aerosol optical thickness events and transport of biomass burning aerosol over South America from AERONET measurements** (*Carlos Alberto Pires Jr, Paulo Artaxo, Brent Holben, Joel Schafer*)
- [25.12-P](#) **Changes in total, direct and diffuse solar and PAR radiation at the surface due to Amazonian biomass burning: a modeled study** (*Aline S. Procopio, Paulo Artaxo, Lorraine A. Remer, Yoram J. Kaufman, Joel S. Schafer*)
- [25.13-P](#) **MODIS Cloud Products and Observed Cloud Attenuation of Solar Flux: An Investigation of a Method for Scaling Local Observations to the Regional Level** (*Joel Schafer, Brent Holben, Tom Eck, Paulo Artaxo*)
- [25.14-P](#) **Effect of smoke on the vertical profile of photosynthetically active irradiance inside the canopy observed at Rebio Jaru** (*Marcia Akemi Yamasoe, Antonio Ocimar Manzi*)

AC_Geral (*AC_General*)

- [26.1-P](#) **Factors controlling acetic and formic acid concentrations in different tropical forests' rainwater** (*Vanessa Prezotto Almeida, Luciene Lorandi Lara, Plínio Barbosa de Camargo*)
- [26.2-P](#) **Modeling of the Manaus Driven Ozone Plume** (*Leila Droprinchinski Martins, Pedro Leite Silva Dias, Edmilson Dias de Freitas, Luciana Vanni Gatti, Paulo Artaxo, Meinrat O. Andreae, Saulo Ribeiro de Freitas, Karla Maria Longo, Maria de Fátima Andrade*)
- [26.3-P](#) **Monitoring the Transport of Biomass Burning Emissions in South America** (*Saulo Ribeiro de Freitas, Karla Longo, Maria Assução Faus da Silva Dias, Pedro Leite Silva Dias, Robert Chatfield, Elaine Prins, Alberto Setzer*)

- [26.4-P](#) **Seasonality of Isoprene Emissions in the Amazon Basin** (*Luciana Vanni Gatti, Carla Roberta Trostdorf, Amelia Yamazaki, Simone Avino, Carlos Augusto Bauer Aquino, Lizia Murbach, Williams Castro Martins, Alex Guenther, Mark J. Potosnak*)
- [26.5-P](#) **Soil moisture impact on convection and biomass burning pollutants in Roraima, Brazil, during the CLAIRE/1998 Experiment** (*Rodrigo Gevaerd, Saulo Ribeiro de Freitas, Marcos Longo*)
- [26.6-P](#) **Precipitation chemistry in Amazonia - inorganic components** (*Mariana Lino Gouveia, Luciene Lorandi Lara, Theotonio Pauliquevis, Paulo Artaxo*)
- [26.7-P](#) **Variability of VOC emission capacity and composition during leaf phenology of the tropical tree species *Hymenaea courbaril* and its relation to the carbon budget** (*Uwe Kuhn, Stefanie Rottenberger, Thomas Biesenthal, Annette Wolf, Guenther Schebeske, Paolo Ciccioli, Juergen Kesselmeier*)
- [26.8-P](#) **Regional gradients in Carbon Dioxide and Carbon Monoxide Concentrations across the Amazon Basin** (*James William Munger, Scott R. Saleska, Bruce C. Daube, Steven C. Wofsy, Volker W.J.H. Kirchhoff*)
- [26.9-P](#) **Measurement of organic ions in the Amazonian precipitation** (*Luciene Lorandi Lara, Teotônio Pauliquevis, Mariana Lino Gouveia, Paulo Artaxo*)
- [26.10-P](#) **Introducing MOZART chemical mechanism into CATT-BRAMS: preliminary results** (*Karla Longo, Saulo Ribeiro de Freitas, Leila Maria Mercê Albuquerque, Pedro Leite Silva Dias, Martin Schultz, Guy Brasseur*)

B (Biogeoquímica) / B (Biogeochemistry)

B_Geral (*B_General*)

- [27.1-P](#) **Relação entre Parâmetros Bioquímicos Foliares e a Reflectância Espectral de Espécies Lenhosas em dois sítios de Cerrado no Parque Nacional de Brasília, DF** (*Ana Paula Ferreira de Carvalho, Mercedes Maria Cunha Bustamante, Gregory Paul Asner, Birgit Orthen, Ester A. de Farias de Albuquerque*)
- [27.2-P](#) **Uso da krigagem ordinária e da cokrigagem para estimar a matéria orgânica em solos de quatro microbacias sob vegetação de floresta no município de Juruena, MT.** (*Léo Adriano Chig, Eduardo Guimarães Couto, Susan Riha, Mark Johnson, João Paulo Novaes Filho, Johannes Lehmann, Evandro Carlos Selva*)
- [27.3-P](#) **Aplicação da estatística multivariada para identificar diferenças nos atributos de solo em microbacias sob floresta tropical em Juruena-MT** (*Eduardo Guimarães Couto, Johannes Lehmann, João Paulo Novaes Filho, Mark Johnson, Evandro Carlos Selva, Luiz Carlos Mattos Rodrigues, Léo Adriano Chig, Susan Riha, Erick Fernandes*)
- [27.4-P](#) **Pre-harvest Tree and Vine Biomass in a Rainforest in NW Mato Grosso, Brazil** (*Ted R. Feldpausch, Stefan Jirka, Susan J. Riha, Carlos Alberto Moraes Passos, Johannes Lehmann, Franklin Jasper, Erick C.M. Fernandes, Andrew J. McDonald*)
- [27.5-P](#) **Aplicação da geoestatística para identificar a ocorrência de Latossolos e Argissolos em quatro microbacias sob vegetação de floresta no município de Juruena, MT.** (*João Paulo Novaes Filho, Eduardo Guimarães Couto, Susan Riha, Mark Johnson, Johannes Lehmann, Evandro Carlos Selva, Luiz Carlos Mattos Rodrigues, Léo Adriano Chig*)
- [27.6-P](#) **Isotopic Composition of Soils and Plants in a Gallery Forest of Cerrado Biome: Effect of Topographic Gradient** (*Lucilia Parron, Mercedes Maria Cunha Bustamante, Plínio Barbosa de Camargo, Cesar Prado, Luiz Antonio Martinelli*)
- [27.7-P](#) **Dinâmica do carbono em quatro microbacias sob floresta tropical, no município de Juruena, MT** (*Evandro Carlos Selva, Mark Johnson, Eduardo Guimarães Couto, Johannes Lehmann, Luiz Carlos Mattos Rodrigues*)
- [27.8-P](#) **Coarse Woody Debris Remineralization Rates in an Undisturbed Forest and Selective-Logged Areas at the FLONA Tapajós, Santarém** (*Hudson Silva, Patrick Michael Crill, Michael M. Keller*)
- [27.9-P](#) **Carbon, Nutrient, Light Interception and Soil Water Dynamics of Secondary Forests and Agroforestry Systems on Degraded Pastures** (*Steven A. Welch, Karen A. McAfferly, Erick C.M. Fernandes, Susan J. Riha, Elisa Wandelli*)

B_Nutrientes (*B_Nutrients*)

- [28.1-P](#) **Influência da puerária (*Pueraria phaseoloides*), sobre a transformação microbiana de nitrogênio do solo em sistemas agroflorestais do Projeto RECA em Nova Califórnia-RO** (*Patrícia Miranda Dresch, Regina Celi Costa Luizão, Katell Uguen, Sonia Sena Alfaia*)

- [28.2-P](#) **Retorno de Nitrogênio e Fósforo Através de Serrapilheira no Período Úmido em Floresta de Transição Tropical Úmida-Cerrado** (*Eliane Dias de Almeida, Vilidiana Moraes Moura, Luciana Sanches, Carla Maria Abido Valentini, Segundo Durval Rezende Pereira, Márcia Martim Pereira Gallon, Nicolau Priante Filho, José de Souza Nogueira*)
- [28.3-P](#) **Mapping soil micronutrients in a 63 ha low productivity pasture in Rondonia, Nova Vida Ranch** (*Carlos Clemente Cerri, Martial Bernoux, Carlos Clemente Cerri, Marisa Cássia Piccolo, Brigitte J. Feigl, Jerry M. Melillo*)
- [28.4-P](#) **Effects of different land use systems in carbon, nitrogen and phosphorus cycles: comparison between slash-and-burn and chop-and-mulch systems.** (*Roberta de Fátima Rodrigues Coelho, André Luiz Cote Roman, Cláudio José Reis de Carvalho, Ricardo de O. Figueiredo, Tatiana Deane de Abreu Sá, Danielle Santos Fontenelle*)
- [28.5-P](#) **Response of the Soil Microbial Community to Fertilization Practices in Agricultural and Native Cerrado Systems in Brazil** (*Marirosa Molina, Laura Tillman Viana, Mercedes Maria Cunha Bustamante, Richard G. Zepp*)
- [28.6-P](#) **Effect of ash deposition on soil nitrogen availability in burned savannas of the Gran Sabana, Venezuela.** (*Carlos Luis Méndez, Bibiana Alejandra Bilbao*)
- [28.7-P](#) **Major Ions Fluxes in Rainfall and Throughfall at Tapajós National Forest . Belterra, Para State** (*Raimundo Cosme de Oliveira Jr., Michael M. Keller, Patrick Michael Crill, William Zamboni de Melo, Jadson Dizencourt Dias, Kêmeson Oliveira, Eráclito Rodrigues de Sousa Neto, Sérgio N. da Silva Albuquerque, Joelma Dezencourt Dias, Cleuton Pereira*)
- [28.8-P](#) **Enzima Fosfatase Ácida: Importância e Dinâmica no Ciclo Biogeoquímico do Fósforo em Vegetações Secundárias do Nordeste do Estado do Pará.** (*Patricia Chaves de Oliveira, Cláudio José Reis de Carvalho, Tatiana Deane de Abreu Sá*)
- [28.9-P](#) **Atividade da fosfatase ácida, uréase e micorrizas em uma área de vegetação secundária de Paragominas, Estado do Pará, dois anos após adubação com nitrogênio e fósforo.** (*Cláudio José Reis de Carvalho, Eric Atlas Davidson, Tereza Primo dos Santos, Ricardo de Oliveira Figueiredo, Bruno de Oliveira Serrão, Fábio Carneiro Dutra*)
- [28.10-P](#) **Lixiviação do Nitrato em Quatro Microbacias Sob Cobertura Florestal no Município de Juruena/MT** (*Luiz Carlos Mattos Rodrigues, Evandro Carlos Selva, Eduardo Guimarães Couto, Johannes Lehmann, Mark Stephen Johnson, João Paulo Novaes Filho*)
- [28.11-P](#) **Litter Quality of Agroforestry Systems in Central Amazonian** (*Guilherme Castilho Silva, Regina Luizão*)

B_Gases_traço (B_Trace_gases)

- [29.1-P](#) **Herbicide Effect on N Availability and N₂O Fluxes During Pasture Reformation in Rondonia, Brazil.** (*Janaina Braga Carmo, Diana Cecília Garcia-Montiel, Cistiano Alberto Andrade, Carlos Clemente Cerri, Marisa Cássia Piccolo*)
- [29.2-P](#) **Profiles of trace gas concentrations from towers at undisturbed forest in the Brazilian Amazon Region** (*Janaina Braga Carmo, Patrick Michael Crill, Jadson Dizencourt Dias, Plínio Barbosa de Camargo, Michael M. Keller*)
- [29.3-P](#) **NO and N₂O Emissions Related to the Nitrogen Fertilization in a Cornfield Under No-tillage and Tillage Systems** (*Armanda Moreira de Carvalho, Mercedes Maria Cunha Bustamante, Alessandra Rodrigues Kozovits, Danielle Matias Sousa, Laura Tillman Viana, Leo Nobre de Miranda*)
- [29.4-P](#) **Mapeamento temporal de áreas alagadas na planície de inundação da Amazônia: "input" para estimativas de emissão de metano** (*Maycira Costa, Dayson J.J. Lima, John Melack, Denival S. Correa, Laura Hess*)
- [29.5-P](#) **Trace Gas Emissions From the Soil Related to Land-Use Changes in the Cerrado Region** (*Alessandra Rodrigues Kozovits, Laura Tillman Viana, Danielle Matias Sousa, Mercedes Maria Cunha Bustamante, Richard Zepp*)
- [29.6-P](#) **NO fluxes from savannas of Central Brazil (Cerrado) subjected to nitrogen and phosphorus fertilization** (*Alessandra Rodrigues Kozovits, Laura Tillman Viana, Danielle Matias Souza, Alexandre de S. Pinto, Mercedes Maria Cunha Bustamante*)
- [29.7-P](#) **Monitoring soil radon-222 flux at selectively logged and primary forest sites in the Tapajós National Forest and in an agricultural field at km77 Santarém-Cuiabá highway (2003).** (*Risonaldo Leal Lima, Osvaldo Luiz Leal de Moraes, Christopher Sargent Martens, Howard Mendlovitz, José Mauro Moura, Irene Cibelle Sampaio*)
- [29.8-P](#) **Gas Transport, Production and Consumption Rates in the Tapajós National Forest, Para, Brazil, Determined Using RADON-222 Flux Divergence** (*Christopher Sargent Martens, Thomas J. Shay, Howard P. Mendlovitz, José Mauro Moura, Risonaldo Leal Lima, Osvaldo Luiz Leal de Moraes, Patrick Michael Crill, W. Stephen Woodward, Cibelle Gonçalves Sampaio*)

- [29.9-P](#) **The influence of sediment composition on isotopic variation of CH₄ in the eastern Amazonian streams** (*José Mauro Sousa Moura, Christopher Sargent Martens, Marcelo Zacharias Moreira, Howard P Mendlovitz, Risonaldo Leal Lima, Irene Cibelle Gonçalves Sampaio*)
- [29.10-P](#) **Effects of water-addition on N oxides and CO₂ fluxes from soils in pastures of Central Brazil** (*Alexandre de Siqueira Pinto, Mercedes Maria Cunha Bustamante, Laura Tillman Viana, Keith Kisselle, Roger A. Burke, Richard Zepp*)
- [29.11-P](#) **Soil-Atmosphere Flux of Nitrous Oxide and Methane Measured on Sandy Loam and Clay Soils in Undisturbed Forest at the FLONA Tapajos, Brazil** (*Eráclito Rodrigues de Sousa Neto, Jadson Dizencourt Dias, Hudson Silva, Sérgio N. da Silva Albuquerque, Kêmeson Oliveira, Michael M. Keller, Patrick Michael Crill, Raimundo Cosme de Oliveira Jr.*)
- [29.12-P](#) **NOX and CO Emissions from Cerrado Plant Litter** (*Keith W. Kisselle, Richard G. Zepp, Roger A. Burke, Marirosa Molina, Mercedes Maria Cunha Bustamante*)

HD (Dimensões Humanas) / HD (Human Dimensions)

HD_Dados_ET (HD_Data_ET)

- [30.1-P](#) **An Interactive CD-Rom for Teaching Remote Sensing Applied to Amazon Issues and Exemplified by LBA Case Studies.** (*Nelson W Dias, Getulio T Batista, Paul W Mausel, Evelyn M Novo, Dennis L Skelton, Thelma Krug*)
- [30.2-P](#) **The Data and Information System of the Large Scale Biosphere-Atmosphere Experiment in Amazonia - LBA** (*Luiz M. Horta, Merylyn J. Gentry, Larry D. Voorhees, Laurindo C. Santos*)
- [30.3-P](#) **SIG sem computador: ferramenta para comunidades rurais monitorarem os serviços ambientais no Programa Proambiente** (*Nara Vidal Pantoja, Irving Foster Brown, Diogo Selhorst*)
- [30.4-P](#) **Estudos temáticos de Pesquisas do LBA: Uma contribuição para a produção de material Didático-Pedagógico para o Ensino Fundamental.** (*Aline Heveny Sousa dos Santos, Chieno Suemitsu, Thatiana Pereira da Silva*)
- [30.5-P](#) **Avaliação de livros e material didático usado para o ensino de ciências nas escolas de ensino fundamental da região oeste do Pará, Brasil.** (*Thatiana Pereira da Silva, Aline Heveny Sousa dos Santos, Chieno Suemitsu*)
- [30.6-P](#) **O Ensino dos Ciclos da Água e do Carbono no Ensino Médio em Santarém-PA** (*Elinei Pinto dos Santos, Roseilson Souza do Vale, Viviane Pereira Barbosa*)
- [30.7-P](#) **The ORNL DAAC: A Source for Biogeochemical and Ecological Data¹** (*Larry D. Voorhees, Robert B. Cook, B. Tim Rhyne*)
- [30.8-P](#) **GIS Smart Client: Sharing Intelligence Worldwide** (*Genong Yu, Ryan R Jensen, Paul W Mausel, Vijay Lulla, Eduardo Sonnewend Brondizio, Emilio F. Moran*)

HD_Geral (HD_General)

- [31.1-P](#) **O Papel da Floresta Amazônica nas Negociações Internacionais sobre Mudança de Clima Global** (*Luis Antônio Lacerda Aimola*)
- [31.2-P](#) **Market incentives for environmental law compliance in Mato Grosso: opportunities and limitations to environmental certification of soy and meat in the Amazon.** (*Oriana T Almeida, Daniel Curtis Nepstad*)
- [31.3-P](#) **Population redistribution in the Ecuadorian Amazon in the 1990s** (*Alisson F. Barbieri, Richard E. Bilsborrow*)
- [31.4-P](#) **Fogo Inimigo? As transformações do discurso ambiental na agricultura familiar** (*Luciana Miranda Costa*)
- [31.5-P](#) **A escala e o método como bases para análises: tipologias e setorizações** (*Reinaldo Corrêa Costa*)
- [31.6-P](#) **A Natureza como Recurso e a (re)criação de Territorialidades** (*Reinaldo Corrêa Costa*)
- [31.7-P](#) **Searching for a place on the Amazonian frontier: the trajectories of invisible rural workers in Acre, Brazil and Pando, Bolivia.** (*Benedita Esteves*)
- [31.8-P](#) **Institutional Dimensions and Land-Cover Change: Regional and Local Variability in the Lower Amazon** (*Celia R T Futemma, Eduardo Sonnewend Brondizio*)
- [31.9-P](#) **Building Collaborative Networks in LUCC Case Studies in Acre, Brazil** (*Carlos Valerio A. Gomes, Thomas Ludewigs, Jacqueline M. Vadjunec*)
- [31.10-P](#) **Social Change and Land Cover Change in Santarem, Para State, Brazil.** (*Alvaro de Oliveira D'Antona, Corey Hayashi Hayashi*)

- [31.11-P](#) **Revisiting the livestock and deforestation interplay in the Amazon: The cases of Uruara and southern Para** (*Pablo Pacheco*)
- [31.12-P](#) **Examination of migration to agricultural frontiers using temporal and spatial cohorts** (*William Kuang-Yao Pan, Clark Gray*)
- [31.13-P](#) **Socio-spatial Processes of Road-building and Land Cover Change: The Case of Sinop, MT** (*Stephen G Perz, Marcellus M Caldas, Robert T Walker*)
- [31.14-P](#) **Basin-Scale Econometric Modeling III: local interactions in deforestation decisions** (*Juan Robalino, Alexander Pfaff, Claudio Bohrer*)
- [31.15-P](#) **The causes of deforestation in the Brazilian Amazon : Crossing results from economic models and farmers behaviour analysis** (*Piketty Marie-Gabrielle, Mertens Benoît*)
- [31.16-P](#) **Two stage simulation model of Brazilian Amazon deforestation** (*Eustáquio J Reis, Leonardo S. Bastos*)
- [31.17-P](#) **Study and prediction of malaria distribution at Novo Repartimento municipality-southeast Pará state** (*Cíntia Honório Vasconcelos, Evlyn M.L.Moraes Novo*)
- [31.18-P](#) **A expansão da pecuária na Amazônia Oriental: O papel dos colonos** (*Jonas Bastos da Veiga, Jean François Tourrand, Marie Gabrielle Piketty, Ailce Margarida Alves*)
- [31.19-P](#) **Recuperando áreas de pastagens degradadas por sistemas agroflorestais: serviços ambientais x economia** (*Elisa Vieira Wandelli, Erick Marian Fernandes, Silas Aquino Souza, Rogério Perin, Joanne Régis Costa, Frank Correa Ferreira*)
- [31.20-P](#) **Economic Aspects of Fire Use and Prevention: a household model for the Brazilian Amazon** (*Larissa Steiner Chermont*)

HD_Industria_madeiraira (*HD_Timber*)

- [32.1-P](#) **Cost functions for harvest, transport, and milling in the timber industry of the Brazilian Amazon** (*Simone Bausch, Gregory Amacher, Frank Merry, Daniel Curtis Nepstad*)
- [32.2-P](#) **Timber Concessions and Public Forests in the Brazilian Amazon: the ITTO Project in the Tapajós National Forest.** (*Margaret Francis, Maria Rosenildes Guimarães dos Santos, Frank Merry, Daniel Curtis Nepstad*)
- [32.3-P](#) **The potential of small farm forestry in the economic development of the Transamazon highway.** (*Eirivelthon Lima, Frank Merry, Maria Rosenildes Guimarães dos Santos, Ailton Alves, Daniel Curtis Nepstad*)
- [32.4-P](#) **O Manejo Florestal e o Uso de Recursos Florestais por Famílias Assentadas: Os Impactos do Projeto Florestas Familiares** (*Mary Catherine Menton, Frank Merry, Maria Rosenildes Guimarães dos Santos, Nick Brown, Anna Lawrence*)
- [32.5-P](#) **Industrial development on logging frontiers in the Brazilian Amazon** (*Frank Merry, Eirivelthon Lima, Gregory Amacher, Simone Bausch, Daniel Curtis Nepstad*)
- [32.6-P](#) **Collective action without collective ownership: community associations and formal logging contracts.** (*Frank Merry, Gregory Amacher, Eirivelthon Lima, Duncan Macqueen, Maria Rosenildes Guimarães dos Santos*)
- [32.7-P](#) **Emerging smallholder forest management contracts in the Brazilian Amazon: impacts on welfare and labor supplies.** (*Gregory Amacher, Frank Merry, Eirivelthon Lima, Maria Rosenildes Guimarães dos Santos, Daniel Curtis Nepstad*)

CD (Armazenamento e Trocas de Carbono) / CD (*Carbon Dynamics*)

CD_Biometria_Dinâmica (*CD_Biometry_Dynamics*)

- [33.1-P](#) **Biomass and net primary productivity in savannas, Gran Sabana, Canaima National Park, Venezuela** (*Bibiana Alejandra Bilbao, Zamira Hasmy, Alejandra Verónica Leal, Carlos Luis Méndez, Eduardo Zambrano, José Manuel Moreno*)
- [33.2-P](#) **The Effects of Logging and Understory Fires on Biomass in Dense and Transitional Forests** (*Oswaldo de Carvalho Jr, Ane Alencar, Daniel Curtis Nepstad, Sanae Hyashi*)
- [33.3-P](#) **Distribuição Espacial de Parâmetros Biofísicos da Vegetação na Floresta Nacional do Tapajós - PA** (*Fernando D. B. Espírito-Santo, Yosio E. Shimabukuro, Luiz Eduardo Oliveira Cruz de Aragão*)
- [33.4-P](#) **If we understand how trees are constructed we could explain why tree growth rate is higher in the west Amazon** (*Sandra Patiño, Timothy R. Baker, Lina Maria Mercado, Romilda Maria Quintino, Carlos Alberto Quesada, Oliver L. Phillips, Yadvinder Singh Malhi, Jonathan James Lloyd*)

- [33.5-P](#) **Relating secondary forest characteristics to time series of Landsat-derived reflectances** (*Stephen Hagen, William Salas, Lucas Fortini, Mark Ducey, Jiaguo Qi, Daniel Zarin, Joanna Tucker, Diogenes Alves*)
- [33.6-P](#) **Stocks and Fluxes of Coarse Woody Debris in Southwestern Amazon forests** (*Eurídice Honorio, Timothy R. Baker, Phillips Oliver, Martin Jim*)
- [33.7-P](#) **Relationships between Forest Composition and Soil and Hydrological Characteristics in a Tropical Forest in NW Mato Grosso** (*Stefan Jirka, Ted R Feldpausch, Andrew J McDonald, Susan J Riha, Carlos Alberto Moraes Passos, Léo Adriano Chig, Eduardo G Couto, Maria José de Souza Noquelli*)
- [33.8-P](#) **Variation of Aboveground Biomass in the Forest of Bananal Island, Tocantins State** (*Dariusz Kurzatkowski, Divaldo Rezende, Humberto Ribeiro da Rocha, Erich Collicchio, Rita da Mata Ribeiro*)
- [33.9-P](#) **Diversidade Florística e Biomassa em Cronosequência de Florestas Secundárias no Leste do Pará, Amazônia Oriental** (*Eliane Constantinov Leal, Ima Célia Vieira, Arlete Silva de Almeida, Eric A. Davidson, Mário dos Santos Jr.*)
- [33.10-P](#) **Taxa incremento diamétrico de árvores e estoque de carbono de uma floresta primária na FLONA Tapajós, Santarém-Pará.** (*Raimundo Sousa Lima Jr., Plínio Barbosa de Camargo, Chieno Suemitsu, Lucy Hutyra*)
- [33.11-P](#) **Spatial patterns in forest carbon dynamics, biomass and biomass change across the Amazon basin.** (*Yadvinder Singh Malhi, Oliver L. Phillips, Timothy R. Baker, Sandra Patiño, Jonathan James Lloyd*)
- [33.12-P](#) **Application of Remote Sensing Tools to Identify Forest Composition and Seasonal Dynamics in NW Mato Grosso** (*Andrew J. McDonald, Stefan Jirka, Ted R. Feldpausch, Susan J. Riha, Carlos Alberto Moraes Passos, Johannes Lehmann*)
- [33.13-P](#) **Séries de Estereo-Fotografias para Quantificar a Biomassa da Vegetação do Cerrado** (*Roger D Ottmar, Robert E Vihnanek, Heloisa S Miranda, Margarete N Sato, Saulo M Andrade*)
- [33.14-P](#) **Efeito de tratamentos silviculturais na estrutura de floresta tropical Ombrófila Aberta, na Amazônia Meridional** (*Carlos Alberto Moraes Passos, Johannes Lehmann, Susan Riha, Elenara Gandini, Maria José de Souza Noquelli, Péricles Aquino Botelho, Silvana Fuhr, Erick C.M. Fernandes, Ted R. Feldpausch, Stefan Jirka*)
- [33.15-P](#) **Estimativas de volume de madeira na Amazônia Central: efeitos de irregularidades do fuste e ocos** (*Euler Melo Nogueira, Bruce Walker Nelson*)
- [33.16-P](#) **Effects of wood density and the height-x-diameter relationship on biomass differences between three widespread Amazonian forest types** (*Bruce Walker Nelson, Mabiane Batista França, Euler Melo Nogueira, Átila Cristina Oliveira*)
- [33.17-P](#) **Isotopic composition of plant and soil nitrogen on a precipitation gradient in the Brazilian Amazon Forest** (*Gabriela Bielefeld Nardoto, Jean Pierre Ometto, James Ehleringer, Luiz Antonio Martinelli*)
- [33.18-P](#) **Necromass Density Estimates from Two Brazilian Amazonia Forests** (*Michael William Palace, Michael M. Keller, José Natalino Macedo Silva, Gregory Paul Asner*)
- [33.19-P](#) **A Portable Lidar System for Rapid Determination of Forest Canopy Structure** (*Geoffrey Parker, David Harding, Michelle Berger*)
- [33.20-P](#) **Monitoramento da Taxa de Incremento Diametral em Biomassa de Carbono em Floresta Primária na Floresta Nacional do Tapajós** (*Kleber da Costa Portilho, Daniel Nunes Figueiredo, Marcos Heil Costa*)
- [33.21-P](#) **Effect of contrasting irradiances on the carbon balance and biomass partition in Brazilian savanna (Cerrado) woody seedlings** (*Carlos Henrique Prado, Carlos Cesar Ronquim*)
- [33.22-P](#) **Interactions Between Soil Fertility and Forest Dynamics in the Bolivian Amazon Forest.** (*Carlos Alberto Quesada, Jonathan James Lloyd, Sandra Patiño, Oliver L. Phillips, Yadvinder Singh Malhi, Almuth Arneith, Luzmilla Arroyo, Timothy Killeen*)
- [33.23-P](#) **Estimativa do estoque de carbono em distintos materiais e coberturas vegetais no noroeste da Amazônia Legal** (*Segundo Durval Pereira Rezende, Yves-Marie Gardette, Pedro Correto Priante, Nicolau Priante Filho, Eliane Dias de Almeida, Carla Maria Abido Valentini, Vilidiana Moraes Moura*)
- [33.24-P](#) **Padrões Estruturais e Alométricos em Florestas Alagáveis na Região da Ilha do Bananal, Estado do Tocantins** (*Rita da Mata Ribeiro, Dariusz Kurzatkowski, Divaldo Rezende, Humberto Ribeiro da Rocha, Erich Collicchio*)
- [33.25-P](#) **Distribution of coarse and fine root biomass in native ecosystems and planted pasture in the Cerrado of Central Brazil** (*Patricia Rodin, Carlos Augusto Klink, Flavia Pinto, Thiago Andre*)
- [33.26-P](#) **Carbon dynamics and Landscape-scale vegetation patterns in an old-growth Amazonian rainforest** (*Gregory W. Santoni, Lucy Hutyra, Simone Aparecida Vieira, V.Y. Chow, Raimundo Sousa Lima Jr., Dulcyana F. Marques, Kadson Oliveira Silva, Elizabeth Hammond-Pyle, Scott R. Saleska, Plínio Barbosa de Camargo, Steven C. Wofsy*)

- [33.27-P](#) **Análise Florística e Estrutural de uma Floresta Ombrófila Aberta Primária no Hotel de Selva Cristalino, Alta Floresta-MT** (*Vanessa Aparecida Santos, Rubens Marques Rondon Neto, Kelli Cristina Aparecida Munhoz, Higo José Dalmagro, Leandro Gomes de Almeida, George Sanches Suli, Nicolau Priante Filho, José de Souza Nogueira, George Louis Vourlitis, Cléia Rosana Dal Bem*)
- [33.28-P](#) **Relação da Precipitação Pluviométrica com a Taxa de Crescimento de Espécies Arbóreas com Diâmetro Entre 60 e 70 cm da Amazônia, em Área de Parcela Permanente da Flona Tapajós, Santarém.** (*Kadson Oliveira Silva, Plínio Barbosa de Camargo, Scott R. Saleska, Dárcio Raimundo Batista da Cruz*)
- [33.29-P](#) **Efeito da exploração seletiva de madeira no crescimento e respiração do tronco em floresta de terra-firme na região de Manaus.** (*Liliane Martins Teixeira, Jeffrey Q. Chambers, Edgard S. Tribuzy, Roseana P. da Silva, Rosana M. Rocha, Alberto M. Pinto, Niro Higuchi, Susan E. Trumbore, Plínio Barbosa de Camargo, Joaquim dos Santos*)
- [33.30-P](#) **Análise da Biomassa utilizando método "direto" para pastagem em Rondônia.** (*Fabrício Berton Zanchi, Maarten J. Waterloo, Humberto Ribeiro da Rocha, Fernando Luiz Cardoso, Paulo Renda Anderson, Leonardo J. G. Aguiar, Juliano Alves de Deus, Kécio Gonçalves Leite, Anderson Teixeira Telles, Antonio Ocimar Manzi*)

CD_Geral (CD_General)

- [34.1-P](#) **Internal carbon cycling in native Cerrado and a pasture in Central Brazil** (*Roberto Engel Aduan, Carlos Augusto Klink, Eric Atlas Davidson*)
- [34.2-P](#) **Photosynthetic rates and nitrogen use efficiencies in plants of different functional groups in the open savannas of Gran Sabana, Canaima National Park, Venezuela** (*Bibiana Alejandra Bilbao, Carlos Luis Méndez, Eduardo Zambrano, Rosana Castillo, Mercedes Jaffé, José Manuel Moreno*)
- [34.3-P](#) **Plant Community Phenological Responses to Simulated Drought Stress: Preliminary Results from a Partial Throughfall Exclusion Experiment** (*Paulo Brando, David Ray, Daniel Curtis Nepstad, Lisa Curran, Paulo Moutinho*)
- [34.4-P](#) **Drought-tolerance of an eastern Amazon forest, recovery of canopy water status: results from a throughfall exclusion experiment.** (*Gina Knust Cardinot, Daniel Curtis Nepstad, N. Michele Holbrook, David Ray*)
- [34.5-P](#) **Efeitos do estresse hídrico sobre a condutividade hidráulica foliar do xilema em *Coussarea racemosa* e *Eschweilera pedicellata* em uma área de floresta tropical úmida amazônica.** (*Williams Martins Castro, Gina Knust Cardinot, Daniel Curtis Nepstad, N. Michele Holbrook*)
- [34.6-P](#) **Dry events, forest fires occurrences, Human displacement in Amazon and changes in carbon cycle during the upper Holocene** (*Renato Campello Cordeiro, Bruno Turcq, Abdelfettah Sifeddine*)
- [34.7-P](#) **Evaluation of Observing and Modeling requirements for the Balanço Atmosférico Regional de Carbono na Amazônia (BARCA) Project** (*Scott A. Denning, Marek Uliasz, Marcos Longo, Saulo Ribeiro de Freitas, Ian Baker, Pedro Leite Silva Dias, Maria Assução Faus da Silva Dias*)
- [34.8-P](#) **The effect of warming on tropical forest gas exchange.** (*Chris Eric Doughty, Michael L. Goulden*)
- [34.9-P](#) **Varição Sazonal da Área Foliar em Três Extratos da Floresta Amazônica na Região de Sinop** (*João Areis Ferreira Barbosa Jr., Francisco de Almeida Lobo, Vinícius Buscioli Capistrano, Segundo Durval Pereira Rezende, Eduardo Jacusiel Miranda, Marcelo Sacardi Biudes*)
- [34.10-P](#) **Medição de Área Foliar Através da Reflectância Espectral em Espécies Diversificadas na Floresta Nacional do Tapajós, Santarém-Pará - Brasil** (*Daniel Nunes Figueiredo, Kleber da Costa Portilho, Marcos Heil Costa*)
- [34.11-P](#) **Recuperação e Valor de Resgate para o Seqüestro do Carbono Atmosférico em Ecossistemas Manguezais** (*Sérgio Mattos Fonseca, Sonia MF Gianesella*)
- [34.12-P](#) **Atmospheric CO₂ Budget over Amazon Basin: The Role of the Convective Systems** (*Valdir Inácio Herrmann, Saulo Ribeiro de Freitas, Robert Chatfield*)
- [34.13-P](#) **Ecosystem Demography Model (ED)** (*Paul R. Moorcroft, George Hurtt, Steve Pacala*)
- [34.14-P](#) **Ecosystems responses to seasonal variation and different land use in Amazon Basin using the isotope approach** (*Françoise Yoko Ishida, Jean Ometto, Jim Ehleringer, Tomas Domingues, Luiz Antonio Martinelli, Plínio Barbosa de Camargo, Joe Berry, Edmar Mazzi, Haroldo Jackson Silva*)
- [34.15-P](#) **Modeling Studies of Carbon Cycling at the Tapajos National Forest using the NASA-CASA Ecosystem Model** (*Steven Klooster, Christopher Potter, Raimundo Cosme de Oliveira Jr., Cláudio José Reis de Carvalho, Marc Kramer*)

- [34.16-P](#) **Annual carbon cost of stem CO₂ flux in an old growth tropical forest** (*Evilene Lopes, Patrick Michael Crill, Michael M. Keller, Ruth Varner*)
- [34.17-P](#) **The influences of mesoscale circulations and River CO₂ effluxes on regional carbon balance in the Tapajos Region, Para, Brazil.** (*Lixin Lu, Scott A. Denning, Maria Assução Faus da Silva Dias, Pedro Leite Silva Dias, Marcos Longo, Saulo Ribeiro de Freitas, Jeffrey E. Richey, Sassan Saatchi*)
- [34.18-P](#) **Understanding the effects of drought upon carbon allocation and cycling in tropical forest.** (*Daniel Metcalfe*)
- [34.19-P](#) **First results from a new high precision trace gas analysis system for air analysis within Brazil** (*John Miller, Luciana Vanni Gatti, Andrew Croswell, Pieter Tans, Paulo Artaxo, Monica Tais Siqueira D'Amelio*)
- [34.20-P](#) **Ecophysiological distinction of plant functional groups in Central Amazonian primary forest** (*Tomas F. Domingues, Françoise Y. Ishida, Jean P.H.B. Ometto, Luiz Antonio Martinelli, Joseph A. Berry, James R. Ehleringer*)
- [34.21-P](#) **Comparação de Dois Métodos Para Determinação da Radiação Fotossinteticamente Ativa Interceptada Pelo Dossel** (*Pedro Correto Priante, Segundo Durval Pereira de Resende, João Areis Ferreira Barbosa Jr., Eduardo Jacusiel Miranda, Vinicius Buscioli Capistrano, Francisco de Almeida Lobo, Nicolau Priante Filho, George Louis Vourlitis*)
- [34.22-P](#) **Fraction of Photosynthetically Active Radiation Absorbed by Amazon Tropical Forest: A Comparison Among Estimates Based on in situ Measurements, Modeling and Remote Sensing.** (*Mônica Carneiro Alves Senna, Marcos Heil Costa*)
- [34.23-P](#) **Evaluation of Multi Sensor Satellite Data for Macrophyte Population Assessment at the Amazon Floodplain** (*Thiago Sanna, Evlyn Márcia Leão de Moraes Novo, André Lima*)
- [34.24-P](#) **Efeito da Exclusão Artificial de Chuvas no Fenômeno de Autopoda de Galhos em *Perebea mollis* (Poepp. & Endl.) Huber Subsp. *mollis* (MORACEAE).** (*Wanderley Rocha da Silva, Moacyr Dias-Filho, Daniel Curtis Nepstad*)
- [34.25-P](#) **Estimating scalar sources, sinks and fluxes in tropical forests using inverse models** (*Mario B. Siqueira, Humberto Ribeiro da Rocha, Michael L. Goulden, Scott Dennis Miller, Renato Ramos da Silva, Katul G. Gabriel*)
- [34.26-P](#) **Resposta do índice de área foliar à radiação fotossinteticamente ativa refletida pelo dossel de ecótono floresta tropical úmida cerrado** (*Jonas Spolador, Luciana Sanches, Vinicius Buscioli Capistrano, Nicolau Priante Filho, George Louis Vourlitis*)
- [34.27-P](#) **Drought Effects on Plant Mortality, Forest Structure, and Dead Biomass Pools in an Eastern-Central Amazonian Rainforest: Results of a Partial Throughfall Exclusion Experiment** (*Ingrid Marisa Tohver, David Ray, Daniel Curtis Nepstad, Paulo Roberto Moutinho*)
- [34.28-P](#) **Modeling optimum temperature of leaves of canopy tree species in the Central Amazon** (*Edgard Siza Tribuzy, Jeffrey Quintim Chambers, Susan E. Trumbore, Plínio Barbosa de Camargo, Cristina Aledi Felseburgh, Tatiane da Silva Reis, Niro Hguchi, Joaquim dos Santos*)
- [34.29-P](#) **Can satellite images track the seasonal dynamics of leaf emergence, leaf aging and litterfall in seasonal tropical evergreen forests?** (*Xiangming Xiao, Qingyuan Zhang, Lucy Hutyra, Scott R. Saleska, Plínio Barbosa de Camargo, Stephen Boles, Steven C. Wofsy, Berrien Moore III*)
- [34.30-P](#) **Daily courses isotopic analysis of plant tissues and water vapor at Seca Floresta experiment, Santarem, PA.** (*Haroldo Jackson Silva, Jean Ometto, James Ehleringer, Luiz Antonio Martinelli, Joe Berry, Françoise Yoko Ishida, Tomas Ferreira Domingues, Edmar Mazzi, Sebastiao Lopes*)

CD_Micrometeorologia (*CD_Micrometeorology*)

- [35.1-P](#) **Fluxos de massa e de energia em área de reflorestamento, obtidos pelo método de covariância de vórtices turbulentos, a partir de diferentes tempos de amostragem** (*Renata Gonçalves Aguiar, Vinicius Buscioli Capistrano, João Areis Ferreira Barbosa Jr., Leonardo J. G. Aguiar, Paulo Cesar Nunes, Nicolau Priante Filho, José de Souza Nogueira, George L. Vourlitis*)
- [35.2-P](#) **Fluxos de CO₂ num Ecossistema de Manguezal em Bragança-PA** (*Vanda Sales Andrade, Jose Maria Nogueira da Costa, Antônio Carlos Lôla da Costa, Rommel Benicio Costa Silva, Yadvinder Singh Malhi, Patrick Meir, Julia Clarinda Paiva Cohen*)
- [35.3-P](#) **Energy closure test in central Amazon: sensitivity to the angle of attack corrections** (*Alessandro Carioca de Araujo, John H. C. Gash, Jan A Elbers, Albertus Johannes Dolman, Maarten J Waterloo, Bart Kruijt, Eddy Moors, Celso Von Randow, Antonio Donato Nobre*)
- [35.4-P](#) **Carbon dioxide concentrations within a tropical forest canopy in Central Amazon: spatial and temporal variability in a topographic gradient.** (*Alessandro Carioca de Araujo, Bart Kruijt, Antonio Donato Nobre, Juliana Silva de Souza, Albertus Johannes Dolman, Maarten Johannes Waterloo, Eddy Moors*)

- [35.5-P](#) **Comparação entre os fluxos de calor sensível e de calor latente em áreas de pastagem e de floresta de transição, no noroeste de Mato Grosso** (*Jose Carlos Arruda, Fernando Reiter, Vinícius Buscioli Capistrano, Marcelo Sacardi Biudes, George Sanches Suli, Francisco de Almeida Lobo, Nicolau Priante Filho, George Louis Vourlitis*)
- [35.6-P](#) **Automatic calibration of energy-water and carbon exchange processes in the SiB2 model for tropical forest before and after selective logging.** (Rafael Rosolem, W. James Shuttleworth, Eleanor J. Burke, *Luis A. Bastidas, Humberto Ribeiro da Rocha, Luis G. Gonçalves, Scott Dennis Miller, Michael L. Goulden*)
- [35.7-P](#) **Comparação entre os fluxos de calor sensível e de calor latente em áreas de floresta tropical úmida e de floresta de transição, no sudoeste da Amazônia** (*Vinicius Buscioli Capistrano, Higo José Dalmagro, Fernando Raiter, Wander Hoeger, Kelli Cristina Aparecida Munhoz, Vanessa Aparecida Santos, Marcelo Sacardi Biudes, Luciana Sanches, Nicolau Priante Filho, José de Souza Nogueira, George Louis Vourlitis*)
- [35.8-P](#) **Seasonality in water and energy fluxes in the Tapajós** (*Lucy Hutyrá, Scott R. Saleska, Steven C. Wofsy, Plínio Barbosa de Camargo*)
- [35.9-P](#) **Effects of Intra-Biome Variations in the Tropical Rainforest Biophysical Parameters on the Fluxes Between the Surface and the Atmosphere** (*Hewlley Acioli Imbuzeiro, Gleidson Charles Botelho Baleeiro, Marcos Heil Costa*)
- [35.10-P](#) **Mangrove forests: what mechanism(s) underly seasonal changes in productivity and evapotranspiration? Evidence from plant physiology and eddy covariance studies.** (*Patrick Meir, Jose Maria Nogueira da Costa, Mathew Williams, Yadvinder Singh Malhi, Rosie Alice Fisher, Antônio Carlos Lôla da Costa, João Athaydes Silva Jr, Vanda Andrade, Rommel Benicio Costa Silva, Raquel Lobo do Vale, Rafael Costa, Luiz Eduardo Oliveira Cruz de Aragão, Eleneide Doff Sotta, Paulo Jorge Oliveira*)
- [35.11-P](#) **Rates of Energy Storage and Stem Heat Fluxes in a Terra Firme Forest in Central Amazonia** (*Alessandro Augusto Michiles, Ralf Gielow*)
- [35.12-P](#) **Comparação Entre Trocas Gasosas Medidas Pontualmente e Pelo Método de Vorticidades Turbulentas na Região de Sinop** (*Eduardo Jacusiel Miranda, Durval Rezende, Clovis Lasta Fritzen, Pedro Correto Priante, Moacir Lacerda, José Holanda Campelo, Nicolau Priante Filho, George Vourlitis*)
- [35.13-P](#) **Is the similarity theory adequate to describe turbulent surface fluxes at the LBA-ECO agricultural site in Santarém?** (*Oswaldo Luiz Leal de Moraes, Otávio Costa Acevedo, David Roy Fitzjarrald, Ricardo Kendi Sakai, Hans Rogério Zimmermann, Rodrigo da Silva, Matthew J. Czikowsky, Ralf M. Staebler, Vagner Anabor*)
- [35.14-P](#) **Comparação dos Fluxos de Dióxido de Carbono e Energia em uma Área de Transição Entre a Floresta Amazonica e o Cerrado Matogrossense no Norte de Mato Grosso** (*João Paulo Novaes Filho, Vinícius Buscioli Capistrano, George Sanches Suli, Renata Gonçalves Aguiar, Nicolau Priante Filho, George Louis Vourlitis*)
- [35.15-P](#) **Comportamento dos Fluxos Noturnos de CO2 Atmosférico em um Ecossistema de Manguezal da Amazônia** (*Paulo Jorge Oliveira, Yadvinder Singh Malhi, Jose Maria Nogueira da Costa, Edson José Paulino Rocha, João Batista Miranda Ribeiro, Julia Clarinda Paiva Cohen, Rafael Ferreira da Costa, Marco Antonio Vieira*)
- [35.16-P](#) **Solução de problemas técnicos em sistemas para medidas de "eddy covariance".** (*Jean Reinildes Pinheiro, Jorge Luiz Brito de Faria, Marcelo Biudes, Kelli Cristina Aparecida Munhoz, Fernando Raiter, José de Souza Nogueira, Nicolau Priante Filho*)
- [35.17-P](#) **Monitoring Carbon, Heat, and Water Vapor turbulent fluxes over an Agricultural Field in Santarém.** (*Ricardo K. Sakai, David Roy Fitzjarrald, Oswaldo Luiz Leal de Moraes, Matthew J. Czikowsky, Otávio C. Acevedo, Rodrigo da Silva, Eleazar Brait, Valdelírio Miranda*)
- [35.18-P](#) **Horizontal Advection of CO2 in the Old Growth Forest: LBA preliminary results** (*Julio Tota da Silva, David Roy Fitzjarrald, Ralf M. Staebler, Ricardo K. Sakai*)
- [35.19-P](#) **Avaliação e comparação de fluxos de CO2 e H2O em duas torres em Manaus** (*Julio Tota da Silva*)
- [35.20-P](#) **Measuring subcanopy CO2 advection in the FLONA Tapajós.** (*Julio Tóta, David Roy Fitzjarrald, Ralf M. Staebler, Ricardo K. Sakai*)
- [35.21-P](#) **Perfis Noturnos de Temperatura, Umidade e CO2 utilizando Balão Cativo, em dois sítios do LBA-ECO em Santarém, PA.** (*Rodrigo da Silva, Oswaldo Luiz Leal de Moraes, Otavio C. Acevedo, Hans R. Zimmermann, David Roy Fitzjarrald, Ricardo K. Sakai, Matthew J. Czikowsky*)
- [35.22-P](#) **Fluxos de Calor Latente, Calor Sensível e Saldo de Radiação em um Ecossistema de Manguezal do Estado do Pará** (*Rommel Benicio Costa Silva, Vanda Maria Sales Andrade, Jose Maria Nogueira da Costa, Antônio Carlos Lôla da Costa, Julia Clarinda Paiva Cohen, Yadvinder Singh Malhi, Patrick Meir*)
- [35.23-P](#) **Fluxos de CO2 Entre a Vegetação e a Atmosfera em Áreas de Pastagem e Floresta em Rondônia** (*Anderson Teixeira Telles, Fernando Luiz Cardoso, Fabricio B. Zanchi, Paulo Renda Anderson, Juliano Alves de Deus, Leonardo J. G. Aguiar, Kécio Gonçalves Leite*)

- [35.24-P](#) **Variação do efluxo de CO₂ no solo em uma floresta de transição no noroeste de Mato Grosso** (*Carla Maria Abido Valentini, Luciana Sanches, Eliane Dias de Almeida, Segundo Durval Pereira Rezende, Vinícius Buscioli Capistrano, Sérgio Roberto de Paulo, Nicolau Priante Filho, José de Souza Nogueira*)
- [35.25-P](#) **Low frequency transports in the atmospheric surface layer over Amazon forest** (*Celso Von Randow, Bart Kruijt, Bert Holtslag, Leonardo Deane de Abreu Sá, Antonio Ocimar Manzi, Alessandro Carioca de Araujo, Antonio Donato Nobre*)

CD_Solos_Liteira (*CD_Soil_Litter*)

- [36.1-P](#) **Soil respiration in native Cerrado and a pasture in Central Brazil: Seasonal variation and deep soil contribution on total flux** (*Roberto Engel Aduan, Carlos Augusto Klink, Eric Atlas Davidson*)
- [36.2-P](#) **População Microbiana, Carbono e Nitrogênio Microbiano Como Indicador de Biomassa Microbiana de um Solo de Terra Firme sob a Floresta Nacional de Caxiuanã Experimento LBA, na Estação Científica Ferreira Pena, Melgaço-Pará.** (*Eric Bruno Silva Batista, Maria de Lourdes Pinheiro Ruivo, Maria de Lurdes Oliveira, Elessandra Laura Nogueira Lopes, Brenda Costa Guimarães*)
- [36.3-P](#) **Soil organic matter dynamics and physico-chemical properties of intensively-managed Eucalyptus plantations compared to native forests in the Brazilian Amazon** (*Troy Patrick Beldini, Kenneth L. McNabb, B. Graeme Lockaby, Felipe G. Sanchez*)
- [36.4-P](#) **An Approach to Deal with Sources of Data Uncertainty in Dissolved Organic Carbon Dynamic** (*Virginia Brilhante, J. L. Campos dos Santos*)
- [36.5-P](#) **Flutuação Temporal e Espacial da Liteira Sobre o Solo e da Umidade da Camada Superficial do Solo** (*Adriana Castro da Conceição, Flavio J. Luizão*)
- [36.6-P](#) **Soil-Atmosphere Carbon Dioxide Fluxes Measured with Automated Chambers at the Tapajos National Forest** (*Ruth Varner, Patrick Michael Crill, Michael M. Keller, Raimundo Cosme de Oliveira Jr., Eráclito Rodrigues de Sousa Neto, Jadson Dizencourt Dias, Hudson Silva, Kêmeson Oliveira, Sérgio N. da Silva Albuquerque, Jess Alexander*)
- [36.7-P](#) **Decomposição de folhas de espécies em uma Floresta de Transição Amazônia Cerrado e uma Floresta Amazônia em período de transição seco-úmido** (*Higo José Dalmagro, Luciana Sanches, Kelli Cristina Aparecida Munhoz, Vanessa Aparecida Santos, Leandro Gomes de Almeida, Nicolau Priante Filho, José de Souza Nogueira, George Louis Vourlitis*)
- [36.8-P](#) **Influência da Quantidade de Biomassa de Liteira Comparada ao Efluxo de CO₂ do Solo Para uma Floresta em Ji-Paraná, RO.** (*Juliano Alves de Deus, Fabrício Berton Zanchi, Jorge Luiz Nepomuceno de Lima, Fernando Luiz Cardoso, Kécio Gonçalves Leite, Leonardo J. G. Aguiar, Paulo Renda Anderson, Anderson Telles, Humberto Ribeiro da Rocha, Antônio Ocimar Manzi*)
- [36.9-P](#) **Leaf Area Index (LAI) and Litter Production Before and After Selective Logging in a Tropical Forest, Eastern Amazônia, Santarém-PA.** (*Adelaine Michela Figueira, Cleilim Albert Dias de Sousa, Augusto Rodrigues Maia, Michael L. Goulden, Scott Dennis Miller, Humberto Ribeiro da Rocha, Mary Catherine Menton*)
- [36.10-P](#) **Efeito da Exclusão de Água do Experimento ESECAFLOR Sobre a Abundância dos Díptera Presentes na Liteira de uma Floresta de Terra Firme** (*Ivaneide da Silva Furtado, Michele de Azevedo Pinto, Marlúcia Bonifácio Martins*)
- [36.11-P](#) **Biomassa de raízes em sistemas agroflorestais implantados em áreas de pastagens degradadas na Amazônia central** (*Jorge Luis Enrique Gallardo Ordinola, Flavio Jesus Luizão, Erick Fernandes, Elisa Wandelli*)
- [36.12-P](#) **Influência da temperatura e umidade do solo e do ar na produção e acúmulo de serrapilheira em floresta de transição tropical úmida - cerrado** (*Márcia Martim Pereira Gallon, Marcia Elisabete Klein, Eliane Dias de Almeida, Marina Meira Coelho, Luciana Sanches, Carla Maria Abido Valentini, Sérgio Roberto de Paulo, Nicolau Priante Filho, José de Souza Nogueira*)
- [36.13-P](#) **Fluxos de carbono orgânico dissolvido em microbacias pareadas(floresta x pastagem)no estado de Rondônia.** (*Sérgio C. Gouveia Neto, Adriana L. Castellanos B., Alexandra Ayres Montebelo, Alex V. Krusche, Chris Neill, Helmut Elsenbeer*)
- [36.14-P](#) **Relação entre efluxo de CO₂ do solo e o relevo** (*Brenda Rocha Guimaraes, Eleneide Doff Sotta, Maria de Lourdes Pinheiro Ruivo, Edzo Veldkamp*)
- [36.15-P](#) **Internal and external fluxes of dissolved organic carbon in forested headwater Amazonian catchments: Near-surface and aboveground controls on DOC exports.** (*Mark S. Johnson, Johannes Lehmann, Eduardo Guimarães Couto, Susan Riha, Mara Abdo, Evandro Carlos Selva, Erick C.M. Fernandes*)
- [36.16-P](#) **Terra Preta de Indio of the Amazon: opportunity to study black carbon dynamics in soil** (*Johannes Lehmann, Biqing Liang*)

- [36.17-P](#) **Carbono e Nitrogênio Orgânico no Solo e Carbono e Nitrogênio da Biomassa Microbiana em Solos com Gradiente de Umidade, Caxiuana - PA.** (*Elessandra Laura Nogueira Lopes, Maria de Lourdes Pinheiro Ruivo, Eric Bruno Silva Batista, Brenda Rocha Guimarães, Rejane Rocha Costa*)
- [36.18-P](#) **Soil Carbon Stocks and Dynamics in Acre: Contrasts with the Remaining Brazilian Amazon** (*Antonio Willian Flores de Melo, Plínio Barbosa de Camargo, Cleber Ibraim Salimon, Eric A. Davidson, Susan E. Trumbore, Judson Ferreira Valentim*)
- [36.19-P](#) **Transporte de carbono e nutrientes da liteira para o igarapé em uma pequena bacia hidrológica de Terra-Firme na Amazônia central** (*Terezinha Ferreira Monteiro, Flavio Jesus Luizão*)
- [36.20-P](#) **Relações entre a produção de liteira e os componentes do balanço hídrico na Estação Científica Ferreira Penna, Melgaço-PA.** (*Rosecélia Moreira Silva, Jose Maria Nogueira da Costa, Samuel Soares Almeida, Antônio Carlos Lôla da Costa, Patrick Meir, Maria de Lourdes Pinheiro Ruivo*)
- [36.21-P](#) **Influence of soil texture on the dynamics of dissolved organic carbon in soil solution of a primary forest in the Amazon ZF2, Manus** (*Vania Neu, Alex Vladimir Krusche, João Ferraz*)
- [36.22-P](#) **Concentrações carbono e nitrogênio em folhas de árvores em duas florestas de terra firme na Amazônia brasileira, sobre solos de fertilidade contrastante.** (*Romilda Maria Quintino Paiva, Flavio Jesus Luizão*)
- [36.23-P](#) **Fluxo de CO₂ e CH₄ em pastagens abandonadas, sistemas agroflorestais e floresta primária na Amazônia Ocidental** (*Juliete Tomé Queiroz, Lucerina Trujillo Cabrera, Flavio Jesus Luizão*)
- [36.24-P](#) **Soil Aluminium Influence Over Tree Species Distribution in the Bolivian Amazon Forest** (*Carlos Alberto Quesada, Jonathan James Lloyd, Sandra Patiño, Oliver L. Phillips, Yadvinder Singh Malhi, Almuth Arneth, Luzmilla Arroyo, Timothy Killeen*)
- [36.25-P](#) **Decomposição de folhas de espécies em uma Floresta Tropical de Transição em Sinop/MT em períodos de transição úmido- seco e seco-úmido** (*Fernando Raiter, José de Souza Nogueira, Segundo Durval Pereira Rezende, Wander Hoeger, Jansen Luiz Trierweiler, Luciana Sanches, George Sanches Sulli, Nicolau Priante Filho, Francisco de Almeida Lobo*)
- [36.26-P](#) **Aumento da Produção de Liteira em um Período de El Niño em Floresta de Terra Firme na Amazônia Central** (*Fabiana Rocha Pinto, Flavio J. Luizão, Regina C.C. Luizão*)
- [36.27-P](#) **Capacidade de Água Disponível no Solo e Suas Relações com a Fauna do Solo e as Funções Reprodutivas Vegetal: Experimento LBA Esecaflo- Caxiuana/PA** (*Maria de Lourdes Pinheiro Ruivo, Marlúcia Bonifácio Martins, Samuel Soares Almeida, Eleneide Doff Sotta*)
- [36.28-P](#) **Assessing the impact of land-use change on soil organic carbon dynamics in Central Panama using physical soil fractionation and stable carbon isotopes** (*Luitgard C Schwendenmann, Elise Pendall*)
- [36.29-P](#) **The influence of water in the relationship between CO₂ efflux and soil chemical properties in a terra firme forest** (*Juliana Silva de Souza, Regina Costa Luizão, Flavio Jesus Luizão*)
- [36.30-P](#) **Carbono e nutrientes na interface solo-liteira em plantios florestais e florestas nativas de terra firme na Amazônia peruana** (*Sandra Celia Tapia-Coral, Flavio Jesus Luizão, Dennis del Castillo*)
- [36.31-P](#) **Variação sazonal da biomassa microbiana-C e da umidade do solo sob diferentes coberturas vegetais na Amazônia central** (*Lucerina Trujillo-Cabrera, Flavio J. Luizão*)
- [36.32-P](#) **Carbon distribution in particle size fractions of soil organic matter under primary forest and agroforestry systems on two soil types in western Amazonia** (*Katell Uguen, Thierry Desjardin, Sonia Sena Alfaia, Flavio Jesus Luizão*)
- [36.33-P](#) **Medição do Efluxo de CO₂ do Solo com Câmaras Automáticas Sobre Floresta em Rondônia.** (*Fabício Berton Zanchi, Humberto Ribeiro da Rocha, Helber Custódio de Freitas, Bart Kruijt, Juliano Alves de Deus, Fernando Luiz Cardoso, Paulo Renda Anderson, Leonardo J. G. Aguiar, Antonio Ocimar Manzi*)

SH (Hidrologia e Química das Águas) / SH (Surface Hydrology and Water Chemistry)

SH_Biogequímica (SH_Biogeochemistry)

- [37.1-P](#) **Balanco de Nitrogênio em Microbacias Pareadas (Floresta vs. Pastagem) no Estado de Rondônia, Brasil** (*Adriana L. Castellanos B., Alex V. Krusche, Christopher Neill, Sérgio C. Gouveia, Sonja Germer, Alexandra Ayres Montebelo, Marcos A. Bolson*)

- [37.2-P](#) **The role of suspended sediments in the metabolism and nutrient concentrations in river waters of Rondonia.** (*Michelle Cristine Cogo, Alexandra Ayres Montebelo, Alex Vladimir Krusche, Anthony K Aufdenkampe*)
- [37.3-P](#) **Estudo das Variáveis Físico-química, Química e Bacteriológica de Igarapés das Bacias Hidrográficas de São Raimundo, Educandos e Tarumã.** (*Hilandia Brandao Cunha*)
- [37.4-P](#) **Determinação dos Parâmetros Físico-Químico e Bacteriológico de Poços Rasos cacimbas da Região Leste da Cidade de Manaus.** (*Hilandia Brandão Cunha, José Rodrigues Rocha Neto*)
- [37.5-P](#) **Stream size influences the biogeochemistry of nitrogen in pasture stream channels.** (*Christie L. Hauptert, Linda A. Deegan, Christopher Neill, Alex V. Krusche, Reynaldo L. Victória, Victoria R. Ballester*)
- [37.6-P](#) **Towards a Large-Scale Aquatic Carbon Model for the Amazon Basin** (*Erica Akiko Howard, Michael T. Coe, Jonathan A. Foley, Marcos Heil Costa*)
- [37.7-P](#) **Controls on stream DOC flux and composition in the Amazon region, Tapajos national forest** (*Marc Gerald Kramer, Christopher Potter, Raimundo Cosme de Oliveira Jr., Steven Klooster, Venessa Brooks*)
- [37.8-P](#) **Riparian control of carbon dynamics in streams of Rondônia** (*Alex Krusche, Maria Victoria Ballester, Reynaldo Luiz Victória, Linda Deegan, Christopher Neill*)
- [37.9-P](#) **The Biogeochemistry of Ji-Paraná River, Rondonia** (*Nei Kavaguichi Leite, Alex Vladimir Krusche, Reynaldo Luiz Victória, Maria Victoria Ramos Ballester, Jeffrey E. Richey*)
- [37.10-P](#) **Relação Entre Carbono Orgânico Dissolvido e Condutividade Elétrica na Bacia Asu, Amazônia Central, Brasil** (*Sylvia Mota de Oliveira, Antônio Donato Nobre, Maarten Waterloo, Luz Adriana Cuartas Pineda, Javier Tomasella, Martin George Hodnett, Antônio Huxley Melo Nascimento, Glauco Siqueira Gonçalves*)
- [37.11-P](#) **Availability of Nutrients in Solutions in a Gallery Forest of Cerrado Biome** (*Lucilia Parron, Mercedes Maria Cunha Bustamante, Daniel Markewitz, Cesar Prado*)
- [37.12-P](#) **A Simulation Model of Carbon Cycling and Methane Emissions in Amazon Wetlands** (*Christopher Potter, John Melack, Laura Hess, Bruce Forsberg, Evelyn Moraes Novo, Steven Klooster*)
- [37.13-P](#) **The influences of total dissolved inorganic carbon (DIC) concentrations and pH on potential outgassing from rivers in Rondônia.** (*Maria de Fátima Fernandes Lamy Rasera, Alex Vladimir Krusche, Nei Kavaguichi Leite*)
- [37.14-P](#) **Impact of a phytoplanktonic bloom on the trace concentrations of amazonian floodplain lakes (Lago de Curuai, Para, Brazil)** (*Barroux Gwénael, Viers Jérôme, Seyler T Patrick, Maria de Socorro Rodrigues Ibanez*)
- [37.15-P](#) **How the Amazonian floodplain vegetation can affect the geochemical status of some trace elements in the Amazon River mainstream (Brazil)?** (*Viers Jérôme, Pinelli Marcello, Barroux Gwénael, Boaventura R Geraldo, Seyler T Patrick*)
- [37.16-P](#) **Potabilidade das Águas Subterrâneas do Município de Ji-Parana. Estudo de Caso: Bairro Nova Brasília** (*Ariveltom Cosme Silva*)
- [37.17-P](#) **Desenvolvimento de metodologia analítica para a determinação simultânea de ácidos carboxílicos de baixo peso molecular e ânions inorgânicos em amostras dos rios da bacia Amazônica empregando Cromatografia de íons** (*Cristiane Azevedo Tumang, Alex Vladimir Krusche, Reynaldo Luiz Victória, Alexandra Ayres Montebelo, Jeffrey E. Richey*)

SH_Geral (SH_General)

- [38.1-P](#) **Estudo, Análise e Modelagem da Dinâmica da Descarga em uma Micro-bacia Monitorada na Amazônia Central** (*Juan Camilo Múnera-Estrada, Luz Adriana Cuartas, Javier Tomasella, Maarten Waterloo, Martin George Hodnett, Antonio Donato Nobre*)
- [38.2-P](#) **Spatial Distribution of the Hydrological Impact of Deforestation in Amazonia** (*Cassiano D'Almeida, Charles J. Vörösmarty, George Hurtt, José A. Marengo, S. Lawrence Dingman, Barry D. Kiem*)
- [38.3-P](#) **Caracterização de Margens de Lagos da Planície Amazônica a Partir de Fusão de Imagens Ópticas e de Radar** (*Andreia Maria S. França, Evelyn M. L. M. Novo*)
- [38.4-P](#) **Hydraulic Slope of Negro and Solimões Rivers From Satellite Altimetry : Relationship With the Distribution of Erosion/Sedimentation Areas.** (*Seyler Frédérique, Calmant Stéphane, Bonnet Marie-Paule, Marco Antonio de Oliveira*)
- [38.5-P](#) **Propagação da Maré no Estuário do Rio Amazonas** (*Marcos Nicolas Gallo, Susana Beatriz Vinzon, Adriana Dantas Medeiros, Felipe Augusto Oliveira*)
- [38.6-P](#) **Impact of Land Use/Land Cover Change on Hydrological Processes in a Mesoscale Basin in Rondônia (Western,Amazônia)** (*Manuel Enrique Gamero Guandique, Reynaldo Luiz Victória*)

- [38.7-P](#) **Processes of streamflow generation in a small rainforest catchment in Central Amazonia** (*Martin George Hodnett, Javier Tomasella, Luz Adriana Cuartas, Antonio Donato Nobre, Maarten Waterloo, Sylvia Mota de Oliveira, Camilo Renno*)
- [38.8-P](#) **Landsat TM image restoration for mapping narrow water channels connecting small lake systems in Central Amazon: Mamirauá Sustainable Development Reserve - RDSM *** (*Dayson Jardim-Lima, Maria Teresa Fernandez Piedade, Helder Lima Queiroz, Evlyn Márcia Leão de Moraes Novo*)
- [38.9-P](#) **A base de dados "on-line" do projeto HiBAm-Hidro-geodinâmica da bacia amazônica.** (*Gérard Cochonneau, Jean Loup Guyot, João Bosco Alfenas, Geraldo Boaventura, Jacques Callede, Naziano Filizola, Valdemar Guimarães, Pascal Kosuth, Alain Laraque, Reginaldo Simões Longuinhos, Jean-Michel Martinez, Laurence Maurice-Bourgoin, Patricia Moreira-Turcq, Frédéric Muller, Julien Nicod, Eurides Oliveira, Marcos Assis Rios, Josyane Ronchail, João Bosco Rondon, Frédéric Seyler, Patrick Seyler, Gutemberg Menezes Silva, José Jorge da Silva, Francis Sondag*)
- [38.10-P](#) **Los regimenes hidrológicos en la Cuenca Amazónica del Perú** (*Jorge Yerren, Waldo Lavado, Pascal Fraizy, Jean Loup Guyot*)
- [38.11-P](#) **A 1D sediment transport model for the Amazone river** (*Julien Nicod, Jean-Pierre Baume, Pascal Kosuth, Benoit Le Guennec*)
- [38.12-P](#) **Avaliação da confiabilidade de dados hidrográficos para a bacia trinacional da Bolívia, Brasil e Peru do Alto Rio Acre, Amazônia Sul-Occidental.** (*Mônica De Los Rios Maldonado, Irving Foster Brown*)
- [38.13-P](#) **Operação e Manutenção de uma Bacia Hidrográfica Instrumentada na Amazônia Central** (*Antonio Huxley Melo Nascimento, Glauco Siqueira Gonçalves, Luz Adriana Cuartas Pineda, Sylvia Mota de Oliveira, Antonio Donato Nobre, Javier Tomasella*)
- [38.14-P](#) **Macro-geomorphologic analysis of the Araguaia River basin, Brazil** (*Thiago Morato de Carvalho*)
- [38.15-P](#) **Sedimentation in the "varzea" floodplain systems as a potential tool for the study of past natural perturbation events in Amazonia.** (*Patricia Moreira-Turcq, Renato Campello Cordeiro, Bruno Turcq, Patrick Seyler, Arnaldo Carneiro, Marcello Bernardes, Lilian C. dos Santos Carlos, Renata Lima da Costa*)
- [38.16-P](#) **Seasonal changes in phytoplankton distribution from Óbidos to Almerim in response to Amazon flood pulse.** (*Evlyn M. Novo, Claudio F. Barbosa, Ramon M. Freitas, John M. Melack, Yosio E. Shimabukuro, Waterloo Pereira Filho*)
- [38.17-P](#) **Regionalisation of the discharge-sea surface temperature relationships in the Amazon basin** (*Josyane Ronchail, Gérard Cochonneau, David Labat, Luc Bourrel, Laurence Maurice-Bourgoin, Naziano Filizola, Jacques Callede, Jean Loup Guyot, Eurides Oliveira*)
- [38.18-P](#) **Validation of a soil moisture model for pasture in Rondônia, Brazil.** (*Luciana Rossato, Regina Célia dos Santos Alvalá, Javier Tomasella*)
- [38.19-P](#) **Hydrological Modeling of Large Scale: Initial Parameterizations in Amazon** (*Alailson Venceslau Santiago, Daniel de Castro Victoria, Maria Victoria Ramos Ballester, Antonio Roberto Pereira, Reynaldo Luiz Victória, Mariza C. Costa-Cabral, Jeffrey E. Richey*)
- [38.20-P](#) **Monitoramento do Nível do Lençol Freático em Área de Pasto, Floresta Nativa e Área de Manejo Florestal - Sinop, MT** (*Livia Fernanda Chaves dos Santos, Shozo Shiraiwa*)
- [38.21-P](#) **Transporte de Sedimentos de Arraste no Rio Amazonas** (*Maximiliano Andres Strasser, Susana Beatriz Vinzon, Flavio Cesar Borba Mascarenhas*)
- [38.22-P](#) **Water balance for the Ji-Paraná Basin using remote sensing and GIS** (*Daniel de Castro Victoria, Maria Victoria Ramos Ballester, Antonio Roberto Pereira, Luiz Antonio Martinelli, Jeffrey E. Richey, Reynaldo Luiz Victória*)
- [38.23-P](#) **Flow regime and flood dynamic of the Araguaia River, Brazil** (*Sâmia Aquino, Edgardo M. Latrubesse*)

LC (Mudanças dos Usos da Terra e da Vegetação) / LC (Land Use and Land Cover Change)

LC_Desmatamento_Desenvolvimento (LC_Deforestation_Development)

- [39.1-P](#) **A Extensão dos Incêndios Florestais na Amazônia Brasileira em Anos de El Niño e Não El Niño** (*Ane A.C. Alencar, Daniel Curtis Nepstad, Maria Del Carmen V. Diaz*)
- [39.2-P](#) **Dinâmica de Ocupação e Perda de Carbono no Leste da Amazônia** (*Arlete Silva de Almeida, Ima Célia Guimarães Vieira, Thomas A. Stones, Eric A. Davidson*)
- [39.3-P](#) **Evaluating Selective Logging Pressure upon the Amazonian Biome Using GIS Cost Surface Models** (*Paulo Barreto, Carlos Moreira de Souza Jr., Marco Lentini, Dar Roberts*)

- [39.4-P](#) **Deforestation Patterns Along the Highway Belem/Tome-Acu, Brazilian Amazonia.** (Doris Graziela Navarro, Scott S. Hetrick, *Eduardo Sonnewend Brondizio*)
- [39.5-P](#) **Estimating climatic implications of soy and pasture expansion in Mato Grosso** (Julia Pongratz, *Ruth DeFries*, Lahouari Bounoua, Douglas Morton, Liana Anderson, Yosio Shimabukuro)
- [39.6-P](#) **The Rubber Tappers' Rapidly Transitioning Land Use Strategies: Cattle Ranching Expansion in the Chico Mendes Extractive Reserve in Acre, Brazil** (*Carlos Valerio A. Gomes*, Stephen G Perz, Irving Foster Brown)
- [39.7-P](#) **Avaliação da abrangência das Áreas de Proteção Permanente (APP) em relação a Reserva Legal em ambientes de floresta da Amazônia** (*Felipe Resque Jr, Ane Alencar, José Heder Benatti*)
- [39.8-P](#) **Conversão de Floresta Tropical em Pastagem e Sua Influência no Balanço Hídrico da Região de Ji-Paraná, Rondônia.** (*Kécio Gonçalves Leite, Carlos Mergulhão Jr., Fernando Luiz Cardoso, Fabrício Bertoni Zanchi, Juliano Alves de Deus, Leonardo J. G. Aguiar, Paulo Anderson Renda, Anderson Teixeira Telles*)
- [39.9-P](#) **Land Use and Land Cover Change in Amazonia Frontier, Ji-Paraná Basin - Rondônia** (*Lais Carvalho Hanada, Maria Victória Ramos Ballester, Reynaldo Luiz Victória, Jeffrey E. Richey*)
- [39.10-P](#) **Análise da Intensidade da Exploração Madeireira em Áreas de Floresta Densa e de Transição na Amazônia** (*Sanae Nogueira Hayashi, Ane Costa Alencar, Oswaldo Carvalho Jr.*)
- [39.11-P](#) **Avaliação do manejo seletivo de madeira e alteração da biomassa através da análise de imagens Ikonos, no município de Cláudia - MT** (*Wander Hoeger, George Sanches Suli, Peter Zeilhofer, Rodrigo Marques, Sérgio Gripp, Gisele Cristina Baldissera, Roberto Juliano Benedito Serra*)
- [39.12-P](#) **Monitoramento da expansão de soja em relação ao Zoneamento Agroecológico do município de Santarém** (*Wanja Janayna Lameira, Ane Alencar*)
- [39.13-P](#) **Infrastructure, Regional Development and Livestock in the state of Para, Brazilian Amazon** (*Benoit Mertens*)
- [39.14-P](#) **O impacto do número de queimas sobre o potencial regenerativo da vegetação secundária na Amazônia Central** (*Marcelo Paustein Moreira, Rita Guimarães Mesquita, Ana Luísa Albernaz, Eduardo Martins Venticinqu*)
- [39.15-P](#) **Carbon and nutrient transfers following selective logging in the Amazon: Combining remote sensing and allometry.** (*Lydia Pauline Olander, Gregory Paul Asner, Mercedes Maria Cunha Bustamante*)
- [39.16-P](#) **Relações hídricas de sistemas agroflorestais seqüenciais no nordeste do Pará: avaliação do potencial hídrico em componentes arbóreos¹** (*Valdirene Costa de Oliveira, Cláudio José Reis de Carvalho, Tatiana Deane de Abreu Sá*)
- [39.17-P](#) **Plantio de árvores de crescimento rápido para recuperação da capacidade produtiva da agricultura familiar na Amazônia Oriental brasileira** (*Silvio Brienza Jr., Valdirene Costa de Oliveira, Adélia Ribeiro Ferreira*)
- [39.18-P](#) **Effects of land use changes on soil microbial communities in the Cerrado region** (*Maria Regina Silveira Sartori da Silva, Joana Dias Bresolin, Ricardo Henrique Kruger, Mercedes Maria Cunha Bustamante, Fabio Bueno Reis Jr.*)
- [39.19-P](#) **Diagnóstico da capacidade de uso da terra de distintos cenários na bacia hidrográfica do rio Ji-Paraná (RO)** (*André Marcondes Andrade Toledo, Maria Victoria Ramos Ballester, Letícia Ayres Montebelo, Ana Luiza Costa Iemini Bertini, Fabrício de Oliveira Lombardi*)
- [39.20-P](#) **Situação da cobertura florestal no Distrito Agropecuário da Zona Franca de Manaus: a importância da escala para espacialização das taxas de desmatamento** (*Eduardo Martins Venticinqu, Amanda F Mortati, Juliana Stropp Carneiro, Marcelo P Moreira, Marina Antongiovanni Fonseca, Taise F Pinheiro, Jansen A Zuanon, Carlos E Da Costa*)

LC_Geral (LC_General)

- [40.1-P](#) **Teores de matéria orgânica, nutrientes e disponibilidade de água, como fatores de limitação ao uso da terra nas bacias dos rios Acre e Iaco, Acre, Brasil** (*Eufran Ferreira do Amaral, João Luiz Lani, Irving Foster Brown*)
- [40.2-P](#) **Socio-spatial processes of forest fragmentation in the Brazilian Amazon: the role of settlement roads** (*Marcellus Marques Caldas, Robert T. Walker, Eugenio Arima, Stephen G Perz, Cynthia Simmons, Alexander Paff, Steve Aldrich, Jiaguo Qi*)
- [40.3-P](#) **Conhecimento Atual dos Solos do Estado de Goiás: Elaboração de Sistemas de Informação Geográficos de Solos / Sig-Solos** (*Pérola Moraes Calil, Virlei Álvaro de Oliveira*)
- [40.4-P](#) **Uso de regressão logística para modelar distribuição espacial de espécies arbóreas na Amazônia Central** (*Juliana Stropp Carneiro, Eduardo Martins Venticinqu*)
- [40.5-P](#) **Influência da escala na distribuição espacial da densidade de árvores Amazônia Central** (*Juliana Stropp Carneiro, Eduardo Martins Venticinqu*)

- [40.6-P](#) **Land Conversion along the Transoceanic Road Iñapari - Iberia: A Socio-Spatial Study of Road Extension and Forest Fragmentation** (*Andrea Birgit Chavez*)
- [40.7-P](#) **Avaliação de Projetos Para Recuperação de Ecossistemas Manguezais, Como Contribuição ao Seqüestro do Carbono Atmosférico e À Mitigação do Efeito Estufa Antrópico** (*Sérgio Mattos Fonseca, Sonia MF Giancesella*)
- [40.8-P](#) **Floresta-De-Baixio: Diversidade e Riqueza de Espécies** (*Kianny Martins Formiga, Iêda Leão Amaral, Arlem Nascimento Oliveira*)
- [40.9-P](#) **Efeito de tratamentos silviculturais na regeneração natural de floresta tropical Ombrófila Aberta, na Amazônia Meridional** (*Elenara Gandini, Carlos Alberto Moraes Passos, Maria José de Souza Noquelli, Erick C.M. Fernandes, Johannes Leahmann, Susan Riha, Péricles Aquino Botelho, Silvana Fuhr, Stefan Jirka, Ted Feldpausch*)
- [40.10-P](#) **The Cuiabá- Santarém Road Linkage and the Effects on Land Cover.** (*Corey Miyano Hayashi, Scott S. Hetrick*)
- [40.11-P](#) **Biophysical Predictors of Soy Expansion in Mato Grosso state, Brazil** (*Ellen Jasinski, Douglas Morton, Ruth DeFries, Yosio Shimabukuro, Liana Anderson, Matthew Hansen, Marcelo Lopes Latorre*)
- [40.12-P](#) **Soil biochemical characteristics under second growth forests of distinct ages and former land use in central Amazonia** (*Fabiane Lima de Oliveira, Regina C>C Luizão, Flavio J. Luizão*)
- [40.13-P](#) **Dinâmica de Fragmentos Florestais Naturais Ipuacas considerando-se a Avaliação Multitemporal nos Últimos 48 Anos.** (*Alan Kardec Elias Martins, Iracy Coelho de Menezes Martins, Paula Benevides Moraes*)
- [40.14-P](#) **Diagnóstico Ambiental no Contexto da Paisagem de Fragmentos Florestais Naturais - Ipuacas - no Município de Lagoa da Confusão, Tocantins.** (*Iracy Coelho de Menezes Martins*)
- [40.15-P](#) **Efeito de tratamentos silviculturais no estoque de madeira em floresta tropical Ombrófila Aberta, na Amazônia Meridional** (*Carlos Alberto Moraes Passos, Susan Riha, Johannes Leahmann, Silvana Fuhr, Péricles Aquino Botelho, Maria José de Souza Noquelli, Elenara Gandini, Erick C.M. Fernandes, Stefan Jirka, Ted R. Feldpausch*)
- [40.16-P](#) **Regeneração natural de floresta tropical Ombrófila Aberta com Palmeiras, primária, na Amazônia Meridional** (*Maria José de Souza Noquelli, Carlos Alberto Moraes Passos, Erick Fernandes, Johannes Leahmann, Susan Riha, Ted R. Feldpausch, Stefan Jirka, Elenara Gandini, Péricles Aquino Botelho, Silvana Fuhr*)
- [40.17-P](#) **Extensive analyses for pasture biophysical and biogeochemical dynamics under the interactions between human and soil types in Rondônia** (*Izaya Numata, Dar A Roberts, Oliver A Chadwick, Joao Viane Soares, Francisco Chagas Leonidas, Fernando Antonio Sampaio, Joao Luiz Esteves, Flavio Fendt*)
- [40.18-P](#) **Aspectos da avaliação estatística de biodiversidade arbórea para floresta de transição de terra firme amazônica.** (*George Sanches Suli, Nelson M. Yoshitake, Marcos Silveira, Nicolau Priante Filho, George L. Vourlitis, Vanessa Aparecida Santos, Rodrigo Marques*)
- [40.19-P](#) **Estrutura e Funcionamento de Fragmentos Florestais Naturais (Ipuacas) na Planície do Araguaia** (*Iracy Coelho de Menezes Martins, Paula Benevides Moraes, Alan Kardec Elias Martins*)

LC_Sensoriamento_remoto (*LC_Remote_Sensing*)

- [41.1-P](#) **Rapid assessment of deforestation in Mato Grosso State using MODIS and ETM+ data** (*Liana Oighenstein Anderson, Yosio Edemir Shimabukuro, Douglas Morton, Ruth DeFries, Marcelo Lopes Latorre, Ellen Jasinski, Matthew Hansen, André Lima*)
- [41.2-P](#) **O Uso de Imagens de Alta Resolução na Construção de Bibliotecas Espectrais de Árvores** (*Marina Antongiovanni, Eduardo Martins Venticinque, Marcelo Paustein Moreira, Fernanda Gomes Ferreira, Taise Farias Pinheiro, Juliana Stropp Carneiro, Ana Segalim Andrade, Sammya D´Angelo, William F. Laurance*)
- [41.3-P](#) **Detection of Mesoscale Seasonal and Inter-annual Variation In Vegetation of the Amazon Basin** (*Victoria Ramos Ballester, Miles G Logsdon, Milton Smith, Robin Weeks, Reynaldo Luiz Victória, Jeffrey E. Richey*)
- [41.4-P](#) **Detecção da Dinâmica da Cobertura Vegetal na Região de Cristalina - GO a Partir de Processamento Digital de Imagens Landsat no Período de 1995 e 2003** (*Maria Gonçalves da Silva Barbalho, Simone Almeida Jácomo, Niransi-Mary da Silva Rangel Carraro*)
- [41.5-P](#) **Mapping deforestation and secondary succession forest in the Brazilian Amazon using SPOT-4 VEGETATION data** (*João Brito Carreiras, José Cardoso Pereira, Manuel Lameiras Campagnolo, Yosio Edemir Shimabukuro*)
- [41.6-P](#) **Method for Large-scale Mapping of Forest Gap Fraction and Logging in Amazonia** (*Amanda Naslund Cooper, Gregory Paul Asner, Kathleen Heidebrecht, Amanda Susan Warner, José Natalino Macedo Silva, Mercedes Maria Cunha Bustamante*)

- [41.7-P](#) **An Assessment of Land Cover Dependencies of VI-Biophysical Relationships for Regional Extrapolations of Ground LBA Ecology Measurements in Brazilian Cerrado** (Tomoaki Miura, Alfredo R. Huete, Laerte G. Ferreira, Edson E. Sano)
- [41.8-P](#) **Seasonal and Inter-Annual MODIS Data Responses over a Dry to Wet Amazon Tropical Forest Gradient** (Alfredo R Huete, Kamel Didan, Yosio Edemir Shimabukuro, Tomoaki Miura)
- [41.9-P](#) **High resolution image processing for tree diversity mapping in Tropical Forests of the Western Amazon, Tiputini Biological Station (TBS) Ecuador.** (Edwin Keizer)
- [41.10-P](#) **Sensitivity of Automated Monte Carlo Unmixing to Surface Reflectance Uncertainties Caused by Aerosols, Water Vapor, and Terrain Slope-Aspect** (David E. Knapp, Gregory Paul Asner, Amanda Naslund Cooper, Mercedes Maria Cunha Bustamante, Michael M. Keller, José Natalino Macedo Silva, Darrel L. Williams)
- [41.11-P](#) **Aspectos relevantes para o desenvolvimento de uma metodologia para a correção atmosférica, de imagens geradas pelo sensor IKONOS.** (Rodrigo Marques, Peter Zeilhofer, George Sanches Suli, Sérgio Gripp, Gisele Cristina Baldissera, Roberto Juliano Benedito Serra)
- [41.12-P](#) **Problemas no uso de imagens de alta resolução para quantificação de indivíduos arbóreos** (Taise Farias Pinheiro, Marina Antongiovanni Fonseca, Eduardo Martins Venticinqu, Marcelo Paustein Moreira, Felipe de Araújo Sobrinho, Ana Segalim Andrade, William F. Laurence, Sammya Agra D'Angelo)
- [41.13-P](#) **Uso de imagens de alta resolução para quantificação de indivíduos arbóreos em Florestas Tropicais** (Taise Farias Pinheiro, Marina Antongiovanni Fonseca, Eduardo Martins Venticinqu, Marcelo Paustein Moreira, Felipe de Araújo Sobrinho, Ana Segalim Andrade, William F. Laurance, Sammya Agra D'Angelo)
- [41.14-P](#) **Is P band polarimetric Radar necessary or sufficient to create accurate maps as basis of a monitoring System for the Amazon Forest??** (Marcela Jose Quinones, Dirk Hoekman)
- [41.15-P](#) **Comparação da distribuição espacial de pontos quentes AVHRR e MODIS na região tri-nacional Brasil-Bolívia-Peru e municípios do Estado do Acre** (Diogo Selhorst, Irving Foster Brown, Nara Vidal Pantoja, Leigh Johnson, Peter Schlesinger)
- [41.16-P](#) **Field Assessment of Hot Pixel Data: A Case Study of the Alcobrás Settlement Wildfire to Evaluate the Accuracy of AVHRR, GOES, and MODIS Sensors as Indicators of Biomass Burning Events** (Leigh Johnson, Jorge Henrique Garcia, Diogo Selhorst, Elsa Mendoza, Erika Nascimento, Irving Foster Brown, Manuel Cesario)
- [41.17-P](#) **Monitoramento Ambiental em Áreas de Cerrado a Partir de Dados MOD13Q1 Realçados Através de um Modelo de Mistura Espectral** (Adriana Aparecida Silva, Laerte Guimarães Ferreira, Manuel Eduardo Ferreira, Nilson Clementino Ferreira)
- [41.18-P](#) **Identificação de clareiras através de imagens de satélite de alta resolução** (Felipe de Araújo Sobrinho, Taise Farias Pinheiro, Marcelo Paustein Moreira, Marina Antongiovanni Fonseca, Eduardo Martins Venticinqu)
- [41.19-P](#) **A Review and an Intercomparison of Remote Sensing Techniques to Map Selective Logging in the Brazilian Amazon** (Carlos Moreira de Souza Jr., Gregory Paul Asner, Dar A. Roberts)
- [41.20-P](#) **Sensor MODIS para análise ambiental em Zona Transfronteírica- Brasil/Uruguai: avaliação e perspectivas.** (Valdir Adilson Steinke, Eristelma Teixeira de Jesus Barbosa, Christian Niel Berlinck)
- [41.21-P](#) **Multi-Scale Evaluation Of The Region Of Eastern Amazonia Using Ikonos, Landsat, SRTM And MODIS Data** (Thomas A Stone, Ima Celia Vieira, Arlete Silva de Almeida, Eric A Davidson)
- [41.22-P](#) **Arranjo espacial do dossel e alguns problemas relacionados ao uso de imagens de alta resolução no estudo de florestas tropicais** (Eduardo Martins Venticinqu, Marina Antongiovanni Fonseca, Marcelo P. Moreira, Taise P. Farias, Fernanda G. Ferreira, Juliana Stropp Carneiro, Felipe de Araújo Sobrinho, Ana S. Andrade, William F. Laurance)
- [41.23-P](#) **A Supervised Neural Linear Feature Extractor for Remotely Sensed Data** (Genong Yu, Ryan R Jensen, Paul W Mause)

PC (Física do Clima) / PC (Physical Climate)

PC_Nuvens (PC_Clouds)

- [42.1-P](#) **Microphysical evidence of the transition between predominant convective/stratiform rainfall associated to the large-scale variability of precipitation in Southwest Amazon** (Rachel Ifanger Albrecht, Maria Assução Faus da Silva Dias)
- [42.2-P](#) **Drop Size Distribution Measurements in TRMM-LBA and beyond** (Ali Tokay, Rachel Ifanger Albrecht)

- [42.3-P](#) **Modeling of LBA/EMfInI/SMOCC-2002 Cloud Microphysics** (*Gerson Paiva Almeida, Alexandre Araújo Costa, Antonio Charles Silvério*)
- [42.4-P](#) **Classificação de Nuvens em Imagens Multiespectrais GOES-8 na Região Amazônica: Comparação com Radiosondagens** (*Marcus Jorge Bottino, Juan Carlos Ceballos, Wagner Flauber Lima*)
- [42.5-P](#) **Daily Cycles of Type and Amount of Cloud Cover Over Amazon Region Deduced From GOES-8 Imagery** (*Juan Carlos Ceballos, Marcus Jorge Bottino*)
- [42.6-P](#) **Changes in the microphysical structure of convective clouds over the Amazon** (*Alexandre Araújo Costa, Steven C Sherwood*)
- [42.7-P](#) **Ceilometer Observation of Seasonal and Diurnal Variation in Cloud Cover Fraction, Cloud Base Height, and Visual Range in the Eastern Amazon Region** (*Matthew J. Czikowsky, David Roy Fitzjarrald, Ricardo K Sakai, Osvaldo Luiz Leal de Moraes, Otávio C. Acevedo, Rodrigo da Silva*)
- [42.8-P](#) **Aspectos climatológicos e de mesoescala dos ecos de radar em Rondônia durante o experimento DRY-TO-WET SEASON CAMPAIGN - LBA, para o período de 18/10 a 04/11/2002** (*José Carlos Figueiredo, Gerhard Held*)
- [42.9-P](#) **Cumulus Parameterization Impact of the Simulation of the Dry to Wet Transition using Period in 2002 in the SW Amazon** (*Silvio Nilo Figueroa, Antônio Marcos Mendonça, Pedro Leite Silva Dias*)
- [42.10-P](#) **Caracterização dos Sistemas Convectivos durante Dry-to-Wet 2002** (*Maria Eugenia Baruzzi Frediani, Carlos Augusto Morales, Luiz Augusto Toledo Machado*)
- [42.11-P](#) **Characterization of Storm Types During a 30-HOUR Period of Radar Observations During the Dry-to-Wet Atmospheric Mesoscale Campaign of the LBA in 2002** (*Gerhard Held*)
- [42.12-P](#) **Characterization of Storm Types During a 30-HOUR Period of Radar Observations During the Dry-to-Wet Atmospheric Mesoscale Campaign of the LBA in 2002** (*Gerhard Held*)
- [42.13-P](#) **Dry to Wet Season: Cloud cover, precipitation and thermodynamics features** (*Luiz Augusto Toledo Machado, Carlos Augusto Morales, Henri Laurent, Carlos Frederico Angelis*)
- [42.14-P](#) **Thermo-Electrodynamical analysis related to thunderstorm activities in Pantanal Sul Matogrossense, Brazil: preliminary studies.** (*Odin Mendes Jr, Margarete Oliveira Domingues, Chou Sin Chan, Cesar A. A. Beneti*)
- [42.15-P](#) **A data mining methodology for tracing convective kernels from cloud-to-ground discharge and other atmospheric datasets.** (*Jacques Politi, Stephan Stephany, Margarete Oliveira Domingues, Odin Mendes Jr.*)
- [42.16-P](#) **Cloud Top Ascent Speeds during SMOCC** (*Earle Williams, Luiz Augusto Toledo Machado, Carlos Augusto Morales, Gerhard Held*)

PC_Geral (PC_General)

- [43.1-P](#) **Perfis de aquecimento diabático na Região Amazônica** (*Aline Anderson de Castro, Maria Assução Faus da Silva Dias, Marcos Longo, Pedro Leite Silva Dias*)
- [43.2-P](#) **Monitoramento dos fluxos de energia e CO2 em torre meteorológica na Reserva Florestal do Jaru, em Rondonia** (*Fernando Luiz Cardoso*)
- [43.3-P](#) **Inclusion of radiosondes data of the Campaign of LBA in the Regional Data Assimilation in CPTEC during October 15 to 29, 2002.** (*Rosângela Saher Cintra, Elizabeth Silvestre Espinoza*)
- [43.4-P](#) **Variabilidade Sazonal das Temperaturas do Ar e do Solo no Projeto ESECAFLOR Caxiuanã Pará** (*Antônio Carlos Lôla da Costa, Alan Pantoja Braga, João Athaydes Silva Jr, Paulo Henrique Lopes Gonçalves, Rafael Ferreira da Costa, Patrick Meir, Yadvinder Singh Malhi*)
- [43.5-P](#) **Variabilidade Sazonal do Balanço de Energia em Ecossistema de Manguezal no Nordeste do Estado do Pará** (*Antônio Carlos Lôla da Costa, João Athaydes Silva Jr, Paulo Henrique Lopes Gonçalves, Alan Pantoja Braga, Jose Maria Nogueira da Costa, Patrick Meir, Yadvinder Singh Malhi*)
- [43.6-P](#) **Nocturnal Variability in CO2 Concentration in Amazonian Pasture: Episodes of Fast Decline** (*Margarete Oliveira Domingues, Leonardo Deane de Abreu Sá, Antonio Ocimar Manzi, Celso Von Randow, Luis Marcelo de Mattos Zeri*)
- [43.7-P](#) **The Convective Boundary Layer Over Pasture in Amazonia During the LBA Dry-to-Wet Experiment 2002** (*Gilberto Fisch, Luiz Augusto Toledo Machado, Maria Assução Faus da Silva Dias, Roberto F. da Fonseca Lyra, Anton J. Dolman*)
- [43.8-P](#) **Influences of biomass burning on land-atmosphere interactions and dry-to-wet transition over Amazonia** (*Yan Zhang, Hongbin Yu, Rong Fu*)
- [43.9-P](#) **Severe meteorological events in Northern Mato Grosso between June 1999 and September 2003.** (*Ralf Gielow, João Andrade Carvalho, Ernesto Celestino Alvarado, David Victor Sandberg, José Carlos Santos*)

- [43.10-P](#) **Observações de clima e Fluxos turbulentos de água e CO2 sobre o Cerrado sensu stricto e cana-de-açúcar** (*Robinson Isaac Negrón Juárez, Humberto Ribeiro da Rocha*)
- [43.11-P](#) **Latent and Sensible Heat Flux Height Variation Within and Above the Rebio Jaru Amazonian Rain Forest Canopy** (*Maria Betânia Leal Oliveira*)
- [43.12-P](#) **Detection of real time influence regions on the eddy flux and concentration measurements as a support for aircraft measurements during FIRE** (*Marcos Longo, John Lin, Christoph Gerbig, Maria Assução Faus da Silva Dias, Pedro Leite Silva Dias, Saulo Ribeiro de Freitas, Rodrigo Gevaerd, Steven C. Wofsy, Paulo Artaxo*)
- [43.13-P](#) **Características dos Sistemas Convectivos de Mesoescala Observados Sobre a Amazônia Durante o Experimento RACCI/LBA** (*Suzana Rodrigues Macedo, Luiz Augusto Toledo Machado, Carlos Augusto Morales, Daniel Vila, Henri Laurent*)
- [43.14-P](#) **Importance of the Low Level East East of the Andes (LLJ) and the moisture transport from the Amazon Basin to the la Plata Basin** (*José A. Marengo, Pedro Leite Silva Dias, Maria Assução Faus da Silva Dias, Tercio Ambrizzi, Gilberto F Fisch, Luiz Augusto Toledo Machado, Tracema F Cavalcanti*)
- [43.15-P](#) **Sobre a Participação do Avião Laboratório Para Pesquisas Atmosféricas (ALPA) no LBA** (*Emerson Mariano Silva, Gerson Paiva Almeida, João Bosco Verçosa Leal Jr., Carlos Jacinto Oliveira, Francisco Geraldo Melo Pinheiro*)
- [43.16-P](#) **Avaliação de perfis de vento interior da Camada Limite Atmosférica** (*Sylvia Elaine Marques de Farias, Chou Sin Chan*)
- [43.17-P](#) **Time Evolution of the Nocturnal Boundary Layer Over Amazonia** (*Rosa Maria Nascimento dos Santos, Gilberto Fernando Fisch*)
- [43.18-P](#) **Low Level Jet Influence on the Nocturnal Boundary-layer Vertical Structure Above Caxiuanã Forest Reserve During Wet Season** (*Daniele Santos Nogueira, Leonardo Deane de Abreu Sá, Julia Clarinda Paiva Cohen*)
- [43.19-P](#) **Fontes e Sumidouros de Vapor D'água e Calor Sensível Sobre o Pantanal** (*André Becker Nunes, Prakki Satyamurty*)
- [43.20-P](#) **Um Estudo de Caso Envolvendo Evaporação Regional na Camada Limite Planetaria Através do Abracos e Modelo MM5.** (*José Francisco Oliveira Jr, Eduardo Barbosa Correa, Daniel Carlos Menezes, Rodrigo Santos Costa, Nilton Oliveira Moraes*)
- [43.21-P](#) **Estudo da Convecção em Pastagem-Floresta Utilizando Radiossondagem e Modelo MM5.** (*José Francisco Oliveira Jr, Rodrigo Santos Costa, Nilton Oliveira Moraes, Eduardo Barbosa Correa, Daniel Carlos Menezes*)
- [43.22-P](#) **Do amazonian trees loose water at night?** (*Rafael S Oliveira, Todd E Dawson, Stephen O Burgess, Scott R. Saleska, Steven C. Wofsy, Daniel Curtis Nepstad*)
- [43.23-P](#) **Sistema de Aquisição de Dados ALPA2000** (*Francisco Geraldo Pinheiro, Carlos Jacinto Oliveira, Rafael Castelo Martins, Francisco Walber Silva*)
- [43.24-P](#) **Radiação Fotossinteticamente Ativa No Sub-bosque De Uma Floresta Primária No Oeste Do Pará, Amazônia** (*Irene Cibelle Sampaio, Osvaldo Luiz Leal de Moraes, David Roy Fitzjarrald, Ricardo Sakai*)
- [43.25-P](#) **Análise da Variabilidade Temporal do IWV na Pré Estação Chuvosa Utilizando GPS.** (*Luiz Fernando Sapucci, Luiz Augusto Toledo Machado, João Francisco G. Monico, Artemio Plana Fattori*)
- [43.26-P](#) **Impacto da convecção úmida na baixa estratosfera - um estudo de caso** (*Thaís Machado Scherrer, Pedro Leite Silva Dias*)
- [43.27-P](#) **Variação Sazonal de Alguns Elementos Meteorológicos em Ecossistema de Manguezal no Nordeste do Estado do Pará** (*João Athaydes Silva Jr, Antônio Carlos Lôla da Costa, Paulo Henrique Lopes Gonçalves, Alan Pantoja Braga, Rafael Ferreira da Costa, Patrick Meir, Yadvinder Singh Malhi, Jose Maria Nogueira da Costa*)
- [43.28-P](#) **Estudo Observacional da Altura da Camada de Mistura em Bragança e Caxiuanã Durante o Período Chuvoso de 2002.** (*Adriano Marlisom Sousa, Julia Clarinda Cohen, Edson José Paulino Rocha*)
- [43.29-P](#) **Mecanismos de Controle da Variação Sazonal da Transpiração de Uma Floresta Tropical no Nordeste da Amazônia** (*José Danilo Costa Souza Filho, Aristides Ribeiro, Marcos Heil Costa, Julia Clarinda Cohen*)
- [43.30-P](#) **Variação Sazonal do Albedo Para a Floresta de Caxiuanã-PA** (*José Danilo Costa Souza Filho, Aristides Ribeiro, Marcos Heil Costa, Julia Clarinad Cohen*)
- [43.31-P](#) **Variabilidade Pluviométrica Multi-escala na Amazônia Oriental e Mecanismos Dinâmicos Associados** (*Everaldo B. de Souza, Julia C.P. Cohen, Edson José Paulino Rocha, Tércio Ambrizzi*)
- [43.32-P](#) **Estimativa do balanço de radiação médio à superfície por satélite durante o DRY-TO-WET AMC/LBA** (*Jaidete Monteiro de Souza, Juan Carlos Ceballos*)
- [43.33-P](#) **Análise de Desempenho dos Sistemas de Sondagem Aqua e ICI/NOAA Sobre Rondônia Durante o Experimento Dry-to-wet LBA** (*Rodrigo Augusto Souza, Juan Carlos Ceballos, Christopher Dwight Barnet*)

- [43.34-P](#) **Análise em tempo-escala de um evento associado a um jato em baixos níveis no Pantanal matogrossense** (Luís Marcelo de Mattos Zeri, *Leonardo Deane de Abreu Sá*, Eliana Soares de Andrade, Gannabathula Sri Sesha Durga Prasad)
- [43.35-P](#) **Análise do Ambiente Convectivo na Região Sudoeste da Amazônia: Um Estudo de Caso** (*Eder Paulo Vendrasco*, Maria Assução Faus da Silva Dias)
- [43.36-P](#) **O Microclima do Manguezal de Bragança-PA** (*Marco Vieira Ferreira*, João Batista Miranda Ribeiro, Leonardo Deane de Abreu Sá, Julia Clarinda Paiva Cohen, Mirlen Tássia Filgueira Silva)
- [43.37-P](#) **Análise de Múltiplas Escalas de Tempo Sobre a Atmosfera no Leste da Amazônia Durante o Experimento Cimela** (*Maria Isabel Vitorino*, Leonardo Deane de Abreu Sá, Pedro Leite Silva Dias)
- [43.38-P](#) **Análise estatística de variáveis meteorológicas em diferentes ecossistemas do litoral Atlântico da Amazônia** (*Wladimir José de Santis Jr.*, Adilson Wagner Gandu, Julia Clarinda Paiva Cohen)
- [43.39-P](#) **Estudo da Variação Média Horária da Temperatura do Solo em Diferentes Profundidades em Manguezal Natural e Degradado (Período Menos Chuvoso)** (*Neri Ellen Fernandes Nóbrega*, Antônio Carlos Lôla da Costa, *Paulo Henrique Lopes Gonçalves*, João Athaydes Silva Jr, Alan Pantoja Braga, Rafael Ferreira da Costa, Patrick Meir, Yadvinder Singh Malhi)

PC_Cobertura_da_terra (PC_Land Cover)

- [44.1-P](#) **Estudo do Balanço de Radiação em Áreas de Pastagem e Floresta em Rondônia** (*Leonardo J. G. Aguiar*, Fabrício Berton Zanchi, Renata Gonçalves Aguiar, Fernando Luiz Cardoso, Paulo Renda Anderson, Juliano Alves de Deus, Kécio Gonçalves Leite, Anderson Teixeira Telles, Antônio Ocimar Manzi, Bart Kruijt, Celso Von Randow, Edgar Martinez Marmolejo)
- [44.2-P](#) **Intradiurnal variability of soil temperature, heat flux, and soil thermal diffusivity in different ecosystems in eastern Amazonian** (*Regina Célia dos Santos Alvalá*, Julia Clarinda Paiva Cohen, Ralf Gielow, José Ricardo Santos de Souza, Leonardo Deane de Abreu Sá, Paulo Rogério de Aquino Arlino, Adilson Wagner Gandu)
- [44.3-P](#) **Variabilidade observada da umidade do solo em Floresta Tropical Úmida e Cerrado** (*Rogério Deitali Bruno*, Humberto Ribeiro da Rocha, Helber Custódio de Freitas, Robinson Isaac Negrón Juárez, Scott Dennis Miller, Michael L. Goulden, Osvaldo M. R. Cabral)
- [44.4-P](#) **Dissociação das Propriedades do Solo da Vegetação no Esquema de Superfície SSiB e seu Impacto no Balanço Hidrológico da Amazônia** (*Luiz Antonio Candido*, Javier Tomasella, Manzi Antonio Ocimar, Carlos Afonso Nobre)
- [44.5-P](#) **Mudanças no clima regional devido as modificações recentes da cobertura vegetação Amazônica** (*Francis Wagner Silva Correia*, Regina Célia dos Santos Alvalá, Antonio Ocimar Manzi)
- [44.6-P](#) **Investigation of South American Land/Atmosphere Interactions Using the Regional Eta/ssib Model** (*Fernando Henrique De Sales*, Yongkang Xue)
- [44.7-P](#) **Simulação do desmatamento no leste da Amazonia usando um modelo de alta resolução** (*Adilson Wagner Gandu*, Julia Clarinda Paiva Cohen, José Ricardo S. de Souza)
- [44.8-P](#) **High Resolution Numerical Simulation of the Deforestation Impact in the Cuiba/Santarem Region** (*Adilson W. Gandu*, Pedro Leite Silva Dias, Demerval S. Moreira)
- [44.9-P](#) **Variações micrometeorológicas foram observadas entre área de manguezal natural e área desmatada, durante o experimento do CiMeLa** (*João Batista Miranda Ribeiro*, Paulo Jorge Souza, Mirlen Tássia Filgueira Silva, Marco Antônio Ferreira)
- [44.10-P](#) **Fluxos de massa e energia em área de reflorestamento em função do crescimento da vegetação** (*Kelli Cristina Aparecida Munhoz*, Nicolau Priante Filho, Sérgio Roberto de Paulo, José de Souza Nogueira, Luciana Sanches Souza, George Louis Vourlitis)
- [44.11-P](#) **Impactos Climáticos Associados à Cenários Futuros de Desmatamento da Floresta Amazônica** (Gilvan Sampaio, *Carlos Afonso Nobre*, Luiz Antônio Cândido)
- [44.12-P](#) **Impacto da Utilização de Diferentes Esquemas de Superfície na Previsão Regional do Modelo Eta** (*José Roberto Rozante*, Luiz Antonio Candido, Simone Shizue Tomita)
- [44.13-P](#) **Measuring Vegetation Aerodynamic Roughness Over the Amazon Basin** (*Sassan S. Saatchi*, Regina Célia dos Santos Alvalá, Scott A. Denning)
- [44.14-P](#) **Impacts of Land-Cover Change on the Hydrometeorology of the Amazon** (*Renato Ramos da Silva*, Roni Avissar)
- [44.15-P](#) **Clima e Fluxos de Superfície-Atmosfera Sobre Cerrados Seco e Alagável** (*Rafael Nora Tannus*, Humberto Ribeiro da Rocha, Helber Custódio de Freitas, Robinson Isaac Negrón Juárez, Rogério Bruno, Leuda da Silva Oliveira, Osvaldo M. R. Cabral, Rita Maria Ribeiro, Dariusz Kurzatkowski, Stefano Merlin, Erich Collicchio)

PC_Modelagem (PC_Modeling)

- [45.1-P](#) **Two-dimensional Pattern of Forecast Model Drift in the Amazon Basin** (José Antonio Aravéquia, Pedro Leite Silva Dias)
- [45.2-P](#) **The CPTEC global model bias in the Amazon region: results of long term simulations and predictive skill in seasonal forecasting.** (Helio Camargo, Pedro Leite Silva Dias, José A. Marengo, Anete Fernandes, Lincoln Muniz, Nuri Calbete, Christopher Castro, Ana Paula Maletba, Ana Cláudia Araújo Preste)
- [45.3-P](#) **Proposta de uma Metodologia de Inicialização da Umidade do Solo para a Previsão de Tempo Regional** (Luiz Antonio Candido, Gilvan Sampaio de Oliveira, Carlos Afonso Nobre)
- [45.4-P](#) **Circulações de Mesoescala no Leste da Amazônia - CiMeLa** (Julia Cohen, Regina Célia dos Santos Alvalá, Adilson Gandu, Leonardo Deane de Abreu Sá, Galdino Mota, Maria Isabel Vitorino, Paulo Arlino, João Batista Miranda Ribeiro, Isa Maria Silva, Edson José Paulino Rocha, Jose Paulo Costa, Jose Danilo Souza Filho, Jose Ricardo Souza, Paulo Jorge Oliveira)
- [45.5-P](#) **On the performance of the Meso Eta regional weather forecast model in Rondonia** (Jorge Luís Gomes, Josiane F. Bustamante, Margarete O. Domingues)
- [45.6-P](#) **Data Assimilation using RPSAS during the experiment of LBA, October, 15 to 29 2002** (Elizabeth Silvestre Espinoza, Rosangela Saher Cintra)
- [45.7-P](#) **Data Assimilation Impact on the Moisture Transport from the Amazon to the Plata Basin** (Dirceu Luis Herdies, Pedro Leite Silva Dias)
- [45.8-P](#) **Sensibilidade do clima no Sudeste do Brasil devido às mudanças do uso da terra** (Robinson Isaac Negrón Juárez, Humberto Ribeiro da Rocha)
- [45.9-P](#) **September/October 2002 Mesoscale Reanalysis of the RACII campaign in Rondonia/Brazil** (Demerval Soares Moreira, Pedro Leite Silva Dias)
- [45.10-P](#) **Dry to Wet Transition Simulation with Dynamic Vegetation** (Demerval Soares Moreira, Pedro Leite Silva Dias, Adriana Beltran, Roger Pielke)
- [45.11-P](#) **Avaliação do Esquema de Convecção RAS Utilizando o Modelo CGM/CPTEC Durante o Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia (LBA)** (Maria Aurora Mota, Antônio Marcos Mendonça)
- [45.12-P](#) **Utilização do Conceito de Entropia Generalizada Para Caracterizar Diferenças Entre as Flutuações de Temperatura e de Velocidade do Vento Acima e Abaixo da Copa da Floresta Amazônica em Rondônia** (Maurício José Alves Bolzan, Fernando Manuel Ramos, Leonardo Deane de Abreu Sá, Reinaldo Roberto Rosa)
- [45.13-P](#) **Reducing the uncertainty of surface albedo in climate models for better predictions of the future Amazonia climate** (Silvia Monteiro Santos, Marcos Heil Costa)
- [45.14-P](#) **A General Mean Wind Velocity Profile Relationship for an Amazonian Rain Forest Environment** (Leonardo Deane de Abreu Sá, Vanusa Bezerra Pachêco)
- [45.15-P](#) **Low Level Jet Effects Upon the Surface Atmospheric Boundary-layer Wind Field Above Caxiuanã Forest Reserve During Dry Season** (Leonardo Deane de Abreu Sá, Daniele Santos Nogueira, Julia Clarinda Paiva Cohen)
- [45.16-P](#) **Estudo diagnóstico da interação Oceano - Atmosfera no litoral de Ajuruteua - Bragança (PA), Norte do Brasil: Correlação entre os parâmetros meteorológicos e oceânicos.** (Alexandre Melo Casseb do Carmo, Tiago Pereira Brito)

PC_Precipitação (PC_Precipitation)

- [46.1-P](#) **Estimativa da difusividade térmica do solo em áreas de floresta e de pastagem em Rondônia.** (Paulo Renda Anderson, Ralf Gielow, Regina Célia dos Santos Alvalá, Fabrício Bertoni Zanchi, Fernando Luiz Cardoso, Leonardo J. G. Aguiar, Juliano Alves de Deus, Anderson Telles, Kécio Gonçalves Leite, Antonio Ocimar Manzi)
- [46.2-P](#) **Diurnal cycle of rainfall over tropical South America using 3-yr TRMM-PR data** (Carlos Frederico Angelis, Glenn R. McGregor, Chris Kidd)
- [46.3-P](#) **Variação Diurna da Precipitação no Leste da Amazônia** (Fabio Calixto Cabral, Adilson Wagner Gandu, Julia Clarinda Paiva Cohen)
- [46.4-P](#) **Ciclo diurno da precipitação na Amazônia e o transporte de umidade para a região Sul/Sudeste da América do Sul em simulações sazonais com o modelo regional Eta e o global CPTEC/COLA** (Iracema Albuquerque Cavalcanti, Adma Raia)
- [46.5-P](#) **Variação da Precipitação Pluviométrica no Sítio Experimental do LBA na Floresta Nacional de Caxiuanã, Pará, Brasil (2002-2003)** (Rafael Ferreira da Costa, Antônio Carlos Lôla da Costa, Patrick Meir, Alan Pantoja Braga, Yadvinder Singh Malhi, Paulo Henrique Lopes Gonçalves, Joao Athaydes Silva Jr, Paulo Jorge Oliveira)

- [46.6-P](#) **Variabilidade Sazonal da Precipitação Pluviométrica em Ecossistema de Manguezal no Nordeste do Pará** (*Paulo Henrique Lopes Gonçalves, Antônio Carlos Lôla da Costa, João Athaydes Silva Jr, Alan Pantoja Braga, Rafael Ferreira da Costa, Patrick Meir, Yadvinder Singh Malhi*)
- [46.7-P](#) **Estimativa de precipitação e conteúdo integrado de vapor d'água utilizando o sensor HSB durante o experimento RACCI/LBA** (*Wagner Flauber Lima, Luiz Augusto Toledo Machado, Carlos Augusto Morales*)
- [46.8-P](#) **Variabilidade da precipitação no leste da Amazônia (Amapá, Pará, Maranhão) associada aos ENOS** (*Andreza Carla da Silva Martins, Ulisses Confalonieri, Edson José Paulino Rocha*)
- [46.9-P](#) **Padrões da precipitação diária sobre a Amazônia: 1979-93** (*Guillermo O. Obregón, Carlos Afonso Nobre*)
- [46.10-P](#) **Un Análisis Estadístico Breve de la Lluvia Estacional en el Norte de Perú** (*Jorge Chira*)

Plenária II

(Plenary II)

1.1: Interações entre Clima e Vegetação na Amazonia: Do Último Período Glacial até o Clima do Futuro (Overview of Climate-Vegetation Interactions in Amazonia: From the Last Glacial Maximum to the Climates of the Future)

Carlos Afonso Nobre, CPTEC-INPE, nobre@cptec.inpe.br (Apresentador / Presenting)

LBA research on Physical Climate aspects of Amazonia is uncovering novel features of the interaction of vegetation and the atmosphere in many spatial and temporal scales. The question of the importance of the Amazonian heat source for the global circulation of the atmosphere will be reviewed to establish likely remote climate changes due to Amazonian deforestation via atmospheric teleconnection patterns. Regionally, the question of the heterogeneity of deforestation patterns will be discussed. High resolution model simulations tend to indicate an increase of rainfall over the intensely deforested areas of Rondonia through the so-called "forest breeze" effect. However, a review of raingauge and satellite-derived observations of cloudiness and rainfall over Rondonia do not show, as yet, an increase of rainfall in either the dry or the wet season. The dynamics of the main circulation features associated with the heat source, namely the continental tropical convection in Amazonia, the South Atlantic Convergence Zone (SACZ) and the Inter-Tropical Convergence Zone (ITCZ), and their association to remote forcing from the Tropical Pacific and Atlantic Oceans, will be addressed and alterations of these large scale features due to land use change will be summarized. Next, a discussion of paleoclimate vegetation reconstructions from the Last Glacial Maximum (LGM) 20 kaBP to the present will be assessed in light of our current knowledge of biome-climate stability. Finally, a consideration will be given to likely scenarios of ecosystems changes in Amazonia due to scenarios of future climate change.

1.2: Desmatamento e Queimadas como os forçantes da Mudança Regional Climática na Amazônia (Deforestation and Biomass Burning as Drivers of Regional Climate Change in Amazônia)

Maria Assução Faus da Silva Dias, CPTEC/INPE and IAG/USP, assuncao@cptec.inpe.br (Apresentador / Presenting)

Deforestation and biomass burning represent potential drivers of significant regional climate change in the Amazon Basin. The horizontal and temporal scales over which these drivers are affecting the atmosphere varies for the different part of the Amazon but a few common features arise from the research carried out in LBA. Deforestation is associated to a change in land cover, from forest to grassland or agriculture, or even a substitution by secondary growth forest. The change in land cover has direct impact on the energy input, through the change in surface albedo, and on the energy output through availability of soil moisture at root depth defining the partitioning of sensible and latent heat fluxes. This is basically a boundary forcing for the atmospheric boundary layer and the effect on the atmosphere is a function of the scale where it is happening. One key result is an increase in surface temperature locally and impacts on cloudiness and rainfall depending on the scale of the deforested area. Biomass burning also has an impact on the surface forcing through a change in surface albedo, but the main impact is in the change of atmospheric composition, in particular with respect to number concentration of aerosol. The internal forcing represented by biomass burning alters the thermodynamic structure of the lower layers and the cloud microphysical structure with both effects combined changing the rainfall occurrence and amounts. The two effects, deforestation and biomass burning, combine in nature and the suggested effect is seen as a delay on the start of the rainy season, and a tendency to produce more thunderstorms in the end of the dry season.

1.3: Fumaça, Aerossóis, Nuvens, Chuva e Clima na Amazonia (Smoke Aerosols, Clouds, Rain and Climate)

Meinrat O. Andreae, Max Planck Institute for Chemistry, andreae@mpch-mainz.mpg.de (Apresentador / Presenting)

Paulo Artaxo, Univ. Sao Paulo, artaxo@uspif.if.usp.br

Daniel Rosenfeld, Hebrew University, daniel@vms.huji.ac.il

Maria Assução Faus da Silva Dias, Univ. Sao Paulo, CPTEC, assuncao@cptec.inpe.br

Alexandre Araújo Costa, UECE, alexandre.costa@yale.edu

José Carlos Parente Oliveira, UFC, parente@fisica.ufc.br

Willy Maenhaut, Univ. Gent, Willy.Maenhaut@ugent.be

Magda Claeys, Univ. Antwerp, claeys@uia.ua.ac.be

Sandro Fuzzi, ISAC, s.fuzzi@isac.cnr.it

Erik Swietlick, Univ. Lund, erik.swietlicki@pixe.lth.se

Olga L. Mayol-Bracero, Univ. Puerto Rico, omayol@sunites.upr.clu.edu

Luciana Vanni Gatti, IPEN, lvgatti@net.ipen.br

Karla M Longo, CPTEC, longo@cptec.inpe.br

Yinon Rudich, Weizmann Inst., yinon@wisemail.weizmann.ac.il

Research over the past decade has confirmed and highlighted the importance of a number of aerosol effects on climate, both through direct interaction of the aerosol with solar and terrestrial radiation, and via perturbations of cloud properties and convective dynamics. In this presentation, I will highlight recent results from a study of the effect of biomass smoke on tropical clouds and the consequences for regional and global climate. We investigated the emission of smoke from biomass burning, its regional distribution, and its effects on cloud microphysics during the LBA-SMOCC experiment in Amazonia, September-October 2002. The campaign consisted of airborne, ground-based, remote-sensing, and modeling

components. Two instrumented aircraft investigated trace gases, aerosol properties and cloud microphysics across a large region that comprised highly polluted and essentially pristine airmasses. At a ground site, we made continuous measurements of trace gases and a large suite of aerosol properties, and collected samples for laboratory analysis. Measurements spanned from the peak of the burning season, with high smoke concentrations, to fairly clean conditions in the early rainy season.

We found high loadings of smoke particles and pyrogenic trace gases in the boundary layer over vast reaches of Amazonia, and evidence for efficient vertical transport of smoke into the free troposphere. Smoke aerosols had pronounced effects on the radiation budget, cloud microphysics and precipitation formation over Amazonia, as shown by in-situ measurements and remote sensing data. These effects are likely to perturb convective dynamics, radiative flux, and atmospheric composition on regional to global scales.

Sessões Paralelas I

(Parallel Sessions I)

RH3: Pesquisas em Destaque - Usos da Terra e Dimensões Humanas (*Research Highlights: Land Use and Human Dimensions*)

2.1: Human Dimensions in LBA

Bertha K Becker, UFRJ, b.becker@uol.com.br (Apresentador / Presenting)

Diogenes S Alves, INPE, dalves@dpi.inpe.br

Eustaquio J Reis, IPEA, ejreis@ipea.gov.br

Ima C Vieira, MPEG, ima@museu-goeldi.br

Mateus Batistella, EMBRAPA, mb@cnpm.embrapa.br

(preliminary list of authors)

By focusing on the linkages between human-induced land cover/use change and the functioning of Amazonian systems, LBA research needs significant contributions from the social and human sciences.

This talk summarizes two major outcomes of the "human dimensions" component within the framework of LBA, aimed at developing a stronger interface between the natural and the social and human sciences.

First, a survey of the scientific literature in human sciences in the period 1990-2002 is presented. The survey identified scientific production on the themes of cities, networks, ethno-cultural representations, agriculture and extractivist activities, and the dynamics of industrial activities in the Amazon, which originated a special report for the LBA Scientific Steering Committee entitled "Síntese da Produção Científica em Ciências Humanas na Amazônia: 1990-2002".

The talk also summarizes the outcomes of the Workshop on Human Dimensions held in Ubatuba, São Paulo, to discuss a research agenda and related topics, such as databases, logistics, regional development, institutions and governance, land tenure and the agrarian question, population dynamics, urbanization, environmental valuation and land cover/use change.

2.2: A dimensão humana nos programas de pesquisa em Mudanças Globais: o caso LBA.

Tatiana Schor, FEA/SENAC, PROCAM/USP, tschor@usp.br (Apresentador / Presenting)

Programas de pesquisa compreendidos como instituições têm um papel importante no desenvolvimento de modelos que auxiliem na previsão e no assessoramento do risco e da vulnerabilidade social com relação à Mudança Global. Cientistas de diferentes nacionalidades e formações distintas têm feito esforços conjuntos com o objetivo de atender às demandas sociais referentes à Mudança Global. Esses esforços culminaram na formulação de programas de pesquisa de cooperação internacional. Estes programas são importantes instituições científicas que interagem diretamente com a sociedade. Especificamente nos países em desenvolvimento, muitas vezes frágil em outras instituições científicas, o programa de pesquisa é a única instituição tratando das questões relacionadas à Mudança Global.

O arcabouço institucional tem um papel importante na criação de possibilidades de interação entre as diversas ciências envolvidas na pesquisa interdisciplinar. São os espaços criados que viabilizam o diálogo tanto epistemológico quanto metodológico entre as ciências humanas e naturais.

Neste sentido, o estudo de programas de pesquisa internacional visando compreender como o arcabouço institucional viabiliza ou não o diálogo interdisciplinar é um interessante ponto de partida para a análise da interação ciências humanas e da natureza. Desta análise derivam duas perguntas de interesse epistemológico e institucional: (1) esta relação traz inovações teóricas, metodológicas que alteram o conteúdo das disciplinas? (2) esta relação traz modificações organizacionais e institucionais nos padrões dominantes de legitimação do conhecimento científico?

Para abordar estas questões foi analisado um programa de pesquisa de cooperação internacional: O Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia - LBA .

2.3: Patterns of land cover change and land use intensification

Diogenes S Alves, INPE, dalves@dpi.inpe.br (Apresentador / Presenting)

The mapping of deforestation in Brazilian Amazon started in a pioneer assessment carried out by INPE and IBDF in the 1970s. Three decades later, inter-annual deforestation rates are regularly estimated at INPE, and land cover/use studies are executed by state agencies, universities and NGOs based everywhere in Brazil, including the Amazon. Recent progresses in understanding patterns and processes of land cover/land use change have been achieved within LBA, helping to improve our understanding of human occupation and some of its impacts on the functioning of Amazonian systems.

Ironically, the significant advances in science and the dissemination of techniques have helped to witness surprisingly high deforestation rates during the past few years. Besides, the recent peak in deforestation rates occurred after Forest Code limits to clear cut were augmented, and Land Zoning and Land Development legislation was passed in Mato Grosso and Rondônia.

Here, we hypothesize that not only deforestation has intensified in recent years, but land use equally tends to "intensify" as the frontier gets "older". Intensification of land use leads to specific impacts on the biogeochemical and hydrological functioning of Amazonian systems, thus representing new challenges to the "natural" sciences agenda in LBA, where intensification is not usually taken into consideration. In addition, intensification of land use puts very challenging questions from the "human dimensions" perspective in LBA. We conclude by reviewing some indications of land use intensification and pointing out some challenges of understanding intensification to foresee how the Amazonian territory and people living in different regions can be affected by such process.

2.4: Population Dynamics in the Amazonian Frontier: Scarcity of Labor and Fertility

Emilio F. Moran, Indiana University/ACT, moran@indiana.edu (Apresentador / Presenting)
Leah VanWey, Indiana University/ACT, lvanwey@indiana.edu

The Amazon was opened up to development and settlement by means of Roads of National Integration beginning in 1970. Since that period, settlers have been coming to the Amazon from throughout Brazil to farm land offered by the government through colonization schemes. One of the better known of these projects, the Altamira Integrated Development Project along the TransAmazon highway, began in 1971 in the Lower Xingu Basin and along with Rondonia represented special opportunities for farmers because of the presence of better than average soils for cultivation. Over the past 30 years, settlers have come and gone in the Altamira project, and they have been studied over this entire period by the author. In this paper, a discussion of the evolution of the project is provided that reviews the deforestation and land use trajectories that have been observed using both field studies and in the past decade using Landsat data as well. A focus of the presentation will be on the data collected in the past 7 years that examines the shifts in labor supply of farmers as well as projects labor supply given current contraceptive practices and age-specific female fertility. Our field surveys suggest that modeling land use and land cover change in the Amazon will need to take into account demographic projections that are sensitive to the precipitous decline in female fertility in the Amazon, and that not taking this evidence into account is likely to result in very misleading scenarios of future land cover change.

2.5: Reconstructing landscape histories and land use trajectories in Eastern Amazônia: Social, demographic, and economic dimensions of deforestation in comparative, multi-level perspective

Eduardo Sonnewend Brondizio, Indiana University, ebrondiz@indiana.edu (Apresentador / Presenting)

This synthesis paper presents a comparative, multi-level analysis of land use trajectories in Eastern Amazônia. Emphasis is given to the analysis of factors affecting intra-regional variability in land use trajectories, such as the role of time of settlement, infrastructure change, land tenure and institutional arrangements, and economic incentives, particularly credit programs and market opportunities. Research sites discussed in the paper represent differences in historical occupation, social groups and population dynamics, land tenure, and environmental conditions. Three sites located in the state of Para are analyzed: Site 1. government colonization areas along the TransAmazon Highway west of Altamira, Site 2. Caboclo and colonist settlements, and large-scale farms along the Cuiabá-Santarém Highway, and Site 3. Caboclo community settlements in the Southeastern portion of the Amazon estuary. Building upon previous work at each site, the paper provides a synthesis based on the integration of historical remote sensing data (post-1969), vector layers for farm-lots, communities and settlements, survey and archival data, and ethnographic research. The colonization and land use history of each site is reconstructed at the levels of farm-lots (n=5,500), community areas (n=20), and whole settlements (n=5) based on a common timeframe for the three sites: 1970-72, 1975-76, 1978-79, 1985-86, 1991-92, 1995-96, and 2000-01). The paper provides a comparative analysis of deforestation and land use trajectories within and across sites since 1970 and examines the role of historical conditions and contemporary factors affecting these trajectories.

2.6: Determinantes da Expansão da Pecuária Bovina na Região do Alto Rio Acre

Fabiano Toni, Universidade Federal do Rio Grande do Norte, ftoni@uol.com.br (Apresentador / Presenting)

Neste trabalho estudamos a dinâmica da pecuária na região, analisando os diversos fatores que afetam o processo de decisão dos produtores rurais em relação às opções de: 1) investir ou não na pecuária; 2) intensificar sua produção e; 3) promover o desmatamento para implementar pastagens. A região do Alto Rio Acre localiza-se no extremo Oeste do chamado "arco do desmatamento" na Amazônia. Durante a década de 80 a região experimentou um rápido crescimento da atividade pecuária e, conseqüentemente, do desmatamento. Este processo foi desacelerado por políticas públicas que resultaram da pressão de movimentos sociais e organizações internacionais, entre outros. Dentre estas políticas destacam-se o fim dos subsídios à pecuária e a criação da Reserva Extrativista Chico Mendes. Apesar das mudanças nas políticas públicas, identifica-se uma tendência de crescimento constante da pecuária na região entre as mais diversas categorias de produtores rurais. A explicação para esta expansão passa pela racionalidade econômica dos produtores, expressa não somente pela lucratividade da pecuária, mas também por sua versatilidade. Fatores não econômicos, como o marco regulatório e arranjos institucionais locais também afetam esta expansão, ora positivamente, ora negativamente. Ao contrário do que costuma se propalar, a intensificação da produção não necessariamente resulta em uma menor pressão sobre a floresta. Melhores resultados econômicos podem se traduzir em mais estímulos ao desmatamento.

2.7: Why such a tremendous expansion of cattle ranching in the Amazon ? Discussion from a new research methodology

Jonas Bastos da Veiga, Embrapa Amazônia- ORiental, jonas@cpatu.embrapa.br (Apresentador / Presenting)

Marie Gabrielle Piketty, Cirad-USP/FEA-Procam, piketty@usp.br

Jean François Tourrand, CIRAD-UNB/CDS, tourrand@aol.com

Pablo Pacheco, IPAM-CIFOR (Belem), p.pacheco@cgiar.org

Deforestation in the Brazilian Amazon is strongly linked to the expansion of cattle ranching: according to national inventories, the creation of pasture for cattle ranching accounts for about 80 percent of the deforested areas. Several studies, based on traditional farming systems surveys and analysis, pointed out that this activity has one of the lowest rate of return and is not suited for small scale agriculture, therefore questioning the true underlying factors of such a tremendous investment in this sector from both large and small landholders. During a research project financed by the National Science Foundation, a new methodology has been developed to try to better understand the whole determinants of livestock expansion in several agricultural frontiers of the Amazon (tree cases studies in Brazil, one in Ecuador and in Peru). This paper will present the methodology as well as the results for the Eastern Brazilian Amazon case. The methodology is based on the identification of key-informants and qualitative open surveys led by multidisciplinary groups. Results allow to better rank the main determinants of livestock expansion in the Eastern Brazilian Amazon as drawn from the actors themselves. Policies implications will be discussed as well as methodological limitations.

2.8: Landscape Fragmentation and Conservation in Rondônia: The Role of Settlers, Loggers, and Forest Peoples

Mateus Batistella, Embrapa Satellite Monitoring, mb@cnpem.embrapa.br (Apresentador / Presenting)

An understanding of changes in Amazonian landscapes depends on documentation about alterations in land cover. This paper addresses studies in areas of rural settlement in Rondônia, where distinct actors have altered the pristine environment during the last twenty years. Two situations were compared in terms of their biophysical and institutional aspects. Remote sensing and fieldwork were used to map land-use/land-cover (LULC) changes. Settlers, loggers, forest peoples, and other local actors were interviewed about their production systems and land-use history. Spatial metrics were calculated to analyze changes in landscape composition and configuration. The results indicate that the combination of private lots with communal reserves, managed by local populations, produces positive outcomes in maintaining larger patches of forest. The research is intended to serve as a contribution to analyses and syntheses about LULC change processes, subsidizing public policies that incorporate social and environmental dimensions. Current trends within the region are also addressed.

2.9: Agents of Deforestation

Eustáquio J. Reis, IPEA, ejreis@ipea.gov.br

Diana Weinholt, LSE, weinholt@lse.ac.uk (Apresentador / Presenting)

Using some traditional and some more recent econometric results for model evaluation in panel data and a comprehensive data set on land use in the Brazilian Amazon, we revisit the question of whether the size composition of agricultural establishments in the Amazon region plays a role in determining the rate of deforestation. Fearnside (1993) has presented evidence that, contrary to some official Brazilian claims, small land holders account for a relatively small proportion of deforestation in the Amazon. States in which large establishments are relatively abundant are also those which tend to have the greatest percentage of deforested land, although small land holders deforest land more intensively.

We use census tract level data and a large array of variables to control for the natural vegetation, climate and economic environment to examine whether the size composition of establishments plays a significant causal role in land use decisions and deforestation.. In addition we employ dynamic econometric modelling techniques rather than relying exclusively on contemporaneous correlation to study how these relationships have evolved over time and across space

2.10: Transportation Logistics and Endogenous Development in the Amazon

Bertha K Becker, UFRJ, b.becker@uol.com.br (Apresentador / Presenting)

Brazil is a continent, and was historically forged according to the frontier economy paradigm. From the sixties on, huge roads have been built in the Amazon aiming, first, to national integration, and then to exports, mainly of soy. Meanwhile, intrarregional connectivity was neglected. There is, therefore, a conflict between: a) Soy competitiveness on external markets, which depends on lower costs based on a powerful logistics that is being developed by corporations; b) Local and regional endogenous development based on diversified production mainly for local markets, that lack adequate infrastructure to support their activities. In other words, there is a conflict between two, very different time-spaces, that demand different strategies for their existence.

It is well known the perverse social and environmental impacts of road building in the Amazon. Nevertheless, although with different motivations, all regional actors today ask for transportation. The central question, therefore, is how to solve the conflict between such different time-spaces associated to divergent interest and forces. The paper discusses alternatives at the political, territorial, scientific and technological levels.

S6: Sessões Especiais - Variação dos Processos nos Ecossistemas Florestais da Amazônia (*Variation of Forest Ecosystem Processes Across Amazonia*)

3.1: Compositional Changes in Undisturbed Neotropical Forests and Their Implications for Carbon Dynamics

William F. Laurance, Smithsonian Tropical Research Institute, laurancew@tivoli.si.edu (Apresentador / Presenting)

Richard Condit, Smithsonian Tropical Research Institute, condit@ctfs.si.edu

Recent studies suggest that, since the early 1980s, undisturbed forests in a central Amazonian landscape have experienced pervasive changes in tree-community composition. Although the cause of these changes is uncertain, a leading explanation is that forest productivity is increasing in response to rising atmospheric CO₂ levels. These changes are manifested by increased growth, mortality, and recruitment of most tree taxa and compositional shifts in tree communities, with faster-growing canopy and emergent genera increasing at the expense of smaller, slower-growing genera. However, the generality of these findings for other tropical forests is uncertain. We contrast results from central Amazonia with those from Barro Colorado Island (BCI) in Panama, where forest composition and dynamics have also been carefully monitored since the early 1980s. Preliminary results suggest that BCI forests are more strongly influenced by El Niño droughts than are those in central Amazonia, and that severe droughts have been the main cause of recent changes in BCI tree-community composition. These differences suggest that local climatic conditions can have a strong influence on forest dynamics and composition. The implications of these findings for forest carbon storage will be discussed.

3.2: Concerted Changes in Amazon Forest Dynamics

Oliver L. Phillips, University of Leeds, o.phillips@geog.leeds.ac.uk (Apresentador / Presenting)

Simon L Lewis, University of Leeds, s.lewis@geog.leeds.ac.uk

Timothy R. Baker, Max Planck Institute for Biogeochemistry, t.baker@geog.leeds.ac.uk

and 31 others, 25 institutions

We characterise Amazon-scale patterns of stand-level growth, recruitment, and mortality using improved datasets now available that span the last 25 years. Specifically, we assess whether concerted changes are occurring, and if so whether they are general throughout the Amazon or restricted to one region or environmental zone. We find that: (1) trees >10 cm diameter recruit and die twice as fast on the richer soils of southern and western Amazonia than on the poorer soils of eastern and central Amazonia; (2) stem turnover rates have increased throughout Amazonia; (3) basal area growth and mortality rates have increased throughout Amazonia; (4) gain rates have consistently exceeded loss rates; (5) absolute increases in rates are greatest in western Amazonian sites; (6) basal area and stem density pools increased by 0.38 ± 0.15 % a⁻¹ and 0.18 ± 0.12 % a⁻¹ respectively; (7) fluxes into and out of these pools increased, in relative terms, by an order of magnitude more than the pools; (8) gain terms consistently exceeded the loss terms throughout, suggesting that whatever process is driving these changes was already acting when the plot network was established. The trends cannot be directly driven by a mortality driver (such as increased drought-related death) because the biomass in these forests has simultaneously increased. Large, long-term increases in growth and simultaneous increases in pools imply a continent-wide increase in resource availability which is increasing net primary productivity and altering forest dynamics. Our findings therefore indicate that long-acting and widespread environmental changes are accelerating growth and dynamics across the world's largest tract of tropical forest.

3.3: Spatial Variation of Forest Structure and Aboveground Biomass in Jaru Reserve, Rondonia, Brazil

Sassan S. Saatchi, JPL/CALTECH, saatchi@congo.jpl.nasa.gov

Regina Célia dos Santos Alvalá, CPTEC/INPE, regina@cptec.inpe.br (Apresentador / Presenting)

Spatial variation in tropical rain forest structure is an important factor in quantifying the aboveground biomass (AGB) and carbon stock and extrapolating plot measurements to regional or global scales. We analyzed structural data collected in 25 ha area in an intact lowland forest around the flux tower at the Jaru Reserve in Rondonia, Brazil to address the spatial variability in stem density, basal area, canopy roughness, and AGB. The transects were designed prior to the field survey with the help of a one meter resolution IKONOS image over spectrally homogeneous regions away from disturbances. Five permanent 50 m x 1000m transects were installed and Live trees with diameter at breast height (dbh) ≥ 35 cm were collected within the 50 m wide transect with an addition of trees ≥ 5 cm in a narrower transect (5 m x 1000 m) in the middle of wider transects. Among the total of 3626 trees measured on all transects, trees with dbh ≥ 5 cm had average frequencies of 1015 ha⁻¹ and whereas the trees ≥ 35 cm had a frequency of 48 ha⁻¹. Allometric equations based on dbh were used to compute canopy height and above ground biomass for various segments of the transect to estimate the effect of spatial scales from 100 m to 1 km for roughness and biomass estimation. The results for five transects are compared and the scaling criteria are discussed within and across transects.

3.4: Scaling Up Above Ground Live Biomass from Plot Data to Landscape in Amazon Basin

Sassan S. Saatchi, JPL/CALTECH, saatchi@congo.jpl.nasa.gov (Apresentador / Presenting)

The amount and spatial distribution of forest biomass in the Amazon basin is a major source of uncertainty in estimating the flux of carbon released from land-cover and land-use changes. Direct measurements of above ground biomass are limited to small areas of forest inventory plots, and site-specific allometric regression equations that cannot be readily generalized for the entire basin. Furthermore, there is no spaceborne remote sensing instrument that can measure tropical

forest biomass directly. To determine the spatial distribution of forest biomass of the Amazon basin, we introduce a methodology based on a combination of land cover map, remote sensing derived metrics, and more than 500 forest plots distributed over the basin. A model has been developed to extrapolate the plot data through remote sensing metrics to the entire Amazon region. Several landscape and forest structural attributes such as digital elevation, slope, canopy roughness, percent tree cover are incorporated in the model to augment the remote sensing metrics. The plot data are included in a bootstrapping approach to derive a multivariate parametric expression to extrapolate the forest above ground live biomass over the entire basin at 1 km spatial resolution. The bootstrapping methodology provided a performance accuracy of estimation that increased with forest biomass to a maximum of 70 tons/ha for undisturbed forests of approximately 400 tons/ha.

The resulting biomass map was used to determine the total carbon stored in live forest biomass of the basin and its partition in land cover types. It has also been used to compare with two other estimates derived from spatial interpolation of plot data and an ecosystem models. By examining the uncertainties of biomass measurements, an error analysis was performed to quantify the uncertainties in basin-wide biomass in amplitude and spatial variations.

3.5: Carbon stocks and sequestration in above-ground wood biomass of Central Amazonian white-water floodplain forests

Jochen Schöngart, Max-Planck-Institute for Limnology, jschoen@gwdg.de (Apresentador / Presenting)

Florian Wittmann, Max-Planck-Institute for Limnology, florian@inpa.gov.br

Maria Teresa Fernandez Piedade, Instituto Nacional de Pesquisas da Amazônia, maitepp@inpa.gov.br

Martin Worbes, Institute of Agronomy in the Tropics, mworbes@gwdg.de

Wolfgang Johannes Junk, Max-Planck-Institute for Limnology, wjj@mpil-ploen.mpg.de

Understanding dynamical processes of tropical forests is one of the most important questions in tropical forest research linked to the discussion on carbon cycle in the frame of the Kyoto protocol. In this study we focus on the dynamic of almost undisturbed várzea forests along the middle Solimões River, analysing changes in tree species diversity and composition, age structure, wood density, stocks and production of above-ground wood biomass comprising the whole successional gradient from young pioneer stages on fresh deposited sand-bars to climax stages on higher elevated sites. Above-ground wood biomass accumulates from 19 Mg/ha in the 7 yr-old young pioneer stage to 206 Mg/ha in the 50 yr-old late secondary stage; the estimations in the 120-240 yr-old stages varies between 185 and 194 Mg/ha. The wood biomass production ranges between 5.6 and 16.7 Mg/ha/y depending on the successional stage. Above-ground wood biomass production is thus much higher than in terra firme forests, which can be traced back to the good nutrient status of the várzea. The successional sequence shows an accumulation of wood biomass only during the first fifty years. Despite the high wood biomass production in the over 100-yr old forests, the stock of above-ground wood biomass does not increase, indicating losses of wood biomass in these stands by tree damage and gaps in the same range as the annual production. Thus, above-ground wood biomass in várzea forests only can be a significant carbon sink during the first 50 years of the primary succession on newly deposited alluvial soils.

The detection of different successional stages by aerial photographs and multi-spectral optical-based satellite images (Landsat TM) is possible by analysing upper-canopy crown features. A strong correlation can be found between the crown area and the above-ground wood biomass production of canopy trees of different successional stages, which allows us to estimate wood biomass production and carbon stocks by remote-sensing techniques on a regional scale.

3.6: Old paradigms grow up: tree species composition and forest productivity across Amazonia

Timothy R. Baker, Max Planck Institut for Biogeochemistry, Jena, Germany and Earth and Biosphere Institute, School of Geography, University of Leeds, UK, t.baker@geog.leeds.ac.uk (Apresentador / Presenting)

Oliver L. Phillips, Earth and Biosphere Institute, School of Geography, University of Leeds, UK, o.phillips@geog.leeds.ac.uk

Yadvinder Singh Malhi, University of Oxford, UK, ymalhi@ed.ac.uk

Samuel Soares Almeida, Museu Paraense Emilio Goeldi, Belém, Brazil, samuel@museu-goeldi.br

Luzmilla Arroyo, Museo Nacional Noel Kempf Mercado, Santa Cruz de la Sierra, Bolívia, luzmillaarroyo@hotmail.com

Anthony Di Fiore, Department of Anthropology, New York University, USA, anthony.difiore@nyu.edu

Terry Erwin, Smithsonian Institution, Washington DC, USA, Erwin.Terry@nmnh.si.edu

Niro Higuchi, Instituto Nacional de Pesquisas Amazônicas, Manaus, Brazil,, niro@inpa.gov.br

Timothy Killeen, Center for Applied Biodiversity Science, Conservation International, Washington DC, USA, t.killeen@conservation.org

Susan Laurance, Smithsonian Tropical Research Institute, Balboa, Panama,, laurances@tivoli.si.edu

William F. Laurance, Smithsonian Tropical Research Institute, Balboa, Panama,, laurancew@tivoli.si.edu

Abel Monteagudo, Herbario Vargas, Universidad Nacional San Antonio Abad del Cusco, Cusco, Peru, tamarainfor@latinmail.com

David Neill, Missouri Botanical Garden, co. Herbario Nacional del Ecuador, Quito Ecuador, neill@ecnet.ec

Percy Núñez Vargas, Herbario Vargas, Universidad Nacional San Antonio Abad del Cusco, Cusco, Peru,, nunez1ca@yahoo.ca

Nigel Pitman, Center for Tropical Conservation, Duke University, Durham, USA,, ncp@duke.edu

José Natalino Macedo Silva, EMBRAPA Amazonia Oriental, Belém, Brazil,, natalino@cpatu.embrapa.br

Jonathan James Lloyd, Max Planck Institut for Biogeochemistry, Jena, Germany, jon.lloyd@bgc-jena.mpg.de

Ecological understanding of variation in the growth rates of different tree species in tropical forests is largely based on studies of seedlings and variation in the rate of diameter increment amongst adult trees. These studies indicate that growth rates are related to species light demand and maximum size. However, it is not known whether these paradigms apply to the biomass increment of adult trees, or whether variation in the composition of Amazonian forests may therefore be important for understanding large-scale variation in forest productivity.

Using long-term, field data from a network of forest plots, we show that: (1) rates of above-ground biomass increment are highest for the most light demanding, compared to more shade tolerant species, and species maximum size is positively

correlated with the rates of relative biomass increment, (2) light demanding species are more abundant in western Amazon forests, whereas species with greater maximum heights are more common in central and eastern Amazon forests, and, (3) as a result of these patterns, variation in species life history strategy may explain one third of the basin-wide variation in forest productivity.

These results illustrate the importance of species composition, as well as environmental factors, in understanding large-scale spatial variation in carbon cycling in Amazonian forests.

3.7: Separating Genetic versus Environmental Effects on Amazon Forest Growth and Nutrient Uptake Characteristics

Jonathan James Lloyd, Max Planck Institute for Biogeochemistry, Jena Germany, jon.lloyd@bgc-jena.mpg.de (Apresentador / Presenting)

Timothy R. Baker, Earth and Biosphere Institute, University of Leeds, t.baker@geog.leeds.ac.uk

Oliver L. Phillips, Earth and Biosphere Institute, University of Leeds, o.phillips@geog.leeds.ac.uk

Samuel Soares Almeida, Museu Paraense Emilio Goeldi, Belém, Brazil, samuel@museu-goeldi.br

Luzmilla Arroyo, Museo Nacional Noel Kempf Mercado, Santa Cruz de la Sierra, Bolivia, luzmillaarroyo@hotmail.com

Niro Higuchi, Instituto Nacional de Pesquisas Amazônicas, Manaus, Brazil, niro@inpa.gov.br

Timothy Killeen, Center for Applied Biodiversity Science, Conservation International, Washington DC, USA, t.killeen@conservation.org

Susan Laurance, Smithsonian Tropical Research Institute, Balboa, Panama, laurances@tivoli.si.edu

William F. Laurance, Smithsonian Tropical Research Institute, Balboa, Panama, laurancew@tivoli.si.edu

Abel Monteagudo, Herbario Vargas, Universidad Nacional San Antonio Abad del Cusco, Cusco, Peru

David Neill, Fundacion Jatun Sacha, Quito, Ecuador

Pecy Núñez Vargas, Herbario Vargas, Universidad Nacional San Antonio Abad del Cusco, Cusco, Peru

Nigel Pitman, Center for Tropical Conservation, Duke University, Durham, USA

Rafael Salomão, Museu Paraense Emilio Goeldi, Belém, Brazil

José Natalino Macedo Silva, EMBRAPA Amazonia Oriental, Belém, Brazil, natalino@cpatu.embrapa.br

Rodolfo Vásquez Martínez, Proyecto Flora del Perú, Jardín Botánico de Missouri, Oxapampa, Perú

Claudia Czimczik, Max Planck Institute for Biogeochemistry, Jena Germany

Lina Maria Mercado, Max Planck Institute for Biogeochemistry, Jena Germany, lmercado@bgc-jena.mpg.de

Carlos Alberto Quesada, Universidade de Brasília, Brazil, quesada@unb.br

Sandra Patiño, Max Planck Institute for Biogeochemistry, Jena Germany, spatino@bgc-jena.mpg.de

Yadvinder Singh Malhi, University of Oxford, England, ymalhi@ed.ac.uk

In order to assess the basis of differences in above ground productivity for rainforest stands across the Amazon Basin Restricted Maximum Likelihood (REML) Analysis was used to determine the extent to which growth rates of individual trees were affected by site conditions as opposed to being affected by their genotype. This information was then scaled up to the stand level.

It was found that although the growth rate of individual trees was to a large extent determined by their genotype, significant site effects also existed with relatively poor soils in particular contributing to lower stand growth rates in Central and Eastern Amazonia as opposed to elsewhere. Nevertheless, in many cases the overall species make-up of the stand was of prime importance in determining its observed mean rate of new wood production.

REML was also used to determine genetic versus plot effects on foliar nutrient composition and leaf characteristics. Specific leaf area and foliar carbon content emerged as two key factors that were both genetically dependent and affected by soil conditions, this most likely also being, at least in part, the cause of some stand level differences in above ground carbon acquisition rates across the Basin.

3.8: Modelling Spatial Patterns of Gross Primary Productivity in the Tapajós Region

Luiz Eduardo Oliveira Cruz de Aragão, INPE, aragao@ltid.inpe.br (Apresentador / Presenting)

Yosio Edemir Shimabukuro, INPE, yosio@ltid.inpe.br

Mathew Williams, University of Edinburgh, mat.williams@ed.ac.uk

The aim of this work was to generate gross primary productivity (GPP) surfaces for the Tapajós region, using the Aggregate Canopy Model (ACM), to evaluate the effects of land cover and of atmospheric CO₂ increase over carbon assimilation by vegetation. We used a multi-scale methodology, involving field, GIS and remote sensing techniques, to create the GPP surfaces. After the implementation of the ACM in a GIS, we calculated the GPP surfaces, at 270 m spatial resolution, for 4 dates, 20/03/2001, 03/04/2001 (wet season), 22/08/2001 and 05/10/2001 (dry season). We also estimated the spatial GPP pattern at different atmospheric CO₂ levels (from 250 ppm to 550 ppm). The results showed that GPP range from 4 g C m⁻² to 15 g C m⁻², in a clear day. Primary forests located in areas with an altitude between 100 m and 200 m high, associated to the "platô" formation, are more productive than primary lowland forests. Old secondary forest has an assimilation pattern quite similar to that observed for lowland forests. During the wet season irradiance limits the GPP process, reducing around 2 times the CO₂ assimilation of the more productive locations. According to the model, an increase of 55% in the atmospheric CO₂ concentration can lead to an assimilation increment of ~3 g C m⁻² for the forests located in the "platô" region and ~2 g C m⁻² for the lowland and the secondary forests. However, this positive feedback can be limited by temperature range oscillations. We concluded that GPP process is spatially variable over Tapajós at the regional scale, due to differences in land cover types, and this information can improve the accuracy of large scale studies to understand carbon budget in the tropics.

3.9: Canopy structure and nutrient productivity across the western Amazon

Sandra Patiño, Max Planck Institute for Biogeochemistry, spatino@bgc-jena.mpg.de (Apresentador / Presenting)

Romilda Maria Quintino Paiva, INPA, romilda@inpa.gov.br

Mercado Lina, Max Planck Institute for Biogeochemistry

Horna Viviana, Max Planck Institute for Biogeochemistry

Schmerler Jens, Max Planck Institute for Biogeochemistry

Quesada Beto, Universidade de Brasilia

Timothy R. Baker, Max Planck Institute for Biogeochemistry, t.baker@geog.leeds.ac.uk

Phillips Oliver, University of Leeds, O.Phillips@geog.leeds.ac.uk

Malhi Yadvinder, University of Edinburgh

Lloyd Jon, Max Planck Institute for Biogeochemistry

The Amazon basin is home to the largest contiguous tropical forest in the world, which is a highly heterogeneous system. Multiple, different vegetation formations may store and uptake carbon in different amounts and rates. Indeed, recent results from a network of 1 ha permanent sample plots across the Amazon basin suggest that tree growth rates are higher in the western half of the Amazon than in the eastern half. The purpose of this work was to assess the main factors that determine the differences in tree growth across the basin.

We sampled more than 55 plots across the basin in Bolivia, Peru, Ecuador, Colombia, and Brazil. In these plots we have analysed canopy structure and soil characteristics, as well as assessing plant hydraulic properties and leaf nutrient status from more than a thousand trees.

Our findings suggest that nitrogen may not be a limiting factor in these tropical environments, that carbon construction cost of leaves varied across species independent of the location within the basin, and that, in spite of the structural and compositional differences among forests within the Amazon basin, leaf area index varies remarkably little. We conclude that differences in tree growth are due mainly to the phylogeny of the species adapted to each formation, and to a lesser extent to the physical properties of the formations.

3.10: Spatial patterns and temporal dynamics of photosynthesis and transpiration in Amazon basin

Xiangming Xiao, University of New Hampshire, xiangming.xiao@unh.edu (Apresentador / Presenting)

Qingyuan Zhang, University of New Hampshire, qzhang@eos.sr.unh.edu

Stephen Boles, University of New Hampshire, stephen.boles@unh.edu

Matthew Fearon, University of New Hampshire, matthew.fearon@unh.edu

Berrien Moore III, University of New Hampshire, b.moore@unh.edu

Seasonal dynamics of gross primary production (GPP) and ecosystem respiration determines the net ecosystem exchange of CO₂ between terrestrial ecosystems and the atmosphere. Here we report basin-wide estimates of GPP and transpiration using new and innovative satellite-based Vegetation Photosynthesis Model (VPM) and Vegetation Transpiration Model (VTM). The VPM model is built upon the conceptual partition of leaf and canopy into photosynthetically active vegetation (PAV, e.g., chloroplast) and non-photosynthetic vegetation (NPV). It uses two vegetation indices (Enhanced Vegetation Index, Land Surface Water Index) and climate data (air temperature and photosynthetically active radiation) to estimate GPP. The VPM model represents an alternative approach to the other existing Production Efficiency Models (e.g., the CASA model, MODIS-PSN model and GLO-PEM model), which are built upon the LAI-NDVI-FAPAR paradigm. We run the VPM model using the 10-day composite images (1-km spatial resolution) from the VEGETATION sensor onboard SPOT-4 satellite (3/1998 - 12/2002), and 8-day composite images (500-m spatial resolution) from the MODIS sensor onboard Terra (2002), respectively. We have also developed the Vegetation Transpiration Model (VTM) that estimates transpiration of vegetation, based on the transpiration ratio between photosynthesis and transpiration. The results from multi-year simulations of VPM model and VTM will quantify the sensitivity of GPP and transpiration to changes in climate and disturbance in Amazon basin since 1998. The resultant geospatial datasets of GPP and transpiration could be used to evaluate biogeochemical models and hydrological models in a diagnostic mode.

[S9: Sessões Especiais - Balanços de Água e Energia da Bacia Amazônica \(Water and Energy and Balances of the Amazon Basin\)](#)

4.1: The evapotranspiration of the Amazon basin

David Werth, Duke University, werth@duke.edu

Natalia Hasler, Duke University, natalia.hasler@duke.edu

Roni Avissar, Duke University, avissar@duke.edu (Apresentador / Presenting)

Evapotranspiration (ET) is a key component of the regional water cycle. It is not yet well known over the Amazon river basin. Previous studies have mainly used radiation observations to estimate ET, which generally assumes that there is no soil water limitation for plant transpiration. As part of the LBA experiment, several towers were equipped to perform eddy-covariance measurements of carbon and energy fluxes. We use these different measurements of water fluxes to compare ET across sites over the Amazon and understand latitudinal variations in ET. Results are also compared to radiation-estimated ET to test the soil water availability assumption. Finally, measured ET are compared to simulated climate models output to understand how well and where the models are able to reproduce the measured ET and why.

4.2: Water and energy variation associated with the wet season onset over the Amazon

Wenhong Li, Georgia Institute of Technology, wenhong@eas.gatech.edu

Rong Fu, Georgia Institute of Technology, fu@eas.gatech.edu

Kátia Fernandes, Georgia Institute of Technology, kfernandes@eas.gatech.edu (Apresentador / Presenting)

Using fifteen-year instantaneous European Center for Medium-range Weather Forecasts Reanalysis data (ERA), we have examined the changes of surface energy, water fluxes and the energetics of the atmospheric circulation during the transition from dry to wet seasons over the Southern Amazon region (5-15S, 45-75W). Our composite results suggest that the increase of local land surface fluxes, especially latent heat flux, initiates the transition three months prior to the onset of the wet season, by increasing the available potential energy of the lower troposphere. At this stage, the cross-equatorial flow and upper tropospheric circulation remain unchanged from those of the dry season. Starting from about one and one-half months before the onset of the wet season, local convection begins to increase. The stretching of the atmospheric column converts the available potential energy to divergent kinetic energy. The latter further converts into rotational kinetic energy in the upper troposphere. This energy conversion accelerates the transition of the large-scale atmospheric circulation, leading to the reversal of the low-level cross-equatorial flow in the western Amazon, and increase geopotential height and anticyclonic circulation in the upper tropospheric. These processes lead to the onset of the wet season. After onset, the lower tropospheric potential energy reaches equilibrium, but the conversion from divergent to rotational kinetic energy continues to spin up the upper troposphere anticyclonic circulation associated with the Bolivian High. Our analysis implies that a slower increase of land surface energy and water fluxes, or increase the Bowen ratio of the surface energy and water fluxes could delay or prolong the initiation of the transition. The transition could also be delayed by a late or weaker reversal of the cross-equatorial flow, which consequently delays/weakens the moisture transport to the Amazonian basin. Abnormally strong upper troposphere westerly wind and subsidence could also slow the energy conversion in the upper troposphere and consequently the transition of the upper tropospheric circulation.

4.3: Activities of the GEWEX Hydrometeorology Panel (GHP)

John Roads, UCSD/SIO, jroads@ucsd.edu

José A. Marengo, CPTEC/INPE, marengo@cptec.inpe.br (Apresentador / Presenting)

During the past decade, the Global Energy and Water Cycle Experiment (GEWEX), under the auspices of the World Climate Research Program (WCRP), has coordinated the activities of the Continental Scale Experiments (CSEs) and other global land surface research through the GEWEX Hydrometeorology Panel (GHP). The GHP contributes to specific GEWEX objectives such as "determining the hydrological cycle and energy fluxes, modeling the global hydrological cycle and its impact, developing a capability to predict variations in global and regional hydrological processes and fostering the development of observing techniques, data management and assimilation systems." GHP activities include diagnosis, simulation and prediction of regional water balances by various process and modeling studies aimed at understanding and predicting the variability of the global water cycle, with an emphasis on regional coupled land-atmosphere processes in different climate regimes. This talk will provide an overview of past, present and future GHP efforts to develop a water and energy budget synthesis over the individual CSEs. For example, during summer, atmospheric water vapor, precipitation and evaporation as well as surface and atmospheric radiative heating increase and the dry static energy convergence decrease almost everywhere. We can further distinguish differences between hydrologic cycles in midlatitude and monsoon regions like the Amazon. The monsoon hydrologic cycle shows increased moisture convergence, soil moisture, runoff, but decreased sensible heating with increasing surface temperature. The midlatitude hydrologic cycle, on the other hand, shows decreased moisture convergence and surface water and increased sensible heating.

4.4: Radiation Budgets in Support of LBA Hydrological Modeling

Rachel T Pinker, University of Maryland, pinker@atmos.umd.edu (Apresentador / Presenting)

Banglin Zhang, University of Maryland, zhang@atmos.umd.edu

Hiroko Kato, University of Maryland, hkato@atmos.umd.edu

Juan C. Ceballos, CPTEC-INPE, Cachoeira Paulista, ceballos@cptec.inpe.br

Enio B. Pereira, INPE, S. J. Campos, enio@dge.inpe.br

To improve the understanding of the hydrological cycle in the Amazon region, information on radiative fluxes is needed for modeling and predicting the surface hydrological and energy budgets on time scales from diurnal to interannual, and on spatial scales as required by climate models, meso-scale models, and at local scales. Such information is also needed to improve surface parameterizations, and to test their implications for global climate and weather forecast models.

To respond to these needs, about twenty years of historical satellite observations from PATHFINDER data were used to infer radiative fluxes at 2.5-degree resolution on global scale; a higher resolution GOES and METEOSAT observations were used to infer radiative fluxes at 0.5 degree resolution for about ten years to cover North and South America, using optimal interpolation techniques to merge the observations; pixel level data from GOES satellites were used to obtain radiative fluxes for the Amazon Basin at a 1/8-degree resolution for a period spanning three years during the LBA project. New methodologies were developed for implementing the inference schemes at this scale and for incorporating updated information on aerosols. The above products include information on total shortwave radiative fluxes, Photosynthetically Active Radiation (PAR), Near-Infra-Red (NIR) radiation (upwelling and downwelling), all at both boundaries of the atmosphere. The time scale for the first two products is 3 hourly instantaneous; hourly averaged; daily; and monthly means, while the high spatial resolution product is available at hourly time scale. In the presentation, described will be: methodologies used to infer such fluxes; the available products; and their evaluation against ground truth.

4.5: Estimativas das Perdas por Interceptação Mediante Novo Método de Medição Desenvolvido e Aplicado em Floresta Não Perturbada na Amazonia Central

Luz Adriana Cuartas, CPTEC/INPE, adriana@cptec.inpe.br (Apresentador / Presenting)

Antonio Donato Nobre, INPA, anobre@ltd.inpe.br

Javier Tomasella, CPTEC/INPE, javier@cptec.inpe.br (Apresentador / Presenting)

Martin George Hodnett, Vrije Universiteit Amsterdam, mhodnett@lineone.net

Maarten Waterloo, Vrije Universiteit Amsterdam, watm@geo.vu.nl

Juan Camilo Múnera-Estrada, INPA, jcmunera@inpa.gov.br

O balanço hídrico de curto prazo (escalas de tempo diário, semanal, mensal) requer algumas variáveis, como a interceptação, que para as estimações de longo prazo (como aquelas para alimentar modelos do clima) poderia ser insignificante, uma vez que a variação armazenamento da água no dossel é aproximadamente zero. Entretanto, a interceptação é estreitamente relacionada com o balanço de energia com seus efeitos na evaporação. Assim, a interceptação é um componente crucial do balanço de energia que tem sido mal quantificado devido às dificuldades associadas às complexidades inerentes do ambiente de floresta tropical úmida. Conseqüentemente, foi projetado e desenvolvido um novo sistema de medição da precipitação interna e escoamento de troncos, metodologia completamente diferente à usada em estudos anteriores. Este trabalho é parte de um projeto que visa quantificar os fluxos de C associados ao ciclo da água, em uma microbacia de 6.37 km², na Reserva Biológica do Cuieiras pertencente ao INPA (Manaus-AM). A característica deste sistema é a medida associada da troca do vapor de água na interfase floresta-atmosfera usando medições de fluxos por covariância de vórtices turbulentos (eddyflux covariance). A precipitação interna é medida através de dois sistemas de canaletas (5cm x 36 m). O escoamento de troncos é coletado em 60 árvores, que cobre aproximadamente a área do estudo da precipitação interna. O sistema de medição é complementado com um perfil vertical de sensores registrando o umedecimento de superfície. Os resultados das observações no período julho-2002 até janeiro-2004 indicam que as perdas por interceptação representam o 22.9 % da precipitação total, sendo a precipitação interna o 76.4 % e o escoamento de troncos representa somente o 0.7 %. O sistema foi comparado com a metodologia tradicional de coletores aleatórios, obtendo 78.8% de precipitação interna, e perdas por interceptação de 21.2%. Estes valores são maiores que os obtidos em estudos prévios na Amazônia. A metodologia de amostragem da precipitação interna desenvolvida neste trabalho permitiu uma medida integrada da mesma, já que está ao longo de um transecto, cobrindo uma grande variedade de árvores representativas, se comparada com a área ao redor.

4.6: Impact of Precipitation Assimilation on Climate Simulations over Brazil

Ana Nunes, ECPC/SIO/UCSD, anunes@ucsd.edu (Apresentador / Presenting)

John Roads, ECPC/SIO/UCSD, jroads@ucsd.edu

Masao Kanamitsu, ECPC/SIO/UCSD, mkanamitsu@ucsd.edu

Although atmospheric analyses and reanalyses are now providing physical realistic fields for many variables, precipitation remains problematic. This study describes the implementation of an initialization procedure, which allows assimilation of precipitation by the Regional Spectral Model (RSM) and improves related hydroclimatological simulation skills as well. We currently nudge atmospheric moisture, since the atmospheric humidity adjustment leads to stable temperature and wind changes and the RSM precipitation then remains close to the observed precipitation. Experiments nudging the atmospheric heating are also being developed to determine if further improvements can be made. In particular, RSM simulations over Brazil, during the rainfall season of the Amazon region and increased activity of the South America Convergence Zone, forced only by the large-scale global analysis are being compared to simulations that also incorporate precipitation assimilation into Simplified and Relaxed Arakawa-Schubert convection schemes. Additional long-range forecast skill may result from coupled interactions of a more realistic precipitation with the RSM land surface, which may thus be better initialized by this procedure than it is currently initialized by the global analyses.

4.7: Insights on modeling the hydrometeorology of the Amazon

Renato Ramos da Silva, Duke University, renato@duke.edu (Apresentador / Presenting)

Roni Avissar, Duke University, avissar@duke.edu

Observations alone cannot be used to explain the complex mechanisms involved in the hydrometeorology of the Amazon and models are needed to bridge the gap in our understanding. Here, we evaluate the performance of the Regional Atmospheric Modeling System (RAMS) in simulating the hydrometeorology of this region during the rainy season. Model results are compared with observations from several instruments (weather stations, meteorological towers, radiosondes, raingauges, radars and satellites) collected during the WetAMC/TRMM campaign of January and February 1999 in Rondonia. We find that RAMS is capable of simulating correctly the meteorology, including the averaged daily rainfall, of that region. Several sensitivity tests were performed to evaluate the impacts of grid resolution, initial conditions of soil and atmospheric moisture, maximum stomatal conductance, and tree trunk heat storage on the model performance. Overall, the results show that better initial conditions and higher vertical resolution provide significant improvements to the model's performance. Atmospheric humidity forced at the lateral boundaries appears to be particularly important to correctly simulate the onset and accumulation of daily rainfall, emphasizing the needs for very-high quality large-scale forcing conditions.

4.8: Síntese de Quatro Anos de Medidas de Trocas de Energia e de gás Carbônico Acima de Floresta e Pastagem em Rondônia

Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br (Apresentador / Presenting)

Artigo recente de von Randow et al* (Theor. Appl. Climatol. - 2004) faz uma análise comparativa das trocas de energia e de gás carbônico acima de floresta e pastagem em Rondônia, região sudoeste da Amazônia, assim como das componentes de radiação solar e terrestre, temperatura e umidade do ar, precipitação pluvial e armazenamento de água no solo, coletados entre fevereiro de 1999 e novembro de 2002, com ênfase para as variações entre as condições das estações secas e úmidas. O maior seqüestro de carbono pela pastagem, quando comparado com o balanço de gás carbônico sobre a floresta, foi um dos resultados interessantes das análises. Esses resultados serão apresentados nesse trabalho, com a diferença que os fluxos foram recalculados depois da introdução de novo cálculo do fator de correção de rotação de eixos - referente ao 'ângulo de ataque' do vento no anemômetro sônico - baseado em Gash & Dolman (2004) e van der Molen et al. (2004) e com a utilização de médias em bloco ('block average') em vez da utilização de filtro recursivo. Essas correções aumentam os fluxos de energia em 7 a 10 %, mas não alteram muito os totais anuais de seqüestro de gás carbônico. Entretanto, o reprocessamento dos dados com 'block average' diminuiu consideravelmente o seqüestro de gás carbônico sobre ambas as vegetações.

* C. von Randow, A.O. Manzi, B. Kruijt, P.J. de Oliveira, F.B. Zanchi, R.L. Silva, M.G. Hodnett, J.H.C. Gash, J.A. Elbers, M.J. Waterloo, F.L. Cardoso, and P. Kabat. 2004. Comparative measurements and seasonal variations in energy and carbon exchange over forest and pasture in South West Amazonia. Theoretical and Applied Climatology.- accepted.

4.9: The Isotopic Records of Andean Ice Cores, a Response of Precipitation Variability Over the Amazon Basin

Edson Ramirez, Univ. San Andres, ramglace@yahoo.com (Apresentador / Presenting)

Three new ice-cores were drilled in the tropical and subtropical part of the Andes. The first one, 137 meters long, was extracted from the ice sheet of the Illimani (16°37'S, 67°46'W), a 6350m high mountain in the southern part of the Cordillera Real, Bolivia. The second one, 40 meters long, stems from the Sajama (6542 m, 18°06'S, 68°53'W), situated in the western part of the Bolivian Highlands. The third one, 56 meters long, was obtained at the summit of Chimborazo (6280 m, 1.6°S, 78.6°W) in Ecuador close to the ENSO influence region (Pacific Ocean). The isotopic composition of the ice as well as a number of various tracers (dust, calcium ions, electric conductivity) were analyzed in the laboratory and used for a year-by-year dating of the ice. A detailed comparison between the isotope signal of five different Andean high altitude sites (Huascarán, Quelccaya, Illimani, Sajama and Chimborazo) show a nearly identical inter-annual variability in the 20th century. An Andean Isotope Index (AII) constructed from these Andean sites has been compared with general circulation model simulations [Hoffmann et al., 2003]. The results suggest that the Andean high altitude records are primarily controlled by precipitation variability over the Amazon basin. The Illimani ice core record covers approximately the last 18 000 years BP and the analysis suggest that Illimani/Huascarán water isotope history can be explained in terms of a wetter/cooler conditions during glacial times to drier/warmer conditions in the Early Holocene [Ramirez et al., 2003].

References:

Hoffmann, G., E. Ramirez, J.D. Taupin, B. Francou, P. Ribstein, R. Delmas, H. Dürr, R. Gallaire, J. Simões, U. Schotterer, M. Stievenard, and M. Werner, Coherent isotope history of Andean ice cores over the last century, Geophysical Research Letters, 30 (4), 1179-1182, 2003.

Ramirez, E., G. Hoffmann, J.D. Taupin, B. Francou, P. Ribstein, N. Caillon, F.A. Ferron, A. Landais, J.R. Petit, B. Pouyaud, U. Schotterer, J.C. Simoes, and M. Stievenard, A new Andean deep ice core from the Illimani (6350 m), Bolivia, Earth and Planetary Science Letters, 212 (3-4), 337-350, 2003.

4.10: Integration Novelties: new thinking for Earth System modelling and climate adaptation and mitigation.

Sarah Cornell, Tyndall Centre for Climate Change Research (HQ), s.cornell@uea.ac.uk (Apresentador / Presenting)

John Schellnhuber, School of Environmental Sciences, University of East Anglia, Norwich, NR4 7TJ UK, h.j.schellnhuber@uea.ac.uk

In the three years since its inception, the UK's Tyndall Centre has become an internationally recognized source of high quality integrated climate-change research. Its aim is to shape the long-term strategic objectives of UK and international climate policy. With a deeply trans-disciplinary perspective, we engage new elements of society in the global environmental change debate, and advance the science of integration by developing and applying new methodologies for integrating climate-change related knowledge. Several of our key tasks present opportunities for mutual learning and discussion with the LBA programme:

- The Interactive Integrated Assessment Process: recognizing the need for a two-way flow of information between wider society and the scientific community, Tyndall's Community Integrated Assessment Model provides a distributed, flexible and modular interface. It links socio-economic models with models of the climate system to explore a wide range of impacts (e.g., health, hydrology, ecosystems, human vulnerability).
- Local/Regional-scale assessment: admittedly, our Coastal Simulator does not address the 'right' ecosystem but it does demonstrate new methods for integrating diverse research outputs at the scale needed for many governance responses.
- Research projects: for example - Evaluation of options for biosequestration of carbon; Clean Development Mechanism for sustainability; Regional GHG emission inventories; Contraction and Convergence; Advanced Terrestrial Ecosystem Analysis and

Modelling; The role of nature conservation in mitigating climate change.

Finally, as one of the founding partners in Europe's Virtual Institute for Integrated Assessment (E?VIA), we are driving forward transnational integration science. E-VIA offers new and exciting scope to perform intercomparison, ensemble and distributed-modular studies. In addition to its scientific and agenda setting aims, there is outstanding scope for human capital development through exchanges, training and information channelling.

S10: Sessões Especiais - Respostas Ecofisiológicas e Bioquímicas das Plantas Tropicais à Elevação da Concentração de CO₂ (*Eco-physiological and Biochemical Responses of Tropical Plants to Elevated CO₂*)

5.1: Photosynthesis and water use efficiency in twenty tropical tree species of differing successional status in a Brazilian reforestation

Carlos Alberto Martinez, USP/RP/FFCLRP/Departamento de Biologia, carlosamh@ffclrp.usp.br (Apresentador / Presenting)

Anselmo Nogueira, USP/RP/FFCLRP/Departamento de Biologia, anselmo_bio@bol.com.br

Leonnardo Lopes Ferreira, UFSCar/Departamento de Botânica, leonnardo@lycos.co.uk

Carlos Henrique Prado, UFSCar/Departamento de Botânica, caique@power.ufscar.br

Leaf gas exchange characteristics were measured in twenty woody species of differing successional status ranging from pioneer species to non-pioneers (late successional species) in a Brazilian rain-reforestation ecosystem. Light saturated photosynthetic rate both calculated on either a leaf area (PNA) or a dry mass (PNM) basis, differed among species. PNA and PNM were highest in the pioneer species and lower in non-pioneer species. Variation among species was 3-fold (from 7 to 23 mmol m⁻² s⁻¹) for PNA, and 5-fold (from 50 to 275 mmol kg⁻² s⁻¹) for PNM. The highest PNA (23 mmol m⁻² s⁻¹) and PNM (275 mmol kg⁻² s⁻¹) values were recorded in the pioneer *Croton urucurana*, while the lowest PNA (7 mmol m⁻² s⁻¹) and PNM (50 mmol kg⁻² s⁻¹) values were recorded in the putative non-pioneer late successional species *Aspidosperma cylindrocarpon*. *C. urucurana* also showed highest *g_s* and E. Mass-based photosynthetic rate was highly correlated with SLM in both pioneer and non-pioneer species (*r* = -0.75 and -0.90, respectively). The highest values of instantaneous transpiratory efficiency (ITE) and intrinsic water use efficiency (iWUE) were also observed in the pioneer species when compared with the non-pioneer species. The results suggests that tropical pioneer species have greater ITE and iWUE than later successional species associated with their higher photosynthetic capacity. Multivariate principal components analysis (PCA) was useful to separate in a two-dimensional space the pioneer and non-pioneers species using gas exchange and SLM parameters. Supported by CNPq

5.2: Effects of air temperature and transitory CO₂ availability on carbon assimilation in tropical woody species *Swietenia macrophylla* King, and *Copaifera langsdorffii* Desf.

Carlos Henrique Prado, Laboratory of Plant Physiology, Department of Botany, Federal University of Sao Carlos, SP, 13565-905, Brazil, caique@power.ufscar.br (Apresentador / Presenting)

Zhang Chengjun, Key Laboratory of Forest Plant Ecology, Northeast Forestry University, Harbin 150040, P. R. China, zhangcj211@hotmail.com

Leonnardo Lopes Ferreira, Laboratory of Plant Physiology, Department of Botany, Federal University of Sao Carlos, SP, 13565-905, Brazil, leonnardo@lycos.co.uk

After to display aerial plant part of seedlings of *Swietenia macrophylla* (mahogany) and *Copaifera langsdorffii* (copaiba) to different overnight temperatures (13-35 °C), the leaf net photosynthetic rate (A) was investigated by measuring photosynthetic light-response curves at 360 mmol mol⁻¹ CO₂, and photosynthetic CO₂-response curves at light-saturated intensity (1500 mmol m⁻² s⁻¹). The optimal temperature for photosynthesis (OTP) measured at regular CO₂ concentration (360 mmol mol⁻¹) was 28,0°C in *S. macrophylla* and 23,0°C in *C. langsdorffii*. These OTP values shifted upward 5°C under CO₂ saturation. At temperature below 25 °C, the decline in A was mainly due to the drop in carboxylation efficiency (C_e), while temperature was over 31 °C, the reduction in A resulted from decrease in C_e, increase in both leaf respiration and photorespiration. The CO₂-induced stimulation of photosynthesis was strongly inhibited at temperatures below 16 °C. The results showed that, the leaf photosynthetic process of tropical evergreen plants should not be accelerated at low temperature in winter season under elevated CO₂ concentration in the future if diurnal local mean temperature decreases beyond 16°C. On the other hand, the OTP values could change significantly upward (5°C) under atmospheric CO₂ concentration able to saturate photosynthetic process. These results pointed out that both ambient factors changed by the greenhouse effect (air temperature and atmospheric CO₂ availability) could act simultaneously on photosynthesis in a complex approach. Under elevated CO₂ concentration low temperatures remove photosynthesis stimulation; and high temperatures increase negative components of carbon balance (respiration/photorespiration) and change photosynthetic biochemical machinery shifting upward OTP values.

5.3: Eco-physiology of Tree Species of the Tropical Rain Forest Under Enriched CO₂ Atmosphere: A Successional Approach Using Different Functional Groups Among the Leguminosae

João R.L. Godoy, Instituto de Botânica São Paulo, jrlgodoy@usp.br

Marcos P.M. Aidar, Instituto de Botânica São Paulo, maidar@uol.com.br (Apresentador / Presenting)

Mauro Marabesi, Instituto de Botânica São Paulo, mauromarabesi@bol.com.br
Marcos Silveira Buckeridge, Instituto de Botânica São Paulo, msbuck@usp.br

The family Leguminosae is among the most representative in tropical biomes such as the rain forest. Its success seems to be related to the occurrence in the different functional groups along the entire successional continuum, from pioneer to early and late secondary species, playing key roles on the development of forest growth cycle. We have previously evaluated the potential for carbon sequestration of the tropical tree *Hymenaea courbaril*, a late secondary species. We found that they almost doubled their photosynthesis capacity, decreased the stomata index and raised the proportion of cellulose in leaves and stem. In this work, a group of legume species (*Sesbania virgata*, *Schizolobium parahyba*, *Piptadenia gonoacantha* and *Dalbergia nigra*) belonging to different ecological groups in the tropical forest succession, was chosen for studies of ecophysiological behaviour when growing under elevated [CO₂] (720ppm) in open top chambers. The results obtained up to now indicate that under 720 ppm of CO₂, *Piptadenia gonoacantha*, an early secondary species, showed higher growth (+10%) and photosynthesis (+29%), reaching maximum assimilation (A_{max}) of carbon dioxide earlier than plants growing under 360ppm. Plants under 720ppm reached values of A_{max} 16% higher than those under 360ppm and saturated almost in doubled atmospheric [CO₂] (2140 and 1200 ppm, respectively) when A_xC_i curves were performed. These results suggest a good potential for carbon sequestration. Further comparisons among species of the different functional groups (on going experiments) may lead to a new understanding of forest succession under high CO₂ atmospheric concentration. FAPESP; The Nature Conservancy; CNPq.

5.4: Effects of the High Concentration of Atmospheric CO₂ on Growth and Development of Sugar Cane (*Saccharum officinarum*)

Marília Gaspar, Instituto de Botânica de SP, gasparmarilia@yahoo.com.br (Apresentador / Presenting)
Amanda Pereira Souza, Universidade Metodista, amandita_ps@uol.com.br
Mauro Marabesi, Instituto de Botânica de SP, mauromarabesi@bol.com.br
João R.L. Godoy, Instituto de Botânica de SP, jrlgodoy@usp.br
Marcos P.M. Aidar, Instituto de Botânica de SP, maidar@uol.com.br
Marcos Silveira Buckeridge, Instituto de Botânica de SP, msbuck@usp.br

Some studies have been performed to evaluate the effects of the raising [CO₂] on important commercial crops such as maize, soybeans and Pinus, but there is no previous account on sugar cane. Sugar cane is currently among the most important crops in Brazilian agribusiness, being responsible for more than 30% of the sugar produced in the world. A considerable amount of "medium-term" carbon sequestration in Brazil is accounted for by sugarcane which occupies very large areas in Northeast and Southeast regions. Native forests and savannahs have previously occupied most of these lands and it is important to evaluate the potential for carbon sequestration after their conversion to croplands. In the present work, we grew sugar cane plants in open top chambers in order to evaluate its photosynthetic and growth capacity in the atmosphere of 720ppm in comparison with 360ppm. Plants growing in elevated [CO₂] displayed an increase of about 12% in plant height and a significant increase in the rate of leaf production. An increase of as much as 30% in CO₂ assimilation was observed on the basis of curves A x C_i, followed by a raise in fresh and dry masses of the whole plant. Preliminary results show that there is no significant differences in the levels of soluble sugars in leaves suggesting that the higher assimilation of carbon by sugar cane plants is stored as biomass rather than sucrose. This is an indication of a longer-term carbon sequestration potential for the sugar cane as the stored carbon might be accumulated mainly as cellulose. FAPESP

5.5: The photosynthetic response to elevated CO₂ in high altitude potato species (*Solanum curtilobum*)

Carlos Alberto Martinez, Universidade de São Paulo, FFCLRP, Departamento de Biologia, carlosamh@ffclrp.usp.br (Apresentador / Presenting)
Natalia Olivo, Universidad de la Republica, Uruguay, nolivo@adinet.com.uy
Marco Antonio Oliva, UFV, Depto. de Biologia Vegetal, moliva@ufv.br

The photosynthetic responses of two potato species differing in origin, *Solanum curtilobum* (from high altitude) and *Solanum tuberosum* (from low altitude), to CO₂ enrichment were studied in open-top chambers in a greenhouse. Plants were grown at either ambient (AC, 360 mmol mol⁻¹) or ca. twice ambient (EC, 720 mmol mol⁻¹) CO₂ concentrations for 30 d. CO₂ treatments started at the reproductive stage of the plants. There were similar patterns in the physiological response to CO₂ enrichment in the two species. Stomatal conductance was reduced by 59 % in *S. tuberosum* and by 55 % in *S. curtilobum*, but such a reduction did not limit the rates of photosynthesis, which were increased by approximately 56 % in *S. curtilobum* and 53 % in *S. tuberosum*. The transpiration rate was reduced by 16 % in both potato species while instantaneous transpiration efficiency increased by 80 % in *S. tuberosum* and 90 % in *S. curtilobum*. Plants grown under EC showed 36 and 66 % increment in total dry biomass, whereas yields (dry mass of tubers) were increased by 40 and 85 % in *S. tuberosum* and *S. curtilobum*, respectively. Elevated CO₂ concentration promoted productivity by increasing photosynthetic rate. These results suggest that *S. tuberosum*, cultivated around the world at low altitudes and *S. curtilobum*, endemic of the highland Andes, respond positively to elevated CO₂ concentration during the tuberisation stage. / Supported by CNPq/CAPES/FAPEMIG

5.6: Seasonal changes of ecophysiological responses of *Hymenaea courbaril* L.

Madeleine Barriga Puente de la Vega, Escola Politécnica da USP - Laboratório de Automação Agrícola, madelein@usp.br (Apresentador / Presenting)
Antonio Mauro Saraiva, Escola Politécnica da USP - Laboratório de Automação Agrícola, amsaraiv@usp.br
Marcos Silveira Buckeridge, Instituto de Botânica de São Paulo - Seção de Fisiologia e Bioquímica de Plantas, msbuck@usp.br

Henrique Pessoa Santos, Instituto de Botânica de São Paulo - Seção de Fisiologia e Bioquímica de Plantas, henrique@cnpv.embrapa.br

Isis Santos Costa, Escola Politécnica da USP - Laboratório de Automação Agrícola, isis.costa@poli.usp.br

The increase in the concentration of atmospheric CO₂ and the likely associated climatic changes became a subject of most interest from several points of view. In Brazil, this issue is especially important due to the presence of the major tropical forests. Thus, it is important to produce scientific data about the native plants that could help to explain their role in the global carbon balance. It is obviously known that the photosynthetic process is key for this task and several experiments have been or are now being performed to understand the responses of plants to atmospheric CO₂. In this work, we monitored the CO₂ assimilation for 1 year, two times a week between 6am and 6pm with the aim to gather information on how *Hymenaea courbaril* responds during the four seasons in a year. Our results show that the higher assimilation rates occurred during the spring (the growing season) but that the periods during the day in which photosynthesis occurred were larger in the summer. A positive correlation (0.6) was observed between CO₂ assimilation and the PPFD but no correlation was found with humidity. This is a large data set that describes in detail the photosynthesis related events during a whole year, which allowed the evaluation of the seasonal behaviour, a key approach to help understanding of carbon balance in the rain forest.

5.7: Modeling photosynthesis of the tropical tree *Hymenaea courbaril* L. using artificial neural networks

Madeleine Barriga Puente de la Vega, Escola Politécnica da USP - Laboratório de Automação Agrícola, madelein@usp.br (Apresentador / Presenting)

Antonio Mauro Saraiva, Escola Politécnica da USP - Laboratório de Automação Agrícola, amsaraiv@usp.br

Hernán Prieto Schmidt, Escola Politécnica da USP - Departamento de Energia e Automação Eléctricas, hernan@pea.usp.br

Marcos Silveira Buckeridge, Instituto de Botânica de São Paulo - Seção de Fisiologia e Bioquímica de Plantas, msbuck@usp.br

The study of current climatic changes caused by the emission of greenhouse gases such as carbon dioxide is extremely complex and involve the integration of several scientific fields. An important aspect of the problem is the evaluation of the carbon exchange between plants and the atmosphere. Due to the non-linear characteristics of the processes involved in this phenomenon, the development of tools to forecast carbon assimilation has been quite difficult. However, the development of modern artificial intelligence techniques such as artificial neural networks (ANNs) has greatly improved the forecast potential of complex non-linear processes. In the present work, a large set of data concerning CO₂ assimilation by young plants of *Hymenaea courbaril* has been used to train ANNs. The multilayer perceptron with backpropagation learning algorithm was used. Leaves at three levels of six-months-old plants (at the beginning of the experiment) were monitored for CO₂ assimilation during 1 year, twice a week between 6am and 6pm. Sixty five percent of all data collected was used for ANN training and the remaining 35% was used for model testing and validation. Training was performed with different combinations of variables in order to determine the more appropriate sets that give best results (lowest error). In a first phase of training, data corresponding to each season was used and in a second phase the whole data set was used. Modelling through ANNs showed to be very efficient, reaching an average error level of 8% only. These results suggest that this approach could be useful for forecasts of carbon assimilation and sequestration by tropical trees.

5.8: *Hymenaea Courbaril* L. (leguminosae): A Model Tree to Understand Pathways for Carbon Sequestration Into Cellulose in the Rain Forest

Marcos Silveira Buckeridge, Inst.de Botânica, Seç. Fis.Bioq.Plts, msbuck@usp.br (Apresentador / Presenting)

Marcos P.M. Aidar, Instituto de Botânica, Seç.de Fis.Bioq. Plantas, maidar@uol.com.br

Márcia Gaspar, Instituto de Botânica, Seç.de Fis.Bioq. Plantas, gasparmarilia@yahoo.com.br

Solange C.M. Viveiros, Instituto de Botânica, Seção de Anatomia, billysol@uol.com.br

Carlos Alberto Martinez, USP, Depto de Biologia, Ribeirão Preto, carlosamh@ffclrp.usp.br

Paula M.F. Costa, Instituto de Botânica, Seç.de Fis.Bioq. Plantas, paulacosta@uol.com.br

Marco A.S. Tiné, Instituto de Botânica, Seç.de Fis.Bioq. Plantas, matine@ig.com.br

Sônia M.C. Dietrich, Instituto de Botânica, Seç.de Fis.Bioq. Plantas, smcdietrich@aol.com.br

Beatriz J. Lopes, Instituto de Botânica, Seç.de Fis.Bioq. Plantas, lopes@yahoo.com.br

Most work performed to understand how tropical plant respond to higher atmospheric CO₂ concentrations focus on how much more photosynthesis (CO₂ assimilation) and accumulation of mass they acquire after growth under elevated CO₂. With few exceptions, little is known about the biochemical responses of plants to high CO₂. After carbon dioxide is assimilated by the leaves, it is transformed into sucrose that can be further metabolised for 1) cell respiration ; 2) starch synthesis, which can be used for respiration within the next day or week; 3) as a source of carbon for proteins, nucleic acids and secondary metabolites and 4) as a source of carbon for synthesis of cell wall polysaccharides, which will stay in the plant body for much longer. In this work we used *Hymenaea courbaril*, a late secondary species that occur throughout the rain forests in the neotropics, as a model to study morphological, physiological and biochemical landmarks that characterise the behaviour of seedlings of *H. courbaril* under 720ppm of CO₂. Under this condition: 1) Leaves altered their stomata, decreasing their frequency; 2) Leaves collected in 1919, 1929 and 1956 confirmed that *H. courbaril* has been responding to the increase in CO₂ concentration by decreasing stomata indexes since industrial revolution; 3) Sucrose and starch levels were higher in the leaves; 4) Stem and leaves of the seedlings accumulated respectively 19 and 30 % more cellulose. These effects were all buffered when storage mobilisation took place. These results suggest that the CO₂ assimilated by the leaves are partitioned through a pathway that leads to accumulation of carbon into cellulose. We speculate that when plants use their "internal" stored reserves as a source of carbon, a common event in seasonal environment, another carbon pathway becomes active and competes with the photosynthetic path so that carbon sequestration becomes lower. This confirms previous observations that regions with higher seasonality have a lower potential for carbon sequestration. FAPESP, CNPq.

5.9: Mixed Cover of C3 and CAM Species in a Tropical Coastal Vegetation: a Unique Situation for Efficient Carbon Sequestration

Eduardo Arcoverde de Mattos, Depto. de Ecologia, Universidade Federal do Rio de Janeiro, Brazil, eamattos@biologia.ufrj.br (Apresentador / Presenting)

F. R. Scarano, Depto. de Ecologia, Universidade Federal do Rio de Janeiro, Brazil, fscarano@biologia.ufrj.br

The coastal sandy plains of Brazil are frequently covered by open scrub vegetation called restinga. This vegetation shows a mixed cover of species with C3 and CAM photosynthesis. Vegetation patches are often dominated by the obligatory CAM tree *Clusia hilariana* (Clusiaceae), and CAM bromeliads and cacti are abundant in the herb strata. In our study site, at the northern coast of the state of Rio de Janeiro, the total area covered by vegetation patches ranges from 20 to 60%, for plots set in a 1,600 ha area. Average leaf area index of the vegetation patches varied from 3.0 to 3.5, whereas litter stock was between 1590 to 1936 gm⁻². Average leaf mass per area of C3 woody plants was 156 gm⁻², whereas in *C. hilariana* the values found were around 320 gm⁻². Photosynthetic capacity of C3 species is between 8 to 18 mmol m⁻² s⁻¹, whereas overnight CO₂ uptake of *C. hilariana* is around 7 mmol m⁻² s⁻¹. We postulate that this unique situation of dense cover of a CAM tree mixed with C3 woody species, imply in an unusual relatively high 24-hour pattern of carbon sink. Moreover, unfavourable conditions for organic matter decomposition emerge due to low availability of water and nutrients and the low quality of the litter. Thus, we are gathering data to confirm that the restinga vegetation will have a major role to play in carbon sequestration and storage in a future scenario of climate change due to an unusual day-night carbon sink, low decomposition rates and intrinsic abilities of the component species to persist under extreme periods of environmental stresses.

S14: Sessões Especiais - Trocas de Carbono Entre os Ambientes Aquáticos, a Terra e a Atmosfera (*Carbon Exchanges Between Aquatic Environments, Land, and Atmosphere*)

6.1: Examining the results from the Asu catchment in a wider Amazonian context

Martin George Hodnett, Free University of Amsterdam, mhodnett@lineone.net (Apresentador / Presenting)

Javier Tomasella, CPTEC - INPE, javier@cptec.inpe.br

Waterloo Maarten, Free University of Amsterdam, watm@geo.vu.nl

Luz Adriana Cuartas, CPTEC - INPE, adriana@cptec.inpe.br

Antonio Donato Nobre, INPA, anobre@ltid.inpe.br

The important results from the 6.4 km² Asu catchment are examined in a wider context. These were: the importance of storage in the deep unsaturated zone and groundwater in the water balance (?memory effect?), the scale dependence of the processes of flow generation, and the sandy soils of the valley/floor being the main source of DOC in streamflow. The storage capacity in the Asu catchment, and areas with a similar deep and permeable geological sequence, is large and catchment storage does not return to the same level each year. The assumption that the net annual storage change is zero would cause much noise in model results, and erroneous estimates of evapotranspiration from rainfall and runoff data.

In the headwater areas of Asu (areas of a few ha), throughflow and return flow can cause surface runoff, but scaling up from such small areas would give misleading results. Saturation excess overland flow (SOF) from the saturated valley floor was the main process of runoff generation in Asu. The percentage of total runoff occurring as stormflow depends on the proportion of the catchment area occupied by valley floor. In catchments with a shallow depth of weathering, the proportion of baseflow will be smaller because of the low storage capacity. Storm runoff can be generated as SOF, and from a larger area of the catchment, when a perched water table builds up on the unweathered bedrock. The amount of storm runoff will depend strongly on the rainfall distribution.

6.2: ENSO-Orchestrated Carbon Supply and Sequestration in Amazonian River Basins by Erosion-Sedimentation Processes

Rolf Aalto, University of Washington, Seattle, USA, aalto@u.washington.edu (Apresentador / Presenting)

Anthony K Aufdenkampe, Stroud Water Research Center, PA, USA, aufdenkampe@stroudcenter.org

Laurence Maurice-Bourgoin, IRD, French Research Institute for the Development, Brasilia, Brazil, lmaurice@unb.br

Application of a new geochronological method quantifies century-scale floodplain sedimentation rates across a pristine 720,000 km² basin covering the principal sediment and water sources for the Madeira River, the largest sediment source for the Amazon. Large, rapid-rise, cold-phase ENSO floods account for the preponderance of sediment accumulation and dominate sediment discharge from Andean tributaries into the large rivers of the Amazonian lowland, indicating considerable inter-annual variation of sediment supply and transport resulting from the interaction of Andean erosion and the dynamics of extreme climate. Transient, ENSO-driven processes control the formation of floodplains and sedimentary strata, and modulate the efflux, transport, floodplain storage, exchange due to channel migration, and downstream delivery of sediment and associated (adsorbed) carbon, nutrients, and pollutants to the Amazon main stem. Such infrequent, extreme mechanisms of sediment and carbon transport suggest a three-step process could represent a major carbon sink in Amazonian foreland basins: 1) extensive Andean hillslope failure and channel migration during large La Niña associated storms mobilizes vast quantities of fresh organic matter and sediment with low organic carbon (OC) content; 2) within the river, mineral surfaces acquire normal OC loadings via sorption as they are rapidly evacuated from

the mountainous source basins to adjacent foreland depocenters; and 3) deposited sediments preserve “fresh” carbon within organo-mineral complexes and by deep burial in point bars and “crevasse-splay” deposits that have little potential for exchange with the biosphere and atmosphere. Calculations suggest that this process could sequester 300-500 Mtonnes of carbon per event in the Amazonian foreland and regulate the supply of particulate OC to the lower Amazon.

6.3: Suspended sediment Yield in the Amazon basin. An assessment using the Brazilian national data set

Naziano Filizola, ANA Brasil, naziano@ana.gov.br (Apresentador / Presenting)

Jean Loup Guyot, IRD Peru, jloup@amauta.rcp.net.pe

Frédérique Seyler, IRD France, fseyler@lmtg.ups-tlse.fr

G rard Cochonneau, IRD France, gerard.cochonneau@mpl.ird.fr

Eurides Oliveira, ANA Brasil, eurides@ana.gov.br

In this paper, we make use of a Brazilian National data set on suspended sediment data for the Amazon Region containing more than 2500 samples from 60 sites (Figure 1) which have been running since the 1970s and are still operated, on an almost quarterly basis. These data are useful for assessing suspended sediment yields in the biggest river basin on earth. We also consider the sampling procedures and the methods used for Total Suspended Sediment (TSS) discharge calculation in the Amazon Region using such data. An analysis of the contributions of the largest Amazon River tributaries to the total sediment load of the Amazon, and the relationship between TSS and water discharge was undertaken. The Brazilian data are very representative of the processes operating in the basin, particularly in the central flood plain and in the Brazilian and Guiana shields. A basic assessment of the data highlights the major Andean Suspended Sediment Yield contribution (more than $1000 \cdot 10^6 \text{ t.km}^{-2}.\text{yr}^{-1}$) and the lower contribution from the shield areas (less than $100 \cdot 10^6 \text{ t.km}^{-1}.\text{yr}^{-1}$). Due to the relatively effective spatial distribution of the TSS stations, it was possible to evaluate the shield contributions as represents 7% of the total Amazon River basin suspended sediment yield. A region marked by deposition was identified in the middle of the basin. A sedimentation rate for the “v rzas” in the Amazon River basin lowlands of between 3 to 6 mm.yr⁻¹ is proposed. We also proposed a QS variation by month, at the mouth to the three most important rivers of the Amazon Basin, and a value for the Amazon River TSS discharge to the Atlantic Ocean of about 600 to 800 10^6 t.yr^{-1} .

6.4: Role of Floodplains in Suspended Sediment Transfer and Storage Along the Amazon River

Laurence Maurice-Bourgoin, IRD, lmaurice@unb.br (Apresentador / Presenting)

Pascal Kosuth, CEMAGREF, pascal@teledetection.fr

Jean-Michel Martinez, IRD, jmichel@unb.br

Eurides Oliveira, ANA, eurides@ana.gov.br

The role of channel-floodplain interactions in the fluvial transport and sequestration of sediments in the Amazon basin are still poorly documented mainly because of the lack of regional networks. Floodplains can act as an important sink of sediments and heavy metals associated with fine particles. In this study, we present an estimation of the contribution of an Amazonian floodplain to sediment transport and sequestration. The floodplain studied is the “Lago Grande de Curuai”, located on the right bank of the Amazon R., across from the city of  bidos. This floodplain is a complex system of more than 30 interconnected lakes, with a maximum inundated area of 2,300 km², representing 1% of the total flooded areas of the Central Amazon basin. We determined an average sedimentation rate of 400,000 t y⁻¹ from a network of stations monitored for 4 years, analysis of multi-temporal remote sensing images and a hydrodynamic model. This storage represents approximately 0.5 % of the total annual sediment flux of the Amazon River at  bidos. The associated specific deposition rate approaches 114 t km⁻² y⁻¹.

A very high temporal variability of the monitored TSS has been observed for the lakes and channels. High sedimentation rates are expected in inter-connection channels with the Amazon R. but this rate is much lower at the “varzea” scale. Deposition kinetics in lakes can be disrupted by the re-suspension process under wind effect as it is regularly observed in white water lakes during the low water stage. Suspended sediment concentrations are ranging from 4 mg l⁻¹ during the flood peak to extreme values during the dry season, 1600 mg l⁻¹, exceeding by more than 6 fold the maximum TSS concentration measured in the Amazon mainstream during the same period.

6.5: Isotopic Constraints on Organic and Inorganic Carbon Cycling in the Amazon River System

Emilio Mayorga, University of Washington, emiliom@u.washington.edu

Anthony K Aufdenkampe, Stroud Water Research Center, aufdenkampe@stroudcenter.org (Apresentador / Presenting)

Alex V Krusche, CENA-USP, alex@cena.usp.br

Caroline A Masiello, California Institute of Technology, masiello@gps.caltech.edu

Paul D Quay, University of Washington, pdquay@u.washington.edu

Jeffrey E. Richey, University of Washington, jrichey@u.washington.edu

We analyzed the ¹⁴C and ¹³C isotopic composition of dissolved inorganic carbon (DIC) and organic carbon (OC) size fractions in Amazonian rivers ranging from mountain and lowland streams to the mainstem. Associated measurements include DIC, POC and DOC, organic geochemical tracers, and major ions. Carbonate weathering is a dominant or significant source of DIC in many rivers draining the Andes and headwaters of the Jurua and Purus in the central-western Amazon; because of this confounding influence, assessment of biotic controls on DIC cycling requires consideration of weathering regimes. In the majority of mid to large lowland river systems that are not influenced by carbonate weathering, DIC is very young, and its associated CO₂ is ¹³C-enriched compared to bulk OC or its primary size fractions. Bulk OC is unlikely to be the main source of this DIC; a small, labile OC fraction appears to dominate respiration. Nevertheless, old POC is stored and respired throughout the basin; Andean POC is ultimately replaced by lowland-derived OC. However, respiration of old OC is generally not a dominant source of DIC, except in lowland peat wetlands. In small lowland rivers, lateral transport of aged soil CO₂ is a significant source of DIC; this terrestrial DIC is evaded downstream. We will present estimates of the

isotopic signature of CO₂ evading from central Amazon lowland rivers and discuss implications for regional carbon budgets.

6.6: Pilot Experiments on Air-Water Exchange of Carbon Dioxide in the Amazon Basin

Simone R. Alin, University of Washington, salin@u.washington.edu (Apresentador / Presenting)

Scott Dennis Miller, University of California Irvine, sdmiller@uci.edu

Alex Vladimir Krusche, CENA/USP, alex@cena.usp.br

Jeffrey E. Richey, University of Washington, jrichey@u.washington.edu

Average carbon dioxide (CO₂) concentrations in Amazon waters have been measured at approximately an order of magnitude more concentrated than atmospheric concentrations, leading to a significant water-to-air outgassing. Relatively little research has been done to directly measure these fluxes; most computations have depended on a parameterized exchange coefficient and the difference in partial pressure between water and air. We report here on a suite of pilot experiments to measure outgassing more directly. These experiments include boat-mounted eddy covariance measurements, compared to floating flux chambers, and gradient fluxes. A comparative analysis of the relative benefits and pitfalls of each method will be presented, along with preliminary measurements of CO₂ fluxes.

6.7: Detection of carbon dioxide efflux from the rivers in the atmosphere.

Joe Berry, Carnegie Institution, Dept of Global Ecology, joeberry@stanford.edu (Apresentador / Presenting)

Jean Pierre Ometto, CENA, jpometto@cena.usp.br

Jim Ehleringer, Univ. of Utah, Dept of Biology, jim@biology.utah.edu

Jon Wells, LiCor Inc., jwells@licor.com

Evasion of CO₂ from supersaturated surface waters of rivers and flooded forests is thought to be a substantial source of CO₂ that needs to be accounted for in constructing a carbon budget of the Amazon Basin. We hypothesized that CO₂ evading from the rivers should carry a different isotopic label than CO₂ from surrounding forests and that this should be detectable in the nocturnal boundary layer. In May, 2003 we chartered six flights with a light aircraft near Santarem. These flights occurred just before sunset - as the surface atmosphere becomes stable and just after dawn - before convection begins to dissipate the nocturnal boundary layer of the previous night. Continuous measurements of CO₂ concentration, potential temperature, water vapor mixing ratio, atmospheric pressure and gps location were collected with a modified LiCor 6400 photosynthesis system. In addition, flask samples of dried air were taken for laboratory analysis of CO₂ concentration and isotopes - employing a new automated technology. Good agreement was obtained between flask measured CO₂ concentrations and those measured by the LiCor 6400. Both systems were referenced to a CMDL calibrated tank. The flights sampled air from transects at an elevation of approximately 150 m above surface over areas selected to have long fetches in the prevailing wind direction over river or upland forest. Each flight concluded with a sounding to 3000 m. CO₂ accumulated in the nocturnal boundary layer both over the river and land. However, the concentrations were substantially higher over land. This observation could be attributed to spreading of air containing respired CO₂ from the forests over the rivers during the night. However, the oxygen isotopes of CO₂ collected over the rivers show that a substantial portion of the CO₂ present in the nocturnal boundary layer in the morning above the river evaded from the river.

6.8: Evidence of nocturnal horizontal transport of CO₂ at an Amazon pasture/agricultural site

Otávio C Acevedo, UFSM, otavio@smail.ufsm.br (Apresentador / Presenting)

Oswaldo Luiz Leal de Moraes, UFSM, Moraes@mail1.ufsm.br

Rodrigo da Silva, UFSM, rodrigo@asrc.cestm.albany.edu

David Roy Fitzjarrald, SUNY, fitz@asrc.cestm.albany.edu

Ricardo K Sakai, SUNY, sakai@asrc.cestm.albany.edu

Matthew J. Czikowsky, SUNY, matt@asrc.cestm.albany.edu

The difficulty in correctly determining nighttime surface CO₂ emissions has been a major problem for the closure of carbon budgets of different ecosystems.

Frequently, data from calm nights, for which not enough turbulent activity exists, are neglected and the analysis is restricted to windier conditions. In many cases the use of such technique leads to the removal of an appreciable portion of the datasets. If calm conditions are the predominant state of the lower atmosphere at night, the determination of surface CO₂ fluxes from this method becomes seriously questionable.

At deforested regions at the Amazon, such as the LBA-ECO pasture/agricultural site, surface radiative cooling leads to a strong temperature inversion that suppresses turbulent mixing at almost all the time. Alternative techniques are necessary to estimate surface nocturnal fluxes at these locations.

In previous and companion studies this estimate has been done from the profile of CO₂ accumulation observed respectively at the site micrometeorological tower and by a tethered balloon system that went up to 300 m above the surface.

However, the integration of the CO₂ accumulation rate at the boundary layer only equals the surface emissions if no net horizontal transport exists at the region.

In the present study, it is shown observational evidence that drainage flows exist at the pasture site and that they affect the local CO₂ accumulation rate. The magnitude of the horizontal transport is estimated. Finally, the previous estimates of the nocturnal surface fluxes from the vertical profiles are corrected considering the horizontal transport terms and the impact of this correction to the carbon budget is determined.

6.9: Intraseasonal Variability of the Surface Fluxes in Santarém

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br (Apresentador / Presenting)
Maria Isabel Vitorino, IAG/USP, isabel@model.iag.usp.br
Humberto Ribeiro da Rocha, IAG/USP, humberto@model.iag.usp.br
Scott Dennis Miller, University of California, sdmiller@uci.edu
Michael L. Goulden, University of California, mgoulden@uci.edu

The time variability of the rainfall over large areas in the tropics is modulated by intra-seasonal variability in the 20-60 day range. Most of the intra-seasonal signal is associated to an eastward propagating wave with maximum activity in the equatorial region although significant impact is also found at higher latitudes. Although the Amazon is not particularly influenced by the intraseasonal variability, some effect can be detected in the wind field associated with changes in the intensity of the trades winds and therefore on the moisture inflow in the Amazon. Changes in solar radiation in the intraseasonal band can also be detected in the Amazon, due to changes in the cloudiness. This paper explores the intraseasonal variability of meteorological parameters and surface fluxes in the Santarém area, based on the Net Ecosystem Exchange (NEE) calculated for each half-hour interval as the sum of the turbulent CO₂ flux at 64 m (the eddy flux) and the change in the amount of CO₂ in the air column beneath 64 m (the storage flux). The measurements were made

from a 67-m-tall, 46-cm-triangular-cross-section tower micrometeorological tower data. The wavelet analysis using Morlet functions (Morlet, 1982, Grossman and Morlet, 1984) was used to decompose the variability signal present in the data into their intraseasonal multiple time scales components. This method is appropriated for non stationary processes. Although the intraseasonal variability in the Amazon convection, estimated from the outgoing longwave radiation (OLR) is not particularly strong, compared to other tropical regions, a significant signal seems evident in the CO₂ flux time series. It is hypothesized that the vegetation primarily responds to the intraseasonal signal in the short wave.

6.10: Explicit Calculation of Surface Carbon Flux on the Flona Tapajos using SiB-RAMS

Ian T Baker, Colorado State University, baker@atmos.colostate.edu
Lixin Lu, Colorado State University, lixin@atmos.colostate.edu
Saulo Ribeiro de Freitas, CPTEC/INPE, sfreitas@cptec.inpe.br
Scott A. Denning, Colorado State University, denning@atmos.colostate.edu (Apresentador / Presenting)

We couple the Simple Biosphere Model (SiB) to the CSU Regional Atmospheric Modeling System (RAMS) in order to compare explicitly simulated terrestrial carbon fluxes to observations taken during the Santarém Mesoscale Campaign (SMC) in 2001. SiB calculates photosynthesis using Farquhar kinetics and the Ball-Berry equation for stomatal conductance, so that carbon flux is dependent upon the net assimilation rate, relative humidity and CO₂ concentration at the leaf surface, and soil water stress. Prognostic variables in SiB are vegetation, soil and canopy air space (CAS) temperature, CAS water vapor, and photosynthesis/stomatal resistance. Respiration rate is based upon a zero-net-sum annual net ecosystem exchange. Canopy characteristics (absorbed fraction of PAR, LAI, roughness length) are obtained using satellite-derived values of NDVI. Carbon flux between the terrestrial biosphere and atmosphere is dependent upon stability, CAS CO₂ concentration, and assimilation/respiration rate.

Carbon dynamics in the Tapajos region have been modeled with prescribed surface fluxes, which were based on vegetation type and observed diurnal cycle (see Lu et al, this conference). That study emphasized local mesoscale circulations generated by land/river configuration and trade wind strength. We look at the same case with surface carbon flux calculated using SiB and compare fluxes and concentrations of CO₂ with observations and values derived with prescribed fluxes. Short-term variations in the observed CO₂ flux are more accurately captured with the explicit canopy parameterization provided by SiB.

S5: Sessões Especiais - Dados e Produtos Terra/Aqua MODIS Para a Ciência do LBA: Resultados Atuais e Oportunidades Para Integração de Dados e Sínteses. *(Terra / Aqua MODIS Data and Products for LBA Science: Current Results and Opportunities for Data Integration and Synthesis)*

7.1: Use of MODIS and MERIS data for the water quality monitoring of Amazonian rivers and floodplain lakes

Jean-Michel Martinez, IRD, jmichel@unb.br (Apresentador / Presenting)
Laurence Maurice-Bourgoin, IRD, lmaurice@unb.br
Patricia Moreira-Turcq, IRD, pturcq@geoq.uff.br
Jean Loup Guyot, IRD, jloup@amauta.rcp.net.pe

Few works deal with the use of satellite data to monitor water quality of the Amazonian water bodies, in particular because of the unavailability of appropriated remote sensing sensors and of the dramatic lack of in situ measurements. In these heterogeneous and fast-changing environments, the challenge is to retrieve the parameters of interest when the water optical properties are affected at the same time by the presence of phytoplankton, dissolved organic components and

mineral suspended matter. Sensors such as MODIS and MERIS, by joining fine spectral resolution (15 bands for MERIS), high temporal resolution (2 images each day for MODIS) and medium spatial resolution (250 to 500 meters) appear promising.

In this study, we assess the use of MODIS and MERIS data for the monitoring of both Amazonian floodplain lakes and the largest river mainstems. Making use of a large dataset of water quality measurements we analyzed the spatial and temporal variations of the water signatures in a large floodplain. MERIS allows to identify main water constituents and to retrieve the chlorophyll-a and total suspended solids (TSS) concentrations during the main lake stages. Comparisons of MODIS data with TSS measurements collected every 10 days on the main rivers prove that such sensor allows to finely monitor the surface sediment fluxes. Accuracy of the TSS retrieval using semi-analytical techniques ranges between 5 and 17 mg/l (relative accuracy of about 25 %). We discuss the complementarity of both sensors and the progress made in relation to classical studies based on Landsat data.

7.2: Análise Sazonal dos Produtos MOD13A2 (NDVI/EVI) e MOD15A2 (LAI/fAPAR) Para o Bioma Cerrado

Manuel Eduardo Ferreira, Universidade Federal de Goiás, manuel@iesa.ufg.br (Apresentador / Presenting)

Alfredo R Huete, University of Arizona, ahuete@ag.arizona.edu

Laerte Guimarães Ferreira, Universidade Federal de Goiás, laerte@ag.arizona.edu

Alejandro Alvarado Peccinini, Universidade Federal de Goiás, alalpe@ibestvip.com.br

O Cerrado Brasileiro é um bioma extenso e complexo, marcado por rápidas mudanças quanto ao uso e ocupação do solo. Devido às suas dimensões e variações fisionômicas, acredita-se que o Cerrado desempenhe importante papel quanto aos balanços de água, energia e fluxos de carbono, em nível regional e global. Por outro lado, uma caracterização e discriminação sistemática das principais fisionomias e formas de uso associadas são ainda imprescindíveis para um melhor entendimento deste bioma, no que diz respeito a sua estrutura, funcionamento e efetivo papel ecológico. Assim, neste trabalho avaliamos o principal conjunto de parâmetros biogeofísicos disponibilizados pelo sensor MODIS, o qual inclui os produtos LAI/fAPAR (MOD15A2), produzido à cada 8 dias, e o produto NDVI/EVI (MOD13A2), ambos com um 1 km de resolução. Ao todo, foi avaliado um ano de dados (dez. 2002 - dez. 2003), tiles h13v10 e h12v10 (Estado de Goiás), para as seguintes classes de uso/cobertura: pastagem/agricultura, campo sujo (Cerrado arbustivo) e Cerrado sensu strictu. A conspicua sazonalidade do bioma Cerrado foi melhor caracterizada com os índices de vegetação, em particular o EVI (índice de vegetação realçado), o qual também apresentou maior potencial de discriminação sazonal das distintas paisagens. Deve-se ainda ressaltar a elevada correlação observada entre os índices NDVI/EVI e entre os índices LAI/fAPAR. Os respectivos mosaicos para o Estado de Goiás, bem como maiores informações sobre estes índices podem ser obtidas através da página MODIS Brasil (www.ufg.br/modisbrasil).

7.3: Combining Landsat ETM+ and Terrain Data for Scaling Up Leaf Area Index (LAI) in Eastern Amazon: an Intercomparison With MODIS Product

Luiz Eduardo Oliveira Cruz de Aragão, INPE, aragao@ltd.inpe.br (Apresentador / Presenting)

Yosio Edemir Shimabukuro, INPE, yosio@ltd.inpe.br

Mathew Williams, University of Edinburgh, mat.williams@ed.ac.uk

Fernando Del Bom Espírito Santo, INPE, fernando@ltd.inpe.br

The aim of this study was to produce a continuous field of LAI to evaluate LAI surface (MOD15 product) retrieved from moderate resolution imaging spectroradiometer (MODIS), for the Tapajós region, eastern Amazonia. Our method consisted in generating regression models combining spectral data derived from Enhanced Thematic Mapper Plus (ETM+) sensor (07/30/2001) and terrain slope and altimetry information extracted from a digital terrain model. We built three different models, the first (Model 1) used only spectral variables, the second (Model 2) combined spectral and terrain data, and the last (Model 3) accounted only with terrain data. We compared the mean LAI estimated by the three models (270m spatial resolution) with the 8 days LAI composition (08/13/2001) derived from MODIS sensor (1km spatial resolution) and also with field data. The three models generated by our method fitted the field LAI data within the confidence level of 95%. The model 2 had the best fit ($R^2 = 0.91$), an improvement of 11% over the estimation using a purely spectral model (Model 1). The mean LAI and the standard deviation found for the whole region varied from 3.50 ± 0.83 (Model 2) to 5.46 ± 0.60 (MODIS). The mean LAI for the field measurements was 3.84 ± 0.89 , with a minimum LAI of 1.56 and a maximum of 5.10. The MODIS LAI surface for the Tapajós region showed a more homogenous surface and little information about land cover. when we visually compared with our estimations. This fact occurs due to the 1km resolution from de MODIS LAI against the 270m resolution used in our approach. The mean LAI derived from MODIS sensor is significantly overestimated ($P < 0.05$) in relation to both field and modelled data. We conclude that this approach seems to be promising for generating LAI surfaces over the Tapajós region. The integration of terrain and ETM+ spectral information improved the purely spectral model. In addition, terrain-spectral model captured more realistically the LAI heterogeneity in the Tapajós region than did the spectral and MODIS estimations. The spectral-terrain model also reproduced the mean, standard deviation and minimum and maximum LAI values found in the field data, while MODIS overestimated LAI in the Tapajós.

7.4: Phenological shifts and variations in vegetation along Amazon eco-climatic transect using MODIS VI time series

Piyachat Ratana, Soil, Water, and Environmental Science Dept., University of Arizona, piyachat@ag.arizona.edu (Apresentador / Presenting)

Alfredo Ramon Huete, Soil, Water, and Environmental Science Dept., University of Arizona, ahuete@ag.arizona.edu

Kamel Didan, Soil, Water, and Environmental Science Dept., University of Arizona, kamel@ag.arizona.edu

The major land cover types along a north-south Amazon eco-climatic transect are tropical forest, forest-savanna transition zone, and cerrado or savanna. The Amazon contains the largest extent of tropical forest on Earth, and is undergoing rapid land cover changes. Similarly, the cerrado biome has been experiencing unprecedented rates of clearing and conversion. These have important environmental consequences to biological diversity, the hydrological cycle, energy balance, climate, and carbon dynamics at local, regional and global scales. To better understand these consequences, better knowledge of vegetation dynamics in the Amazon is needed. The Terra - Moderate Resolution Imaging Spectroradiometer (MODIS) was designed to monitor the spatial and temporal dynamics over large-scale areas. In this study, we investigated the seasonality and spatiotemporal behavior of an eco-climatic transect, from the cerrado biome near Brasilia to the cerrado-forest transition zone near Palmas-Xingu, and seasonal tropical forest at Tapajós National Forest near Santarem, using MODIS vegetation index (VI) time series data. MODIS VI 16-day composite data was employed to observe wet-dry seasonal patterns and phenologic shifts and responses in vegetation activity along the eco-climatic transect. Results showed the cerrado region exhibited the highest dry-wet seasonal contrast with a pronounced dry season from June through August and wet season from November to March. We found the transition from cerrado to forest was quite abrupt, but with variable and distinct profiles. Conversely, the tropical forest had the lowest seasonal contrast and during the dry winter months (August to November) had the highest response in their temporal profiles.

7.5: Spatiotemporal Shifts in Biologic Activity Across Amazonia Forest-Cerrado Transitions and Land Conversions: an Analysis with MODIS Biophysical Products

Alfredo Ramon Huete, University of Arizona, ahuete@ag.arizona.edu (Apresentador / Presenting)

Kamel Didan, University of Arizona, kamel@ag.arizona.edu

Yosio Edemir Shimabukuro, INPE, yosio@ltid.inpe.br

Piyachat Ratana, University of Arizona, piyachat@ag.arizona.edu

Laerte Guimaraes Ferreira, Universidade Federal de Goiás - UFG, laerte@iesa.ufg.br

An understanding of the spatiotemporal variations of biologic activity in the Amazon region is needed to help answer key questions on climate variability, forcing and consequences to the carbon and water cycles. High temporal frequency observations with the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard the Terra and Aqua Earth Observing System platforms offer unique opportunities to study climate- and anthropogenic- induced land conversions in the temporal domain. Shifts in vegetation type and physiognomies alter biologic activity and responses to climate patterns in unpredictable ways, with important consequences to the structure and functioning of ecosystems. We utilized 4 years of MODIS multi-product, time series data to analyze the seasonal and spatial patterns of photosynthetic vegetation activity over the Amazon basin and surrounding regions of Brazil. Inter-annual and phenological variations were analyzed along several eco-climatic transects that extended from the cerrado and caatinga regions to the seasonal and perhumid tropical forests. The MODIS biophysical products utilized along the eco-climatic gradients included the vegetation indices (VI), leaf area index (LAI), fraction of absorbed photosynthetically active radiation (FPAR), and net primary productivity (NPP). MODIS-derived seasonal metrics, such as length of the growing season and drying periods, were found to be strongly related with fire frequency and intensity, land surface temperature, carbon flux tower measurements, and land use conversions. We found MODIS data spatiotemporal patterns to vary significantly along the eco-climatic gradients, particularly over the cerrado- forest transition and in land converted and land degraded areas.

7.6: Mapping Expansion of Soybean Cultivation with MODIS data

Ruth DeFries, University of Maryland, rdefries@geog.umd.edu (Apresentador / Presenting)

Douglas Morton, University of Maryland, morton@geog.umd.edu

Matthew Hansen, University of Maryland, mhansen@glue.umd.edu

Yosio Shimabukuro, INPE, yosio@ltid.inpe.br

Liana Anderson, INPE, liana@ltid.inpe.br

Ellen Jasinski, University of Maryland, ejasinsk@pop900.gsfc.nasa.gov

Soybean cultivation is rapidly expanding in the southern portion of the Amazon basin, with potential implications for climate through changes in fire regimes, land cover, and size of clearings. While agricultural statistics document the area planted, spatially-explicit data are required to assess the implications of agricultural expansion on climate and ecosystem function. MODIS data at 250m spatial resolution and daily temporal resolution provide phenological information that distinguishes pasture from cropland. Soy fields display a distinct signature in the growing season with high values of the Enhanced Vegetation Index (EVI). In contrast, pasture displays lower EVI values throughout the year. Phenological patterns from both soy and pasture are distinct and separable from forest and cerrado. Here we show results from analysis of MODIS data for the years 2000 through March 2004 for Mato Grosso state. The results allow us to quantify the land area that has been converted to soy fields from 1) land previously cleared for pasture, 2) cerrado, and 3) forest. New soy fields are predominantly converted from land previously cleared for pasture, although a significant area is converted directly from cerrado and forest. The large size of new clearings in Mato Grosso (mean = 44 ha) reflect the high degree of mechanization in the region and the ability for land owners to deforest 50% of their properties in transition/ecotone forest types.

7.7: Combining Land Cover Data with MODIS Active Fire Detections to Establish Fire Type and Estimate Burned Area

Douglas Morton, University of Maryland, morton@geog.umd.edu (Apresentador / Presenting)

Jeffrey Thomas Morisette, NASA GSFC, jeff.morisette@nasa.gov

Ivan Csiszar, University of Maryland, icsiszar@hermes.geog.umd.edu

Wilfrid Schroeder, IBAMA, wilfrid.schroeder@ibama.gov.br

Ruth DeFries, University of Maryland, rdefries@geog.umd.edu
João Antonio Raposo Pereira, IBAMA, jraposo@ibama.gov.br
Christopher O. Justice, University of Maryland, justice@hermes.geog.umd.edu

Accurate, spatially explicit measurements of fire type and burned area are necessary to estimate the magnitude of smoke emissions, carbon losses, ecosystem impacts, and climate feedbacks from fire in Amazonia. The fire type for active fire detections from moderate or coarse resolution sensors can be difficult to evaluate with high resolution imagery due to limited spatial and temporal coverage from high resolution sensors. MODIS data products at 250 m - 1 km resolution provide several possibilities for integrating regional land cover products and active fire detections to establish fire type and estimate burned area. We compare the MODIS active fire time series for 2000-2003 to the MODIS Vegetation Continuous Fields (VCF) percent tree cover and cloud-filtered 16-day NDVI time series at 250 m resolution to classify fires as deforestation or agricultural maintenance fires. For each analysis, deforestation fires are compared to field data and basin-wide deforestation maps from the INPE PRODES program to evaluate errors of omission and commission. The time series approach permits classification of land use following fire as pasture or agriculture based on the phenological signature of the NDVI time series from the subsequent wet season. We also explore the possibility of identifying understory fires using the phenological response from known understory fires to train the decision tree classification algorithm. Our results suggest that integration of MODIS land cover and active fire products can improve our understanding of the spatial and temporal patterns of maintenance, deforestation, and understory fires in Amazonia.

7.8: Análise espacial dos padrões de desmatamento na região Amazônica através de dados PRODES e MODIS

Nilson Clementino Ferreira, CEFET-GO, ncferrera@brturbo.com (Apresentador / Presenting)
Laerte Guimaraes Ferreira, UFG, laerte@ag.arizona.edu
Alfredo R. Huete, University of Arizona, ahuete@ag.arizona.edu
Manuel Eduardo Ferreira, UFG, manuel@iesa.ufg.br

A cobertura florestal da região amazônica vem sendo sistematicamente convertida em agricultura e/ou pecuária. Devido a esta situação, a partir dos anos 70, com os sensores orbitais, a ocorrência de desmatamentos naquela região começou a ser mapeada anualmente, utilizando-se imagens obtidas pelo satélite Landsat e mais recentemente imagens MODIS. O INPE, através do projeto PRODES, vem mapeando o desmatamento na Amazônia desde 1989. Com a introdução do PRODES-Digital em 2003, os dados relativos à interpretação das imagens Landsat passaram a ser disponibilizados via Internet, o que possibilitou a análise do desmatamento. Especificamente para este trabalho, o qual se insere no âmbito da parceria entre o Sistema de Proteção da Amazônia (SIPAM) e a Universidade Federal de Goiás (UFG) com vistas ao desenvolvimento de um Sistema Integrado de Alerta de Desmatamentos (SIAD), foram analisados os dados PRODES de 1997 a 2002, bem como dados MOD13Q1 (NDVI) para o período 2002 - 2003 (tiles h12v10 e h12v09). A análise espacial destes dados evidenciou 60 municípios, preferencialmente agrupados no chamado Arco do Desmatamento, responsáveis por 70% do desmatamento na Amazônia legal. Pôde-se também constatar a relação (inversa) entre a presença institucional do Estado e a agressividade do desmatamento. A expectativa é de que, a partir de análises como esta, seja possível desenvolver um modelo teórico de ocupação da região Amazônica, bem como elaborar cenários futuros. Maiores informações sobre o SIAD e sobre o uso dos dados MODIS no monitoramento da cobertura vegetal na Amazônia podem ser obtidas através da página MODIS Brasil (<http://www.ufg.br/modisbrasil>).

7.9: Avaliação dos índices de vegetação MODIS para a detecção de mudanças na cobertura vegetal do Cerrado.

Eristelma Teixeira Jesus, UnB, eris@unb.br (Apresentador / Presenting)
Laerte Guimarães Ferreira, IESA/UFG, laerte@iesa.ufg.br
Manuel Eduardo Ferreira, IESA/UFG, manuel@iesa.ufg.br
Nilson Clementino Ferreira, CEFET-GO, ncferrera@brturbo.com
Alfredo Huete, NASA, ahuete@ag.arizona.edu
Edson Eyji Sano, EMBRAPA CERRADOS, sano@cpac.embrapa.br

Estima-se que 60% do Cerrado, segundo maior bioma na América do Sul, já tenham sido convertidos em função da intensa atividade agro-pecuária existente na região. Por outro lado, poucas tem sido as iniciativas voltadas ao monitoramento sistemático deste bioma. Neste sentido, e no âmbito da implementação de um sistema de alerta de desmatamentos para o Cerrado, este trabalho buscou avaliar a habilidade dos índices de vegetação MODIS NDVI (índice de vegetação da diferença normalizada) e EVI (índice de vegetação realçado) quanto à detecção de mudanças associadas às principais fisionomias do Cerrado. Especificamente, foram analisados dados MOD13Q1 (250m) e MOD13A1 (500m), tiles h13v10 e h12v10 (Estado de Goiás), para o período julho de 2001- julho de 2002, conforme quatro limiares de detecção de mudanças: 20, 35, 42 e 50%. Resultados preliminares mostraram diferenças significativas na quantidade de mudança detectada na cobertura, dependendo da resolução espacial e limiar de mudança utilizado. Para o Estado de Goiás como um todo, as áreas de mudança variaram de 10, 588 a 1.839.309 ha (0,03 a 5,30% da área Estadual) e foram principalmente associadas à áreas já previamente convertidas (i.e. agricultura e pastagens). Para áreas testes específicas, como o Parque Nacional de Brasília, as áreas identificadas como mudança variaram de 0,05 a 18,23% da área total do parque e foram associadas principalmente às fisionomias Campo Limpo e Cerrado Sensu Stricto. De forma preliminar, os resultados sugerem o uso do NDVI 250 m e 50% de limiar com vistas ao monitoramento sistemático e operacional do bioma Cerrado.

7.10: Sistema para Visualização e Análise da Qualidade das imagens MOD13

Fábio Lobo, CEFET/UFG, fclobo@museu.ufg.br (Apresentador / Presenting)
Nilson Clementino Ferreira, CEFET/UFG, ncferrera@brturbo.com
Laerte Guimaraes Ferreira, UFG, laerte@iesa.ufg.br
Tomoaki Miura, Hawaii Univ., tomoakim@hawaii.edu

Kamel Didan, Arizona Univ., kamel@ag.arizona.edu

Dados de sensoriamento remoto de resolução moderada, como os fornecidos pelo sensor MODIS, são de mais difícil utilização, haja vista o maior campo de visada instantâneo (IFOV) favorecer a mistura de alvos, bem como a maior contaminação dos dados por nuvens, sombras, etc. No caso do produto MOD13 (índices de vegetação), a dificuldade é ainda um pouco maior, uma vez que este produto é o resultado de 16 dias de observações para cada pixel. Assim sendo, os produtos MODIS em geral, e o produto MOD13 em particular, são acompanhados de um conjunto de metadados, os quais indicam, pixel a pixel, a qualidade e a confiabilidade dos dados (ex. contaminação atmosférica, etc). Neste trabalho, apresentamos uma metodologia para a interpretação destes metadados (Quality Assurance), a qual já está sendo efetivamente utilizada no âmbito do sistema integrado de alerta de desmatamento da Amazônia legal (SIAD - SIPAM). A análise preliminar de um ano de metadados MOD13A1 para diferentes áreas de estudo do projeto LBA indicou acentuada variabilidade espaço-temporal na qualidade das imagens índices de vegetação. Enquanto que para áreas de Cerrado predominam qualidades acima de 60%, para a região Amazônica predominam qualidades abaixo de 60%, em particular para as áreas de floresta (ex. km 67). Os algoritmos para a interpretação dos metadados MOD13, implementados em visual basic e linguagem Avenue, se encontram disponíveis através da nossa homepage (<http://www.ufg.br/modisbrasil>).

Plenária III

(Plenary III)

8.1: Desvendando as Complexidades do Ciclo do Carbono na Amazônia (*Unraveling the Complexities of the Carbon Cycle in the Amazon*)

Antonio Nobre, INPE, anobre@ltid.inpe.br (Apresentador / Presenting)

O Projeto LBA está mostrando através de muitos estudos em variadas disciplinas que a compreensão do ciclo do carbono na Amazônia requer mais do que simples medições em pontos espalhados das trocas entre biosfera e atmosfera ou o monitoramento de mudanças nos estoques de carbono na biomassa. Esta compreensão requer o desvendamento das complexidades espaciais e de processo dos ecossistemas. Por toda a bacia Amazônica a grande diversidade de vida associada com uma percepção enganosa de monotonia verde constitui um paradoxo que tem suprimido a percepção sobre as fortes variações nos ambientes. Comunidades florestais contrastantes se encontram lado a lado em quase todas as escalas espaciais. A dinâmica do carbono nestas comunidades responde correspondentemente aos fatores ecofisiológicos determinantes como o ambiente químico, a qualidade do substrato, o clima e a hidrologia.

Dos ecossistemas mais representativos da Amazônia, muitos tipos tem sido estudados por varios grupos no LBA. Haveria um grande salto no entendimento se estes ecossistemas fossem propriamente posicionados em um quebra-cabeça geográfico que levasse em conta as variações espaciais em diferentes escalas. Esta palestra vai apresentar uma revisão sobre os níveis de entendimento das complexidades espaciais e ecológicas para a dinâmica do carbono na Amazônia e vai abordar perspectivas para se fazer integrações de processos de forma espacialmente representativa.

English Version: LBA is showing through many studies in an array of disciplines that the understanding of the Carbon cycle in the Amazon requires more than simple scattered measurements of exchanges between the biosphere and the atmosphere or monitoring of changes in stocks of carbon in the biomass. It requires the unraveling of the spatial and process complexities of ecosystems. Across the Amazon basin the great diversity of life is commonly associated with a perception of misleading green monotony for wider expanses. This constitutes a paradox that has overshadowed the realization of the stark spatial variations in environments. Contrasting forest communities happens side by side in most spatial scales. The carbon dynamics of these communities respond accordingly to an array of distinct ecophysiological drivers like chemical environment, substrate-quality, climate and hydrology.

Many types of the most representatives ecosystems in the Amazon have been studied by several groups in LBA. There would be a great leap of understanding if these ecosystems are properly placed in a geographical puzzle that take into account different scales of spatial variation. This talk will review the level of understanding of spatial and ecological complexities for the carbon dynamics in the Amazon and will address perspectives for doing spatially-representative integrations of processes.

8.2: Padrões Espaciais da Dinâmica do Carbono na Floresta, Biomassa e Mudanças da Biomassa ao longo de diferentes regiões da Bacia Amazônica (*Spatial Patterns in Forest Carbon Dynamics, Biomass and Biomass Change Across the Amazon Basin.*)

Yadvinder Singh Malhi, Oxford University Centre for the Environment, University of Oxford,, ymalhi@ed.ac.uk (Apresentador / Presenting)

Oliver L. Phillips, o.phillips@geog.leeds.ac.uk

Timothy R. Baker, t.baker@geog.leeds.ac.uk

Sandra Patiño, spatino@bgc-jena.mpg.de

Jonathan James Lloyd, jon.lloyd@bgc-jena.mpg.de

We report results on forest structure, composition and dynamics from over 100 forest plots in eight Amazonian countries. We find that (i) forest wood productivity and turnover is lowest in lowland central and eastern Amazonia, and up to three times higher in western Amazonia; (ii) this gradient in productivity appears to be driven by soil fertility rather than climate; (iii) mean wood density is inversely correlated with productivity, and is highest in lowland eastern Amazonia; (iv) forest basal area declines with increasing dry season length; (v) forest biomass appears highest in central Amazonia, where both basal area and wood density are at an optimum; (vi) the rate of growth and death of forest trees has greatly accelerated in recent decades, (viii) there appears to be a net accumulation of biomass in old growth Amazonian forests. We arrive at new estimates of the wood productivity, biomass and carbon residence time of the Amazonian forest. We also report on initial findings of variations in leaf area index and soil and leaf nutrient content across Amazonia.

8.3: Floresta Primária do Tapajós: Comparação dos dados de Tapajós para Carbono, Forçantes Climáticas e Demografia Florestal através da Amazônia (*Tapajos Primary Forest Study in Context: Comparison of Tapajos Data for Carbon Budgets, Climatic Forcing and Forest Demography Across Amazonia.*)

Steven C. Wofsy, Harvard University, scw@io.harvard.edu (Apresentador / Presenting)

Scott R. Saleska, Harvard University, saleska@fas.harvard.edu

James William Munger, Harvard University, jwm@io.harvard.edu
Lucy Hutyra, Harvard University, lhutyra@fas.harvard.edu
Gregory W. Santoni, Harvard University, santoni@fas.harvard.edu
Victoria Y. Chow, Harvard University, vchow@fas.harvard.edu
Bruce C. Daube, Harvard University, bcd@io.harvard.edu
John W. Budney, Harvard University, jwb@io.harvard.edu
Alfram V. Bright, Harvard University, avb@io.harvard.edu
Michael M. Keller, University of New Hampshire, michael.keller@unh.edu
Michael William Palace, University of New Hampshire, palace@kaos.sr.unh.edu
Patrick Michael Crill, University of New Hampshire, patrick.crill@unh.edu
Hudson Silva, University of New Hampshire, hsilva@kaos.sr.unh.edu
Michael L. Goulden, University of California, Irvine, mgoulden@uci.edu
Scott Dennis Miller, University of California, Irvine, sdmiller@uci.edu
Humberto Ribeiro da Rocha, USP, humberto@model.iag.usp.br
Plínio Barbosa de Camargo, USP/CENA, pcamargo@cena.usp.br
Simone Aparecida Vieira, USP/CENA, savieira@cena.usp.br
Humberto Ribeiro da Rocha, USP, humberto@model.iag.usp.br
Volker Kirchhoff, INPE, kir@dge.inpe.br
David Roy Fitzjarrald, SUNY Albany, fitz@asrc.cestm.albany.edu
Ricardo Sakai, SUNY Albany, sakai@asrc.cestm.albany.edu
Oswaldo Luiz Leal de Moraes, UFFM, moraes@mail1.ufsm.br

Three years of measurements of carbon, water, and heat fluxes, and four years of forest ecological measurements, are reviewed for the km 67 "Primary Forest" site in Flona Tapajos. This forest is approximately in carbon balance, probably losing a small amount of carbon, even though internally the major pools of organic matter and the demographic distribution of forest trees are changing. We compare carbon budgets from tower fluxes, surface fluxes, and ecological surveys at the site, and we compare carbon budgets at the site with adjacent measurements (km 83). We also compare the distribution of tree biomass across size classes with other sites in Amazonia, and we examine CO₂ and CO gradients from the coast to the interior of Amazonia. We summarize these comparisons with an hypothesis that relates the structure and annual carbon balances to a small number of biogeographic factors centered on disturbance: rate of recovery of the ecosystem and its component parts from disturbance, mean growing conditions for the forest, and variance of environmental forcing. This hypothesis will be tested during the next major El Nino drought.

Plenária IV

(Plenary IV)

9.1: Processos do Sistema Terrestre e Saúde Humana: Articulações na Amazônia (*Earth System Processes and Human Health: Linkages in the Amazon*)

Ulisses E.C. Confalonieri, Program on Global Environmental Changes and Health, FIOCRUZ, Rio de Janeiro, Brazil, pmags@ensp.fiocruz.br (Apresentador / Presenting)

Several Earth System processes can interfere with the dynamics of human diseases in the Amazon region. Among these the most important are physical-chemical phenomena such as the oscillations in the climate system; variations in the hydrological cycle; emissions to the atmosphere from forest fires; excess UVB radiation due to the reduction in the ozone layer in the stratosphere and the heavy metal pollution (mercury) in the aquatic environment. Of equal importance are the anthropic processes (land use) that have bio-ecological consequences such as deforestation and its impacts (the degradation of ecosystem services and ecological simplification due to the loss of species). Only a few of these processes have been studied in relation to their health linkages. The best known associations are the effects of climate variability on the dynamics of vector-borne tropical diseases and the consequences of land cover changes to the populations of vectors and reservoirs of focal infections, as well as on human exposure. Data are presented on the effects of land use/land cover changes on the transmission of malaria in the Peruvian and Brazilian Amazon and also on the occurrence of arbovirus infections in Brazil. Also discussed are the influence of the variability of climate and hydrological cycle upon malaria in Brazil, Surinam, Colombia and Venezuela and also on yellow fever outbreaks in Brazil. Some aspects of the ecology of the Amazonian ecosystems and their relevance for public health are discussed, especially the resistance of the natural system to the biological invasions (agents and/or hosts for cholera, kala-azar, schistosomiasis and Chagas disease) and, conversely, its vulnerability to the emergence of infectious diseases.

9.2: A Escala Regional e Planetária das "Mercadorias e Serviços" fornecidos pela Floresta Amazônica: Analisando os compromissos entre as necessidades humanas e a funções ambientais (*Regional- and Planetary-scale "Goods and Services" Provided by the Amazon Basin: Examining Trade-Offs Between Human Needs and Environmental Function*)

Jonathan A. Foley, Center for Sustainability and the Global Environment (SAGE), University of Wisconsin, 1710 University Avenue, Madison, WI 53726 USA,, jfoley@wisc.edu (Apresentador / Presenting)

The Amazon is one of the most important bioregions on the planet, and already provides extremely important ecosystem "goods and services" to humankind - including a wide range of valuable agricultural, forest & timber, mineral and pharmaceutical commodities. The Amazon also contains an incredibly rich diversity of plant, animal and microbial life, and is thus an intrinsically valuable part of the biosphere. However, the Amazon also provides many larger-scale services - often neglected in discussions of tropical forests - that play a role in the physical climate system, hydrologic cycle, and carbon cycle of the globe.

Here we will discuss how we may consider the full "portfolio" of ecosystem goods and services provided by the Amazon basin, including: (1) regional-scale "provisioning services", such as the production of agricultural and timber commodities; (2) regional-scale "supporting services", such as the maintenance of biological diversity and habitats; and (3) planetary-scale "supporting services", such as modulating a significant portion of the carbon cycle, hydrological cycle and physical climate systems of the planet. We will also present a conceptual framework for considering the tradeoffs between human actions and changes in ecosystem goods and services in the Amazon. Finally, we will discuss how LBA science can help inform policy-makers towards the ultimate goal of adaptively managing this complex system, allowing for dynamic tradeoffs between human needs, the flow of different ecosystem goods and services, and the health of the biosphere.

9.3: A relevância para políticas públicas das "Ciências das Dimensões Humanas" do LBA: Uma Revisão das Realizações e Oportunidades (*Policy Relevance of LBA "Human Dimensions" Science: A Review of Accomplishments and Opportunities*)

Daniel Curtis Nepstad, Woods Hole Research Center & Instituto de Pesquisa Ambiental da Amazônia, dnepstad@whrc.org (Apresentador / Presenting)

The success of "human dimensions" science (HDS) must be measured by its contribution to both theory and practice. LBA's investment in HDS represents an historical opportunity to improve the scientific basis for policy decisions and natural resource management during the early stages of frontier expansion. This review asks the question: How well have we done in responding to this opportunity? I argue that our success has been "fair"—a C grade. Human dimensions science is most relevant for policy formulation when it helps to identify policy levers for both reducing the ecological impact and increasing the socio-economic benefits of land uses. This implies identification and communication of key socio-ecological trends, and elucidation of mechanistic, accessible tools for interpreting the causes of and possible solutions to human environment problems. Examples of HDS successes are given, as are opportunities that could still be seized.

Sessões Paralelas II

(Parallel Sessions II)

RH2: Pesquisas em Destaque - Carbono, Biogeoquímica, e Hidrologia (Research Highlights: Carbon, Biogeochemistry, and Hydrology)

10.1: The Biological Control of Carbon Pathways Inside the Plant as a Response to Changing Environment: a Learning Experience

Marcos Silveira Buckeridge, Instituto de Botânica, Seção de Fisiologia e Bioquímica de Plantas, msbuck@usp.br (Apresentador / Presenting)

Plants are one of the principal components of the carbon cycle in the biosphere. When carbon dioxide enters plant leaves through stomata, its pathway is tightly controlled as it is metabolically partitioned through different tissues and cells. Carbon enters the plant through photosynthesis, producing sucrose, which is transported and transformed into several different carbon containing compounds with structural and/or dynamic functions in the plant. It is becoming clear that along side plant hormones and other signalling compounds in plant cells, carbon itself, in the form of simple sugars such as sucrose and glucose can also work as signals for partitioning. The flux of carbon through the plant involves a network of multiple signals that may result in stimulatory or inhibitory changes depending on the environmental conditions. Plants appear to have a "perception" of the patterns of environmental changes that result in a learning-like process. The responses of plants to environmental changes have been modulated during evolution. At least for the last 400,000 years, most plants have not experimented living in a CO₂ atmospheric concentration with more than ca.300ppm. While the CO₂ concentration is rising quickly due to emission related to human activities, we can speculate about what will plants learn from this new experience. FAPESP

10.2: Stable isotopes: integrators and tracers of processes from the leaf and microbe to the atmosphere and basin.

Joe Berry, Carnegie Institution, Dept of Global Ecology, joeberry@stanford.edu (Apresentador / Presenting)

Luiz Antonio Martinelli, CENA, luizm@stanford.edu

Jim Ehleringer, Univ of Utah, Dept of Biology, Jim@biology.utah.edu

The Amazon Basin by virtue of its size and the shelter provided by the High Andes to the west, is partially closed with respect to atmospheric, hydrologic and biogeochemical processes. This partial closure provides unique opportunities to study earth system processes at a scale unrivaled anywhere else on earth. Dramatic progress has been made through LBA in quantitative studies of many of these key processes. For the most part, however, these studies have focused on relatively small portions of the basin and few have attempted to encompass the entire basin. This remains as one of the challenges for the follow-on studies that build on LBA. Stable isotopes provide one approach that has already been used in basin scale integrative studies. The goal of this talk is to illustrate how stable isotope studies have provided unique insight into the functioning of the Amazon system; to review progress that has been made through LBA in extending our understanding of isotope fractionation at scales of organisms and ecosystems in Amazonia; to identify areas where work is still needed, and finally to share a vision of what isotopes might ultimately tell us about hydrologic and biogeochemical cycles in Amazonia.

10.3: The water balance of a forested tropical basin near Manaus: Impacts of the interannual variability of climate on the hydrological cycle.

Javier Tomasella, INPE, javier@cptec.inpe.br (Apresentador / Presenting)

Martin George Hodnett, Free University, mhodnett@lineone.net

Luz A. Cuartas, INPE, adriana@cptec.inpe.br

Antônio D. Nobre, INPA, anobre@ltid.inpe.br

Maarten Waterloo, Free University, watm@geo.vu.nl

Sylvia Mota de Oliveira, INPA, smoli@inpe.gov.br

During 2002, the Carbonsink and Ecocarbon projects set up an instrumented catchment in the Asu Basin, located approximately 70 km NNW of Manaus. The catchment, with a drainage area of a 6.37 km², collects the discharge from five first order streams, and encompasses the most common landscape forms (and their associated soil types) that occur in the region.

The instrumental layout provides measurements of rainfall and water discharge at high resolution. In addition, a

hydrological transect was installed along a characteristic slope. This transect includes neutron probe access tubes to measure soil water content to depths of up to 4.8m, and wells for monitoring the groundwater level from the floodplain to the plateau (catchment divide).

We present results showing the effects of interannual variability of climate on the soil water and groundwater stores and on the streamflow.

Preliminary results suggest a strong interannual signal, with still unknown implications for the hydrological functioning of the catchment on a longer time scale: During 2003, the groundwater storage increase as a result of deep recharge was 500 mm less than in 2002. Since groundwater is crucial to sustaining baseflow in the dry season, we will analyse the potential implications for the overall discharge of the river system in the longer term.

10.4: Seasonal and interannual variability of Amazon carbon and water vapour exchange in response to the environment

Bart Kruijt, ALTERNIA - WUR, bart.kruijt@wur.nl (Apresentador / Presenting)
Antonio Donato Nobre, INPE, anobre@ltid.inpe.br
Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br
Celso Von Randow, Wageningen University and Research Centre, celso.vonrandow@wur.nl
Alessandro Carioca de Araujo, Free University of Amsterdam, arau@geo.vu.nl
Yadvinder Singh Malhi, University of Oxford, ymalhi@ed.ac.uk
Paulo Jorge Oliveira, Universidade Federal Rural da Amazonia, pj@ufrpa.edu.br
John Grace, University of Edinburgh, jgrace@ed.ac.uk
Fernando Cardoso, Universidade de Rondonia, cardoso@unir.br
Nicolau Priante Filho, Universidade Federal do Mato Grosso, nicolaup@terra.com.br
George Luiz Voulitis, Cal State University San Marcos, georgev@csusm.edu
Yves-Marie Gardette, Office National de Forets - Brazil, onfbrasil@juruea.com
Leonardo Deane de Abreu Sá, Museu Emilio Goeldi, ldsa@museu-goeldi.br
John H. C. Gash, Centre for Ecology and Hydrology, jhg@ceh.ac.uk
Eddy Moors, ALTERNIA - WUR, eddy.moors@wur.nl

There are now multi-year eddy-correlation flux data sets from about ten tower sites across the Amazon, available for analysis of environmental sensitivity in carbon and water vapour exchange at various time scales. We will give an overview of these data sets, especially for those in Rondonia, Mato Grosso, Amazonas and around Belem, and, for a subset of these data, analyse which factors are dominant in causing variation over synoptic (weeks) to interannual time periods, looking at primary weather variables such as precipitation, radiation and temperature. Carbon fluxes will be decomposed into Gross Primary Productivity and Ecosystem respiration as far as possible, using filtered daily totals. Evaporative fluxes will be analysed in terms of surface conductance. Existing data suggest a dominance of rainfall as a driving factor for net carbon exchange at several, but not all sites, at monthly scales. The present analysis will show whether this relationship holds for updated data sets and for different time periods, and analyse the possible underlying explanations as well as the predictive power of such relationships. It will also show the benefits and limitations of eddy correlation data for such analysis.

10.5: Controls on tropical forest CO₂ and energy exchange

Michael L. Goulden, University of California at Irvine, Department of Earth System Science, Irvine USA, mgoulden@uci.edu (Apresentador / Presenting)
Scott Dennis Miller, University of California at Irvine, Department of Earth System Science, Irvine USA, sdmiller@uci.edu
Humberto Ribeiro da Rocha, DCA/IAG/USP, Universidade de Sao Paulo, humberto@model.iag.usp.br
Christopher E Doughty, University of California at Irvine, Department of Earth System Science, Irvine USA, chris_doughty@hotmail.com
Adelaine Michela e Silva Figueira, CENA/USP, Santarem, michela@lbaeco.com.br
Helber Custódio de Freitas, DCA/IAG/USP, Universidade de Sao, helbercf@model.iag.usp.br
Cleilim Albert Dias de Sousa, Universidade Federal do Pará, Santarem, albert@lbaeco.com.br

One of the goals of the Large Scale Biosphere-Atmosphere Experiment in Amazonia is to understand how and why tropical forest CO₂ and energy exchange vary diurnally, seasonally, and interannually. Many researchers believe canopy gas exchange is controlled entirely by the interaction between weather (cloudiness, temperature, humidity, rainfall) and plant physiology (photosynthesis, respiration, decomposition). Following this logic, researchers and models attribute an afternoon decline in photosynthesis to the direct effect of increasing evaporative demand on leaf physiology. Similarly, researchers and models attribute a decline in gas exchange during the dry season to the direct effect of drought stress on plant and leaf physiology. While there is little doubt that these biophysical feedbacks are critically important, there is growing evidence that endogenous rhythms in plant physiology also help control tropical forest CO₂ and energy exchange. For example, the stomatal conductance and photosynthesis of leaves held in constant irradiance and temperature declines at night and recovers during the subsequent day as a result of an endogenous circadian rhythm. Likewise, the rates of whole canopy gas exchange begin to recover before the dry season ends as a result of an endogenous phenological rhythm. Both of these observations indicate that forest gas exchange is controlled in part by the direct feedback effect of the physical environment, and in part by endogenous, feed-forward mechanisms whereby plants increase or decrease their LAI or photosynthetic capacity in "anticipation" of changes in the physical environment.

10.6: From dry to flooded, from Cerrado to Forest : scaling the CO₂ and H₂O atmospheric fluxes across tropical ecosystems

Humberto Ribeiro da Rocha, USP, humberto@model.iag.usp.br (Apresentador / Presenting)

A number of micrometeorological flux towers in South America have collected continuous data of climate, soil moisture, soil respiration and surface-atmosphere turbulent fluxes of heat, CO₂ and H₂O along the last years. A large heterogeneity of biomes, ranging from savanna to tropical forests, have been investigated in LBA and outside LBA in South America. Particularly in Amazonia, the terra-firme tropical forest sites have been studied with strong emphasis, as long as flooded or varzea-type areas have had less attention.

Ecosystem's gross and net primary productivity depend partly on the input of energy, what is partly correlated with the latitude. Other local factors also influence the productivity and water control, e.g. the soil type, geomorphology and topography. They all help to define the biome type, and the feedbacks between the climate and the local factors. The aim of this work is to select a few biomes, among tropical terra-firme forest, dry Cerrado, flooded Cerrado, over different latitudes, for a comparison. It is attempted to separate how much variables like water use efficiency, CO₂ and H₂O fluxes, are influenced by climate, and, on the other hand, by other local conditions. It is believed that we can quantify how the climate control the extremes of variability across the biomes, whereas local factors constrain the variability within the sub-classes.

10.7: Carbon, biogeochemistry, and hydrology: from terrestrial to aquatic systems

Johannes Lehmann, Cornell University, CL273@cornell.edu (Apresentador / Presenting)

Mark S. Johnson, Cornell University, msj8@cornell.edu

Eduardo Couto, Universidade Federal do Mato Grosso, couto@cpd.ufmt.br

Susan Riha, Cornell University, sjr4@cornell.edu

Luiz Carlos Mattos Rodrigues, Universidade Federal do Mato Grosso, mattosr@cpd.ufmt.br

Mara Abdo, Universidade Federal do Mato Grosso, maraabdo@hotmail.com

Evandro C. Selva, Universidade Federal do Mato Grosso, evandroc@cpd.ufmt.br

Erick C.M. Fernandes, The World Bank, efernandes@worldbank.org

The characteristics of carbon and nutrient transport from terrestrial to fluvial system in the Amazon remains poorly understood. Carbon and nutrient cycles are coupled when leaf litter is mineralized or humified to soil organic matter. While infiltration in microaggregated soils is very rapid, groundwater concentrations of DOC as well as nutrients are generally low as confirmed for our watersheds in Southern Amazonia (Juruena, MT). However, concentrations in headwater streams were significantly greater than groundwater even during base flow. Our detailed observations of deep soil biogeochemistry shed light on the sources of carbon and nutrients in streams. While DOC concentrations decreased from soil solution (0.1m depth) to groundwater (7 mg L⁻¹ to 0.2 mg L⁻¹), CO₂ concentrations were high in the groundwater. In our acid soils, NO₃ fluxes to the groundwater were restricted by strong adsorption to the subsoil (250-1100 kg N ha⁻¹) and recycling to vegetation, whereas CO₂ moved freely to groundwater and into the stream in our acid soils indicating a decoupling of nutrient and carbon cycles. CO₂ outgassing within tens of meters of groundwater emergence in undisturbed forested watersheds was significant, groundwater DIC concentrations being fifty times greater than groundwater DOC concentrations. DOC mineralization may contribute somewhat to DIC but DOC amounts could not explain DIC production. A re-coupling of nutrients and carbon cycling occurred after or during groundwater emergence. While emerging groundwater is very low in nutrients but high in carbon (mostly DIC), streamwater showed a significant increase in solute concentrations of DOC (0.2 to 2 mg L⁻¹ for May 2003) and Ca (38 to 109 meq L⁻¹) after only tens of meters of stream passage. In-stream generation of DOC and nutrients originated from fine and coarse organic material being transported via overland flow and deposited in the stream bed. In pristine forests, the demonstrated dynamic decoupling and re-coupling of carbon and nutrients are additionally complicated by the mosaic of different soil types which influence flow paths and nutrient retention and are a challenge for regionalization of solute fluxes from terrestrial to aquatic systems. Additionally, landuse and landcover changes could significantly impact the observed dynamics.

10.8: Coupling of Carbon, Biogeochemical, and Hydrological Cycles: A Fluvial Perspective

Jeffrey E. Richey, University of Washington, jrichey@u.washington.edu (Apresentador / Presenting)

Reynaldo Luiz Victória, Centro de Energia Nuclear na Agricultura, reyna@cena.usp.br

While it is often stated that, at regional scales, river basins are natural integrators of surficial processes, the mechanics of how to interpret such information is far from understood (indeed, the "truth" of the statement has rarely, if ever, even been validated). The chemical composition of river water is sensitive to both underground and surficial processes acting over a wide range of characteristic temporal and spatial scales. Chemical signatures of riverine materials can, in theory, be used to identify different drainage basin source regions, reaches or stages and can be tied to landscape-related processes such as chemical weathering and nutrient retention by local vegetation. Fluxes of measured constituents can be compared over any segment of the water flowpath to establish local mass balances and budgets. Such comparisons are particularly useful in establishing the magnitudes of unknown sources (e.g. photosynthesis or groundwater inputs) or sinks (e.g. respiration or gas exchange) of bioactive materials within critical sections of the water network. In this talk we utilize a coupled hydrologic and geochemical model to evaluate an extensive field data set to see if we can establish a systematic basin perspective that can deconvolve chemical hydrographs at the mouths of Amazon tributaries, in terms of their antecedent causes.

10.9: Multi-scale analyses of inundation and wetland vegetation dynamics: Applications to measurements and modeling of carbon fluxes

John Melack, University of California,, Santa Barbara, melack@lifesci.ucsb.edu (Apresentador / Presenting)

Evllyn Novo, INPE, evlyn@ltid.inpe.br

Laura Hess, University of California,, Santa Barbara, lola@icess.ucsb.edu

Maycira Costa, INPE and University of Victoria, maycira@office.geog.uvic.ca

Bruce Forsberg, INPA, forsberg@horizon.com.br

Optical and microwave remote sensing analyses continue to refine the spatial and thematic accuracy of a basin-wide Amazon wetlands mask and to identify inundation/vegetation states in the entire lowland basin. Hydrologic sub-regions, similar with respect to inundation periodicity, are delineated using long-term stage and precipitation datasets, radar mosaics, and the SRTM DEM. High-resolution analysis focus on the Cabaliana, Mamiraua, and Curuai reaches of the main stem floodplain, the northern Bananal near the LBA tower and the upper Negro floodplain and adjacent interfluvial wetlands. Field measurements of phenological changes in aquatic macrophyte biomass provide a basis for calibrating radar images to estimate productivity of aquatic macrophytes. These remote sensing and field analyses are integrated into regional, collaborative estimation and modeling of carbon dioxide and methane emissions

10.10: Tropical forests and the global nitrous oxide budget

Jerry M. Melillo, Marine Biological Laboratory, jmelillo@mbl.edu (Apresentador / Presenting)

Carlos Clemente Cerri, Centro de Energia Nuclear na Agricultura, cerri@cena.usp.br

Paul A. Steudler, Marine Biological Laboratory, steudler@mbl.edu

Diana C. Garcia-Montiel, Woods Hole Research Center, dgarcia@whrc.org

Christopher Neill, Marine Biological Laboratory, cneill@mbl.edu

Brigitte J. Feigl, Centro de Energia Nuclear na Agricultura, beduardo@cena.usp.br

Nitrous oxide (N₂O) is a long-lived and powerful greenhouse gas and its atmospheric concentration has been increasing over the past century. In recent decades, the annual rate of increase has been $0.25 \pm 0.05\%$. Most of the increase in atmospheric N₂O is currently unexplained although there is strong evidence that the cause of the N₂O trend appears to be a combination of a growing tropical source and a growing northern mid-latitude source. There is speculation that growth in the tropical source is related to tropical land-use disturbance. Here we offer a new explanation for part of the growing tropical source that involves tropical forests and an interaction between the cycles of carbon and nitrogen. We hypothesize that the growing tropical N₂O source is in part a result of carbon dioxide (CO₂) fertilization of tropical forests. The increase in atmospheric CO₂ concentration stimulates forest productivity and the production of labile carbon compounds that move from the trees to the soil along several pathways. Once in the soil, these labile carbon compounds stimulate N₂O production by soil microorganisms. We present data from our own field and modeling studies and data for other relevant research, including field measurements, remote sensing and modeling, to support this hypothesis.

S3: Sessões Especiais - O Papel do Ecossistema Amazônico na Determinação das Variabilidades Climáticas Regional e Global. *(Role of Amazon Ecosystem in Determining Regional and Global Climate Variabilities)*

11.1: How are Land Properties in a Climate Model Coupled through the Boundary Layer to Affect the Amazon Hydrological Cycle?

Robert Earl Dickinson, Gatech, robted@eas.gatech.edu (Apresentador / Presenting)

Climate modelers have frequently considered how land use change in the Amazon would impact aspects of the Amazon hydrological cycle such as its precipitation and evapotranspiration. Their simulations have given a wide variety of answers. We look at the processes by which land links to the atmospheric hydrological cycle and argue that these are more complex in detail than what is currently assumed by climate models. Thus, we argue that the parameterizations of boundary layer, clouds, and moist convection in climate models need to be advanced to better match the requirement of their land component. Convection parameterizations need to move beyond a single mass flux controlled by CAPE to pdfs of convective cells with spatial scaling properties. These would allow us to have more confidence in our modeling of the hydrologic response to Amazon land properties.

11.2: Oceanic Influence on Brazilian Rainfall

W. Timothy Liu, Jet Propulsion Lab., liu@pacific.jpl.nasa.gov (Apresentador / Presenting)

Wenqing Tang, Jet Propulsion Lab., wqt@pacific.jpl.nasa.gov

Rong Fu, Georgia Institute of Technology, fu@eas.gatech.edu

A method has been developed to provide high-resolution vertical integrated moisture transport (IMT) in the atmosphere by combining the observations by spacebased scatterometers and microwave radiometers. The method is able to capture both high and low frequency variations of IMT, as validated with time series of global radiosonde stations. The IMT fields over the tropical and subtropical oceans have been computed between 1999 and 2003, using data from QuikSCAT and the

Tropical Rain Measuring Mission (TRMM). The rainfall over Brazil over the same period of time has also been derived from TRMM. The relation between Brazilian rainfall and IMT from the oceans, from intraseasonal to interannual time scales will be presented.

11.3: The influence of land surface on the wet season onset over the Amazonia

Wenhong Li, Georgia Institute of Technology, wenhong@eas.gatech.edu

Rong Fu, Georgia Institute of Technology, fu@eas.gatech.edu (Apresentador / Presenting)

The influence of Amazon ecosystems change on the large variation of wet season onset has been analyzed using the fifteen years of European Centre for Medium Range Weather Forecasts reanalysis (ERA). Our results suggested that the transition from dry to wet season in Southern Amazonia is initially driven by increases of surface latent heat flux. These fluxes rapidly reduce Convective Inhibition Energy (CINE) and increase Convective Available Potential Energy (CAPE), consequently providing favorable conditions for increased rainfall even before the large-scale circulation has changed. The increase of rainfall presumably initiates the reversal of the cross-equatorial flow, leading to large-scale net moisture convergence over Southern Amazonia. An analysis of early and late wet season onsets on an interannual scale shows that a longer dry season with lower rainfall reduces surface latent heat flux in the dry and earlier transition periods compared to that of a normal wet season onset. These conditions result in a higher CINE and a lower CAPE, causing a delay in the increase of local rainfall in the initiating phase of the transition and consequently in the wet season onset. Conversely, a wetter dry season leads to a higher surface latent heat flux and weaker CINE, providing a necessary condition for an earlier increase of local rainfall and an earlier wet season onset. Our results support the notion that if land use change in Amazonia reduces rainfall during dry and transition seasons, it could significantly delay the wet season onset and prolong the dry season as pointed in Nobre et al. (1991).

11.4: Seasonal variations in C and H₂O cycling of a tropical transitional forest

George Louis Voullitis, Department of Biological Sciences, California State University, San Marcos, CA 92096, USA., georgev@csusm.edu (Apresentador / Presenting)

Nicolau Priante Filho, Departamento de Física, Universidade Federal de Mato Grosso, Cuiaba, MT, Brasil, nicolaup@terra.com.br

José de Souza Nogueira, Departamento de Física, Universidade Federal de Mato Grosso, Cuiaba, MT, Brasil, nogueira@cpd.ufmt.br

Luciana Sanches, Departamento de Física, Universidade Federal de Mato Grosso, Cuiaba, MT, Brasil, lsanches@cpd.ufmt.br

Fernando Raiter, Instituto Universitario do Norte Matogrossense, Universidade Federal de Mato Grosso, Sinop, MT, Brasil, raitersn@terra.com.br

Wander Hoeger, Instituto Universitario do Norte Matogrossense, Universidade Federal de Mato Grosso, Sinop, MT, Brasil, wander_hoeger@yahoo.com.br

Eduardo Jacusiel Miranda, Departamento de Física, Universidade Federal de Mato Grosso, Cuiaba, MT, Brasil, aquaviva@zaz.com.br

George Sanches Suli, Departamento de Física, Universidade Federal de Mato Grosso, Cuiaba, MT, Brasil, suli@terra.com.br

Carla Valentini, Departamento de Física, Universidade Federal de Mato Grosso, Cuiaba, MT, Brasil, valentini@vspmail.com.br

Measurements of net ecosystem CO₂ exchange and evapotranspiration of a tropical transitional (ecotonal) forest near Sinop-MT were made between August 1999-present using eddy covariance measurement techniques. Measurements of leaf photosynthesis, plant water potential, soil respiration, and litter fall were also made to determine how component C and/or H₂O fluxes contributed to the temporal patterns in forest CO₂ and H₂O exchange. Data indicate that leaf and forest gas exchange is strongly affected by seasonal variations in rainfall. For example, leaf gas exchange and water potential and soil respiration are on average 2-fold lower while litter fall is 4-5 times higher during the dry season (June-August). While variations in maximum gross primary production (G_{max}), canopy conductance (g_C) and ecosystem respiration (R₀) also followed trends in rainfall, variations in these whole-forest indices of gas exchange tended to lag behind rainfall by 1-2 months. These data suggest that seasonal variations in rainfall affect canopy CO₂ and H₂O exchange processes in a complex manner. Furthermore, comparisons between the transitional forest and less seasonal rain forests suggest that the magnitude in the seasonal variation in CO₂ exchange is somewhat unique to the transitional forest. These data suggest that potential warming and drying of tropical forest may cause seasonal variations in CO₂ and H₂O vapor exchange to increase in the future.

11.5: The atmospheric boundary layer characteristics over forest and pasture in the Amazon region

Gilberto Fisch, Centro Tecnico Aeroespacial (CTA), gfisch@iae.cta.br (Apresentador / Presenting)

The growth and development of the convective (CBL) and nocturnal (NBL) boundary layers over forest and pasture areas in the Ji-Paraná area (Rondonia) are investigated using observational data collected during the dry season 1994 (ABRACOS/RBLE experiment), wet season 1999 (Wet AMC/LBA-TRMM) and during transition period from dry-to-wet 2002 (RACCI-LBA/SMOCC). The data set consist of rawinsoundings, tethered balloon, surface automatic weather station and turbulent fluxes, SODAR, etc. The structure of the CBL over forest is almost independent of the period of the year (dry or wet) and its depth is typically around 1100-1200 m. The pasture CBL shows a very strong dependence on the soil moisture conditions, ranging from 1000-1100 m for the wet period and 2000-2200 m in the dry season. The surface sensible heat fluxes also responds to the soil moisture conditions. For the NBL, both sites presented the same behavior, with maximum development around 300 m for dry and wet conditions. Some case studies like cold front event, the coupling between a

low level jet and shallow CBL during nighttime conditions, heat budget required for the erosion of the NBL, destruction of the CBL due to intense rainfall are also discussed.

11.6: Hydraulic redistribution in amazonian trees

Rafael S Oliveira, University of California - Berkeley, rafaels@socrates.berkeley.edu (Apresentador / Presenting)

Todd E Dawson, UC Berkeley, tdawson@socrates.berkeley.edu

Stephen O Burgess, University of Western Australia, ssb@cyllene.uwa.edu.au

Daniel Curtis Nepstad, Woods Hole research center, dnepstad@whrc.org

About half of the Amazon rainforest is subject to seasonal drought. However, several studies have documented that these forests, under a strongly seasonal climate, do not become water stressed during the dry season. In addition to deep soil water uptake, another contributing explanation for the absence of plant water stress during drought is the occurrence of hydraulic redistribution, the nocturnal transfer of water by roots from moister to drier regions in the soil profile. Here, we present patterns of sap flow in roots of 3 dimorphic-rooted species in the Tapajós Forest that are consistent with the occurrence of hydraulic redistribution. We measured sap flow in lateral and tap roots of our 3 study species over a 2-year period using the heat ratio method, a sap flow technique that allows bi-directional measurement of water flow. On certain nights during the dry season, reverse or acropetal flow (i.e. in the direction of the soil) in the lateral roots and positive or basipetal sap flow in the tap roots of *Coussarea racemosa* (caferana), *Manilkara huberi* (maçaranduba) and *Protium* sp. (breu) were observed, a pattern consistent with upward hydraulic redistribution (hydraulic lift). With the onset of heavy rains, we observed continuous nighttime reversals in sap-flow in the tap root, and positive sap flow in lateral roots, indicating water movement from wet top soil to deeper soils (downward hydraulic redistribution). Both patterns were documented in trees within a rainfall exclusion plot (Seca Floresta) and also in the control plot. Hydraulic redistribution may help facilitate seedling recruitment and tree survival under extreme water deficits. Therefore, our findings have fundamental implications for understanding the linkage between tree function and forest function as driven by plant response to drought.

11.7: Is the Amazon Heat Source Relevant for Higher Latitude Climate Anomalies?

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br (Apresentador / Presenting)

Jose Aravequia, CPTEC/INPE, araveq@cptec.inpe.br

Carlos F.M. Raupp, IAG/USP, cfmraupp@model.iag.usp.br

The Amazon heat source clearly stands as the second largest in the tropics (the first in the west Pacific). An approximate regional energy budget over the Amazon region in January shows an energy surplus of the order of 175 W/m². The precipitation gain is of the order of 350 W/m². A simple scale analysis of the thermodynamic equations reveals that the horizontal heat transport can not be responsible for the necessary cooling in the Amazon region, primarily in January. The required mean upward vertical motion in the Amazon is of the order of 100 mb/day (approximately 1,000m.day⁻¹) in January. Thus, a large perturbation in the tropical flow is expected to be produced by the Amazon convection. Given that tropical heat sources are known to induce remote large scale circulation patterns, it is natural to question what are the impacts associated with changes in the Amazon convection. However, complex global atmospheric models don't seem to provide a conclusive answer to what is the remote impact of the Amazon. A first order approximation can be obtained with a simplified atmospheric models, based on the shallow water equations. The Green 's functions based on a linearized version about realistic basic states are used to explore the remote impact of Amazon anomalous convection. In spite of the strength of the Amazon heat source, it is interesting to show that that the Amazon heat source is not directly related to Northern or Southern Hemisphere teleconnection patterns, such as the NAO, Eurasian or PNA patterns. However, the remote impact comes from the fact that the Amazon convection changes the South Atlantic Convergence Zone, which is more relevant for remote teleconnection patterns, at least from the point of view of the simplified atmospheric model. The simple models also tell us that the diurnal variability of the heat source provides an extra impact on the remote influence. Thus, the simple analysis suggests an explanation for the intriguing results provided by the complex models.

11.8: Can Amazon Rainfall influence the Winter Weather over Europe and North America?

Rong Fu, Georgia Institute of Technology, fu@eas.gatech.edu (Apresentador / Presenting)

Robert E. Dickinson, Georgia Institute of Technology, robted@eas.gatech.edu

Mingxuan Chen, Georgia Institute of Technology, mchen@eas.gatech.edu

Hui Wang, Georgia Institute of Technology, huiwang@eas.gatech.edu

Using state-of-art daily scatterometer winds provided by NASA QuikSCAT, the authors found that an increase in wet-season rainfall over the Amazon could amplify the anomalous atmospheric circulation patterns resemble to NAO. This pattern, however, cannot be adequately captured by ECMWF and NCEP reanalyses at the surface. The latitudinal propagation of the atmospheric waves appears to carry out such influence, consistent with previous numerical experiments. The same dynamic processes could determine the influences of strong interannual and decadal variations of Amazon rainfall on the anomalous atmospheric circulation in the North Atlantic and European regions. This finding also supports the simulated impact on climate over Europe and North Atlantic region by changes of Amazon rainfall due to decrease of rainforest.

11.9: Teleconnection between tree growth in the Amazonian floodplains and the El Niño-Southern Oscillation effect

Jochen Schoengart, Max-Planck-Institute for Limnology, jschoen@gwdg.de (Apresentador / Presenting)

Maria Teresa Fernandez Piedade, Instituto Nacional de Pesquisas da Amazônia, maitepp@inpa.gov.br

Wolfgang Johannes Junk, Max-Planck-Institute for Limnology, wjj@mpil-ploen.mpg.de

Martin Worbes, Institute of Agronomy in the Tropics, mworbes@gwdg.de

There is a limited knowledge about El Niño-Southern Oscillation (ENSO) effects on the Amazon basin, the world's largest tropical rain forest and a major factor in the global carbon cycle. Seasonal precipitation in the Andean watershed annually causes a several month-long inundation of the floodplains along the Amazon River which induces the formation of annual rings in trees of the flooded forests. Radial growth of trees is mainly restricted to the non-flooded period and thus the ring width corresponds to its duration. This allows the construction of a tree-ring chronology of the long-living hardwood species *Piranhea trifoliata* Baill. (Euphorbiaceae). El Niño causes anomalously low precipitation in the catchment which results in a significantly lower water discharge of the Amazon River and consequently in an extension of the vegetation period. In those years tree rings are significantly wider. Thus the tree-ring record can be considered as a robust indicator reflecting the mean climate conditions of the whole Western Amazon basin. We present a more than 200-yr long chronology which is the first ENSO-sensitive dendroclimatic proxy of the Amazon basin and permits the dating of pre-instrumental El Niño events. Time series analyses of our data indicate that during the last two centuries the severity of El Niño increased significantly.

11.10: Tree ring studies related to carbon uptake in Amazon lowland forests: Tree Growth and Climate

Marco Sack, Institute for Forest Botany, University of Göttingen, Büsgenweg 2, 37077 Göttingen, Germany, msack@gwdg.de (Apresentador / Presenting)

Wolfgang Johannes Junk, Max-Planck-Institute for Limnology, Tropical Ecology, P.O. Box 165, 24302 Plön, Germany, wjj@mpil-ploen.mpg.de

Maria Teresa Piedade, Instituto Nacional de Pesquisas da Amazônia, Av. André Araújo 1756, Cx. P. 478, 69011-910, Manaus/AM, Brasil, maitepp@internext.com.br

Jochen Schöngart, Max-Planck-Institute for Limnology, Tropical Ecology, P.O. Box 165, 24302 Plön, Germany, jschoen@gwdg.de

Martin Worbes, Institute of Agronomy in the Tropics, University of Göttingen, Griesebachstraße 6, 37077 Germany, mworbes@gwdg.de

In contrast to popular belief, the annual dry season induces temporary cambial dormancy of many tree species in non-flooded terra-firme forests near Manaus and leads to the formation of annual tree rings. This allows individual tree age determination and provides detailed information about aboveground wood biomass allocation and carbon fixation by ring width measurements. For tree ring analysis we chose the genus *Eschweilera* due to its high relative abundance, importance and value as main sample tree. Tree rings of this genus are well defined by alternating tissues of fibres and parenchyma and allow an accurate age determination. From a total of sixteen trees the ring-width curves of nine individuals were statistically and visually cross-dated to develop a mean chronology, which was indexed by a five-year running mean to eliminate long term growth trends. The indexed ring-width curve correlated significantly with November to June rainfall. This correlation was indicated by the percentage of parallel run (p.p.r.=74.6%), the Student's t-value ($t=4,0$) and the correlation coefficient ($r=0,47$). El-Niño causes exceptional droughts during the rainy season in central Amazonia (Sombroek 2001). On the other hand, in the last 30 years the intensity of El-Niño has increased dramatically (Trenberth 1997) and for the twelve El-Niño events since 1970 significantly lower growth rates (mean ring-width index: 85,7) were observed in comparison with other years (mean ring-width index: 105,2; t-value: -2,57; $p<0,01$). This indicates an increasing impact of the El-Niño phenomenon on tree growth in the central Amazonian terra-firme in the latter part of the 20th century.

References:

SOMBROEK, W. (2001): Spatial and temporal patterns of Amazon rainfall. *Ambio* 30, 388-396.

TRENBERTH, K. E. (1997): The definition of El Niño. *Bulletin of the American Meteorological Society* 78, 2771-2777.

S15: Sessões Especiais - Efeitos da Estiagem na Dinâmica do Carbono da Floresta: Resultados de Experimentos de Manipulação de Chuvas (*Drought Effects on Forest Carbon Dynamics: Results From Rainfall Manipulation Experiments.*)

12.1: Large carbon emissions from Amazon forests through drought-induced tree mortality and suppression of wood production

Daniel Curtis Nepstad, Woods Hole Research Center & Instituto de Pesquisa Ambiental da Amazonia, dneptad@whrc.org (Apresentador / Presenting)

David Ray, Woods Hole Research Center, dray@whrc.org

Paulo Roberto Moutinho, Instituto de Pesquisa Ambiental da Amazonia, moutinho@ipam.org.br

Ingrid Marisa Tohver, Instituto de Pesquisa Ambiental da Amazonia, marisa@ipam.org.br

Gina Knust Cardinot, Instituto de Pesquisa Ambiental da Amazonia, cardinot@ipam.org.br

Several processes may lead to the drying of the Amazon region, including global warming, deforestation-induced rainfall inhibition, and ENSO. We established a partial throughfall exclusion experiment in 1999 to examine the effects of this drying trend on the forest. The most sensitive component of net primary productivity to drying was wood production, with an annual decrease of ~2 Mg ha⁻¹ following three years of drought treatment (50% reduction of rainfall). Tree mortality in response to drought increased five-fold for large canopy trees (>30 cm dbh), shifting 10 Mg C ha⁻¹ yr⁻¹ from live to dead pools. Severe drought episodes can cause net releases of carbon to the atmosphere in excess of deforestation-driven release.

12.2: Changes in carbon cycling by Brazilian rain forest: effects of soil moisture reduction on soil, leaves and canopy

Patrick Meir, University of Edinburgh, UK, pmeir@ed.ac.uk (Apresentador / Presenting)

Antônio Carlos Lôla da Costa, Universidade Federal de Para, Brasil, lola@ufpa.br

Samuel Almeida, Museu Paraense Emilio Goeldi, Brasil, samuel@museu-goeldi.br

Fisher Alice Rosie, University of Edinburgh, UK, rosie.fisher@ed.ac.uk

Raquel Lobo do Vale, Instituto Superior de Agronomia, Portugal, raquelvale@isa.utl.pt

Raquel Medeiros, Museu Paraense Emilio Goeldi, Brasil, raquel-medeiros@bol.com.br

Sotta Doff Eleneide, Museu Paraense Emilio Goeldi, Brasil, esotta@gwdg.de

Rafael Ferreira Costa, Museu Paraense Emilio Goeldi, Brasil, rfcosta@museu-goeldi.br

Jose Maria Nogueira da Costa, Universidade Federal de Vicosa, Brazil, jmncoستا@ufv.br

Cláudio José Reis de Carvalho, Embrapa-Oriental, Brasil, carvalho.bel@terra.com.br

Lou Ruivo, Museu Paraense Emilio Goeldi, Brasil, ruivo@museu-goeldi.br

Edso Veldkamp, Universität Göttingen, Germany, eveldka@gwdg.de

Manuela Chaves, Instituto Superior de Agronomia, Portugal, mchaves@isa.utl.pt

Mathew Williams, University of Edinburgh, UK, mat.williams@ed.ac.uk

Yadvinder Singh Malhi, University of Edinburgh, UK, ymalhi@ed.ac.uk

John Grace, University of Edinburgh, UK, jgrace@ed.ac.uk

Rainfall was experimentally excluded from 1 ha of E. Amazonian forest, at Caxiua National Forest, Para with the aim of advancing understanding of the response in the forest carbon cycle to low soil moisture. Measurements were made of sap flow, leaf gas exchange, soil respiration, growth, litterfall and canopy structure in both experimentally treated and control (untreated) 1 ha plots. Comparisons were made between the two treatments and also with reference to eddy covariance measurements made 1-2 km distant. The exclusion of rainfall resulted in a reduction in soil water volume content by approximately 30% in comparison to the control and this resulted in clear effects at stand and species level on carbon cycling in leaves and soil. Strong hydraulic constraints appear to underlie the leaf level response to soil drought, rather than changes in leaf biochemistry; changes in soil respiration are also strong, resulting in reduced and lagged rates of efflux. Strong reductions in evapotranspiration were observed at tree and stand levels in response to moisture stress. By using our data to improve modelling of the response in carbon cycling to drought we identify significant reductions in productivity, a result that is supported through measurements of, for example, reduced plant reproductive capacity.

12.3: Dry-season irrigation alters carbon dynamics in tropical forest regrowth

Daniel Jacob Zarin, University of Florida, zarin@ufl.edu (Apresentador / Presenting)

Débora Veiga Aragão, Universidade Federal Rural da Amazonia, debora@ufra.edu.br

Maristela Machado Araújo, Universidade Federal Rural da Amazonia, maristela@ufra.edu.br

Cláudio José Reis de Carvalho, EMBRAPA, carvalho.bel@terra.com.br

Lucas Fortini, University of Florida, lfortini@ufl.edu

Izildinha Miranda, Universidade Federal Rural da Amazonia, izildinhamiranda@uol.com.br

Stephen S. Mulkey, University of Florida, smulkey@ufl.edu

Francisco Assis Oliveira, Universidade Federal Rural da Amazonia, fassis@ufra.edu.br

Patricia Delamonica Sampaio, University of Florida, psampaio@ufl.edu

Joanna Tucker, University of Florida, jmtucker@ufl.edu

Steel Silva Vasconcelos, University of Florida, svascon@ufl.edu

For three consecutive dry seasons (2001-2003) we have irrigated four 20 x 20 m plots in 2 ha of forest regrowth near Castanhal, Pará, Brazil. The stand was last abandoned in 1987 following multiple cycles of shifting cultivation dating back to the 1940s. The experiment was designed to examine the role of moisture as a constraint on carbon dynamics in tropical forest regrowth. Irrigation is applied in the late afternoon at a rate of 5 mm day⁻¹, corresponding to regional estimates of daily evapotranspiration. Relative to measurements made in a corresponding set of control plots within the same stand, dry-season irrigation has significantly altered carbon dynamics by increasing leaf-level assimilation, litter decomposition, and soil respiration during the dry-season. Irrigation also appears to accelerate seed germination, as well as the onset of reproduction in some plants. Treatment effects have occurred in the context of dynamic successional processes, which thus far do not bear an obvious treatment impact. Since our first pre-treatment stand inventory in 1999, dominant pioneer species (*Lacistema pubescens*, *Vismia guianensis*) have suffered 30 percent mortality, and stand-level stem density has declined 20 percent, while basal area and average stem height have increased by 15 and 10 percent, respectively.

12.4: Drought tolerance of Amazon trees reflects a low vulnerability to cavitation: results from a large scale rainfall exclusion experiment.

Gina Knust Cardinot, UFRJ/IPAM, cardinot@ipam.org.br (Apresentador / Presenting)
N. Michele Holbrook, Harvard University, holbrook@oeb.harvard.edu
Daniel Curtis Nepstad, WHRC/IPAM, dneptad@whrc.org

The capacity of xylem to transport water from the soil to the leaves is itself at risk during periods of drought due to the increased potential for cavitation. Our research focuses on the effects of drought on the water transport capacity of Amazonian rainforest trees. Our goal is to understand the extent to which cavitation results in a loss of hydraulic conductivity, potentially leading to stomatal closure, leaf shedding, and tree death. Our research was carried out within the context of the world's largest rainfall exclusion experiment. This experiment, the first conducted in a rainforest (eastern Amazonia; Para State/Brazil) consists of two 1-ha plots, of which one is a control and one in which rainfall reaching the forest floor has been reduced by 50% since 2000. We measured xylem hydraulic conductivity using a field pressure-drop flow meter to test the hypothesis that cavitation limits water uptake from deep soil layer. We chose four species which are common in this area. Our preliminary results indicate that the specific conductivity (Ks) of branches did not differ significantly between plots for all studied species. Vulnerability curves in branches showed a high tolerance to cavitation (50% loss of hydraulic conductivity at values smaller than -3.5MPa), consistent with the lack of an impact of imposed drought on xylem hydraulic conductivity. The possibility that water uptake by leaves (instead of through the soil) could play an important role in the water balance of these trees might be responsible for these findings. Drought tolerance exhibited by Amazon tropical rainforest trees allows them to maintain physiological function and xylem continuity despite the marked seasonality in rainfall in the eastern Amazon.

12.5: Soil CO₂ production and transport in the drought experiment in Caxiua National Forest, Para, Brazil.

Eleneide Doff Sotta, University of Goettingen, esotta@gwdg.de (Apresentador / Presenting)
Rosiene Keila da Paixao, Museu Paraense Emilio Goeldi, rosienepaixao@hotmail.com
Brenda Rocha Guimaraes, Museu Paraense Emilio Goeldi, b_rock1202@hotmail.com
Alessandro Rosario, Museu Paraense Emilio Goeldi, asrosario@museu-goeldi.br
Antônio Carlos Lôla da Costa, Universidade Federal do Para, lola@ufpa.br
Edzo Veldkamp, University of Goettingen, eveldka@gwdg.de
Patrick Meir, University of Edinburgh, pmeir@ed.ac.uk
Maria de Lourdes Pinheiro Ruivo, Museu Paraense Emilio Goeldi, ruivo@museu-goeldi.br
Luitgard Schwendenmann, University of Wyoming, l_schwendenmann@hotmail.com

Soil CO₂ concentration measurements can characterise the soil C pool and determine the effects of low soil water content in soil CO₂ production and transport. The study site was composed of two plots of 1 ha (100m x 100m), the control plot (Plot A) and the treatment plot (Plot B). 70-90% of the rainfall was excluded from the soil of one plot using panels and gutters to deflect the rain out of the plot. The impact of this soil drought on forest carbon and water cycling was assessed by comparing the control and treatment plots.

We measured soil CO₂ concentration in the soil profile in 4 shafts at each plot (in the control plot and in the plot with water exclusion). The samples were collected with syringes at depths 5, 10, 25, 50, 100, 200 and 300 cm and analysed in a gas chromatograph. Radon measurements were made in order to determine soil CO₂ diffusivity.

We will show preliminary results on the CO₂ production and transport rates. First results on CO₂ concentration profiles show seasonality for both plots. CO₂ concentration increases in the soil in the beginning of the wet season and falls as soon as the dry season starts.

12.6: Moisture availability constrains soil trace gas fluxes in an eastern Amazonian regrowth forest

Steel Vasconcelos, School of Forest Resources and Conservation, University of Florida, P.O. Box 110760, Gainesville, FL 32611-0760 USA, svascon@ufl.edu (Apresentador / Presenting)
Daniel Zarin, School of Forest Resources and Conservation, University of Florida, zarin@ufl.edu
Eric Davidson, The Woods Hole Research Center, edavidson@whrc.org
Francoise Ishida, Instituto de Pesquisa Ambiental da Amazônia, yoko@ipam.org.br
Elisana Santos, Instituto de Pesquisa Ambiental da Amazônia, elisana@ipam.org.br
Maristela Machado Araújo, Departamento de Ciências Florestais, Universidade Federal Rural da Amazônia, maristela@ufra.edu.br
Débora Veiga Aragão, Departamento de Ciências Florestais, Universidade Federal Rural da Amazônia, debora@ufra.edu.br
Livia Rangel-Vasconcelos, Soil and Water Science Department, University of Florida, livia@uf.edu
Francisco Assis Oliveira, Departamento de Ciências do Solo, Universidade Federal Rural da Amazônia, fassis@ufra.edu.br
William McDowell, Department of Natural Resources, University of New Hampshire, Bill.McDowell@unh.edu
Cláudio José Reis de Carvalho, Embrapa Amazônia Oriental, carvalho.bel@terra.com.br

Changes in land-use and climate are likely to alter moisture availability in tropical forest soils, and subsequent changes in trace gas fluxes may have an impact on atmospheric chemistry. Quantitative assessment of the role of moisture availability as regulator of soil trace gas fluxes is rather limited. The objective of this study was to quantify the effect of moisture availability on soil trace gas fluxes in an Amazonian regrowth forest. We measured the efflux of carbon dioxide (CO₂), nitric oxide (NO), nitrous oxide (N₂O), and methane (CH₄) from soil in response to increased soil moisture availability as part of an ongoing dry-season irrigation experiment. In the absence of irrigation, soil CO₂ efflux decreased during the dry season while irrigation maintained soil CO₂ efflux levels similar to the wet season. Large variations in soil CO₂ efflux consistent with a significant moisture constraint on respiration were observed in response to soil wet-up and dry-down events. Annual soil C efflux for irrigated plots was 27 and 13 % higher than for control plots in 2001 and 2002,

respectively. In general, fluxes of N₂O and CH₄ were higher during the wet season and both fluxes increased during dry-season irrigation. There were no treatment or seasonal effects on NO fluxes. Overall, the significant soil moisture constraint on soil CO₂ efflux suggests that possible alterations in soil moisture availability due to climate and land-use changes could have significant effects on regional CO₂ fluxes.

12.7: Stable isotope analyses provide evidence of drought stress impacting plant function at the Seca Floresta

James R Ehleringer, University of Utah, ehleringer@biology.utah.edu (Apresentador / Presenting)

Jean P Ometto, CENA-USP, ometto@biology.utah.edu

Francoise Y Ishida, CENA-USP, fyishida@cena.usp.br

Luiz Antonio Martinelli, CENA-USP, zebu@cena.usp.br

Joseph A Berry, Carnegie Institution of Washington, joeberry@stanford.edu

Tomas Domingues, University of Utah, domingues@biology.utah.edu

Haroldo Jackson Silva, CENA-USP, haroldo@ibaeco.com.br

Edmar Mazzi, CENA-USP, eamazzi@cena.usp.br

Daniel Curtis Nepstad, Woods Hole, dneptad@whrc.org

Carbon isotope ratios have been measured to examine the impacts of a drought treatment at the Seca Floresta. We measured the carbon isotope ratio values of leaf organic matter and on the carbon dioxide effluxing from soil and litter components in droughted and non-droughted plots. In addition, we quantified soil carbon dioxide efflux rates in order to partition this flux into its soil and litter components. The observations suggest that a reduction in soil moisture availability results in both increased carbon isotope ratio values of the leaf organic matter and increased carbon isotope ratio values of the soil carbon dioxide efflux. Further examination of the data suggest that the carbon isotope ratio values of the soil carbon dioxide efflux can be partitioned into two components: a litter component that changed modestly its carbon isotope ratio value seasonally and a soil component that showed larger interseasonal fluctuations in carbon isotope ratio values. The seasonal fluctuations in both the leaf organic matter and the carbon dioxide efflux of the soil component were consistent with a photosynthetic carbon supply reflecting reduced stomatal closure.

12.8: Correlation but no causation between leaf nitrogen and maximum assimilation: the role of drought and reproduction in gas exchange in an understory tropical plant *Miconia ciliata* (Melastomataceae)

Débora Veiga Aragão, Universidade Federal Rural da Amazônia, debora@ufra.edu.br (Apresentador / Presenting)

Lucas B Fortini, University of Florida, lfortini@ufl.edu

Stephen S. Mulkey, University of Florida, smulkey@ufl.edu

Daniel J Zarin, University of Florida, zarin@ufl.edu

Maristela Machado Araújo, Universidade Federal Rural da Amazônia, maristela@ufra.edu.br

Cláudio José Reis de Carvalho, Empresa Brasileira de Pesquisa Agropecuária, carvalho.bel@terra.com.br

We tested two alternative hypotheses that may explain a previously reported anomaly in the response of leaf A_{max} in *Miconia ciliata* (Rich.) DC to dry-season irrigation. The anomaly is characterized by an abrupt increase in leaf A_{max} values for non-irrigated plants at the onset of the rainy season that caused those values to significantly exceed corresponding measurements for plants that were irrigated during the previous dry season. Hypothesis 1 posits that a pulse in leaf nitrogen causes the increase of CO₂ assimilation of non-irrigated plants at the onset of the wet season and is dampened for irrigated plants; this hypothesis was rejected because, although a wet-season nitrogen pulse did occur, it was identical for both irrigated and non-irrigated plants, and was preceded by the increase in assimilation by non-irrigated plants. Hypothesis 2 posits that a reproduction-related compensatory photosynthetic response occurs in non-irrigated plants following the onset of the wet season and is dampened in irrigated plants; consistent with hypothesis 2, high maximum assimilation rates for control plants in the wet season were significantly correlated with fruiting and flowering, whereas irrigation caused flowering and fruiting in the dry season, spreading *M. ciliata* reproductive activity in irrigated plants across the entire year. Water availability and reproductive phenology triggered by increased water availability are the primary factors that explain variance in leaf A_{max} for this species.

12.9: Coupling soil hydraulics to stomatal conductance; a mechanism for modelling the impacts of drought on forest gas exchange.

Rosie Alice Fisher, University of Edinburgh, rosie.fisher@ed.ac.uk

Mathew Williams, University of Edinburgh, mat.williams@ed.ac.uk

Antônio Carlos Lôla da Costa, Universidade Federal do Para, lola@ufpa.br

Maria de Lourdes Pinheiro Ruivo, Museu Paraense Emílio Goeldi, ruivo@museu-goeldi.br

Patrick Meir, University of Edinburgh, pmeir@ed.ac.uk (Apresentador / Presenting)

At our throughfall exclusion experiment at Caxiuanã (Para), we are investigating how forest gas exchange responds to drought stress. We have artificially reduced the soil water content, and are observing how the sapflow, leaf physiology, tree dynamics and soil respiration change as the drought progresses. Substantial reductions in sapflow have been measured at our droughted site compared to the control site. In order to apply what we have learnt about the behaviour of the drought tolerance of the Caxiuanã forest to other area of Amazonia, or to alternative droughting scenarios, it is necessary to integrate our new understanding of drought physiology into a simulation model.

The majority of soil-vegetation-atmosphere-transfer models express drought induced stomatal closure as a simple function of soil water content or potential, the parameters of which are generally poorly known. Our goal is to remove the need for this empiricism by explicitly simulating the movement of water through the soil and plant to the leaf, and optimising the

stomatal conductance such that the plant maximises photosynthesis rates whilst avoiding desiccation.

To parameterise our soil-plant-atmosphere model (SPA), we collected data on soil hydraulic properties, LAI, root biomass profiles, and photosynthetic capacity. The model was validated against sapflow, soil moisture, and leaf physiology data. We found that the key factor driving reductions in forest gas exchange in the dry season is soil hydraulic resistance, however, measurements of soil hydraulic resistance are extremely uncommon in Amazonia, and we conclude that a survey of soil hydraulics is necessary to identify areas of Amazonia most vulnerable to climate drying.

S7: Sessões Especiais - Estradas e Mudanças no Uso da Terra e Desflorestamento na Amazônia Brasileira. *(Roads, Land-Cover and Land-Use Changes in Brazilian Amazon)*

13.1: Understanding the Function of Roads in Land Cover Change

Robert Walker, michigan state university, rwalker@msu.edu

Marcellus Caldas, michigan state university, caldasma@msu.edu (Apresentador / Presenting)

Stephen G Perz, university of florida, sperz@soc.ufl.edu

Eugenio Arima, michigan state university, arimaeug@msu.edu

The probability that a specific parcel of land in the Amazon basin is deforested or not is highly conditioned on a sequence of spatial decisions involving the choice of route for a Federal Highway, choice of area for public or private colonization, and choice of pathways for settlement roads. Once the road system in place, of course, colonists, agro-industrial interests, and loggers alter the vegetative cover of the land far beyond the spatial imprint of the roads themselves. This presentation considers elements of this hierarchical process, and focuses special attention on the placement of the Federal Highway system, and of local-scale, settlement roads. To this end, we address the evolution of the Federal system over the past thirty years, and link it to the regional development process, using historical and topographical data. We then discuss the nature of road development by private interests such as loggers who extend the government system and by so doing unleash the forces of forest fragmentation.

13.2: Determinantes e Tendências da Ocupação da Amazônia

Eustáquio J Reis, IPEA, ejreis@ipea.gov.br

Ajax B Moreira, IPEA, ajax@ipea.gov.br (Apresentador / Presenting)

A ocupação econômica da Amazônia brasileira é analisada como um processo sistêmico caracterizado pelo contágio entre regiões vizinhas ao longo do tempo e condicionado pela características do clima, do solo e o custo de transporte. Esse processo é descrito por 3 atividades: agrícola, pecuária e extração de madeira, caracterizadas pela sua intensidade ou pela extensão. A interação entre as medidas de intensidade ou de extensão e o custo de transporte, caracteriza o processo de ocupação. Formalmente o processo da ocupação é descrito de foram complementar por um modelo dinâmico e um modelo estático. O primeiro descreve a ocupação como um processo espaço temporal e o segundo ignora o aspecto temporal isolando o espacial. A dinâmica espacial da ocupação representada pelo primeiro modelo induz a formação de conglomerados de regiões vizinhas que apresentam valores semelhantes de algumas das variáveis que caracterizam a ocupação. Este padrão espacial é descrito pelo segundo modelo que focaliza a interação entre as quantidades de cada região e as quantidades das regiões vizinhas.

Os modelos foram estimados tomando como unidade os municípios da Amazônia Legal. A fonte de informação são os censos agropecuários realizados para os anos de 1970, 1975, 1980, 1985 e 1995 e a pesquisa realizada sobre custo de transporte no Brasil (Castro 2002).

A abordagem sistêmica esta limitada pelo nível de agregação, o que na AML é uma restrição importante devido a dimensão das regiões.

13.3: Amazon Soybean Transport Costs

Maria del Carmen Vera-Diaz, Ipam/Boston University, mcarmen@bu.edu (Apresentador / Presenting)

Robert Kaufmann, Boston University, kaufmann@bu.edu

Daniel Curtis Nepstad, Ipam/Woods Hole Research Center, dnepstad@whrc.org

Investments planned under the last Brazilian Government's "Avança Brasil" (Forward Brazil) federal program and continued under the Lula's government aim to improve transport networks and build infrastructure (ports, waterways, and hydroelectric power plants) in the Amazon region. These politics have important economic and environmental impacts by reducing transport costs, facilitating access to remote places, and promoting the expansion of the agricultural frontier in the Brazilian Amazon. These changes will benefit agro-industry by increasing the area where soybean production is economically viable.

We estimate spatial variations in transportation costs from the Amazon basin to soybean export ports. Cost surfaces are generated for the entire Amazon using a least cost location approach in GIS-Software. Additional cost surfaces are created to simulate the complete pavement of Cuiaba-Santarém highway.

Preliminary results indicate that transport costs vary greatly over Brazilian territory. The highest transport costs occur in the Amazon region. In some areas, costs exceed US\$800 per ton of shipped product because poor transport infrastructure and large forest areas restrict accessibility. In general transport costs in the Eastern Amazon are lower than the Western Amazon because of government investments in transport infra-structure.

13.4: Land Use and Transportation Costs in the Brazilian Amazon

Diana Weinhold, LSE, d.weinhold@lse.ac.uk (Apresentador / Presenting)
Eustaquio Reis, IPEA, ejreis@ipea.gov.br

The Brazilian government's Avança Brazil program has allocated over \$3 billion for approximately 7,500 km of new Amazonian highways through 2007, prompting concerns about the effects on deforestation. In this paper we put forth some empirical evidence from the Brazilian Amazon that suggests that the relationship between roads and land clearing may be much more complex than the current conventional wisdom assumes. In particular we find that in areas that already at least partially cleared, improving the road network (i.e. decreasing transport costs) may actually decrease the rate of deforestation. We argue that our methodology of explicitly modeling the dynamics should be preferred to the more common static, contemporaneous analyses found in the literature. Furthermore, we endeavor to provide an encompassing explanation of our results. In other words, not only do we show that dynamic modeling yields different conclusions from the conventional wisdom, but using our dynamic approach we are able to explain why so many other studies came to (possibly erroneous) conclusions using more traditional methods.

13.5: As mudanças sócio-ambientais na Amazônia Sul-Occidental: Avaliação pelas populações ao longo da Estrada Interoceânica no Estado do Acre, Brasil e no Departamento de Madre de Dios, Peru.

Elsa Huamán Mendoza, IPAM/UFAC/PZ, elsa_mendoza@uol.com.br (Apresentador / Presenting)
Irving Foster Brown, WHRC/UFAC, fbrown@uol.com.br
Daniel Curtis Nepstad, WHRC/IPAM, dneptad@whrc.org
Armando Muñante, SENASA, iran1958@hotmail.com
Rodrigo Serrano, Menstrando - UFAC, serrano@psainfo.com.br
Denise Temporim Furtado, BIOMA, denisetemporim@bol.com.br
Sumaia Vasconcelos, BIOMA, sumaia@yahoo.com.br
Mercedes Peralta, Aluna - UNSAC, leomeche@hotmail.com
Jessica Swansson, UFAC-PZ, sica520@yahoo.com
Socorro Pea, IPAM, socorro@ipam.org.br

A Estrada Interoceânica (1.600 km) está em vias de construção entre Rio Branco/Acre/Brasil e portos peruanos na costa do Oceano Pacífico e representa um grande motor para transformar o uso da terra na região. O presente trabalho visa avaliar como populações locais na planície Amazônica do leste do Estado do Acre/Brasil e do Departamento de Madre de Dios/Peru percebem as mudanças que estão ocorrendo com a melhoria de transporte e suas expectativas para o futuro. Foram feitas reuniões em 13 municípios (6 brasileiros e 7 peruanos) com um total de >350 participantes do governo local, sociedade civil organizada e setor privado. Nestas reuniões os participantes esboçaram suas preocupações e desenharam o uso atual da terra de cada município. O asfaltamento da BR-317 entre Rio Branco a Assis Brasil (340km) foi iniciada em 1995 e concluída em 2002. Na parte peruana entre Iñapari e Masuko (390 km) desde o ano 2000 teve melhorias, porém, nenhum trecho foi asfaltado. Houve diferenças marcantes nas percepções das melhorias e problemas entre os participantes brasileiros e peruanos associadas à estrada. No lado brasileiro as preocupações decorrentes do asfaltamento foram em como mitigar os impactos negativos (subida do preço da terra e êxodo rural, aumento de violência e de drogas, falta de água nos igarapés, incremento de desmatamento) e como reivindicar soluções para estes impactos. No lado peruano a sociedade reivindica o asfaltamento da estrada e manifesta que será a solução para a maioria de seus problemas sem perceber os possíveis impactos negativos. A falta de ações mitigadoras antes e depois do asfaltamento está originando impactos negativos que estão tornando-se graves problemas sociais, ambientais e econômicos, um resultados que têm implicações para políticas públicas regionais.

13.6: Roads: A Proximate or Underlying Cause of Deforestation?

Marie Scouvar, University of Louvain (UCL), scouvar@geog.ucl.ac.be (Apresentador / Presenting)
Eric Lambin, University of Louvain (UCL), lambin@geog.ucl.ac.be

The causal link between roads and deforestation is not clearly established. Are roads proximate or underlying drivers of deforestation? Are they endogenous or exogenous factors to the deforestation process? And do they mostly influence rates or location of deforestation? To answer these questions and assess the specific role and influence of transportation infrastructure development on deforestation, we propose a comparative approach based on local case studies corresponding to situations associated with different impacts of road construction in forested regions on the deforestation process. Our main hypothesis is that, in most cases, roads are only a spatial determinant of deforestation at the proximate level, while the quantity of deforestation is mostly determined by macro-economic factors or national policies. To implement the comparative analysis, we used Ragin's Qualitative Comparative Analysis (QCA). QCA is a powerful technique to reveal causality and understand phenomena because it explicitly takes into account the complexity involved in causal relationships between potential explanatory conditions. QCA was applied based on a dozen case studies from the Brazilian Amazon. Data on the case studies were assembled from the literature and through a formal expert consultation process. This application opens new methodological perspectives in geography and demonstrates the interest of comparing in a systematic way datasets from local case studies. Some theoretical perspectives on the role of roads on deforestation will be discussed. The methodology will be presented, initial results shown and the main policy implications discussed.

13.7: Heterogeneity in Road-building Processes and Road Network Architecture: A Comparison of Two Amazonian Arenas and Implications for Projecting Future Land Cover

Stephen G Perz, University of Florida, sperz@soc.ufl.edu (Apresentador / Presenting)

Marcellus M Caldas, Michigan State University, caldasma@msu.edu

Robert T Walker, Michigan State University, rwalker@msu.edu

Previous work on the impact of roads on land cover, ecology and climate has rarely drawn distinctions in the social processes or spatial architecture of road networks. However, socio-spatial processes of road-building are closely tied together, vary across the Amazon, and greatly determine patterns of forest fragmentation and its ecological and climatic consequences. Here we report fieldwork and present data products from research on road-building in two distinct arenas of the Brazilian Amazon: the Transamazon corridor, a smallholder colonization zone characterized by the well-known “fishbone” pattern, and central Mato Grosso, an agorindustrial frontier with a very different road architecture. We compare the socio-spatial processes behind these distinct road networks, and present data products to visualize their contrasting impacts on land cover. Our analysis shows the heterogeneity of road network structures, due to the different histories and interest groups at work in road-building. This implies that projections of future forest cover in the Amazon, and the consequences of distinct fragmentation patterns, needs to account for locally distinct socio-spatial processes of road-building.

13.8: Logging roads in the Amazon basin and forest fragmentation: modeling challenges

Eugenio Arima, Michigan State University and IMAZON, arimaeug@msu.edu (Apresentador / Presenting)

This presentation addresses the spatial process of logging road extension and the resulting spatial architecture of expanding road networks in the Brazilian Amazon forest. Roads have been usually associated with governmental investments to promote national integration and development. However, the private sector (e.g., loggers) has been active in building roads and has therefore been playing an important role in the dynamics of the frontier expansion in the Amazon. In building roads, loggers seek to maximize profits subject to capital and institutional constraints (laws and regulations). The choice of a route to extract trees also results from social interactions with other actors such as farmers, colonists, and politicians. I will present a typology of logging roads and the information and assumptions needed to model each type of road. Finally, I will present advances in modeling applied to a portion of the Transamazon region in Pará state.

13.9: Basin-Scale Econometric Modeling I: road endogeneity and road impacts

Alexander Pfaff, Columbia University, ap196@columbia.edu (Apresentador / Presenting)

Eustaquio Reis, IPEA, ejreis@ipea.gov.br

Claudio Bohrer, Universidade Federal Fluminense, bohrer@vm.uff.br

Juan Robalino, Columbia University, jar101@columbia.edu

By observing land-cover changes under historical conditions and projecting them into the future, we can evaluate impacts of policies and of economic changes upon Amazonian forest dynamics.

This presentation is the first one to report upon the earliest basin-scale research within the project “A Basin-Scale Econometric Model for Projecting Future Amazonian Landscapes”. This talk will focus on endogeneity of roads, i.e. roads result from decisions at given times for specific reasons.

This is of course the case. Yet this obvious statement motivates some analysis of those decisions, in particular efforts to distinguish parts of road networks in terms of who created them and why. Project team members have been studying precisely these questions within the historical record.

For empirical analyses of deforestation at basin scale, this question suggests additional analyses. First, when data exist over time, we can explore what the data suggest might lead to road creation. Building upon our team’s efforts to establish measures of changes in the road network over time, we examine empirically what land-use settings are the most likely to give rise to additional roads.

Second, this question leads us to revisit the crucial issue of the impact of roads on forest clearing. When the location of additions to the road network is acknowledged to be driven by other factors, inferring the effects of roads on deforestation versus effects of the other factors is more complex. We will present first steps to address this issue to improve our estimation of the impacts of roads.

13.10: Basin-Scale Econometric Modeling II: spatial disaggregation and spatial impacts

Alexander Pfaff, Columbia University, ap196@columbia.edu (Apresentador / Presenting)

Eustaquio Reis, IPEA, ejreis@ipea.gov.br

Claudio Bohrer, Universidade Federal Fluminense, bohrer@vm.uff.br

Juan Robalino, Columbia University, jar101@columbia.edu

Regional landscape projections constitute a valuable tool for identifying policies that can address the development needs of Amazonian populations while minimizing loss of ecosystem integrity. By estimating the probability of forest clearing as a

function of factors that affect profitability, we can generate projections of land cover across the basin for a suite of different scenarios.

This presentation is the second reporting upon the earliest basin-scale research within the project "A Basin-Scale Econometric Model for Projecting Future Amazonian Landscapes". This talk will focus on spatial disaggregation within basin-scale modeling, starting with use of census tract data and, from this vantage point, also adding questions about regional processes and spatial patterns.

Most empirical work at basin scale within the Brazilian Amazon has been at the municipio level. The availability of relevant socioeconomic information from the census has dictated this choice. Here we examine the question of road and other impacts on deforestation at census tract level. While for now we use this significantly disaggregated census data for only one point in time, these first efforts are a good robustness check and set the stage for extending to more points.

In addition, the greater number of spatial units of smaller size sets the stage for other questions. First, with more observations per region, it is more feasible to estimate regional differences. Second, within smaller units, it is more sensible to consider spatial patterns of deforestation. Based on satellite data, we explore fragmentation and its relation to socioeconomic factors.

S19: Sessões Especiais - Avaliações de Precisão e Suas Implicações Para o Monitoramento de Fogo e Desflorestamento *(Accuracy Assessments and their Implications for Fire and Deforestation Monitoring)*

14.1: Números de Desflorestamento Devem Incorporar Fundamentos de Medidas

Alberto W Setzer, INPE-CPTEC, asetzer@cptec.inpe.br (Apresentador / Presenting)

Este trabalho descreve uma limitação comumente encontrada nos dados de desflorestamento e desmatamento obtidos por sensoriamento remoto: o uso de algarismos não significativos como se fossem significativos. Medidas analógicas e digitais de grandezas estão sujeitas a erros sistemáticos, aleatórios, acidentais, experimentais e grosseiros. O valor de uma medida expressa sua quantificação mais provável, a partir da acurácia e precisão associadas. Por convenção, o penúltimo algarismo do valor de uma medida ou estimativa é na maioria das vezes considerado correto, e o último algarismo é incerto em até +- 50% de sua magnitude. Em cartografia, a multiplicação da escala do mapa por 0.2mm determina a menor unidade linear mensurável; assim, na escala de 100.000 nada menor que 20 m deve ser indicado. Operações algébricas com medidas possuem regras para controlar a propagação de erros, e o resultado de uma operação terá tantos algarismos significativos quanto a medida com menor número de algarismos significativos usada na operação. A formação de profissionais em ciências exatas, mesmo no nível médio, inclui estes conceitos básicos. São comuns textos didáticos de técnicas de laboratório e de estatística descrevendo este tema, assim como normas técnicas oficiais de engenharia definido a quantidade aceitável de algarismos significativos. Por exemplo, a estimativa de desflorestamento de 607.957 km² em 2001 divulgada para a Amazônia, supondo apenas efeitos de precisão, sem incorporar os cinco tipos básicos de erro, deveria ter no máximo três algarismos significativos (ou mesmo dois), e não seis! O artigo de I.F. Brown e outros em revista científica nacional em 1995, já chamou a atenção para a falta destes critérios em medidas de área feitas no país com sensoriamento remoto orbital. Insistir no uso de algarismos significativos não condizentes com as grandezas medidas e as técnicas usadas é um depoimento contra os próprios dados e seus autores.

14.2: Public policy implications of accuracy assessment for fire and deforestation monitoring: Don't forget the error bars

Irving Foster Brown, Woods Hole Research Center and the Federal University of Acre, fbrown@uol.com.br (Apresentador / Presenting)

Deforestation and fire are two major inter-related driving forces for land cover change in Amazonia. Monitoring their occurrence has been a central focus of the LBA research agenda and of federal and state agencies within Brazil. Data from satellites (Landsat, NOAA-AVHRR, MODIS, GOES) have influenced public policy decisions on the percentage of forest reserves to be maintained on private properties and on the allocation of resources for controlling fires. Like all data, estimates of deforestation and fire events contain inherent uncertainty, which typically manifests itself when estimates are validated in field studies or subject to inter-comparison. The proliferation of accessible imagery, low-cost image processing, and qualified personnel has resulted in differing estimates of deforestation and fire events for the same geographic area. Such differences can lead to confusion among decision makers - be they small farmers or national government representatives - as to what is the 'right' value. This confusion is due in part to the tendency of data producers to use excessive numbers of significant figures and to the predisposition of data users to accept estimates as the exact truth, rather than as indicators. The concept of inherent uncertainty has been successfully introduced to the lay public during election campaigns with regards to opinion polls. A similar educational effort could accompany the publication of deforestation and fire estimates, making explicit the uncertainty in these estimates (errors of commission/ omission, classification, and location). The alternative may be a loss of credibility of the remote sensing community when society is faced with multiple, discordant estimates of deforestation and fire events.

14.3: Incorporating the use of MODIS data into INPE deforestation mapping

Yosio Shimabukuro, INPE, yosio@ltd.inpe.br (Apresentador / Presenting)

Ruth DeFries, University of Maryland, rdefries@geog.umd.edu
Douglas Morton, University of Maryland, morton@geog.umd.edu
Liana Anderson, INPE, liana@ltid.inpe.br
Marcelo Lopes Latorre, INPE, latav@ltid.inpe.br
Matthew Hansen, University of Maryland, mhansen@glue.umd.edu
Ellen Jasinski, University of Maryland, ejasinsk@pop900.gsfc.nasa.gov

Moderate resolution satellite data, such as those from the EO-1 Terra and Aqua MODIS sensors, permit more rapid analysis of deforestation in the Brazilian Amazon than high resolution Landsat data due to their regional coverage with small data volumes. We evaluated the use of MODIS data to prioritize high resolution analysis in the INPE PRODES program by comparing MODIS deforestation maps generated by four different algorithms to 2002 INPE PRODES deforestation maps from Landsat ETM data. For 6 Landsat scene test areas, NDVI differencing and linear mixture model techniques were performed on both daily surface reflectance and 16-day composite surface reflectance MODIS products at 250 m resolution. Vegetation Cover Change (VCC) and Vegetation Continuous Fields (VCF) algorithms were also run on 250 m resolution MODIS data. The accuracy of each MODIS deforestation map with respect to the 2002 PRODES analysis was calculated as the percent of true positives, percent of PRODES deforestation area, and percent of PRODES deforestation polygons detected by polygon size. Results from all four algorithms show a high degree of potential to reliably identify new deforestation. The relative importance of minimizing false positives, maximizing deforestation area identified, or maximizing the percent of small (0.25-3 ha) deforestation areas detected will determine the most appropriate algorithm and data type. The accuracy and speed of MODIS data analysis techniques show a high degree of potential to assist priority setting for high-resolution analysis as part of operational deforestation monitoring at INPE.

14.4: Representatividade e limitações dos dados da detecção orbital de queimadas do INPE

Alberto W Setzer, INPE/CPTEC, asetzer@cptec.inpe.br (Apresentador / Presenting)

Este trabalho resume informações da representatividade da detecção de queimadas feita pelo INPE em imagens de satélites em relação aos focos observados por equipes de campo, assim como das limitações inerentes ao processo de detecção. Para tanto, são usados relatórios de usuários e comparações da detecção feita por satélites e sensores distintos. Por exemplo, no caso das unidades de conservação federais em 2003, apenas o satélite NOAA-12 detectou 88% das ocorrências registradas nas unidades. O uso de outros satélites aumenta esta representatividade, levando à conclusão esperada de que quanto maior o número de imagens, maior o número de detecções. Condições locais altamente variáveis como cobertura de nuvens, pequenos focos e fogo rasteiro no interior de florestas densas, e características do imageamento como horário da imagem, ângulo de visada, ruídos do sensor e na recepção, resultam em restrições no número de focos detectáveis. Características dos algoritmos de detecção que têm finalidade de eliminar falsos sinais de queimadas, tendem a minimizar o número de ocorrências registradas. E imprecisões no cálculo da posição real dos focos também adiciona limitações aos dados. A detecção orbital de queimadas deve ser considerada como o melhor dado possível, mas sempre subestimado em relação à realidade.

14.5: Characterizing Vegetation Fire Regimes in Brazil Through Adjusted Satellite Fire Detection Data

Wilfrid Schroeder, IBAMA, wilfrid.schroeder@ibama.gov.br (Apresentador / Presenting)
Jeffrey Thomas Morisette, NASA GSFC, jeff.morisette@nasa.gov (Apresentador / Presenting)
Louis Giglio, University of Maryland, giglio@hades.gsfc.nasa.gov
Ivan Csizsar, University of Maryland, icsizsar@hermes.geog.umd.edu
Douglas Morton, University of Maryland, morton@geog.umd.edu
Christopher O. Justice, University of Maryland, justice@hermes.geog.umd.edu
João Antonio Raposo Pereira, IBAMA, jraposo@ibama.gov.br

The role of biomass burning on the terrestrial climate system has been widely studied over the last two decades. In particular, correctly characterizing the frequency and distribution of fire occurrence is a fundamental question for better understanding the resulting environmental impacts of burning. Satellite data have been developed and applied operationally to map vegetation fires over different regions of the globe. Hot spots detected by both the NOAA/AVHRR and NASA/MODIS sensors are used to report clearly apparent annual trends in fire activity through Brazil. However, while relative numbers of spatial and temporal distribution of hot spots correctly describe the situation, absolute values are known to underestimate total number of vegetation fires that occur at the surface. Satellite overpass time, cloud coverage and image acquisition characteristic are the main issues affecting detection performance and thereby the resulting fire statistics. Here we quantify the influence of clouds and viewing geometry on satellite fire detection statistics and develop a straightforward curve-fitting approach to adjust the total fire counts from MODIS-Terra, MODIS-Aqua and NOAA-12 throughout Brazil. The method compensates for day-to-day variation due to cloud cover and changing image acquisition geometry. The results of this adjusted number of fire counts are used to calculate monthly fire counts for each Brazilian state for the past four years to establish Brazilian fire regimes.

14.6: Validation and comparison of Terra/MODIS active fire detections from INPE and NASA/UMd algorithms

Jeffrey Thomas Morisette, NASA GSFC, jeff.morisette@nasa.gov (Apresentador / Presenting)
Ivan Csizsar, University of Maryland, icsizsar@hermes.geog.umd.edu
Louis Giglio, University of Maryland, giglio@hades.gsfc.nasa.gov
Wilfrid Schroeder, IBAMA, Wilfrid.Schroeder@ibama.gov.br
Douglas Morton, University of Maryland, morton@geog.umd.edu
João Antonio Raposo Pereira, IBAMA, jraposo@ibama.gov.br
Christopher O. Justice, University of Maryland, justice@hermes.geog.umd.edu

The Committee on Earth Observing Satellites defines validation as "the process of assessing, by independent means, the

quality of the data products derived from the system outputs". In this validation study, the data products considered are the active fire detections from two algorithms applied to Terra/MODIS data at 1 km resolution: the standard global MOD14 algorithm developed by the MODIS fire team at NASA and UMD; and a regional algorithm from INPE. We assess the quality of these two products by comparing them to coincident fire detections derived independently from the ASTER sensor on the same Terra satellite. The high spatial resolution of ASTER (30m in the SWIR spectral region) allows for detailed spectral and visual inspection of fires throughout Brazil. This presentation describes the algorithm used to create the ASTER fire product and the statistical methods used to compare the ASTER fire map with MODIS fire detection from the INPE and NASA/UMD algorithms. Results indicate that the INPE algorithm is more conservative, finding large hot fires with few false detections; the NASA/UMD product finds many more fires, but also contains more false detections. The difference between the two algorithms appears larger for the detection of "off nadir" fires. This study provides a quantitative assessment of both products in order to guide their proper use by the various user communities.

14.7: Dinâmica das queimadas no Estado do Mato Grosso

Alexandre Camargo Coutinho, Embrapa Monitoramento por Satélite, alex@cnpm.embrapa.br (Apresentador / Presenting)

A busca pela compreensão dos processos condicionantes da incidência e dinâmica das queimadas no Brasil, passa, invariavelmente, por uma avaliação da precisão dos dados produzidos e por um processo de espacialização que permita estabelecer e compreender, de forma organizada, qual a dinâmica imposta por esse fenômeno.

A avaliação da precisão dos dados de queimadas produzidos para o território nacional, mostrou existirem duas fontes de erro principais que são: imprecisão da coordenada geográfica definida e imprecisão na detecção dos focos de calor (Figura 1). Observando os principais tipos de erros encontrados, podemos dizer que existem dois processos que devem ser aperfeiçoados para a redução dessa imprecisão: o sistema de definição das coordenadas e os algoritmos utilizados na identificação dos focos.

Apesar da alta porcentagem de erro encontrada, em função de sua origem e dimensão, foi possível estruturar uma abordagem mais genérica, como a utilização da malha municipal para identificação e caracterização da dinâmica espaço-temporal da ocorrência de queimadas no Estado.

Usando a série temporal de queimadas, detectadas no período de 1995 a 2003, com base em análises estatísticas, descritiva e componentes principais, foi possível identificar cinco grupamentos de municípios com características e dinâmicas distintas. Esses grupamentos são caracterizados por: 4 municípios com dinâmica progressiva acelerada e incidência de queimadas extremamente alta; 24 com dinâmica progressiva moderada e incidência de queimadas alta; 26 com dinâmica "estável" e incidência de queimadas moderada; 31 com dinâmica "estável" e incidência baixa; 54 com dinâmica regressiva fraca e incidência de queimadas muito baixa.

14.8: Passive ground-based analyses for interpreting satellite fire data - Applications to AVHRR and MODIS active fire detections in Amazonia

Manoel Cardoso, Complex Systems Research Center, University of New Hampshire, Durham, NH 03824 United States, manoel.cardoso@unh.edu (Apresentador / Presenting)

George Hurtt, Complex Systems Research Center, University of New Hampshire, Durham, NH 03824 United States, george.hurtt@unh.edu

Berrien Moore III, Complex Systems Research Center, University of New Hampshire, Durham, NH 03824 United States, b.moore@unh.edu

Carlos Afonso Nobre, Centro de Previsão de Tempo e Estudos Climáticos, Rod. Pres. Dutra, Km 40, Cachoeira Paulista, SP 12630-000 Brazil, nobre@cptec.inpe.br

Heather Bain, Complex Systems Research Center, University of New Hampshire, Durham, NH 03824 United States, h_bain03@yahoo.com

Because of their broad spatial and temporal coverage, satellites are very important for providing information on fire activity in Amazonia. A key to the application of these tools for environmental studies is the accurate interpretation of the data they provide. Examples of factors that should be considered include temporal sampling, cloud coverage, fire intensity below detection, and confounding reflective surfaces. To enhance the interpretation of satellite data for this region, we collected ground-based information on fire activity and statistically related them to corresponding satellite-based data. Ground-based data were collected in Para in 2001 and in Mato Grosso in 2002 using a simple and passive method. Corresponding fire data from AVHRR and MODIS were then obtained and related to the ground-based data using error matrixes. Results from these analyses indicate that the total accuracy for both fire products was very high and dominated by accurate non-fire detection. Fire-detection accuracy was lower, and errors of commission were less than errors of omission. Satellite fire products differed in the frequency of omission and commission errors for fires. Omission errors were lower for AVHRR, and commission errors were lower for MODIS. Preliminary attribution studies suggest that sampling time, fire size and land cover are important complicating factors for active fire detection in the region. Results from this study show that passive ground-based analyses can substantially contribute to the interpretation of satellite fire data.

14.9: Remote Sensing Database for the LBA Project

Dalton M. Valeriano, INPE, dalton@ltid.inpe.br (Apresentador / Presenting)

Yosio E. Shimabukuro, INPE, yosio@ltid.inpe.br

Laura Hess, UCSB, lola@icess.ucsb.edu

John Melack, UCSB, melack@lifesci.ucsb.edu

Evlyn Novo, INPE, evlyn@ltid.inpe.br

Claudio F. Barbosa, INPE, claudio@dpi.inpe.br

Egidio Arai, INPE, egidio@ltid.inpe.br

Fernando D. B. Espírito-Santo, INPE, fernando@ltd.inpe.br
Adriana G. Affonso, INPE, affonso@ltd.inpe.br

Due to the extension of the Brazilian Amazon (approximately 5,000,000 km²), as well as remote access, remote sensing data have an important role in characterizing land use/land cover change. Several studies have addressed the problem of land use/land cover change, deforestation, and secondary succession forest mapping in the Brazilian Amazon using high resolution optical remote sensing data. During the last decade, several orbital platforms have provided different sources of information for global studies. Several international and Brazilian led studies focused on the Amazon Basin are: the Global Rain Forest Mapping (GRFM) project that covered the Amazon Basin with L band radar data on two hydrological conditions; the Global Land Cover 2000 (GLC 2000) project that is providing, for the year 2000, a harmonized land cover database over the whole globe, but with some emphasis in areas considered as deforestation hotspots; the Large Scale Biosphere Atmosphere (LBA) experiment in Amazonia that aims to study the role of the Amazon region as part of the Earth system and to evaluate the influence of land-use and climate change in biological, chemical, and physical processes. The purpose of this work is to organize a global remote sensing database for the LBA project. The data to be available in this database are: (1) Moderate Resolution Imaging Spectroradiometer (MODIS) monthly composites, (2) Japanese Earth Remote Sensing Satellite (JERS) mosaics, (3) Shuttle Radar Topography Mission (SRTM), (4) Aerial videography mosaics, etc. It will also include the PRODES deforestation surveys, IBGE Vegetation Map, Floodplain maps. The information in this database will be continuously updated by new sensor images such as the three sensors on CBERS satellite and by new results generated from this dataset.

S21: Sessões Especiais - Impacto de Partículas de Aerossol no Clima da Amazônia (*Impact of Aerosol Particles on the Amazonian Climate*)

15.1: CCN Variability During LBA-SMOCC-EMfiN! 2002 and Its Role on Precipitation Initiation Over the Amazon Basin

Alexandre Araújo Costa, Yale University/Funceme, alexandre.costa@yale.edu (Apresentador / Presenting)
Antonio Charles Silvério, Universidade Estadual do Ceará/Universidade Federal do Ceará, silverio@fisica.ufc.br
Gerson Almeida Paiva, Universidade Estadual do Ceará, gerson@uece.br

One of the main goals of the LBA-SMOCC-EMfiN! 2002 was to collect data to investigate the impact of biomass burning on regional climate during the "dry-to-wet" transition season over the Amazon basin, Brazil. During the field campaign, a large amount of material coming from fires was released in the atmosphere, producing high cloud condensation nuclei (CCN) concentrations. A wide range of instruments was used to characterize the aerosols and the cloud microphysics during the experiment. Preliminary results suggest that many factors may lead to significant changes in the onset of precipitation over the Amazon, including the increase of the CCN concentration due to forest fires, the presence of giant and/or ultragiant particles in the atmosphere and changes in the environmental humidity associated with the large-scale circulation. In case of a moderately polluted environment, as during the transition to the rainy season, observations suggest that giant and ultragiant CCN can, in fact, collaborate with the increase of precipitation efficiency in convective clouds.

15.2: Cloud Condensation Nuclei concentrations in the Amazon Basin

Göran Frank, Max Planck Institute for Chemistry, Mainz, Germany, gfrank@mpch-mainz.mpg.de (Apresentador / Presenting)
Greg Roberts, Centre for Atmospheric Sciences, Scripps Inst. of Oceanography, La Jolla, California, USA, greg@fiji.ucsd.edu
Erik Swietlicki, Dept. of Physics, Lund University, Sweden, erik.swietlicki@pixe.lth.se
Paulo Artaxo, Dept. of Physics, University of Sao Paulo, Sao Paulo, Brazil, artaxo@if.usp.br
Luciana Varanda Rizzo, Dept. of Physics, University of Sao Paulo, Sao Paulo, Brazil, lrizzo@if.usp.br
Pascal Guyon, Max Planck Institute for Chemistry, Mainz, Germany, guyon@mpch-mainz.mpg.de
Olga L. Mayol-Bracero, Institute for Tropical Ecosystem Studies, University of Puerto Rico, San Juan, Puerto Rico, omayol@sunites.upr.cu.edu
Anders Erik Vestin, Dept. of Physics, Lund University, Sweden, anders.vestin@nuclear.lu.se
Jenny Rissler, Dept. of Physics, Lund University, Sweden, jenny.rissler@pixe.lth.se
Jingchuan Zhou, Dept. of Physics, Lund University, Sweden, jingchuan.zhou@pixe.lth.se
Meinrat O. Andreae, Max Planck Institute for Chemistry, Mainz, Germany, andreae@mpch-mainz.mpg.de

Cloud Condensation Nuclei (CCN) concentrations have been measured in the Amazon Basin during the LBA/CLAIRE-1998, LBA/EUSTACH-1999, LBA/CLAIRE-2001 and LBA/SMOCC-2002 projects. Measurements were made at several locations, both at ground-based stations and in aircraft measurements, ranging from background environments to highly polluted biomass burning smoke environments, during different seasons. The CCN measurements in the LBA/CLAIRE-1998 campaign took place during the wet season (March-April 1998) at a ground-based station in the Manaus region. The measurements during the LBA/EUSTACH-1999 took place during two measurement periods, both times at two different locations in the state of Rondonia. The first measurement period was during the transition from the wet-to-dry season, and the second during the transition from the dry-to-wet season. The measurements in the LBA/CLAIRE-2001 campaign took place in the Manaus region July 2001, mainly from an aircraft but also at a ground-based station. Finally, the LBA/SMOCC campaign took place September to November 2002 at a ground-based station in Rondonia, as well as in aircraft measurements over the states of Rondonia, Mato Grosso, Acre and the west of Amazonas.

The results show large variations in CCN concentrations from a few hundred CCN per cm³ in the natural background areas

to several thousands of CCN per cm³ in the hazy smoke layer in biomass burning areas. Also CCN efficiency, expressed as ratios between CCN concentrations and total aerosol particle concentrations, shows large variations. This can to a large extent be explained by varying aerosol size distributions.

15.3: Role of aerosol chemical composition on the formation of cloud condensation nuclei during biomass burning periods

Swen Metzger, Max-Planck Institute for Chemistry, Mainz, Germany, metzger@mpch-mainz.mpg.de (Apresentador / Presenting)

Ivonne Trebs, Max-Planck Institute for Chemistry, Mainz, Germany, ivonne@mpch-mainz.mpg.de

Laurens Ganzeveld, Max-Planck Institute for Chemistry, Mainz, Germany, ganzevl@mpch-mainz.mpg.de

Jos Lelieveld, Max-Planck Institute for Chemistry, Mainz, Germany, lelieveld@mpch-mainz.mpg.de

Philip Stier, Max-Planck Institute for Meteorology, Hamburg, Germany, stier@dkrz.de

Franz X. Meixner, Max-Planck Institute for Chemistry, Mainz, Germany, meixner@mpch-mainz.mpg.de

Meinrat O. Andreae, Max-Planck Institute for Chemistry, Mainz, Germany, andreae@mpch-mainz.mpg.de

Paulo Artaxo, Instituto de Física, Universidade de São Paulo, São Paulo, Brasil, artaxo@fap01.if.usp.br

Amazonian deforestation leads to unique changes in atmospheric gas and aqueous phase chemistry with consequences for gas/aerosol partitioning and cloud formation. Chemical box model studies indicate the importance of organic aerosol compounds for the total cation/anion balance and gas/aerosol partitioning during burning periods. Subsequently, hygroscopic growth of aerosols and cloud formation are affected. To investigate these effects for the Amazonian atmosphere and climate, we apply the Mainz version of the ECHAM5 chemistry climate-model, which includes a modular earth submodel system (MESSy), in which on-line emissions, chemical transformations and deposition of gases and aerosols have been included.

The aerosol scheme includes inorganic and organic secondary aerosols. It consists of a modal aerosol dynamical model (with 7 modes), i.e. M7, coupled to equilibrium simplified gas/aerosol partitioning model (EQSAM), which includes mineral dust components, sea salt and lumped organics in addition to the ammonium-sulfate-nitrate-water system.

15.4: Airborne Measurements of Trace Gases and Aerosol Particles Emission Ratios From Biomass Burning in Amazonia

Pascal Guyon, Max Planck Institute for Chemistry, guyon@mpch-mainz.mpg.de (Apresentador / Presenting)

Göran Frank, Max Planck Institute for Chemistry, gfrank@mpch-mainz.mpg.de

Michael Welling, Max Planck Institute for Chemistry, welling@mpch-mainz.mpg.de

Paulo Artaxo, Universidade de Sao Paulo, artaxo@if.usp.br

Gilberto Nishioka, Universidade de Sao Paulo, nishioka@if.usp.br

Jonathan James Lloyd, Max Planck Institute for Biogeochemistry, jon.lloyd@bgc-jena.mpg.de

Olaf Kolle, Max Planck Institute for Biogeochemistry, olaf.kolle@bgc-jena.mpg.de

Maria Assunção Faus da Silva Dias, Universidade de Sao Paulo, assuncao@cptec.inpe.br

Luciana Vanni Gatti, Universidade de Sao Paulo, lvgatti@net.ipen.br

Ana Maria Leal Cordova, Universidade de Sao Paulo, acordova@intihuasi.inia.cl

Meinrat O. Andreae, Max Planck Institute for Chemistry, andreae@mpch-mainz.mpg.de

The SMOCC (Smoke Aerosols, Clouds, Rainfall and Climate: Aerosols from Biomass Burning Perturb Global and Regional Climate) study investigates the connection between large-scale aerosol emission due to biomass burning in tropical regions and potential climatic implications. As part of this project, tropospheric airborne measurements (between 0 and 5km altitude) of trace gases and aerosol particles were performed over the Amazon basin. The measurement period from September to October 2002 marks the transition period from dry to wet season. We will present results of these measurements with particular emphasis on particle number (CN), cloud condensation nuclei (CCN), CO, and CO₂ concentrations. From these measurements, we have derived emission ratios and emission factors for aerosol particles and trace gases from deforestation and agricultural maintenance fires in southern Amazonia, which are important for determining the effects on the regional scale and on the global scale due to export of longer-lived substances.

15.5: Comments on "Smoking Rain Clouds over the Amazon" by M.O. Andreae, D. Rosenfeld, P. Artaxo, A.A. Costa, G.P. Frank, K.M. Longo and M.A.F. Silva-Dias

Earle Williams, Massachusetts Institute of Technology, earlew@ll.mit.edu (Apresentador / Presenting)

Recently published observations during the dry-to-wet transition season in Rondonia, Brazil, characterized by large-scale subsidence, show evidence that enhanced aerosol concentrations are invigorating moist convection, causing "intense thunderstorms, large hail, and greater likelihood for overshooting cloud tops into the stratosphere". These results are puzzling because they stand in apparent contradiction with earlier findings in the same location in the same meteorological season (Williams et al, 2002). In particular, Williams et al could not discern differences in measured peak total lightning flash rate, daily cloud-to-ground lightning totals, or in the daily lightning yield per unit rainfall on several highly polluted days in October 1999 and several 'clean' days in November 1999.

Unfortunately, Andreae et al (2004) did not explore these parameters for cases they discuss, and their macroscopic evidence (in contrast with their in situ cloud microphysical evidence) for differences in convective vigor is mainly qualitative. Furthermore, extraordinarily intense thunderstorms with stratospheric penetrations were observed in November 1999 with radar by Williams et al (2002) when the aerosol concentrations were also "almost as low as over the

ocean". It has previously been established that the transition season surface air is hotter and hence more unstable (Williams and Stanfill, 2002) than the following wet season, supporting the notion that thermodynamics is playing the primary role in setting the vigor of the convection. A possible factor in these apparent discrepancies is the different degree of control over key observables (aerosol, instability, cloud microphysics, rainfall and lightning) in the two studies, and these aspects will be initially addressed toward resolution of the discrepancy. Andreae et al (2004) also conclude with multiple global implications for their local findings—in particular, "substantial effects on the ...global circulation systems" and "enhancing planetary scale upper-level waves that affect global climate". No quantitative results in this regard are shown. In judging the validity of such claims, it is important to note that the local regime explored in Brazil in both studies is characterized by pronounced subsidence of the Hadley circulation. As a consequence, from the standpoint of total latent heating, the variations in this regime are decidedly minor players in the general circulation. Radical effects of aerosol are therefore needed to have "substantial" global effects. Suggestions are made for transition season rainfall measurements in years with contrasting smoke prevalence (independently measured), toward quantifying these effects.

15.6: Characteristics of the Precipitating Systems during the 2002 Dry-to-Wet Field Campaign in the Amazon Region.

Carlos Augusto Morales, USP, morales@model.iag.usp.br (Apresentador / Presenting)

Luiz Augusto Toledo Machado, CPTEC, machado@cptec.inpe.br

Maria Assução Faus da Silva Dias, CPTEC, assuncao@cptec.inpe.br

Wando Amorim, USP, amorim@model.iag.usp.br

Maria E. Frediani, USP, frediani@model.iag.usp.br

Rachel Albrech, USP, rachel@master.iag.usp.br

This paper will present the main characteristics of the raining systems observed during the 2002 Dry-to-Wet field campaign in the Amazon region. This experiment was set during the pre-wet season in order to understand the transition between the dry to wet raining season and the impact of the aerosols produced by forest burning in the development of clouds. Weather radar, rain gauges, and lightning measurements are used to depict the main precipitation characteristics observed during this field campaign. Preliminary results indicate that Mesoscale Convective Systems (MCS) that propagated over the radar area are responsible for most of the total rain volume and lightning observations. Additionally, a persistent convective diurnal cycle was observed with local convection, and these convective clouds have raining cloud tops ranging from 12 to 18 km top. Some of these raining clouds presented lightning observation. Therefore, this study will try also to investigate the main differences observed during the formation of thunderstorms.

15.7: Airborne and Ground Based Measurement of the Vertical Structure of Cloud Properties

J. Vanderlei Martins, JCET/UMBC - NASA GSFC and IFUSP, martins@climate.gsfc.nasa.gov (Apresentador / Presenting)

Yoram J. Kaufman, NASA GSFC, kaufman@climate.gsfc.nasa.gov

Paulo Artaxo, USP, artaxo@if.usp.br

Lorraine A. Remer, NASA GSFC, remer@climate.gsfc.nasa.gov

Daniel Rosenfeld, The Hebrew University of Jerusalem, daniel@vms.huji.ac.il

Ilan Koren, NRC-NASA GSFC, ilank@atmos.gsfc.nasa.gov

A new technique for measuring the microphysical properties of cloud droplets was applied by the first time during the SMOCC experiment in Amazonia. A scanning spectrometer system covering wavelengths from 350 to 2500nm was used onboard the INPE Bandeirante aircraft, in parallel with in situ measurement of aerosol microphysical and chemical properties. The system was used to scan clouds from their illuminated side providing profile information of the cloud spectral reflectance. The spectral reflectance is later converted to cloud thermodynamic and microphysical properties. The simplest product of this data is the vertical separation between water and ice droplets. The difference in refractive indices of water and ice in this spectral range is enough for a very significant separation between both phases. A more complex inversion was also applied to the spectral reflectance data in order to provide measurements of the cloud droplet size. Estimates of the droplet size as a function of the cloud vertical structure shows important characteristics of the growing mechanism of the droplets. This vertical structure can be readily associated with the effect of aerosols particles on cloud droplets and precipitation processes. Results from aircraft measurements during the SMOCC campaign in Amazonia and ground based measurements from Mount Evans in Colorado, US, will be discussed and compared.

15.8: O contexto "Green Ocean" visto através da distribuição de gotículas de nuvem e sua representatividade por uma função gama generalizada.

Jorge A. Martins, USP, CEFET-PR, jmartins@model.iag.usp.br (Apresentador / Presenting)

Fábio L. T. Gonçalves, USP, fgoncalv@model.iag.usp.br

Maria Assução Faus da Silva Dias, USP, CPTEC/INPE, assuncao@cptec.inpe.br

Este trabalho tem por objetivo avaliar a eficiência dos parâmetros associados a uma função gama generalizada em representar a distribuição de gotículas de nuvens. A função gama tem sido amplamente usada em trabalhos de modelagem de processos de nuvens, em particular, é parte da parametrização de nuvens presente no modelo RAMS. Os dados utilizados nessa avaliação foram obtidos durante o experimento LBA-SMOCC/2002, enfocando a transição entre as estações seca e úmida e o contraste entre as condições de atmosfera poluída e limpa. A partir das medidas das propriedades associadas às distribuições de gotículas de nuvem, distribuições gamas foram construídas com base em parâmetros de forma, assumidos como números inteiros no intervalo de 1 a 20. O parâmetro representativo da medida foi escolhido com base no melhor ajuste encontrado. Como critério de melhor ajuste foi assumido o coeficiente de correlação obtido entre os valores das medidas e da função gama, calculada para as mesmas classes de tamanho. Os resultados

mostram que parâmetros de forma menores (entre 1 e 4), representativos de distribuições mais largas, são predominantes em condições de atmosfera limpa, enquanto que parâmetros maiores (entre 4 e 7), representativos de distribuições mais estreitas, são predominantes em condições de atmosfera poluída. Os espectros de gotículas, representados pela função gama, mostraram alto grau de coerência com o padrão observado para as medidas. Distribuições representativas de ambiente limpo e de cobertura florestal preservada apontam para diâmetros médios maiores, baixas concentrações, formas mais largas e maior crescimento no tamanho com a altura. Por outro lado, distribuições associadas com ambientes sob intensa queima de biomassa apontam para o lado oposto, apresentando diâmetros médios menores, altas concentrações, formas mais estreitas e menor taxa de crescimento no diâmetro com a altura. Os resultados indicam tendências muito parecidas com o conhecido contraste existente entre nuvens marítimas e continentais, que difere por completo o padrão da estrutura de nuvens que predomina sobre os oceanos e continentes. Nesse contexto, os resultados são fortes indicativos de um padrão de comportamento muito semelhante entre oceano e floresta, reforçando a hipótese do "Green Ocean".

15.9: Global Simulation of the Indirect Aerosol Effect With the ECHAM5 GCM

P Stier, Max Planck Institute for Meteorology, Hamburg, Germany, stier@dkrz.de (Apresentador / Presenting)

J Feichter, Max Planck Institute for Meteorology, Hamburg, Germany

S Kinne, Max Planck Institute for Meteorology, Hamburg, Germany

U Lohmann, Dalhousie University, Halifax, Canada

J Zhang, Dalhousie University, Halifax, Canada

The interaction of aerosols and clouds plays an important role for the global aerosol distribution as well as for the cloud distribution and cloud microphysical properties. Changes in cloud distribution and cloud optical-properties in turn affect the global radiation balance. However, the magnitude of these effects remains highly uncertain.

Up to now, most studies of the aerosol-cloud interaction focus either on detailed process modelling on limited spatial and temporal scales or, as most global modelling studies, utilize empirical relations as they do not predict the necessary parameters for process based parameterizations. The new Hamburg (HAM) aerosol model of the ECHAM5 GCM predicts the size distribution, composition, and mixing state of the major global aerosol compounds. The standard cloud scheme of ECHAM5 has been extended by a prognostic treatment of the number concentrations of cloud droplets and ice crystals. This setup allows for a process-based treatment of the aerosol-cloud interaction for long-term simulations on a global scale. We simulate the activation process and the in- and below-cloud aerosol / hydrometeor collision from the simulated aerosol size-distribution and aerosol composition and the hydrometeor size-distribution. Resulting aerosol and cloud fields are evaluated utilizing in-situ and remote sensing measurements from the LBA experiment.

15.10: Biomass burning and implications for the pattern of nitrogen deposition in the Amazon Basin

Luciene Lorandi Lara, CENA/USP, luciene@cena.usp.br (Apresentador / Presenting)

Paulo Artaxo, IF/USP, artaxo@if.usp.br

Elisabeth A. Holland, ACD/NCAR, eholland@ucar.edu

Theotônio Pauliquevis, IF/USP, theo@if.usp.br

Nitrogen deposition has been measured at Fazenda Nossa Senhora in Rondonia during the SMOCC campaign (Smoke aerosols, clouds, rainfall and climate-aerosols from biomass burning perturb global and regional climate) from September 2002 through November 2002, and in Balbina from March, 2000 through December, 2001. Analysis of NO₃⁻, NH₄⁺ and NO₂⁻ were performed by ion chromatography in rainwater samples collected by event in a wet only sampler in these two distinct sites.

In the Amazon region, land use changes have produced a 2 fold increase in nitrogen deposition. This increase is linked to biomass burning emissions, which also drive a shift in the composition of nitrogen deposition from nitrate to an ammonium dominated nitrogen deposition budget. In Balbina, a region that could be considered a pristine area, the annual nitrogen wet deposition is 2.9 kg.N.ha⁻¹.yr⁻¹ and dominated by nitrate. However, in Rondonia which is one of the best examples of how fast Amazonian ecosystems are undergoing anthropogenic changes, the nitrogen wet deposition rate of 5.7 kg.N.ha⁻¹.yr⁻¹ is dominated by ammonium and similar to values found in very industrialized regions. The strong positive correlation of nitrogen wet deposition and the number of hot pixels found in Rondonia shows clearly that the changes in the nitrogen deposition pattern are linked to biomass burning emissions and consequently to land-use changes.

Plenária V

(Plenary V)

16.1: Entendendo a Hidrologia de Superfície da Amazônia: Uma Visão Biogeoquímica (*Understanding the Surface Hydrology of Amazônia: A Biogeochemical View*)

Reynaldo Victória, CENA, reyna@cena.usp.br (Apresentador / Presenting)

Besides being the largest evaporative basin in the planet, Amazônia also holds one of the largest diversity in plants, animals, and aquatic environments. The latter is largely composed of fresh waters, although saline environments may be found in the eastern part of the basin, where it meets the Atlantic Ocean. The largest volume of fresh water are associated with the rivers, followed by the floodplain lakes, which are of crucial importance for fisheries. The rivers may vary from the mighty Amazon to tiny streams ("igarapés"). Depending on its geographical position and the type of soil they are draining, rivers in Amazônia may have different colors and chemical composition. The white water rivers, with headwaters in the Andes or sub-andean regions, are rich in suspended solids, with a "milk and coffee" colour, and pH close to neutrality. The black-water rivers generally drain podzolic soils from the cristaline shield; they are poor in suspended solids, rich in humic and fulvic acids, with an acid pH. The clear water rivers originates in the cristaline shield or the sedimentary highland terrain; they generally have a variable chemical composition, ranging from rich to very poor, depending on the terrain they are draining; they carry virtually no suspended solids.

For millions of years, the Amazonian rivers remained untouched by humans. However, over the last decades, human activities have started to affect the structure and functioning of the Amazonian rivers, especially the small streams and rivers. It is widely known the problem of mercury contamination of waters and biota resulting from gold mining. Another emerging problem is the effect of land use changes in the biogeochemistry of rivers. The population in the region has increased manifolds, and are specially concentrated in relatively large urban centers. As a consequence, untreated domestic sewage are being directly dumped to rivers, drastically altering the structure and functioning of some of them. The objective of this talk is, therefore, to show how the several water focused LBA projects are studying the relationship between anthropogenic actions and the structure and functioning of Amazonian rivers, at different scales.

16.2: Degradação de Pastagem, Desenvolvimento da Floresta Secundária, e Produtividade da Floresta Madura: Os Nutrientes são Importantes? (*Pasture Degradation, Secondary Forest Regrowth, and Mature Forest Productivity: Do Nutrients Matter?*)

Eric A Davidson, The Woods Hole Research Center, edavidson@whrc.org (Apresentador / Presenting)

Nutrient management is common in agronomy and forestry worldwide, but variation in the productivity of mature forests, secondary forests, and cattle pastures has not been clearly linked to nutrient availability in Amazonia. Like other parts of the world, the soils and land use histories of the Amazon Basin are diverse. Lowland soils are highly weathered, lending suspicion of phosphorus limitation. Where frequent burning for site clearing and weed management has occurred, N limitation could be provoked. Base saturation and cation exchange conform to local and regional variation in parent material and generally increase with proximity to the Andes. What is the significance of this variation for forest and agricultural productivity? Part of the answer lies in the time scales over which the plants demand and sequester nutrients. Row-crop agriculture creates intensive demands for nutrients each year, with a large fraction removed as harvest products. Cattle pasture grasses also demand nutrients annually, but the harvest exports are smaller and nutrients accumulate in plant biomass and necromass over years to decades. The biomass of secondary and mature forests accumulates nutrient stocks over decades and centuries. The stocks of nutrients in the soils, litter layers, and biomass of Amazonian ecosystems and the kinetics of their turnover must be compared with these temporal scales of plant demands and sinks. Here I present an approach to understanding rates of Amazonian pasture degradation and forest regrowth based on the kinetics of mineralization of soil stocks of nitrogen and phosphorus.

16.3: Aproveitando a Biogeoquímica e o Conhecimento Tradicional para a Regeneração de áreas desmatadas e degradadas na Amazônia (*Harnessing Biogeochemistry and Traditional Knowledge For Regenerating Deforested and Degraded Lands in the Amazon*)

Erick C. M. Fernandes, The World Bank, efernandes@worldbank.org (Apresentador / Presenting)

Over 4,000 years ago, native Amazonians developed cropping systems based on native species to meet their food, wood, health, and cultural needs. The management of these systems required knowledge of the spatial and temporal (seasonal and annual) variability of the resource base. Long-lived perennial components and intra- and inter-system diversity across space and time were key to surviving environmental and other shocks. Colonization of the Amazon 400 years ago led to the progressive introductions of monoculture cropping of introduced annuals, pasture grasses, and tree crops with a heavy reliance on the unsustainable mining of the nutrient base in the soils and forest vegetation. Over the last 40 years, there has been a significant increase in settlements, unsustainable logging, and poorly managed pastures with a concomitant increase in land degradation. Advances in biogeochemical knowledge and modern plant breeding have resulted in increasingly intensive, high input monocropping systems (rice, corn, soybean, Brachiaria pasture, cotton, oil palm) to supply local and international markets. Some researchers and farmers have also attempted to use these systems to

rehabilitate degraded lands. The large-scale, land cover and land use changes are now impacting local and regional biogeochemical cycles, agroecosystem productivity, native biodiversity, and the livelihood of local populations.

This paper will draw upon LBA and other regional datasets on carbon, nutrient, and water dynamics to demonstrate how deforested and degraded lands in the Amazon can be regenerated with science-based agroforestry analogs of the ancient Amazonian polycultures for food, fibers, and ecosystem services. In the last 4 years and despite the Kyoto protocol, the increasing private trade of carbon and biodiversity commodities make these systems suitable not only for stabilizing forest frontiers far removed from markets, but also for rehabilitating the riparian zones and degraded forest reserves of large farms and cattle ranches.

Plenária VI

(Plenary VI)

17.1: Como as Descobertas do LBA podem ser Úteis para a Agricultura na Amazônia? (*How can LBA Achievements be Useful to Agriculture in Amazônia?*)

Tatiana Deane de Abreu Sá, Embrapa Amazônia Oriental, Tv. Enéas Pinheiro S/N, 66095-100, Belém, PA, Brasil,,
tatiana@cpatu.embrapa.br (Apresentador / Presenting)

Although relatively few studies undertaken by LBA are directly related to agriculture (considered in a broad sense, including agriculture, livestock and forestry), a large proportion of the results achieved by this project is prone to be used in many senses and scales towards sustainable agriculture. Considering that agriculture is the most important driving force promoting land cover change in Amazonia, most of the LBA studies on biophysical and biogeochemical impacts of that change are potential information sources to support strategic and tactical actions associated with agriculture. Nevertheless, little effort has been pursued to integrate LBA results into an agricultural approach. An attempt is made *to translate* into an agricultural perspective results of studies covering issues associated to the LBA science themes, *i.e.* Physical Climate, Carbon Storage and Exchange, Biogeochemistry, Land Surface Hydrology and Water Chemistry, and Land Use and Land Cover. An effort to transform the information generated by LBA into environmental decisions is urgently needed considering that one goal of decision-making and planning institutions associated to agriculture ultimately desire to contribute to the reduction of deforestation and land degradation in Amazonia. A good example is the potential contribution of results generated by LBA on carbon balance components in different ecosystems and land uses to PROAMBIENTE, the recently created Brazilian governmental program oriented to the socio-environmental development of family agriculture in Amazonia. Ultimately, as LBA already exhibits outstanding records in training & education in areas related to agriculture, this may also be considered as a very important and sustainable contribution of LBA to agriculture in Amazonia.

17.2: Sensoriamento Remoto do Corte Seletivo de Madeira: Desafios, Sucessos e o Futuro (*Remote Sensing of Selective Logging: Challenges, Successes, and the Future*)

Gregory Paul Asner, Carnegie Institution, gpa@stanford.edu (Apresentador / Presenting)
Carlos Moreira de Souza Jr., IMAZON and the University of California, carlos@geog.ucsb.edu

Selective logging is one of the most difficult forms of land-cover change to detect with remote sensing. Variation in the biophysical attributes of selective logging challenge traditional methods. LBA has supported the development of improved remote sensing approaches for detecting the location of selective logging, for quantifying forest canopy damage associated with timber harvest, and for monitoring rates of forest canopy closure following disturbance. Different methods have now been compared, and the strengths and weaknesses have been documented. In addition, remotely observed changes in forest canopy cover following timber harvest are now being linked to a range of ecological and biogeochemical processes in the field. This presentation will provide a detailed summary of the overall progress towards understanding how selective logging affects Amazonian forest ecosystems at the regional scale.

17.3: Uma Análise Integrada da Ecologia, Uso da Terra e Dinâmica da Cobertura Florestal na Amazônia Oriental (*An Integrated Analysis of Ecology and Land Use and Land Cover Dynamics in Eastern Amazônia*)

Ima Célia Guimarães Vieira, Museu Paraense Emílio Goeldi, ima@museu-goeldi.br (Apresentador / Presenting)

Land use analysis is central to our understanding of the role that deforestation processes play in the terrestrial biosphere as a source and sink of atmospheric CO₂, and it also helps us to advance towards modeling the links between terrestrial and atmospheric processes and to predict scenarios and support policies. By looking at long and short-term rates of change and its spatial distribution, land use analysis provides a way to discriminate the role of different variables and their importance at different scales. Our approach to land use and cover change analysis combines studies from LBA and GEOMA (a Brazilian research network) initiatives. These use different approaches depending on the question, scale and levels of interest, and availability of data. Some of our results from LBA, contrary to previous expectations, show that landscapes which were colonized and initially deforested several decades ago display a fast dynamic change of land use and land cover that influences biodiversity and C dynamics and that induces initiatives to develop ways to explore better the remaining natural resources. From GEOMA we have preliminary results showing a rapid deforestation process in a new recent frontier in Para state associated with slavery and illegal activities. The understanding of all these aspects in each of these distinctive patterns may contribute to the development of strong public policies leading toward sustainable development of new and old frontiers in the Brazilian Amazonia.

Sessões Paralelas III

(Parallel Sessions III)

RH1: Pesquisas em Destaque - Física do Clima e Química da Atmosfera *(Research Highlights: Physical Climate and Atmospheric Chemistry)*

18.1: Hydroelectric Dams in Amazônia as Contributors to Global Warming: The Controversy Heats Up

Philip M. Fearnside, INPA, pmfearn@inpa.gov.br (Apresentador / Presenting)

Hydroelectric dams in Amazonia emit six times more greenhouse gases as gross recurrent (i.e., inventory) emissions than Brazil's official estimates currently admit. This is because the official estimates only count emissions from the reservoir surface, not from the turbines and spillways. Gross recurrent emissions in 1990 (the worldwide baseline year for national emissions inventories under the climate convention) totaled 8 million tons of CO₂-equivalent carbon if calculated using the global warming potential for methane adopted by the Kyoto Protocol. This is approximately equal to the fossil fuel used by the city of São Paulo. The impact is dominated by Tucuruí (75% of the total), followed by Balbina (18%), Samuel (5%) and Curuá-Una (2%). Emissions from the turbines and spillways are especially important at Tucuruí, while surface emissions are more important at Balbina.

The impact of hydroelectric dams on global warming includes factors in addition to those falling under this category in the national emissions inventories mandated by the climate convention. Most important is CO₂ emission from aerobic decay of dead trees projecting above the water (especially at Balbina). This is considered a form of deforestation and, because the reservoirs were filled before 1990, is not counted in inventory's net committed emissions accounting for deforestation in the baseline period (1990-1994 in the case of Brazil). The net impact of dams on global warming includes downward adjustments for pre-dam ecosystem fluxes and for fossil-fuel emissions displaced by the dam's electrical output. A full-chain energy analysis (not attempted here) would include additional impact from cement, steel and fossil fuel used in dam construction. Net impact decreases with reservoir age but stabilizes after about 10 years; in 1990 Tucuruí was 6 years old, Balbina 3 years, Samuel 2 years and Curuá-Una 13 years. Analyses of Samuel and Curuá-Una indicate stabilization at emission levels substantially higher than those for fossil-fuel generation. In 1990 the net impact of all four "large" (> 10 MW) dams was at least double the impact of generating the same power from oil, and taken together they emitted four times more than the fossil fuel they displaced.

18.2: Mesoclimate of the LBA-ECO Santarém Study Area

David Roy Fitzjarrald, Jungle Research Group, ASRC, UAlbany, SUNY, fitz@asrc.cestm.albany.edu (Apresentador / Presenting)

Ricardo Kendi Sakai, Jungle Research Group, ASRC, UAlbany, SUNY, sakai@asrc.cestm.albany.edu

Oswaldo Luiz Leal de Moraes, Dept. de Física, Universidade Federal de Santa Maria, RS, moraes@mail1.ufsm.br

Matthew J. Czirkowsky, Jungle Research Group, ASRC, UAlbany, SUNY, matt@asrc.cestm.albany.edu

Acedo Otavio C., Dept. de Física, Universidade Federal de Santa Maria, RS, otavio@smail.ufsm.br

Raimundo Cosme de Oliveira Jr., Embrapa Amazônia Oriental, cosme@cpatu.embrapa.br

Characteristics of the LBA Santarém study area might introduce a bias in the ecosystem productivity estimates. In the Santarém study areas, the tall flux towers, for example, are located in a thin area of forest sandwiched between cleared lands and near to large rivers that are known to influence cloudiness and alter winds in their proximity. The mesoclimate of the region must be understood before results regarding net forest carbon uptake can be generalized.

To understand radiation, rainfall and temperature anomalies led to the development of a network of eight surface weather stations. Each station was upgraded by CD-03 to include a GPS receiver that keeps track of time, a barometer, and soil temperature and moisture sensors. Meteorological measurements made at the three flux towers complete the network. Results for the first six years of data will be discussed. We find that that temperature and precipitation are higher and wind speed is lower during the LBA-ECO years compared to the recent past. The daily averaged wind speed at Santarém correlates well with the observed Belém-Santarém surface pressure difference. From composite data we deduce the river breeze pressure gradient forcing, identify double diurnal peaks in precipitation and specific humidity, and discuss recent interannual variability. The precipitation peak in the early morning hours is consistent with previous studies of propagating squall line circulations from the Atlantic coast. Nocturnal flows following local topographic gradients are seen, including the terral along the Tapajós River identified by Bates in 1864.

18.3: Observations and Simulations of the Water and Energy balances in the Amazon Basin

José A. Marengo, CPTEC/INPE, marengo@cptec.inpe.br (Apresentador / Presenting)

Carlos Afonso Nobre, CPTEC/INPE, nobre@cptec.inpe.br

Helio Camargo, CPTEC/INPE, helio@cptec.inpe.br
Candido Luiz, CPTEC/INPE, lcandido@cptec.inpe.br
Castro A Christopher, CPTEC/INPE, castro@cptec.inpe.br

Observations and Simulations of the Water and Energy balances in the Amazon Basin

We study the water and energy budgets in the Amazon basin, using observations from thye different LBA reference sites, and the NCEP reanalysis to estimate the components of the water and energy balances, in terms of seasonal and interannual variability. In addition, simulations of these budgets are analyzed using the results of a 50 years climatology of the CPTEC COLA GCM, in order to estimate the balance components and to investigate the systematic errors in the simulation of these balances.

One important issue is the analysis of uncertainties in the estimates of the water balance in the Amazon basin and its northern and southern basis. In addition, the closure of the water balance is to be investigated.

18.4: Hydroclimatological Teleconnections due to land-cover change in Amazonia

Roni Avissar, Duke University, avissar@duke.edu (Apresentador / Presenting)
David Werth, Duke University, werth@duke.edu

Past studies have indicated that deforestation of the Amazon basin would result in an important rainfall decrease in that region, but that this process had no significant impact on the global temperature or precipitation and had only local implications. Here we show through numerical simulations that deforestation of tropical regions significantly affects precipitation, both positively and negatively, at mid and high latitudes through hydroclimatological teleconnections. In particular, we find that the deforestation of the Amazon basin and Central Africa severely reduces rainfall in the US Midwest during the spring and summer seasons, when water is crucial for agricultural productivity in that region. On the other hand, the elimination of any tropical forests considerably enhances summer rainfall in the Arabian Peninsula.

18.5: Comparisons of the Amazon and Congo River Basins: Hydrology, Fire, Thermodynamics and Lightning

Earle Williams, Massachusetts Institute of Technology, earlew@ll.mit.edu (Apresentador / Presenting)
Gabriella Satori, Geodetic and Geophysical Institute, Hungarian Academy of Sciences,, Sopron, Hungary,, satori@ggki.hu

The Amazon and Congo River basins are largely covered with tropical rainforest at similar geographical latitudes, and on this basis are expected to respond nearly identically to sunlight. Yet optical observations of lightning from space now underway for several years with the NASA Optical Transient Detector and Lightning Imaging Sensor have established a predominance of lightning flash density (flashes/km²/yr) for the Congo, larger by a factor of 2.8 than that in the Amazon. Considerations are given to differences in rainforest canopy properties, hydrology, aerosol and thermodynamics to account for this substantial contrast. Surface station observations are organized to compare the mean basin elevation, the potential temperature, the relative humidity, the diurnal temperature range, the number of sunshine hours, the leaf area index and the number of aerosol-producing fires. It is concluded that the Congo is more continental than the Amazon, primarily because of its more elevated terrain, and its slightly hotter and drier surface conditions. These thermodynamic conditions promote stronger updrafts in cumulonimbus convection in the Congo, which in turn amplify the electrification process responsible for lightning.

18.6: The relationship between biomass burning aerosols, cloud condensation nuclei and cloud structure in Amazonia

Paulo Artaxo, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, artaxo@if.usp.br (Apresentador / Presenting)
Meinrat O. Andreae, Max Planck Institute for Chemistry, Mainz, Germany, andreae@mpch-mainz.mpg.de
Daniel Rosenfeld, Institute of Earth Sciences, The Hebrew University of Jerusalem, Jerusalem 91904 Israel, daniel@vms.huji.ac.il
Göran Frank, Max Planck Institute for Chemistry, Mainz, Germany, gfrank@mpch-mainz.mpg.de
Pascal Guyon, Max Planck Institute for Chemistry, Mainz, Germany, guyon@mpch-mainz.mpg.de
Luciana Varanda Rizzo, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, lrizzo@if.usp.br
Theotônio Pauliquevis, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, theo@if.usp.br
Maria Assunção Faus da Silva Dias, Instituto Nacional de Pesquisas Espaciais, INPE/CPTEC, Cachoeira Paulista, São Paulo, Brazil., assuncao@cptec.inpe.br

During the SMOCC (Smoke, clouds and aerosols perturbing the Amazonian climate) experiment in August-November 2002, aerosols and CCN measurements were made in Rondonia, Acre and Amazonas states. Aerosol light scattering, absorption and total aerosol particle number (CPC) were measured using the INPE Bandeirante plane. Cloud condensation nuclei (CCN) were measured using a static gradient chamber instrument. Very large aerosol concentrations were observed, with a high proportion of organic aerosols. A large range of values for the CCN efficiency was measured, ranging from 30 to 70%. Several vertical profiles were done at the Fazenda Nossa Senhora in Rondonia, and the airborne measurements were compared with detailed ground based determinations. Lidar vertical profiles indicates cloud formation suppression due to the very high aerosol loading, in agreement with recent remote sensing measurements, as well as with in-situ airborne

measurements.

18.7: Trace Gases Concentrations during Dry and Wet Seasons in the Amazon Basin

Luciana Vanni Gatti, IPEN - Laboratorio de Quimica Atmosferica, lvgatti@net.ipen.br (Apresentador / Presenting)

Ana Maria Leal Cordova, IPEN - Laboratorio de Quimica Atmosferica, acordova@intihuasi.inia.cl

Amelia Yamazaki, IPEN - Laboratorio de Quimica Atmosferica, amelia@net.ipen.br

Angelica Pretto, IPEN - Laboratorio de Quimica Atmosferica, apretto@net.ipen.br

James William Munger, Harvard University, Division of Engineering and Applied Sciences, jwm@io.harvard.edu

Paulo Artaxo, Instituto de Fisica da USP, artaxo@if.usp.br

Carlos Augusto Bauer Aquino, Univ. Luterana do Brasil - Ji-Paraná (ULBRA), paquino@brturbo.com

Lizia Murbach, Univ. Luterana do Brasil - Ji-Paraná (ULBRA), lizia19@ig.com.br

Williams Castro Martins, UFPA - Santarem, williamsmartins@hotmail.com

Meinrat O. Andreae, Max Planck Institute for Chemistry, Biogeochemistry Dept, andreae@mpch-mainz.mpg.de

Franz Meixner, Max Planck Institute for Chemistry, Biogeochemistry Dept, meixner@mpch-mainz.mpg.de

Duli Chand, Max Planck Institute for Chemistry, Biogeochemistry Dept, duli@mpch-mainz.mpg.de

Ivonne Trebs, Max Planck Institute for Chemistry, Biogeochemistry Dept, ivonne@mpch-mainz.mpg.de

Several intensive experiments were performed from 1999 to 2002 in different regions of Amazonia, such as Ouro Preto do Oeste (pasture site - Rondonia), Balbina (forest site at 180 km north of Manaus), and Floresta Nacional (FLONA) do Tapajós (Pará).

During the wet season in Amazônia, the ozone concentration at mid-day (solar radiation maximum) is very similar for the 3 sites studied. The average ozone concentration is between 12 - 14 ppb. At nighttime, we observed significant differences in ozone concentrations for the different sites. At the FLONA Tapajós, the nighttime concentration is similar to diurnal values, with a very high 9 to 11 ppb average. The high ozone concentration during nighttime can be explained by vertical transport of ozone rich air masses, which occurs frequently during the wet season. With higher O₃, the soil NO will have a shorter lifetime and more of it may be converted to NO₂ and recycled in the canopy instead of escaping to the free atmosphere.

During the dry season, typical daytime ozone concentrations were 25-50 ppb, depending on the concentration of biomass burning trace gas precursors. At nighttime, the ozone average concentration was similar for the several sites, at around 12 ppb. Rondônia is the site with the highest observed ozone concentration. here, the average was 50 ppb, compared to 25 ppb at the FLONA Tapajós where the biomass burning impact is lower.

Similarly to O₃, the NO_x concentrations differ significantly between wet and dry seasons, due to high biomass burning emissions. The average concentration for the wet season for NO was 0.23 ppb and NO₂ was 0.69 ppb, while for the dry season NO averaged at a low 0.04 ppb and NO₂ at 2.73 ppb.

Typical levels of CO in the Amazon basin during the wet season were 100 - 150 ppb. In Rondonia, the highest values were observed because of the strong anthropogenic impact on this region, while at FLONA Tapajós the CO average concentration was less than 100 ppb. During the dry season in Rondônia, the observed nighttime average was around 1000-1200 ppb, while during daytime we observed an average of 600 ppb. At FLONA Tapajós, during the nighttime CO was measured at 500 ppb during the peak of the burning season (Oct-Dec) and 200 ppb during the dry season, in the absence of significant biomass burning. At the FLONA Tapajós, a typical daytime average was around 200 ppb, with values similar for both dry and wet seasons.

Research project financed by CNPq and FAPESP.

18.8: Impact of Amazonian deforestation on the oxidizing capacity of the atmosphere

Laurens Ganzeveld, Max-Planck Institute for Chemistry, Mainz, Germany, ganzevl@mpch-mainz.mpg.de (Apresentador / Presenting)

Lex Bouwman, RIVM, Bilthoven, Netherlands, lex.bouwman@rivm.nl

Bas Eickhout, RIVM, Bilthoven, Netherlands, bas.eickhout@rivm.nl

Patrick Joeckel, Max-Planck Institute for Chemistry, Mainz, Germany, joeckel@mpch-mainz.mpg.de

Jos Lelieveld, Max-Planck Institute for Chemistry, Mainz, Germany, lelieveld@mpch-mainz.mpg.de

Swen Metzger, Max-Planck Institute for Chemistry, Mainz, Germany, metzger@mpch-mainz.mpg.de

Rolf Sander, Max-Planck Institute for Chemistry, Mainz, Germany, sander@mpch-mainz.mpg.de

Meryem Tanarhte, Max-Planck Institute for Chemistry, Mainz, Germany, tanarthe@mpch-mainz.mpg.de

The chemistry and climate model ECHAM explicitly simulates surface trace gas exchanges, interactively calculated with representations of dynamical and physical processes and land cover and land use properties. Analysis with a Single-Column Model (SCM) version of ECHAM has indicated that short-term (days) changes in the atmospheric oxidizing capacity due to Amazonian deforestation not only depend on changes in surface trace gas exchanges but in particular also on changes in vertical transport and cloud formation. The latter are strongly linked to the hydrological cycle in which soil moisture and surface energy partitioning play a crucial role.

We apply the global chemistry-climate model ECHAM5/MESy to extend the analysis of the Amazonian deforestation to the long-term (> 1 year), regional and global scale impact of Amazonian deforestation. In addition to long-term changes in surface exchanges, we studied the role of soil moisture, which responds on timescales > months, related to changes in the evapotranspiration, cloud formation and precipitation. Furthermore we assess the impact of land conversion-induced changes in the oxidizing capacity of the atmosphere due to changes in advective transport.

18.9: Testing interactions between radiation, carbon and water cycles using the LBA data

Yongkang Xue, University of California, Los Angeles, USA, yxue@geog.ucla.edu (Apresentador / Presenting)

Fernando Henrique De Sales, University of California, Los Angeles, USA, fsales@ucla.edu

Jim Collatz, NASA, jcollatz@biome.gsfc.nasa.gov

Xiwu Zhan, University of Maryland, Baltimore, xzhan@hsb.gsfc.nasa.gov

The interactions between radiation, water, and carbon are a crucial component in determining terrestrial carbon and water fluxes. In this paper, we will present evidence to demonstrate the close relationship between these processes in an integrated climate system using the Simplified Simple Biosphere Model. We tested this enhanced SSiB using observational data from LBA and Boreal sites. The initial results indicated that the model in general produced a higher than normal rate of photosynthesis which led to an overly large transpiration. We examined model performance and found that this was mainly caused by failing to recognize the effect of diffuse radiation and by not considering the sunlit and shaded leaf areas. Furthermore, only direct radiation effect was included in the scaling equation, which was adapted from SiB2. Diffuse radiation, which arises from atmospheric scattering and from scattering within the canopy, has been shown to have a crucial role in the photosynthetic process. Therefore, we developed a new physically and biologically based parameterization for shading and scaling to more realistically simulate the land/atmosphere interaction processes. The scaling method considers the effects of both direct and diffuse radiations. We have tested the new method using the observational data from the LBA experiment (2000). This new method substantially improved the simulations of daily mean carbon and water fluxes and their diurnal variations, especially in the tropical area. For example, the root-mean-square (RMS) error for the latent heat flux and the carbon flux are reduced from 15.1 W m⁻² and 2.9 mmol m⁻² s⁻¹, to 45.4 W m⁻² and 12.7 mmol m⁻² s⁻¹, respectively. Experiments are also conducted to comprehensively test the effects of soil moisture and clouds in estimating the variability of carbon and water fluxes.

S2: Sessões Especiais - Uma Década de Progresso na Modelagem de Produtividade de Ciclagem de Carbono e Hidrologia de Superfície na Bacia Amazônica. *(A Decade of Progress in Modeling Productivity, Carbon Cycling and Surface Hydrology Across the Amazon Basin)*

19.1: A Decade of Progress in Modeling the Hydroclimatology of the Amazon System

Marcos Heil Costa, UFV, mhcosta@ufv.br (Apresentador / Presenting)

In the last 10 years, we have seen a substantial progress in modeling both the atmospheric and surface components of the hydrological cycle of the Amazon system. The few studies published by 1994 can today be considered as initial studies that explored new research possibilities. Since then, these studies became increasingly sophisticated, addressing old and new questions and paying much more attention to details than before. In the past decade, progress has been related not only to more sophisticated models and increased model resolution, but also to better parameterizations used in the models - provided by field experiments like ABRACOS, HIBAM and LBA - as well as new remote sensing products that are used to either drive model simulations or validate model results. We review the historical perspectives of modeling the hydroclimatology of the Amazon system, discuss some of the ongoing research and proposed future questions that still need to be addressed.

19.2: Recent Progress in Modeling Biome-Climate Interactions in Amazonia

Carlos Afonso Nobre, CPTEC-INPE, nobre@cptec.inpe.br (Apresentador / Presenting)

Vegetation and climate present bidirectional interactions in many time scales from seasons to decades, centuries, and longer. In Amazonia, it is thought that the tropical forest and climate are in a state of stable equilibrium, that is, at least in part the distribution of climate parameters, mostly rainfall distributions, are to a certain extent influenced by the existence of the forest. There are ample paleoclimate evidence of a different vegetation distribution over Amazonia during the LGM: the areas covered by forest were much reduced compared the present-day situation and large areas were covered by savannas. A number of sensitivity studies of the climate impacts of total Amazonian deforestation indeed show the possibility of a post-deforestation drier and hotter climate, consistent with 'savannazation' of portions of Amazonia. Theoretical search of different biome-climate stable equilibrium states has revealed a second stable state not far from the current one for Amazonia. However, this second state presents less forest and more savannas over eastern Amazonia. Deforestation and regional climate changes induced by the global warming could in principle tip the current balance towards this new equilibrium state. The ecological consequences of such theoretical possibility will be discussed.

19.3: Advances in Modeling Land Surface Hydrology in Amazonia

Michael T Coe, SAGE-University of Wisconsin Madison, mtcoe@wisc.edu (Apresentador / Presenting)

Recent progress in the development and application of surface hydrology models has greatly expanded our understanding of the processes controlling the variability of surface hydrology in the Amazon Basin and has illuminated the important role surface waters play in integrating basin-wide processes. Early work in modeling the surface hydrology of the Amazon Basin necessarily focused on understanding the large-scale physical properties of the basin and simple sensitivities such as: how does flooding impact the flow of the river system, what temporal modes of discharge variability exist? Model development expanded with increases in data availability (both temporal and spatial) and computational power. As a result research expanded to include investigations of the combined spatial and temporal variability of surface hydrology and the synergies between vegetation and water. More recently, synthesis of diverse data and models has begun and as a result the focus of surface hydrology research is now broadening to include investigations of not only the basic hydrologic characteristics of the Amazon Basin but also the roles surface hydrology play in linking the Amazon ecosystem. Examples include: 1) synthesis of models such as mechanistic vegetation and water transport models to investigate how the land/water system is coupled, 2) synthesis of diverse data sources, such as satellite altimetry and imagery and ground-based data with

models, to better understand the dynamics of the river/floodplain systems, and 3) synthesis of aquatic and terrestrial chemistry to reveal the fundamental role of surface hydrology in the carbon cycle of the basin. The future of surface water modeling in Amazonia holds enormous potential. The increase in data and most importantly its availability makes it possible to expand understanding of surface hydrology as the integrator of a wide range of physical and chemical processes in the Amazon Basin.

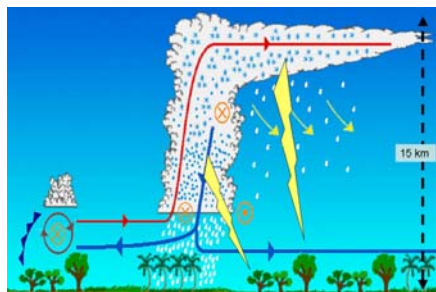
19.4: Recent Progress in Mesoscale Atmospheric Modeling

Maria Assução Faus da Silva Dias, USP e INPE, assuncao@cptec.inpe.br (Apresentador / Presenting)

The atmospheric mesoscale includes phenomena with scales from 10 to 1000 km and lifetimes of a few hours to a day. In such a wide time and length scales, subdivisions have been used like meso-alpha meso-beta and meso-gamma which feature different phenomena like, large convective systems, local circulations produced by regional deforestation, and individual clouds, respectively.

The Amazon region as observed by the several LBA campaigns has shown a wide variety of phenomena in all mesoscale categories and has proven to be both a challenge for modeling and a perfect test bed for exploring the relationships between the surface processes, including the effect of deforestation and biomass burning, and their impact on cloud, rainfall, and on local and regional transports of aerosol and trace gases.

Improvements on parameterizations of biosphere-atmosphere interactions and on convective cloud parameterizations that have been achieved within LBA will be presented and discussed.



19.5: Recent progress in modeling surface hydrology across the Amazon Basin using a Variable Infiltration Capacity approach

Daniel de Castro Victoria, LGTI - CENA/USP, dvictori@cena.usp.br (Apresentador / Presenting)

Jeffrey E. Richey, School of Oceanography - University of Washington, jrichey@u.washington.edu

Mariza C. Costa-Cabral, Dep. of Civil Engineering - University of Washington, cabral@hydro.washington.edu

Alailson Venceslau Santiago, PPG Física do Ambiente Agrícola - ESALQ/USP, santiago@esalq.usp.br

Antonio Roberto Pereira, LCE - Esalq/USP, arpereir@esalq.usp.br

Emilio Mayorga, School of Oceanography - University of Washington, emiliom@u.washington.edu

Reynaldo Luiz Victória, LGTI - CENA/USP, reyna@cena.usp.br

Maria Victoria Ramos Ballester, LGTI - CENA/USP, vicky@cena.usp.br

Since LBA started, a large amount of vital field information has been gathered, improving our knowledge of the Amazon ecosystem dynamics. Due to the extent of the Amazon basin, modeling have become a key tool to synthesize this knowledge and to better understand the basin wide ecosystem functioning. Therefore, to be able to predict the basin hydrology and river biogeochemistry, we are calibrating the VIC (Variable Infiltration Capacity) model for tropical regions, in this case the Amazon basin. First, we are developing specific libraries and input data sets for the area compiled at 0.1° from different sources, including remote sensing, maps and field data. Our initial test area is the Ji-Paraná river basin (RO), in an area of 75.400km², where we are calibrating the program. Our initial results reveal good temporal and spatial distribution of the evapotranspiration and values in the same range of those measured at the field. Soil texture and land use/cover effects on the water cycle are clearly shown. While pasture areas present lower values of ET, the forest maintains higher levels of ET during the dry season.

19.6: Recent progress in estimating suspended sediment yield variability in the Amazon River

Jean Loup Guyot, IRD Peru, jloup@amauta.rcp.net.pe (Apresentador / Presenting)

Naziano Filizola, ANA Brasil, naziano@ana.gov.br

Alain Laraque, IRD France, Alain.Laraque@mpl.ird.fr

The Amazon river sediment load to the Atlantic Ocean have, until present, been calculated starting from a restricted sampling, carried out through a dozen hydrological campaigns. In 1995, program HIBAM (ANA-CNPq-IRD-UnB) installed a network of 10 reference stations in Brazilian Amazonia, with a decadal sampling, to apprehend the temporal variability of the dissolved and particulate fractions during the hydrological cycle, on the main tributaries of the Amazon river. Coupling this decadal surface sediment sampling data with detailed depth sampling at different hydrological period, we propose a new approach to estimate total sediment yields from large Amazonian rivers. Results obtained at the gauging station of Óbidos (Pará, Brazil) - the last gauging station on the Amazon before its mouth - allow to estimate with more precision matter yields to the Ocean.

19.7: Advances in Understanding Land Cover/Land Use Changes for Biogeochemical and Hydrological Modeling

Diogenes S Alves, INPE, dalves@dpi.inpe.br (Apresentador / Presenting)

Recent progress in understanding land cover/land use changes can be included among the most important LBA results. Here, we try to look at how these developments contributed to the modeling of carbon cycling and surface hydrology.

Detailed data about the spatial location of landscape changes, together with advances in the measuring and mapping of biophysical properties of vegetation and soils, helped to improve spatial correlations of forest clearing with vegetation, biomass and soil data, and contributed to improve carbon and hydrological modeling.

Understanding the different patterns of land use influencing the biogeochemical and hydrological cycles continues to be an important research topic. In particular, it is important to recognize land use practices that affect soil properties and carbon stocks. Uncertainties related to carbon emission factors and secondary growth still represent a challenge to reduce errors in annual emission estimates, despite some progresses in understanding inter-annual deforestation rates. Case studies helped understand some of the linkages between patterns of land use, nutrient cycling, second growth and other processes.

The intensification of agriculture in some regions has been pointed out as a major factor of landscape and ecological change. It could be argued, however, that intensification of both agriculture and cattle ranching needs to be better understood, in particular, for its biogeochemical and hydrological implications.

To conclude, advances in modeling deforestation are to be recognized within the framework of LBA and, also, by groups outside the experiment. In this aspect, one of the greatest challenges remains to include "human dimension factors" that would allow to improve models and formulate more plausible scenarios of land cover/use change.

19.8: Recent Progress in Measuring and Modeling Patterns of Biomass and Soil Carbon Pools Across the Amazon Basin

Christopher Potter, NASA Ames Research Center, cpotter@mail.arc.nasa.gov (Apresentador / Presenting)

Yadvinder Singh Malhi, University of Edinburgh, ymalhi@ed.ac.uk

Ever more detailed representations of aboveground biomass and soil carbon pools have been developed during the LBA project. Environmental controls such as regional climate, land cover history, secondary forest regrowth, and soil fertility are now being taken into account in regional inventory studies. This paper will review the evolution of measurement-extrapolation approaches, remote sensing, and simulation modeling techniques for biomass and soil carbon pools, which together help constrain regional carbon budgets and enhance in our understanding of uncertainty at the regional level.

19.9: Recent Progress in Understanding Terrestrial Carbon Cycles in the Amazon Basin

Susan E. Trumbore, UC Irvine, setrumbo@uci.edu (Apresentador / Presenting)

Plínio Barbosa de Camargo, CENA/USP, pcamargo@cena.usp.br

Simone Aparecida Vieira, CENA/USP, savieira@cena.usp.br

Jeffrey Q Chambers, Tulane University, chambers@tulane.edu

Niro Higuchi, INPA, niro@inpa.gov.br

Diogo Selhorst, SETEM/Parque Zoobotanico, selhorst@bol.com.br

Everaldo Telles, Univ. Brasilia, ectelles@uol.com.br

The residence time of carbon is a major determiner of the capacity of an ecosystem to function as a source or sink of carbon. Recent studies of primary forest structure and dynamics have demonstrated differences in carbon use efficiency and growth rates for tropical forests from different regions of the Amazon. The overall residence time of carbon in primary forests is determined by (1) what fraction of photosynthetic products get respired quickly and (2) the residence time of C allocated to leaf (2-3 years), fine root (3-10 years), and stem (40-80 years) tissues, and (3) the time each of these components takes to decay, including what fraction is oxidized to CO₂ versus what becomes stabilized in soil organic matter. Pasture and agricultural systems clearly have shorter ecosystem residence times than the forests they have replaced because they lack woody biomass, while secondary forests recover function belowground faster than aboveground. While biomass recovery in logged forests can be rapid, slow growth rates of individual tree species means that diversity will not recover in less than centuries.

19.10: Towards a Model of Carbon Mobilization, Advection, and Reaction in the Amazon River

Jeffrey E. Richey, University of Washington, jricher@u.washington.edu (Apresentador / Presenting)

Anthony A Aufdenkampe, Stroud Water Research Center, aufdenkampe@stroudcenter.org

Alex K Krusche, Centro de Energia Nuclear na Agricultura, alex@cena.usp.br

Daniel Victoria, Centro de Energia Nuclear na Agricultura, dvictori@cena.usp.br

Maria Ballester, Centro de Energia Nuclear na Agricultura, vicky@cena.usp.br

Large rivers receive and transform inputs from heterogeneous landscapes, resulting in highly aggregated and complex signals in the composition of the dissolved organic matter in transport. We hypothesize that these signals can be

decomposed into their constituent dynamics by representing bulk carbon as a sum of carbon fractions divided by molecular weight (to account for the observed increase in degradation state as the molecular size decreases, and to facilitate the parameterization of organo-mineral associations), mobilized by hydrologic flow paths. We are exploring this hypothesis for the Amazon River system within the construct of a "River Basin Organic Matter and Biogeochemistry Synthesis" (ROMBUS) model. Within ROMBUS each of the organic and inorganic carbon pools are represented by state variables that characterize the nitrogen-to-carbon ratio (for the OM pools), $\delta^{13}\text{C}$ signature and age (via $\Delta^{14}\text{C}$). The model is implemented as pixels within a geospatial model of the landscape, and flow paths are computed via a hydrology model.

S4: Sessões Especiais - Controle do Solo na Biogeoquímica dos Rios. *(Soil Control on Stream Biogeochemistry)*

20.1: A hydrological framework for biogeochemical studies

Helmut Elsenbeer, University of Potsdam, helsenb@rz.uni-potsdam.de (Apresentador / Presenting)
Jorge Marcos de Moraes, CENA/Universidade de Sao Paulo, jmmoraes@cena.usp.br

The ecosystem fluxes of many nutrients are tightly coupled with the flow of water, and the quantification of these fluxes therefore requires quantitative knowledge of hydrological flowpaths. This presupposes that the hydrological functioning in terms of the partitioning of rainfall into various flowpaths is known, because without this knowledge, any field monitoring program for the quantitative assessment of nutrient fluxes is bound to be biased. And yet, many, if not most, nutrient cycling studies pay scant attention to the hydrological functioning of their systems. Instead, the monitoring design of many such studies seems to be predicated on the belief that vertical flowpaths prevail. In particular, this belief rules out lateral flowpaths near the soil surface.

This belief can be traced back to both an outdated view of hydrological processes and to successful biogeochemical studies of systems whose flowpaths happened to be predominantly vertical, hence justifying the monitoring design employed. In view of the now well-documented diversity of ecosystems with respect to their hydrological functioning this belief in the prevalence of vertical hydrological flowpaths has become untenable, and so has the unreflected application of monitoring designs motivated by this belief.

We explore how the interpretation of biogeochemical studies may go astray if a traditional monitoring design based on the verticality assumption is applied to an ecosystem with lateral hydrological flowpaths, and we present the blueprint of a minimal hydrological field assessment designed to select a field monitoring program for biogeochemical studies that is commensurate with a site's hydrological functioning.

20.2: Hydrological Processes in Small Forest and Pasture Catchments of the Eastern Amazonia

Marysol A. E. Schuler, IPAM, Belem, PA-Brazil, marysol@ipam.org.br (Apresentador / Presenting)
Jorge Marcos de Moraes, CENA/ USP, Piracicaba, SP-Brazil, jmmoraes@cena.usp.br
Thommas Dunne, UCSB, Santa Barbara, CA - USA, tdunne@bren.ucsb.edu
Ricardo de O. Figueiredo, EMBRAPA/CPATU, Belem, PA-Brazil, ricardo@cpatu.embrapa.br
Daniel Markewitz, UGA, Athens, GA - USA, dmarke@smokey.forestry.uga.edu
Eric A. Davidson, WHRC, Woods Hole, MA-USA, edavidson@whrc.org
Reynaldo L. Victória, CENA/ USP, Piracicaba, SP-Brazil, reyna@cena.usp.br

In order to evaluate the effects of land use change on hydrological processes, we monitored two small catchments (km^2). Median near surface K_{sat} values were 230 mm h^{-1} in forest and 3.7 mm h^{-1} in pasture. Annual precipitation was $1640 \pm 190 \text{ mm}$, which was partitioned as throughfall ($84 \pm 4\%$), forest canopy interception ($16 \pm 4\%$), overland flow ($4 \pm 2\%$ in forest and $14 \pm 6\%$ in pasture) and subsurface flow (1% on both sites). Ephemeral channels discharged $3 \pm 1\%$ of annual precipitation in forest and $14 \pm 6\%$ in pasture.

Soil moisture and Penman-Monteith evapotranspiration (ET) estimates were calculated using a simple bucket model, coupled with a surface conductance (gc) model to restrict ET. Soil tension was measured and volumetric water content (VWC) calculated from tensiometer data. Coupled bucket model estimates were compared to VWC observations to evaluate model fitness and sensitivity.

From measured and modeled storages and fluxes for the two catchments we were able to quantify the effects of forest-to-pasture conversion on the water balance and the runoff components. Soil properties and fluxes results indicate that forest-to-pasture conversion caused: (1) decreased evapotranspiration; (2) increased overland flow and channel discharge; (3) increased water storage in soils; (4) modified relative distribution of the water balance components.

20.3: Physical and Anthropogenic Controls of the Biogeochemistry of the Ji-Paraná River Basin (Western Amazônia)

Victoria R. Ballester, CENA-USP, vicky@cena.usp.br (Apresentador / Presenting)
Alex V. Krusche, CENA-USP, alex@cena.usp.br
Nei Leite Kavaguishi, CENA-USP, nkleite@esalq.usp.br
Beatriz Machado Gomes, UNIR, gomes@unir.br
Daniel de Castro Victoria, CENA-USP, dvictori@cena.usp.br
Alexandra Ayres Montebelo, CENA-USP, nandaymo@bol.com.br
Christopher Neill, Marine Biological Laboratory, cneill@mbl.edu
Linda Deegan, Marine Biological Laboratory, ldeegan@mbl.edu
Jeffrey E. Richey, University of Washington, jrichey@u.washington.edu
Reynaldo Luiz Victória, CENA-USP, reyna@cena.usp.br

Several LBA studies have shown that forest clearing in the Amazon can alter the transport of sediments, organic matter and associated nutrients to the rivers. In this study, we present the results of an integrated analysis of physical and anthropogenic controls of river biogeochemistry at the Ji-Paraná basin (RO). Previous results obtained by our group demonstrated that both soil properties and pasture cover are the main drivers of river characteristics and metabolism. To quantify the effects of these two drivers, we performed a multiple linear regression analysis, relating basin characteristics (derived from a GIS analysis) and river biogeochemistry at 38 sites along the Ji-Paraná river basin, during wet and dry seasons. Each site represents a different mixture of cover type and soil properties. Effective cation exchange capacity (CEC) and percentage of pastures were treated as independent variables. River water electrical conductivity (EC) and Na^+ , Ca^{2+} , Mg^{2+} , K^+ , Cl^- , DOC, TSS, DIC and PO_4^{3-} concentrations were the dependent variables. Spatially, higher values of all ions were associated with areas dominated by pasture, with the highest concentrations found in the central part of the basin, where pasture areas and soil fertility are at a maximum. As the river enters the lower reaches, forests dominate the landscape, and the concentrations drop. The percentage of the basin area covered by pasture was consistently the best predictor for all parameters during the wet season. Higher DOC concentrations were related to higher values of TSS which, in turn, were originated in pasture areas. During the dry season this pattern was not observed. Our preliminary analysis, relating river biogeochemistry with potential soil erosion in the basin shows that areas covered by pasture are associated with higher concentrations of both DOC and TSS, a pattern also found for other parameters.

20.4: Stream water chemistry in three meso-scale hydrologic basins in Eastern Amazonia

Ricardo de O. Figueiredo, Embrapa Amazônia Oriental, ricardo@cpatu.embrapa.br (Apresentador / Presenting)

Daniel Markewitz, The University of Georgia, DMARKE@smokey.forestry.uga.edu

Eric A. Davidson, The Woods Hole Research Center, edavidson@whrc.org

Ewerton da S. Cunha, Instituto de Pesquisa Ambiental da Amazônia, ewerton@ipam.org.br

Marysol A. E. Schuler, Instituto de Pesquisa Ambiental da Amazônia, marysol@ipam.org.br

Patrício de S. Silva, Universidade do Estado do Pará, patriciomat@bol.com.br

We are evaluating the effects of land use change on stream water chemistry of three meso-scale (100's of km^2) hydrologic basins near Paragominas, in Eastern Amazonia, which have the following areas and percentages of forested cover: Cinquenta e quatro (Cq) watershed (130 km^2) with 18% forest; Sete (St) watershed (150 km^2) with 34% forest; and Pajeú (Pj) watershed (45 km^2) with 45% forest. Eleven field campaigns of stream chemistry measurements were conducted from April 2003 to February 2004 along three first-order streams, from their headwaters in remnant mature forests, through pastures, secondary forests, and agricultural fields. The average values across the sampling stations in each stream are (*nutrient concentrations in μM*): pH (Cq=5.85; St=4.93; Pj=4.60), conductivity (Cq=39.2; St= 30.2; Pj=40.1 $\mu\text{S cm}^{-1}$), turbidity (Cq=96.4; St=13.84; Pj=14.21 FTU), alkalinity (Cq=158; St=10; Pj=6 $\mu\text{Eq L}^{-1}$), O_2 (Cq=4.79; St=6.22; Pj=4.91 mg L^{-1}), Ca^{2+} (Cq=21; St=8; Pj=12), Mg^{2+} (Cq=34; St=13; Pj=19), K^+ (Cq=48; St=63; Pj=95), Na^+ (Cq=82; St=106; Pj=161), NH_4^+ (Cq=3; St=0.8 ; Pj=0.6), NO_3^- (Cq=1.5; St=1.0; Pj=1.8), PO_4^{3-} (Cq=3.6; St=4.7; Pj=3.4), and Cl^- (Cq=119; St=166; Pj=299). In all streams turbidity and pH tend to be lower close to the stream headwaters draining the mature forests and increase downstream. All streams also show a peak in turbidity and pH during the rainy season. Among the three streams, turbidity and pH are highest in the most deforested watershed. Concentrations of O_2 decrease in the reservoirs, that ranchers commonly construct. Because soils are relatively similar within the study area, we suspect land use conversion is an important factor affecting the observed trends in stream chemistry.

20.5: The chemistry of two streams draining kaolinitic soils

Daniel Markewitz, University of Georgia, dmarke@forestry.uga.edu (Apresentador / Presenting)

Ricardo de O Figueiredo, Embrapa-Amazonia Oriental, ricardo@cpatu.embrapa.br

Eric A Davidson, The Woods Hole Research Center, edavidson@whrc.org

Mercedes Maria Cunha Bustamante, University of Brasilia, mercedes@unb.br

Lucilia Parron, Embrapa -Cerrado, Parron@embrapa.br

Julio Resende, University of Brasilia, resende@unb.br

The Amazon and Cerrado regions of Brazil share a predominance of highly weathered, clay-rich soils and an extended dry season. Geology in our two study areas within these regions differ, however, with the eastern Amazon location being tertiary sediments of the Amazon trough and the Cerrado location being Precambrian bedrock of the Brazilian shield. The Amazonian study site has been 80% deforested and converted to cattle pastures, whereas the Cerrado site is located in a preserve that maintains native vegetation. The Amazon watershed is ~13000 ha with baseflow discharge of 800 m^3/sec , while that in the Cerrado is ~2000 ha with baseflow discharge of 100 m^3/sec . Si and Al concentrations in the Amazon and Cerrado streams (Si: 135 and 87 μM ; Al: 1.3 and 0.7 μM , respectively) indicate that kaolinite is most likely in an equilibrium mineral phase in both study areas. However, dissolved element concentrations in the Amazonian stream exceeds that in the Cerrado stream for all macro anions (HCO_3^- : 56 vs 44; NO_3^- : 7.9 vs 1.0; Cl^- : 202 vs 38; SO_4^{2-} : 1.2 vs 30 μM) and cations (NH_4^+ : 2.4 vs 0.8; Ca^{2+} : 78 vs 60; Mg^{2+} : 84 vs. 19; K^+ : 22 vs 1.8; Na^+ : 151 vs 9 μM). Despite concentration differences, HCO_3^- and Cl^- are the predominant charge balancing anions in both streams, and Ca is an important charge balancing cation. However, the contribution of Na to charge balance in the Amazonian stream (31%) exceeds that in the Cerrado stream (10%). The concentration discharge relationships also differ between the two streams: cation concentrations increase with increasing flow in the Amazonian stream and decrease with flow in the Cerrado stream. Mechanisms contributing cations to this Amazon stream during high flow may relate to greater land use conversion in its watershed compared to the Cerrado study site.

20.6: Significant seasonal and event-driven changes of carbon and nutrient fluxes to first-order streams of an Amazon forest

Mark S. Johnson, Cornell University, msj8@cornell.edu (Apresentador / Presenting)
Johannes Lehmann, Cornell University, CL273@cornell.edu
Evandro Carlos Selva, Universidade Federal de Mato Grosso, evandroc@cpd.ufmt.br
Eduardo Guimarães Couto, Universidade Federal de Mato Grosso, couto@cpd.ufmt.br
Mara Abdo, Universidade Federal de Mato Grosso, maraabdo@hotmail.com
Erick C.M. Fernandes, Cornell University, ecf3@cornell.edu
Susan Riha, Cornell University, sjr4@cornell.edu

Carbon and nutrient inputs to streams show significant seasonality in forested and human-impacted watersheds throughout the Amazon Basin. Both higher and lower concentrations during low-flow than high-flow conditions have been reported. Our results from four forested headwater watersheds in seasonally-dry southern Amazonia show DOC and nutrient concentrations to be inversely related to stream discharge on a seasonal basis, while these seasonal dynamics are significantly affected by storm-flow events. Rainfall rapidly generates overland flow and responses in stream discharge are observed within 5 minutes after the beginning of a storm. Streamflow increases rapidly and recedes quickly, generally within 30 minutes following the end of a rainfall event. Concentrations of DOC in streamflow increase four-fold during storm events, whereas K tended to increase slightly by 12% and Ca, Mg, NO₃, NH₄ decrease compared to baseflow. Large increases in stormflow DOC compared to baseflow DOC concentrations appear to be independent of season, while both baseflow and stormflow concentrations become more dilute through the rainy season (from 3 and 12 mg/L early in the rainy season to 2 and 8 mg/L by mid-rainy season, base flow and storm flow respectively). A greater litterfall during the dry than the rainy season and a resulting larger accumulation of litter on the soil surface explains both larger DOC concentrations originating from overland flow, as well as inputs of coarse organic matter (>2mm). Coarse organic matter fluxes in streams are high during the dry-to-wet season transition, but drop off substantially by mid-rainy season. Large fluxes of coarse organic matter were mobilized by large storm events early in the rainy season, while storms of similar magnitude transported little of this material during the mid- and late rainy season. Particulate organic carbon (POC) (

20.7: The role of sorption in retention of dissolved organic carbon in soils of the lowland Amazon basin

Sonya M Remington, University of Washington, School of Oceanography, sunny9@u.washington.edu
Vania Neu, CENA-Universidade de Sao Paulo, bioneu@inpa.gov.br
Jeffrey E. Richey, University of Washington, School of Oceanography, jrichey@u.washington.edu
Erin Ellis, University of Washington, elliserin@yahoo.com (Apresentador / Presenting)

Ecosystem processes in river corridors represent a significant pathway for the export of carbon fixed on land in the humid tropics at a globally significant level. The quantity of dissolved CO₂ in surface waters of tropical river systems is the product of a long sequence of complex biological, hydrological and geochemical processes. Sorption is an important geochemical process that removes dissolved organic carbon (DOC) from water percolating through soils, which may eventually flow into the river channel (via groundwater and subsurface flow) where it may be respired to CO₂. Soil properties, such as texture, Fe- and Al-oxide content, mineral surface area and organic carbon content, are known to affect the concentration of DOC in soil pore water and, therefore, the quantity of DOC transported to river channels. These soil properties vary with soil type. We collected samples from two depths of three different soil types typically found in the lowland Amazon Basin for use in equilibrium and kinetic laboratory "batch" experiments. Batch experiment results showed that the soils of the plateau and slope sorbed ~60% of new DOC input, while valley soils sorbed ~30%. Most DOC was sorbed within the first four hours of the 24 hour batch experiments. The role of respiration in DOC loss from solution during the experiments appeared to be small relative to loss by sorption. Understanding and quantifying DOC lost to sorption as a function of soil properties is an important step in understanding the export of carbon fixed on land and transported to rivers.

20.8: Hydrologic nitrogen losses from tropical forest soils -- patterns and implications.

Lars O Hedin, Princeton University, lhedin@princeton.edu
Megan McGroddy, Princeton University, mcgroddy@princeton.edu (Apresentador / Presenting)
Ben Houlton, Princeton University, houlton@princeton.edu
Emilio F. Moran, Indiana University, moran@indiana.edu
Mateus Battisella, EMBRAPA Brasilia, mb@cnpm.embrapa.br

Tropical forest soils often tend to be rich in nitrogen but poor in phosphorus. We have measured hydrologic nitrogen and phosphorus losses from soils across a soil fertility gradient in the central Amazon basin. We have found significant differences in both nitrogen and phosphorus species and concentrations at regional scales. When considered in combination with data on nutrient concentrations and ¹⁵N stable isotopes from other tropical forests worldwide, these data support the idea that tropical soils develop nitrogen sufficiency over time. We will discuss the paradoxical nature of mechanisms needed to support this apparent pattern.

20.9: Key Connections in Amazon Stream Corridors: Using ¹⁵N to Trace N Transformations and Transport

Linda A. Deegan, Marine Biological Laboratory, ldeegan@mbl.edu (Apresentador / Presenting)
Christopher Neill, Marine Biological Laboratory, cneill@mbl.edu
Reynaldo L. Victória, Centro de Energia Nuclear na Agricultura/USP, reyna@cena.usp.br

Christie L. Haupert, Marine Biological Laboratory, chaupert@mbl.edu
Victoria Ballester, Centro de Energia Nuclear na Agricultura/USP, vicky@cena.usp.br
Alex V. Krusche, Centro de Energia Nuclear na Agricultura/USP, alex@cena.usp.br
Suzanne M. Thomas, Marine Biological Laboratory, sthomas@mbl.edu

Small streams act as important sites in the landscape where nutrients arriving from adjacent uplands are retained, transformed, or released to larger rivers. We are using ^{15}N additions to examine how a change in land use from forest to pasture alters N cycling. Addition of ^{15}N -ammonium to a second order forest stream showed that ammonium was nitrified in the stream channel and that the ^{15}N -nitrate produced traveled long distances downstream. This suggests that N uptake is controlled more by microbial energy demand than by requirements for N. This was consistent with our measurements of high oxygen concentrations, very high ratios of inorganic N:P and low availability of easily used organic matter in forest streams. Under these conditions, forest streams convert ammonium to nitrate and transport nitrate long distances downstream. Mass balance calculations suggest that most N was transported downstream and not retained in the stream. Forest conversion to pasture potentially changes N cycling in small streams by lowering oxygen concentration, raising N:P ratios and increasing available organic matter. We hypothesize that because of these conditions, small pasture streams will have longer transport distances for ammonium and shorter transport distances for nitrate compared to forest streams. Addition of ^{15}N -ammonium to a second order pasture stream was used to compare transport and rates of transformation in pasture to forest streams. These data are being combined with information on the kilometers of channels of different orders and characteristics passing through forest and pasture land-use to model N export at the watershed level.

20.10: Controls of land-water nitrogen movement through small lowland Amazonian forest and pasture drainage basins in Rondônia

Christopher Neill, Marine Biological Laboratory, cneill@mbl.edu (Apresentador / Presenting)
Linda A. Deegan, Marine Biological Laboratory, ldeegan@mbl.edu
Alex V. Krusche, Centro de Energia Nuclear na Agricultura/USP, alex@cena.usp.br
Victoria R. Ballester, Energia Nuclear na Agricultura/USP, vicky@cena.usp.br
Helmut Eisenbeer, University of Potsdam, helsenb@rz.uni-potsdam.de
Jorge Marcos de Moraes, Centro de Energia Nuclear na Agricultura/USP, jmmoraes@cena.usp.br
Reynaldo L. Victória, Centro de Energia Nuclear na Agricultura/USP, reyna@cena.usp.br
Suzanne M. Thomas, Marine Biological Laboratory, sthomas@mbl.edu
Christie L. Haupert, Marine Biological Laboratory, chaupert@mbl.edu
Marisa Cássia Piccolo, Centro de Energia Nuclear na Agricultura/USP, mpiccolo@cena.usp.br

We investigated nitrogen movement through small forest and pasture drainage basins in central Rondônia. The total dissolved nitrogen exported in streamwater from small forest and pasture basins was similar (1.6 to 2.3 kg N/ha/y). Similar N export occurred despite major differences in the way that water and different forms of N moved through soils, riparian zones and stream channels. In soils, modeled fluxes of dissolved N in soil solution to below 1 m depth were 15 kg N/ha/y in forest and 4 kg N/ha/y in pasture. Forest soil dissolved N fluxes were dominated by nitrate (10.5 kg N/ha/y) while pasture fluxes were dominated by ammonium (2.6 kg N/ha/y). Declines in nitrate concentrations from about 200 $\mu\text{mol/L}$ to $< 5 \mu\text{mol/L}$ across forest riparian zones suggested riparian nitrate removal. Comparable gradients in pasture riparian nitrate concentrations were not found because low amounts of nitrate were produced in pasture soils. Both pasture and forest riparian soils showed high rates of potential denitrification in laboratory incubations. Nitrate retention by riparian zones at the watershed depends on the extent to which the flowpaths of water arriving from the terra firme allow contact with riparian soils. Increased compaction caused by cattle decreases soil hydraulic conductivity and shifts the distribution of flowpaths in pastures to more surface and near-surface flows that bypass riparian contact. This higher proportion of near-surface runoff and potential bypassing of riparian zones in pastures has the potential to increase ammonium delivery to streams but has only small consequences for nitrate and total dissolved nitrogen delivery because of the absence of nitrate generation in pasture soils.

S12: Sessões Especiais - Eventos de Perturbações na Ecologia e Biogeoquímica de Florestas Tropicais *(Disturbance Events and Tropical Forest Ecology and Biogeochemistry)*

21.1: Amazon-wide Forest Gap Fraction and Selective Logging from Satellite Analyses

Gregory Paul Asner, Carnegie Institution, gpa@stanford.edu (Apresentador / Presenting)
José Natalino Macedo Silva, EMBRAPA, natalino@cpatu.embrapa.br
Mercedes Maria Cunha Bustamante, Universidade de Brasília, mercedes@unb.br
Michael M. Keller, USDA Forest Service, michael.keller@unh.edu
Amanda Naslund Cooper, Carnegie Institution, acoop@stanford.edu
Lydia Olander, Carnegie Institution, lolander@globalecology.stanford.edu
David E. Knapp, Carnegie Institution, dknapp@globalecology.stanford.edu

Selective logging and forest disturbance can now be quantified throughout the Brazilian Amazon using multiple high spatial resolution satellite sensors (Landsat ETM+, EO-1 ALI, ASTER) and non-linear, Monte Carlo spectral mixture analysis. We have extensively tested the method in different forest environments in central and eastern Para, Northern Mato Grosso, and southern Acre in logged forest of 0.5 to 4.5 years post-harvest. We have also quantified the forest gap variation of mature canopies throughout nearly 5 million square kilometers of the Amazon basin. Results indicate that selective logging can be detected and quantified with high precision and accuracy. They also indicate that forest types and disturbance conditions can be measured on an operational basis. Forest gap fraction varies with canopy architecture, soil conditions, and topographic position. These findings will allow improved quantification of forest carbon stocks, productivity, fire

susceptibility and biogeochemical processes throughout the Amazon basin.

21.2: Micrometeorology, CO₂ and H₂O Exchange of a Tropical Rainforest Before and After Selective Logging

Scott Dennis Miller, UC Irvine, sdmiller@uci.edu (Apresentador / Presenting)

Michael L. Goulden, UC Irvine, mgoulden@uci.edu

Humberto Ribeiro da Rocha, USP, humberto@model.iag.usp.br

Mary Catherine Menton, Oxford, marymenton@hotmail.com

Adelaine Michela e Silva Figueira, CENA, michela@lbaeco.com.br

Cleilim Albert Dias de Sousa, UFPA, albert@lbaeco.com.br

Augusto Rodrigues Maia, USP, augusto@lbaeco.com.br

Helber Custódio de Freitas, USP, helbercf@model.iag.usp.br

Ed Read, UCI, eread@uci.edu

We are using long-term eddy covariance to study the effects of selective logging on the energy and trace gas exchange at km 83 in the Tapajos National Forest, Para, as a component of LBA. In addition to the core flux measurements of carbon dioxide, water vapor, momentum and heat, sensors were installed to measure vertical profiles of CO₂, H₂O, wind velocity, and temperature within and above the forest. Continuous tower and biometric measurements began a year before logging (June 2000) when the forest was still considered primary. A similar tower in an unlogged area of the same forest (km 67) provides a control for the logged site measurements. Selective logging in fall 2001 was conducted by a local firm using reduced impact procedures, and included ~400-ha of forest that extended ~2-km upwind of the tower. The loggers removed ~6% of the biomass in large trees, left another ~18% of the biomass in large trees as slash, and eliminated ~13% of the canopy on an area basis. Tower and biometric measurements at both sites continued throughout the 3 month logging period and up to the present. After the logging, a second 65 m tall tower was installed in a large gap created by the logging, and similarly instrumented, in order to address the role of gaps in affecting forest atmosphere exchange. Preliminary analysis of the tower observations indicate that canopy photosynthesis declined following logging, and that ecosystem respiration increased in the subsequent wet season.

21.3: Selective Logging Effects on Carbon Budgets at Three Sites in the Brazilian Amazon

Michael M. Keller, USDA Forest Service, International Institute of Tropical Forestry, michael.keller@unh.edu (Apresentador / Presenting)

Michael William Palace, University of New Hampshire, palace@kaos.sr.unh.edu

José Natalino Macedo Silva, EMBRAPA, Amazônia Oriental, natalino@cpatu.embrapa.br

Gregory Paul Asner, Carnegie Institution of Washington, Stanford University, gpa@stanford.edu

Single tree selection is the predominant approach to logging in the Brazilian Amazon today. While removal of logs (usually less than 40 m³ ha⁻¹ on a first entry) off-site has a minor effect on site carbon stocks, collateral damage caused by felling, skidding, and road building results in significant mortality and canopy opening. Reduction of canopy leaf area should reduce productivity while the increase in necromass should augment ecosystem respiration. We aim to quantify these effects in both conventional (CL) and reduced impact (RIL) harvest management at sites in the municipalities of Paragominas and Santarem in Para State and in Juruena in Mato Grosso state. Canopy gap fraction (Licor, LAI-2000) and both standing and fallen coarse woody debris (line intercept sampling) were measured at logged and unlogged sites. For logging intensities in the range of 20 to 30 m³ ha⁻¹, CL and RIL increased canopy gap fraction to approximately 20% and 10% compared to approximately 3% gap fraction at undisturbed forest sites. Logging also greatly increased necromass stocks. For example, at the sites in Paragominas, necromass stocks increased by 95% and 35% for CL and RIL over a background of about 28 Mg-C ha⁻¹ in undisturbed forest. We modeled the effects on carbon flux using stand table models and simple compartment models to estimate post-site carbon balance. Based on simple extrapolation from our limited sites, we estimate that logging leads to a net loss of at least 30 Tg-C y⁻¹ from the Brazilian Amazon.

21.4: Biomass and Necromass in Three Undisturbed Forests in the Brazilian Amazon

Michael William Palace, University of New Hampshire, palace@kaos.sr.unh.edu (Apresentador / Presenting)

Michael M. Keller, University of New Hampshire, USDA Forest Service, International Institute of Tropical Forestry, michael.keller@unh.edu

Gregory Paul Asner, Department of Global Ecology, Carnegie Institution of Washington, Stanford University, gpa@stanford.edu

José Natalino Macedo Silva, EMBRAPA-Amazônia Oriental, natalino@cpatu.embrapa.br

Necromass (Coarse Woody Debris [CWD]) is important component of the carbon cycle in tropical forests. The relationship between necromass and biomass may provide interesting insight into the functioning of a forest. Forests with the same biomass but differing necromass pools might have experienced different disturbance and mortality events or have different decomposition histories. This study examined three undisturbed Amazonian forests, Cauaxi, Para (3.75° S, 48.37° W), Tapajos National Forest, Para, Brazil (3.08° S, 54.94° W) and Juruena, Mato Grosso, Brazil (10.48° S, 58.47° W). We compared biomass, DBH distributions, standing necromass, fallen necromass and CWD decay class distributions. Relationships between each of these parameters were used to compare carbon cycling across the sites. At Tapajós, the average mass (+/- S.E.) of fallen CWD was 50.7 (1.1) Mg ha⁻¹ for duplicate sites. The average mass of fallen CWD at Juruena was 44.4 (16.3) Mg ha⁻¹ for duplicate sites. At Cauaxi, fallen CWD mass average was 55.2 (4.7) Mg ha⁻¹. Small (> 2 cm and < 5 cm dia) and medium sized material (> 5 cm and < 10 cm dia) accounted for 8-18% of the total fallen CWD mass. Standing dead average mass was 33.5 (4.0) Mg ha⁻¹ for duplicate sites at Tapajos. At Juruena, the average mass of standing dead was 24.8 (6.5) Mg ha⁻¹ for duplicate sites. Standing dead was not measured at Cauaxi. The biomass estimate for > 10 cm DBH for Juruena was 313 Mg ha⁻¹. Cauaxi biomass for trees > 20 cm DBH was 249 Mg ha⁻¹. Tapajos

biomass estimate for trees > 15 cm was 224 Mg ha⁻¹. Finally, estimates from an automated crown detection algorithm were used to compare disturbances across each of these sites.

21.5: Canopy structure and radiation environment metrics indicate forest developmental stage, disturbance, and certain ecosystem functions

Geoffrey Parker, Smithsonian Environmental Research Center, parkerg@si.edu (Apresentador / Presenting)
David Roy Fitzjarrald, Atmospheric Sciences Research Center, fitz@asrc.cestm.albany.edu

The structural and environmental complexity of a forest is the compound result of a development sequence overlain with perturbations. To date, these complexities have been poorly quantified. Here we introduce some potentially useful metrics derived from measurements of canopy structure and radiation environment and discuss known and potential implications of these measures for understanding forest developmental stage, disturbance intensity, and some ecosystem functions.

Common summaries of forest structure include maximum height, and overall surface area density and cover. However, these measures are inadequate characterizations and provide little indication of forest state or function. High-frequency first-return LIDAR measurements obtained from forest floor or from aircraft can yield summary and distributional measures that are interpretable in terms of whole canopy structure and function.

Most canopy volumes are dominated by open space; various sorts of "porosity" may be defined and specific classes of interior environments may be recognized. The shape of the spatially averaged vertical profile of surface is also a useful descriptor. "Heaviness" is the relative height of median canopy surface. In "top-heavy" canopies, the majority of surfaces are near the top, whereas "bottom-heaviness" indicates a distribution skewed toward the forest floor. The outer canopy surface is the primary interface interacting with the free atmosphere - its texture is important. Various measures of the complexity of its shape may be defined, including the variability in its shape ("rugosity"). The overall canopy gap fraction is likely less important than the distribution of openings penetrating to the ground ("gappiness"). The balance of large and small gaps is described by the slope of the gap-size distribution function.

We discuss how these measures alone and in combination can be used to indicate developmental stage, degree of disturbance or intervention, and some aspects of ecosystem function, including potential growth, radiation balance, the coupling with atmosphere, mixing, storage, and the spatial distribution of sources and sinks of energy and carbon.

21.6: Natural disturbance regimes and tropical forest carbon balance: integrating canopy structure, flux measurements, and modeling across the landscape

Scott R. Saleska, Harvard University, saleska@fas.harvard.edu (Apresentador / Presenting)
Paul R. Moorcroft, Harvard University, paul_moorcroft@harvard.edu
David Roy Fitzjarrald, SUNY Albany, fitz@asrc.cestm.albany.edu
Geoffrey G. Parker, Smithsonian Environmental Research Center, parkerg@si.edu
Plínio Barbosa de Camargo, CENA, pcamargo@cena.usp.br
Steven C. Wofsy, Harvard University, scw@io.harvard.edu

Natural disturbance events play a critical role in the carbon cycling of tropical forests, and hence estimating carbon balance over large spatial scales depends on: (1) understanding how local carbon balance depends on local disturbance status and history; and (2) accurate characterization of the distribution of disturbance states across those larger spatial scales. Here we use ground-based lidar measurements of canopy height (Parker and Lefsky, 2004) to characterize local disturbance status of plots in the Tapajós National Forest of Brazil. Following the approach of Hurtt et al (2004), we then use the observed canopy height distribution to constrain a size-structured forest biogeochemistry model (the Ecosystem Demography model, ED). Finally, we compared the predictions of the constrained ED model to eddy flux and biometric estimates of ecosystem carbon balance at the local scale, and found that the model correctly predicts that the forest around the flux tower is a net carbon source to the atmosphere. This analysis suggests that remote-sensing based estimates of canopy height (like those that would be provided by NASA's airborne Laser-Vegetation Imaging Sensor, LVIS, proposed to fly as part of LBA) can constrain model predictions of carbon balance at landscape scale. Such predictions could be independently tested at the landscape scale by measurements now underway (Santoni et al., this LBA meeting) in large-scale biomass plots spatially distributed across the Tapajós landscape.

21.7: What's driving regional changes in old-growth tropical forests?

Jeffrey Q Chambers, Tulane University, chambers@tulane.edu (Apresentador / Presenting)
Niro Higuchi, INPA, niro@inpa.gov.br
Joaquim dos Santos, INPA, joca@inpa.gov.br
Liliane Martins Teixeira, INPA, liliane@inpa.gov.br
Susan E. Trumbore, University of California at Irvine, setrumbo@uci.edu

A number of dramatic changes have been observed in tropical forest structure and functioning. Many of these studies cite the rising concentration of atmospheric CO₂ as the most likely driver, but in general these are not rigorous quantitative assessments. Using an individual-based model that simulates tree stand dynamics (recruitment, growth, mortality and decomposition) we explore what factors can explain the observed changes at a regional scale. The model was initially parameterized using extensive field data from forests in the Central Amazon, and has been modified to simulate stand dynamics for sites spanning a productivity and dynamism gradient across the entire Amazon basin. The model has also been modified to include potential drivers for observed changes including: (i) explicitly modeling changes in forest

structure and dynamics as a function of the known and expected rise in atmospheric CO₂ concentration, (ii) variability in tree recruitment rate and stem density, (iii) changes in wood density and tree community composition, (iv) the effect of elevated mortality on the growth rate of surviving trees, and (v) other potential environmental drivers. Model results demonstrate that for CO₂ to be proximal driver, a fertilization sensitivity greatly beyond what has been measured experimentally is required. Conversely, observed changes are much more consistent with relatively catastrophic tree mortality events that occurred sometime shortly before most inventory plots were established. Although it is clear that rising atmospheric CO₂ has the capacity to act as a long-term agent of change, observations thus far are much too rapid to have a strong causal link to CO₂.

21.8: Quantifying the effect of sporadic forest disturbances on measured biomass change in forest plots

Yadvinder Singh Malhi, Oxford University Centre for the Environment, ymalhi@ed.ac.uk (Apresentador / Presenting)

Recent forest plot studies have suggested that old-growth forests in general are undergoing a net increase in biomass. However, there has been some debate as to the bias introduced by selective sampling of the natural disturbance-recovery regime of forests. I explore the nature of this bias with a simple quantitative model of disturbance and recovery. The critical uncertainties in our knowledge are highlighted. Finally, the model is used to estimate the probability that selective sampling of stochastic disturbance-recovery regime could explain the net biomass increment in mature Amazonian forests that has been observed by the RAINFOR project.

21.9: Variation in ages and growth rates of trees in Amazonian tropical forests: consequences for carbon and forest management

Simone Aparecida Vieira, CENA/USP, savieira@cena.usp.br (Apresentador / Presenting)

Plínio Barbosa de Camargo, CENA/USP, pcamargo@cena.usp.br

Diogo Selhorst, SETEM/UFAC, dselhorst@pop.com.br

Niro Higuchi, INPA, niro@inpa.gov.br

Luiz Antonio Martinelli, CENA/USP, martinelli@cena.usp.br

Susan E. Trumbore, University of California - Irvine, setrumbo@uci.edu

Tropical forests are important global carbon stocks and clearing of these forests is a major contributor to the accumulation of CO₂ in the atmosphere, while logging is a major source of wood for world markets. A basic understanding of the dynamics of tropical forests is required both for predicting their future role as carbon sources or sinks, and for local design of sustainable extractive management practices.

Key to understanding the dynamics of tropical forests is the determination of the ages and growth rates of trees. As many upland tropical forest trees do not have annual growth rings, the estimates of tree age largely come from extrapolation of growth rates derived from permanent plot surveys or from dendrometer data. Uncertainties associated with these estimates are large because of assumptions of how growth rates change with tree age.

Growth rates for tropical forest trees estimated from radiocarbon ages and dendrometer measurements are in good agreement but show differences in forest age structure among three sites located in the eastern, central and western Amazon basin. The slowest growing trees are found in the Central Amazon, though individuals with ages >400 years are common across all sites. Biomass recovery in tropical forests can be rapid after slow-growing individuals are replaced with fast-growing pioneer species. However, biodiversity will only recover in centuries or longer if logging removes long-lived, slow growing species.

21.10: Seasonal dynamics of soil, litter, and ecosystem respiratory carbon dioxide fluxes as indicated by stable isotope analyses

Jean Pierre Ometto, CENA/USP, University of Utah, jpometto@cena.usp.br (Apresentador / Presenting)

James R Ehleringer, University of Utah, jim@biology.utah.edu

Luiz Antonio Martinelli, CENA/USP, martinelli@cena.usp.br

Joseph Berry, Carnegie Institution, joeberry@stanford.edu

Françoise Yoko Ishida, ESALQ/USP, yoko@lbaeco.com.br

Tomas Ferreira Domingues, University of Utah, domingues@biology.utah.edu

Haroldo Jackson Silva, UFPA/Santarem, haroldo@lbaeco.com.br

Edmar Mazzi, UNIMEP, eamazzi@cena.usp.br

Carbon (d¹³C) and oxygen (d¹⁸O) isotope ratios were measured to examine the seasonal changes in respiratory CO₂ effluxes at the two forest sites (km 67 and km 83) in Santarem. We measured both the d¹³C values of leaf organic matter and the d¹³C and d¹⁸O values of the CO₂ effluxing from the ecosystem, large dead wood, soil, and litter components. In addition, we quantified soil CO₂ efflux rates in order to partition this flux into its soil and litter components. The d¹³C values of soil/litter and total ecosystem respiratory CO₂ differed, with the respiratory values of soil/litter being 13C heavier than that of the entire ecosystem. When comparing the two forest sites, the observations suggest a year-long spike associated with the selected removal of trees at the km 83 site. Thereafter, the d¹³C values of total ecosystem respiration were again similar between the two forests and exhibited changes between dry and wet seasons. The CO₂ efflux from litter and soil without litter differed in their d¹³C values allowing a quantitative estimate of the seasonal contribution of these two components to total soil/litter CO₂ efflux. Furthermore, the CO₂ efflux from large woody debris and of litter/soil differed in their d¹⁸O values allowing a quantitative partitioning of the two components to the overall CO₂ efflux from the surface layer.

S13: Sessões Especiais - Integrando Mudanças dos Usos da Terra, Respostas do Ecossistema e Sistemas Climáticos na Bacia Amazônica *(Integrating Land Use Change, Ecosystem Responses, and Climate Systems in the Amazon Basin.)*

22.1: Amazon scenarios: modeling the interactions of ecosystems, climate, and land use

Daniel Curtis Nepstad, Woods Hole Research Center, Instituto de Pesquisa Ambiental da Amazonia, UFPa/NAEA, dneptad@whrc.org (Apresentador / Presenting)

Britaldo Silveira Soares Filho, Universidade Federal de Minas Gerais, britaldo@csr.ufmg.br

Ane Auxiliadora Alencar, Instituto de Pesquisa Ambiental da Amazonia, ane@ipam.org.br

In 1998, a group of researchers initiated the "Amazon Scenarios Project" to develop policy-sensitive simulations of future trends in land cover, economic prosperity, climate, and ecological processes. The land use modeling component has evolved from spatial statistical approaches to rent-based modeling of competing economic activities. Global (GCM) and regional (RAMS) climate models simulations are run on simulated land cover scenarios, providing inputs (radiation, rainfall, temperature, RH) to the ecosystem model, CARLUC. This process-based model tracks forest disturbances (fire, logging), and adjusts the allocation of NPP to wood, litter and roots in response to drought. Fires are simulated depending upon disturbance and rainfall history, and proximity to fire-dependent land use activities. Responses of surface water flow to land use and climate interactions, and reductions in vertebrate ranges are also estimated.

22.2: Integrated Ecological Economics Modeling of Ecosystem Services from Brazil's Amazon Rainforest

Rosimeiry Portela, UMD/GIEE, rportela@wam.umd.edu (Apresentador / Presenting)

The Amazon rain forest is the largest tract of tropical forest on Earth. Its vegetation is now known to strongly influence the regional pattern of precipitation and radiation, playing an important role on the regulation of global greenhouse gases. Forest clearing, by threatening the current dynamic equilibrium of vegetation and climate, is expected to lead to important changes in the regional, and ultimately global climate. Yet, over the last decades, vast areas of the Brazilian Amazon_ where 60% of that forest is located, have been cleared for logging, pasture, and agriculture. The generation of a direct, monetary income by these activities has been used to justify the current pattern of forest exploitation. Little or no attention has been paid to the value of forests in providing ecological functions such as carbon storage, biodiversity maintenance, and water cycling. This research provides a quantitative dimension of the Brazilian Amazon ecosystem services given current patterns of land cover and their anthropogenic uses. A regional unified meta-model of the Brazilian Amazon was developed to simulate energy, water, carbon and nutrients in the terrestrial systems, and the exchanges between terrestrial systems and the atmosphere. The provision of goods and services_ the result of the conditions and processes described in the model, and their contribution to human economy and welfare were investigated under baseline and alternative scenarios. The model was further used to test the implementation of a market-based mechanism to reduce deforestation, in the form of payments for forest climate regulation service.

22.3: A spatially explicit simulation model of deforestation for the Amazon Basin

Britaldo Silveira Soares Filho, Universidade Federal de Minas Gerais, britaldo@csr.ufmg.br (Apresentador / Presenting)

Daniel Curtis Nepstad, Woods Hole Research Center, dneptad@whrc.org

Gustavo Coutinho Cerqueira, Universidade Federal de Minas Gerais, cerca@ufmg.br

Ane Alencar, Instituto de Pesquisa Ambiental da Amazônia, ane@ipam.org.br

Eliane Voll, Universidade Federal de Minas Gerais, voll@ufmg.br

Paul A. Lefebvre, Woods Hole Research Center, paul@whrc.org

We present a model to simulate deforestation through the entire Amazon Basin. Its architecture embodies coupled models structured in two spatial levels: 1) subregions defined from socioeconomic regionalization and 2) raster cells. An upper model projects the deforestation rates for the subregions, based on data provided mainly by PRODES, and passes them to a spatially explicit simulation model. Each subregion has a unique spatial model with its own set of parameters. Cartographic algebra and cellular automata technique are used in order to develop the spatially explicit simulation that comprises a map of 3144x4238 cells at 1 km² resolution. The model uses cartographic data on infrastructure, administrative units, and biophysical settings and was spatially calibrated for 12 case study areas in the Brazilian Amazon. We ran the model for two scenarios. The "business as usual" scenario considers the deforestation trends across the basin, projecting 1997-2000's rates linearly by using their variations between 2000 and 2001, and adding to them the effect of paving a set of major roads. In this scenario the paving follows a predefined schedule and its effect on deforestation is empirically estimated using PRODES data analyzed at municipality level. The other scenario also considers the current deforestation trends, but now projecting them logarithmically over time. In this so called "governance scenario", it is imposed a 50% limit for deforested land within each basin's subregion and existing and proposed protected areas play a decisive role in hindering deforestation as well. Both simulations encompass 50 annual time steps starting at 2001. Results for the "business-as-usual scenario" show 23% and 37% of total forest decline within 30 years and 50 years, respectively. This expected deforestation is reduced up to 55% in the governance scenario. The simulated spatial patterns of deforestation can be used as inputs to Global Climate Models.

22.4: Analysis of the influence of spatial variables on the location of deforestation in the Brazilian Amazon

Britaldo Silveira Soares Filho, Universidade Federal de Minas Gerais, britaldo@csr.ufmg.br (Apresentador / Presenting)
Hermann O. Rodrigues, Universidade Federal de Minas Gerais, hermann@csr.ufmg.br
Daniel Curtis Nepstad, Woods Hole Research Center, dneptad@whrc.org
Gustavo Coutinho Cerqueira, Universidade Federal de Minas Gerais, cerca@csr.ufmg.br
Eliane Voll, Universidade Federal de Minas Gerais, voll@csr.ufmg.br
Ane Alencar, Instituto de Pesquisa Ambiental da Amazônia, ane@ipam.org.br

Spatially explicit simulations of deforestation rely on the calculation of probability maps, which attempt to quantify and integrate the influences of variables, representing biophysical, infrastructure, and territorial features - such as topography, rivers, vegetation, soils, climate, proximity to roads, towns and markets, and land use zoning -, on the spatial prediction of deforestation. Previous analytical modeling of deforestation included mainly regression methods like *logistic regression* or *weights of evidence*. We have developed a heuristic method of analyzing the effects of spatial variables on the location of deforestation by applying genetic algorithm (GA) to calculate probability surfaces of deforestation. The GA takes advantage of the *weights of evidence* method using its same formulas but that are now calibrated through the GA selection mechanisms. The developed method was tested in 12 case study regions representative of different types of Amazonian colonization frontier, each one comprising a Landsat scene. Database for the selected regions includes INPE/PRODES deforestation maps from 1997 to 2000, at 250 meter resolution, and cartographic layers of road and urban networks, soils, vegetation, topography, rivers, settlement and protected areas, and distance to previously deforested land. The results from GA method were assessed comparing the simulated 1997-2000's deforestation map with PRODES 2000's map through image similarity test based on a fuzzy multiple resolution comparison. GA showed better performance than the *weights of evidence* method, achieving agreements up to 44% at cell by cell comparison and up to 83% for a window size 5x5. This analysis also pointed out the variables "distance to roads" and "distance to previously deforested land" to be the strongest regional predictors of deforestation.

22.5: Reconciling competing land uses along the BR-163 highway: steps towards science-based, participatory land use zoning

Ane A.C. Alencar, IPAM, ane@ipam.org.br (Apresentador / Presenting)
Daniel Curtis Nepstad, IPAM, WHRC, dneptad@whrc.org
Oriana T. Almeida, IPAM, oriana@ipam.org.br
Maria Del Carmen V. Diaz, IPAM, mcarmen@amazon.com.br

The last decade was marked by large investments in land use zoning schemes by federal and State governments in Amazonia. Zoning is an important tool to define the spatial distribution of the land uses in the region. However, the current techniques used to develop and implement zoning can't follow the fast dynamics of frontier expansion and do not take into account variables that capture equally the demands of the various economic groups in Amazonia. We present an approach to zoning based upon the spatial distribution of agricultural and forestry aptitudes along the BR-163 highway. Spatial variables were used to indicate the potential areas for cattle ranching, soybean production, small holder agriculture and logging activities along this road. The variables were selected according to local stakeholder's indication of the most important needs for each activity. Potential areas for each activity were overlapped to derive a map where the potential areas of conflicts for negotiation were pointed out. Employment and income were estimated for each scenario. This technique may be powerful for regional land use zoning processes because it incorporates the real demands of the economic actors and shows the future conflicts of interest.

22.6: Amazon Soybean Expansion: Yield and Rent Models

Maria del Carmen Vera-Diaz, Ipam/Boston University, mcarmen@bu.edu (Apresentador / Presenting)
Robert Kaufmann, Boston University, kaufmann@bu.edu
Peter Schlesinger, Woods Hole Research Center, pschles@whrc.org
Daniel Curtis Nepstad, Ipam/Woods Hole Research Center, dneptad@whrc.org

In the last decade, agribusiness has become one of the main economic forces behind the expansion of the agricultural frontier in the Brazilian Amazon, led by the soybean sector. Between 1990 and 2003, Amazon soybean production, grew from 3 to 14 million tons/year and the area planted increased from 16,000 to 47,000 km². This expansion has been stimulated by several factors such as growth in international demand for soybean, devaluation of the Brazilian Real, improvements in infrastructure, high productivity in the Cerrado area, and the development of soybean varieties suited to Amazonian climate.

Here, we identify possible areas of agribusiness expansion into the Brazilian Amazon using spatial-econometric models that specifies both physical and economic parameters. The effect of these variables is quantified by estimating an econometric model of soybean yield that includes variables such as inputs, production, prices, transport costs, topography, climate and soils. This model is used afterward as input to estimate potential yields across the basin and these yields are used in conjunction with transportation costs to generate information about agricultural rents. Information about rent is used to locate areas where land is likely to be converted to soybean production.

Preliminary results indicate that infrastructure, topography and inputs prices have an important role to the soybean expansion. In rain forest regions of eastern-central Amazon, the flat relief and the investments in physical infrastructure will facilitate the rapid spread of mechanized agriculture. Economic conditions are being enhanced mainly by multinational agribusiness companies that provide production financing, building storage units and ports, and participating directly in the pavement of important roads as Cuiabá-Santarém.

22.7: A Demographic Dynamics System for the Brazilian Amazon's Municipalities.

Ricardo Alexandrino Garcia, Cedeplar/UFGM, rica@cedeplar.ufmg.br (Apresentador / Presenting)
Britaldo Silveira Soares Filho, CSR/ufmg, britaldo@csr.ufmg.br
Daniel Curtis Nepstad, WHRC, dnepstad@whrc.org

Population growth and migration represent an important underlying cause of deforestation in the Brazilian Amazon. Models designed to simulate deforestation should therefore incorporate a demographic dynamics system to help project the influence of these variables on the location and rates of deforestation across the basin. We present a demographic model that projects population at municipality level by computing migration fluxes among the Amazonian municipalities and in and outward the region, as well as their gross birth and death rates. The annual projections from 1995 to 2035 are based mainly on demographic data from 1991's and 2000's IBGE census. The model assumes a logistic curve to project the municipalities' gross birth and death rates, which are derived using specific functions of fertility and mortality by age. The input emigration rates and immigration distribution matrix are calculated for the 1995-2000 time period. VESIM, a system-thinking software, is used to implement the model that is designed to handle various scenarios of regional migration.

22.8: Estimating Amazonian forest fire probability based on edaphic and climatic factors and proximity to land-use and infrastructure.

Paul A. Lefebvre, Woods Hole Research Center, paul@whrc.org (Apresentador / Presenting)
Daniel Curtis Nepstad, Woods Hole Research Center, dnepstad@whrc.org
Ane A. Alencar, Instituto de Pesquisa Ambiental da Amazônia, ane@ipam.org.br

We have developed a spatial model of forest fire probability in the Amazon basin by combining our prior work in estimating forest flammability, with a spatial analysis of ignition likelihood. Recent fire scars were marked by analysis of satellite images of three locations in the eastern and southern Amazon basin, in the zone of intense landuse transition where human activities frequently include the use of fire to manage and transform the landscape. We tabulated the proximity of the fire scars to several landcover types as well as key infrastructure components. The more common indicators derived from this analysis were then used as predictors of ignition probability. Forest flammability was estimated from our RisQue soil moisture balance model. This model uses edaphic factors together with climatic information (Penman-Monteith PET and actual precipitation) to track soil moisture to 10m depth at monthly intervals. Our fieldwork has shown that forest flammability is linked to LAI, and LAI is linked to soil moisture variations. We calculated minimum plant-available soil water (PAW) during a 1-year period prior to the date of the imagery of our fire scars, to determine what range of soil moisture had been present on these sites when these fires occurred. By combining proximity to a number of land use types with soil moisture parameters from actual fires, we generate a probability surface for fire for the Amazonian landscape on a seasonal basis.

22.9: Effects of Land Use Change on Vertebrate Populations in a Dynamic Frontier in Amazonia

Claudia Azevedo-Ramos, Instituto de Pesquisa Ambiental da Amazonia, cramos@amazon.com.br (Apresentador / Presenting)
Lisa M. Curran, Yale University, lisa.curran@yale.edu
Alice MacDonald, Yale University, alice.macdonald@yale.edu
Ana Cristina M. Oliveira, Universidade Federal do Pará, acmo@amazon.com.br
Oswaldo de Carvalho Jr, Instituto de Pesquisa Ambiental da Amazonia, osvaldo@ipam.org.br

Composition, abundance, ranging and dynamics of vertebrate populations are influenced not only by the area and distribution of primary forest, but by the spatial configuration and use of modified matrix habitat found throughout their geographic range. However, consequences of such land use change on vertebrate taxa remain challenging to quantify empirically over meaningful spatio-temporal scales. Yet, projecting potential biodiversity changes under different land use scenarios may be employed as powerful management tool. The Brazilian Government wants to associate the pavement of main road in Central Amazonia (BR-163 or Cuiabá-Santarém highway) with an integrated model of sustainable regional development incorporating socio-environmental concerns. Therefore, as a first approach, we assess how land-cover change along the BR 163 would potentially affect mammalian and avian distributions across their geographic range. Available data were compiled on species' use of specific forest habitats and human land use (e.g., logging, burned, pasture, small-holder and industrial agriculture), coupled with potential mortality threats (i.e., hunting pressure). Land use change from 1996 to 2001 was generated from Landsat ETM+ and projected for 30 years under "business-as-usual" and "governance" scenarios of deforestation in Amazonia. Various weightings of species-specific habitat use and relative abundance were employed in Markov models superimposed on these land use scenarios to simulate spatially-explicit effects of this habitat alteration on vertebrate taxa. From these combined simulations, we identify vulnerable species as well as critical areas/habitats or thresholds of land conversion for management and conservation strategies.

22.10: Biomass of Amazonian Forest and Greenhouse Gas Emissions: New Data and Controversies

Philip M. Fearnside, INPA, pmfearn@inpa.gov.br (Apresentador / Presenting)
Euler Melo Nogueira, INPA, eulerquait@inpa.gov.br
Bruce W. Nelson, INPA, bnelson@internext.com.br

Greenhouse gas emissions from deforestation are almost directly proportional to the biomass of forest cleared. Existing estimates of emissions from Amazonian deforestation vary by more than a factor of two, largely because of widely varying

degrees of completeness in the components included. Other critical portions of the calculation include the growth of secondary forests in deforested areas and the inclusion of inherited and/or committed emissions (or neither). Inclusion of all relevant factors results in estimates for emissions double those of some prominent estimates.

New data indicate that commonly used wood density estimates need to be adjusted downward by 12.1%. Adjustments to biomass and emissions are sufficiently large to be significant for the global carbon balance. For example, an estimate of net committed emissions of 231×10^6 Mg CO₂-equivalent C/year for Brazilian Amazonia in the 1990, of which 204×10^6 Mg CO₂-equivalent C/year was from net removal of biomass, would be reduced by 38×10^6 Mg CO₂-equivalent C/year (14.9%: more than the 12.1% adjustment to gross emissions because regrowth estimates remain unchanged). Decreases of similar proportions would apply throughout the tropics. For the 1980s adjustments to net emissions total 240×10^6 Mg C/year for CO₂ effects alone, or approximately 277 Mg CO₂-equivalent C/year including trace gases. We emphasize that the revised density values will not reduce the discrepancies between the various published estimates for forest biomass and emissions in Amazonia and for the tropics as a whole; instead, all estimates will shift in parallel to a lower level.

S18: Sessões Especiais - Florestas Secundárias na Paisagem Amazônica: Estudos de Campo e de Sensoriamento Remoto que Aprimorem Nossa Compreensão da Dinâmica Espacial, Temporal e Biogeoquímica das Florestas Secundárias (*Secondary Forests in the Amazonian Landscape: Field Studies and Remote Sensing Studies That Advance our Understanding of the Spatial, Temporal, and Biogeochemical Dynamics of Secondary Forests*)

23.1: Changing enzymatic activities and mycorrhizal infections in a chronosequence of secondary and mature forests of eastern Amazonia

Cláudio José Reis de Carvalho, Embrapa Amazônia Oriental, carvalho.bel@terra.com.br (Apresentador / Presenting)
Eric Atlas Davidson, The Woods Hole Research Center, edavidson@whrc.org
Tereza Primo dos Santos, Instituto de Pesquisa Ambiental da Amazônia, tereza@cpatu.embrapa.br
Fábio Carneiro Dutra, Bolsista DTI, CNPQ/LBA, dutrafcb@bol.com.br
Bruno de Oliveira Serrão, Bolsista ITI, CNPQ/LBA, bruno_serrao@hotmail.com

The availability of nitrogen and phosphorus may limit rates of regrowth of secondary forests in Amazonia. The highly weathered soils are nutrient poor, and numerous cycles of slash and burn can further impoverish nutrient stocks and lead to site degradation. The mineralization of N and P from soil and litter by enzymatic activity and the acquisition of nutrients by mycorrhizae could be important for the recuperation of nutrient cycles during secondary forest succession. These processes were studied in a secondary forest chronosequence (5, 8, 12, 22, 42, and 72 years), a recently abandoned black pepper plantation, and a remnant mature forest in the municipality of São Francisco do Pará. At the end of the rainy season, samples of soil and roots were collected from the litter-soil interface and at 0-5, 5-15, and 15-30 cm depths in mineral soil. Available P, total N, extractable NH₄⁺ and NO₃⁻, urease and acid phosphatase activity, the number of fungal spores, and concentrations of total and readily extractable glomalin were measured. Infections of mycorrhizae were counted in roots. The number of spores and mycorrhizal infections decreased with increasing age of the forest, whereas the activity of acid phosphatase increased with forest age. The concentration of NH₄⁺ and readily extractable glomalin tended to increase with forest age, and NO₃⁻ was significantly higher in the mature forest soil. The results indicate that some, but not all, of these indicators of nutrient mineralization and acquisition become similar to the mature forest within 8 years of secondary forest succession.

23.2: Caracterização de Estádios Sucessionais na Amazônia: Resultado do Mapeamento no Sítio Experimental da Floresta Nacional do Tapajós

Fernando Del Bon Espírito-Santo, INPE, fernando@ltdid.inpe.br (Apresentador / Presenting)
Yosio Edemir Shimabukuro, INPE, yosio@ltdid.inpe.br
João Roberto dos Santos, INPE, jroberto@ltdid.inpe.br
Tatiana Mora Kuplich, INPE, tmk@ltdid.inpe.br

Este trabalho apresenta uma metodologia para a classificação semi-automática dos estádios sucessionais na região da Floresta Nacional do Tapajós, Pará. Baseado em imagens Landsat TM de 1988, 1997, 1999 e ETM+ de 2001, a região foi estratificada tematicamente em floresta (F), sucessão secundária (SS), solo exposto (S), pasto (P) e água (A), através da segmentação das bandas 3, 4, 5 e imagens fração solo, sombra e vegetação para cada data. As áreas de SS foram estratificadas em sucessão secundária inicial (SS1), intermediária (SS2) e avançada (SS3). O procedimento de classificação foi executado da seguinte forma: (1) classificação das categorias de S, P, SS e A, através da imagem mais recente (2001); (2) cruzamento entre SS de 2001 e as áreas de F de 1997, para a determinação das áreas de SS1; (3) cruzamento entre F de 2001 e as áreas de S, P e SS de 1988, para a determinação das áreas de SS3; (4) cruzamento entre SS de 2001 e as áreas de S e P de 1997, para a determinação das áreas de SS1, formadas sobre S ou P (áreas sob uso até 1997); (5) composição do mapa de cobertura vegetal através das classes de S, P, SS1 e SS3 (discriminados anteriores) e F e A da imagem mais recente (2001), onde as áreas não classificadas no mapa foram designadas como SS2. De acordo com as imagens utilizadas, as áreas de SS foram estratificadas em SS1 (13 anos). A comparação do mapa com os pontos observados no campo foi obtido o valor de 81% para o coeficiente de Kappa considerando todas as classes temáticas.

23.3: O desmatamento na região de Roraima e sua relação com áreas de regeneração da floresta: Um indicador do uso da terra

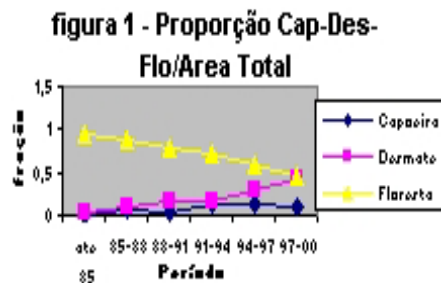
Alexandre Junqueira Homem de Mello, Instituto Nacional de Pesquisas Espaciais, mello@ltid.inpe.br (Apresentador / Presenting)

Neste estudo foi usada uma série temporal de imagens previamente classificadas obtidas pelo sensor TM (Landsat-5) nos anos de 88-91-94-97-2000. A área escolhida compreende parte dos municípios de Machadinho d'Oeste e Theobroma localizados no estado de Rondônia. As imagens foram classificadas em áreas de floresta, desmatadas e capoeira.

Numa primeira parte, procurou-se estabelecer uma forte relação de exclusão entre as áreas de capoeira e desmatamento, contabilizando os tamanhos de área obtidos para cada classe no decorrer do tempo. Numa segunda parte, utilizando-se das imagens temáticas de cada ano, foram selecionadas três imagens (1988, 1991, 1994) para averiguar se nas áreas mais desmatadas a quantidade de capoeira era também menor. Foi criada uma grade de células de 2,5 km x 2,5 km cruzando-a com os respectivos mapas. Esta grade possibilitou calcular as frações que cada classe ocupava em cada célula e assim selecionar o terço das células com maior área desmatadas e o terço de células com menor área desmatada. A partir daí calculou-se a proporção de capoeira em cada um dos agrupamentos.

Com o cruzamento da proporção de áreas desmatadas com a proporção de áreas de capoeira pôde-se observar uma forte relação de exclusão entre as duas classes. Ao passar do tempo, a quantidade de capoeira observada oscilou contrariamente a quantidade de desmatamento. Ou seja, para cada acréscimo de área desmatada houve um decréscimo de área de capoeira e vice versa (figura 1).

Resultados interessantes foram também obtidos na análise da capoeira nas áreas com maior e menor desmatamento. Nos três anos estudados verificou-se que a proporção de capoeira observada foi sempre maior, aproximadamente 20%, nas áreas de menor desmatamento do que nas áreas com maior desmatamento. Este resultado é muito importante e pode mostrar como uma simples análise histórica da capoeira no espaço amazônico pode ajudar a explicar o modo de utilização e frequência do uso da terra.



23.4: Integrating field data and remote sensing to study secondary forests in Amazonian rural settlements

Mateus Batistella, Embrapa Satellite Monitoring, mb@cnpm.embrapa.br (Apresentador / Presenting)

Dengsheng Lu, Indiana University/CIPEC, dlu@indiana.edu

Secondary forests in the Amazon gained importance when attention was called to processes following landscape disturbances, such as deforestation. Sharp distinctions between successional stages are often artificial, but sometimes useful to characterize selected landscapes and to estimate their role in carbon sequestration. Remote sensing and GIS have improved the capability to monitor processes of Land-Use/Land-Cover (LULC) change in the Amazon. In this paper, the results for vegetation structure in Rondônia are presented as a basis for discussing the reflectance of secondary forests when using Landsat TM images. Fieldwork was carried out during the dry seasons of 1999, 2000, 2002, and 2003. Vegetation structure data were collected through surveys encompassing land-cover classes such as initial secondary succession (SS1), intermediate secondary succession (SS2), advanced secondary succession (SS3), and mature forest. Every plot was registered with a Global Positioning System (GPS) device to allow further integration with remote sensing data. Variables analyzed included density, diameter at breast height, basal area, total height, and biomass. The results for vegetation structure analyses informed image classifications. Descriptive statistics, graphic outputs, and analysis of variance (ANOVA) were performed. The results showed that SS1, SS2, SS3, and forest were well separated when using solely the data for vegetation structure ($p < 0.001$). However, analyses of reflectance on selected TM bands allowed the separation of only three of these classes (SS1 and SS2 mixed together, SS3, and forest). The authors are engaged in improving the performance of image classifications using more robust techniques, such as spectral mixture analyses and spatial-spectral classifiers. The implications of this kind of study surpasses the understanding of vegetation recovery processes at local scales. It allows the spatial-temporal monitoring of Amazonian landscapes regarding their land-cover dynamics, useful for integrative programs, such as Proambiente.

23.5: A Survey of Remote Sensing Methods for Mapping Second Growth Forests in Amazônia

Dar Alexander Roberts, UCSB Department of Geography, dar@geog.ucsb.edu (Apresentador / Presenting)

William Salas, Applied Geosolutions, wsalas@agsemail.com

Second-growth forest, resulting from disturbance, forest conversion or pasture abandonment is widely considered to be

one of the most important land-cover types in Amazônia. Second-growth forest plays a key role as a part of forest succession, swidden-agriculture sustainability, and basin wide carbon dynamics. However, second-growth forest is not defined consistently, and considerable variability exists in the methods used to map it, the types of sensors used and the measures typically reported. These differences make it difficult to perform regional comparisons of the extent, duration and properties of second-growth forest in Amazônia. Regional comparisons are likely to be critical in that the role of these forests as a potential sink for carbon and their viability in swidden systems varies depending on management practices, climate and soils.

A survey was developed to provide a better sense of the range of definitions, methods and measures of second-growth forest within the LBA community. This survey was developed as part of two second-growth workshops and designed in consultation with all of the members. Questions include 1) study site locations; 2) definition of and criteria for second-growth; 3) type of remotely sensed data used and whether multi-temporal information was used; 4) methods for mapping second-growth forest; 5) measures reported for second-growth forest, such as height, area or ratio of second-growth to cleared area; 6) presence of prior land-use history; and 7) existence of ancillary data. Responses were solicited from 15 researchers known to use remote sensing to map second growth and additional respondents were encouraged. In this presentation, we will summarize the first results from the survey. We anticipate this survey will lead to a follow-up study providing cross-team, intra-regional comparisons.

23.6: Responses to fertilization of secondary forest growth following pasture abandonment in central Amazônia, Brazil

Ted R. Feldpausch, Department of Crop and Soil Sciences, Cornell University, Ithaca, NY, 14853 USA, trf2@cornell.edu (Apresentador / Presenting)

Susan J. Riha, Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, NY, 14853 USA, sjr4@cornell.edu

Erick C.M. Fernandes, The World Bank, ESSD-ARD, Washington, DC, USA, efernandes@worldbank.org

Elisa V. Wandelli, Embrapa Amazônia Ocidental, C.P. 319, Manaus, AM, 69.000, Brazil, elisa@cpaa.embrapa.br

Secondary forests on abandoned pastures in the Amazon Basin are growing predominately on soils that have been depleted of nutrients via logging, grazing and burning. In this study, we examined the effect of P and Ca additions to soil on the growth of 10 forests in three abandoned cattle ranches by applying the treatments: +P (50 kg ha⁻¹), P+lime (2 t ha⁻¹), P+lime+gypsum (1 t ha⁻¹). We studied the emergence, development and death of over 3000 stems over three years in three age classes of secondary forest (1 to 5, 6 to 10, and 11 to 14 years old. Mean woody biomass accumulation in the recently abandoned pastures was low (1.8±0.5 t ha⁻¹yr⁻¹) and was unaffected by fertilizer treatments. Older secondary forests, with a mean growth rate of 7.1±1.8 t ha⁻¹yr⁻¹ (6 to 10 years) and 7.8±2.2 t ha⁻¹yr⁻¹ (11 to 14 years) did not respond to the P and the P+Ca +gypsum additions. Results of this experiment are compared to similar experiments in which the same fertilizer treatments were applied to improved pastures and multipurpose tree species in the same ranches. In both cases, there was a positive growth response to fertilizer additions.

23.7: Carbon budget estimation in Central Amazonia: successional forest modelling from remote sensing data

Till Neeff, University of Freiburg, INPE, tillneeff@fulbrightweb.org

Paulo M Graça, INPA, INPE, pgraca@ltid.inpe.br

Luciano V Dutra, INPE, dutra@dpi.inpe.br

Corina C Freitas, INPE, corina@dpi.inpe.br

Liana O Anderson, INPE, liana@ltid.inpe.br (Apresentador / Presenting)

The carbon budget resulting from dynamics of forest vegetation is estimated spatially for a study region with intensive landuse change in the Central Amazon forest. A digital model from airborne SAR interferometry describes vegetation height, and is used along with an established relationship between forest height and age to map the successional stages of vegetation. Biomass stocks and annual rates of increment in biomass can be attributed to the forest ages by a comprehensive growth model for forests in the study area. A conceptual model of landuse change for the deforestation zones in Amazonia is developed and applied to the study area. Four different types of landuse are accounted for: primary forest, secondary forest, degraded forest and nonforest. The transition probabilities between those landuse types are described from internal modelling of available data, from literature sources, and from large-scale remote sensing results. The transition probabilities, the areas of forest successional stages from forest age mapping, and the expected carbon dynamics yield a spatialized estimate of net committed emissions in the study area. For the year 2000-2001 the carbon balance is negative, on an area of 5,714 ha, landuse dynamics resulted in a release of 15,986 t of carbon, mainly arising from the cutting of primary forest for agricultural purposes. The secondary forest carbon budget is almost balanced, and forest degradation revealed to be less important.

23.8: Legacy of Fire Slows Carbon Sequestration in Amazonian Forest Regrowth

Daniel Jacob Zarin, University of Florida, zarin@ufl.edu (Apresentador / Presenting)

Ima Vieira, Museu Goeldi, ima@museu-goeldi.br

Patricia Delamonica Sampaio, University of Florida, psampaio@ufl.edu

Rita Guimarães Mesquita, INPA, rita@inpa.gov.br

Ted Feldspach, Cornell University, trf2@cornell.edu

Mark Ducey, University of New Hampshire, mjducey@cisunix.unh.edu

Eric Davidson, Woods Hole Research Center, edavidson@whrc.org

Eduardo Sonnewend Brondizio, Indiana University, ebrondiz@indiana.edu

Much of the ~200,000 km² of post-abandonment forest regrowth in the Brazilian Amazon has been subjected to repeated burning, yet there have been no prior systematic examinations of the role of fire history in altering the trajectory of forest regrowth on previously cleared lands, even though regrowth constitutes a substantial component of the regional carbon budget. We compiled published and unpublished data for nine sites in the Brazilian Amazon for which information about aboveground carbon stocks and fire history were available for a total of 90 forest regrowth plots. We grouped those plots into categories based on the number of times they had previously been burned (0, 1-2, 3-4, 5+) and calculated the annualized difference between observed and predicted aboveground carbon stock for each plot, based on a validated empirical model that predicts biomass as a function of plot age, soil texture, and climate. Relative to model predictions, carbon sequestration in plots burned five or more times was slower than that in plots that were either cleared without burning, or that were burned 1-2 times ($P < 0.05$); the reduction in carbon sequestration for plots with this legacy of five or more fires was $1.7 \pm 0.6 \text{ Mg C ha}^{-1} \text{ y}^{-1}$, compared to predicted sequestration rates of $3.2 \pm 0.6 \text{ Mg C ha}^{-1} \text{ y}^{-1}$ (mean \pm 95% confidence interval). These results should inform regional carbon models as well as Brazil's effort to develop an environmental services payment initiative (PROAMBIENTE) that includes a carbon credit program to encourage Amazonian smallholders to maintain forest regrowth rather than reclearing it for agriculture.

Sessão de Postêres

(Poster Session)

AC (Química da Atmosfera) / AC (Atmospheric Chemistry)

[AC_Aerossóis \(AC_Aerosols\)](#)

24.1-P: CCN Closure Study for Amazonian Dry Season Biomass Burning Aerosol

Anders Erik Vestin, Div. of Nuclear Physics, Lund University, P.O. Box 118, SE-22100 Lund, Sweden, anders.vestin@nuclear.lu.se

Erik Swietlicki, Div. of Nuclear Physics, Lund University, P.O. Box 118, SE-22100 Lund, Sweden, erik.swietlicki@nuclear.lu.se

Jenny Rissler, Div. of Nuclear Physics, Lund University, P.O. Box 118, SE-22100 Lund, Sweden, jenny.rissler@pixe.lth.se

Jingchuan Zhou, Div. of Nuclear Physics, Lund University, P.O. Box 118, SE-22100 Lund, Sweden, jczhou@hawaii.edu

Göran Frank, Max Planck Institute for Chemistry, Biogeochemistry Department, P.O. Box 3060, D-55020, Mainz, Germany, gfrank@mpch-mainz.mpg.de

Meinrat O. Andreae, Max Planck Institute for Chemistry, Biogeochemistry Department, P.O. Box 3060, D-55020, Mainz, Germany, andreae@mpch-mainz.mpg.de (Apresentador / Presenting)

A CCN closure study was performed during the LBA-SMOCC dry season experiment in Amazonia, September-November 2002 where the interactions between smoke from biomass burning, cloud microphysics, precipitation and climate were investigated. Measurements were performed with a DMPS that measures the dry particle size distribution and a H-TDMA measuring hygroscopic diameter growth of individual aerosol particles. A static thermal-gradient CCN counter was used to measure the CCN concentration. Size-resolved particle volume fraction of water-soluble material responsible for the activation into cloud droplets was estimated from H-TDMA measurements, and used in a modified Köhler theory to predict the CCN concentration as a function of the water vapour supersaturation. Our results show that during intensive biomass burning periods, the particles were generally less hygroscopic than at background conditions. The temporal variability of the measured CCN concentrations could be predicted from the DMPS and H-TDMA data. For the seven water vapour supersaturations covered by the CCN counter (0.23 - 1.12 %), the regression of predicted versus measured CCN concentrations had slopes between 0.70 (1.12%) and 0.95 (0.3%) with R2 between 0.94 - 0.97. The CCN spectra can be parameterized for selected time periods or air masses using a simple, but physically sound model. Similar validated parameterizations are available for wet season background conditions (CLAIRE-98 and CLAIRE-2001). This offers a possibility to incorporate a validated description of the CCN properties of the Amazonian biomass burning aerosol into cloud parcel models to study the impact of biomass burning on cloud structure and microphysics.

24.2-P: Long-Term Monitoring of Atmospheric Aerosols in the Amazon Basin: Balbina and Santarem - aerosol source identification and apportionment

Maria Lucia Antunes, UNESP-Unidade Diferenciada Sorocaba/Iperó, malu@sorocaba.unesp.br (Apresentador / Presenting)

Paulo Artaxo, Instituto de Física da USP, artaxo@if.usp.br

Fine and coarse aerosol particles have been measured since 1998 in Santarém (2° 6' 35'' S, 54° 42' 30'' W) and Balbina (1°53' 57'' S, 59° 28' 42'' W), two semi-remote sites located in Amazon Basin. Sampling was performed using stacked filter units, with a sampling time from 1 to 5 days. Elemental analysis was performed with Particle Induced X-ray Emission (PIXE) at the University of São Paulo. Data analysis was performed using multivariate statistical techniques.

For wet season aerosol concentration, averaging about 9800 ng/m³ (Santarem) and 6200 ng/m³ (Balbina) for particles < 2microns. Concentrations in these periods are high, well above wet season. The biogenic coarse mode aerosol concentrations are similar for wet and dry seasons. The elemental composition is dominated by organic compounds that accounts for about 70% of the aerosol mass. The major trace element present are K, S, Ca, Si, Fe, Al and Mg with other minor trace elements such as P, Zn, Cl. Backward air mass trajectory analyses indicate that air masses derived from the Atlantic Ocean and then passed reaching Santarem and them Balbina. It explains the Cl concentration in these areas. Factor analysis shows the presence of four major aerosol sources for both sites: natural biogenic aerosol, soil dust, sea salt and biomass burning particles (only at the fine mode aerosol). Phosphorus is present in low concentrations, typically around 5 - 10 ng/m³. The participation on P in the fine mode aerosol mass (P/FPM) are similar in Santarem and Balbina. The phosphorous source profile derived from APCA for the biogenic coarse fraction of Balbina aerosol is similar to Santarem.

24.3-P: Long-Term Monitoring of Atmospheric Aerosols in the Amazon Basin: Alta Floresta and Rondônia - aerosol source identification and apportionment

Maria Lúcia Antunes, UNESP - Unidade Diferenciada Sorocaba/Iperó, malu@sorocaba.unesp.br (Apresentador / Presenting)

Paulo Artaxo, Instituto de Física da USP, artaxo@if.usp.br

Long term continuous sampling of atmospheric aerosols was carried out at two different sites in the Amazon Basin: Alta Floresta (9°52'32" S, 56°05'10" W) and Rondônia (10°44'54" S, 62°12'57" W) from 1992. These sites are heavily affected by biomass burning emissions. Fine and coarse mode aerosol particles were collected using stacked filter units (SFU). Elemental analysis was performed with Particle Induced X-ray Emission (PIXE). Soot carbon and gravimetric mass analysis were also performed. Multivariate statistical techniques were used to study the relationship between aerosol elemental concentrations. At the Alta Floresta and Rondônia sites, during the dry season, a strong component of biomass burning is observed. Concentrations in excess of 600 µg/m³ were measured during the peak of the dry season. For fine mode particles, we observed an average of 63 µg/m³ (Alta Floresta) and 33 µg/m³ (Rondônia). The elemental composition is dominated by organic compounds that accounts for about 70% of the aerosol mass. The major trace element present are K, S, Ca, Si, Fe, Al and Mg with other minor trace elements such as P, Zn, Cl. Potassium and chlorine concentration in Alta Floresta site is higher than Rondônia site, because of predominance of deforestation emissions. Absolute Principal Factor Analysis (APFA) has derived absolute elemental source profiles. APFA showed three aerosol particles components for both sites: biomass burning (soot, fine mode mass concentration, K, Cl), soil dust (Al, Ca, Ti, Mn, Fe) and natural biogenic aerosol.

24.4-P: Historical record of trace elements in aerosols from Western Amazon Basin during 20th century (1919-1999) from Illimani ice core, Bolivian Andes

Alexandre Correia, Institute of Physics, University of Sao Paulo, LGGE, CNRS and Universite Joseph Fourier, acorreia@if.usp.br (Apresentador / Presenting)

Robert J Delmas, LGGE, CNRS and Universite Joseph Fourier, delmas@lgge.obs.ujf-grenoble.fr

Remi Freydier, UMR5563, LMTG, CNRS and Universite Paul Sabatier, freydier@lmtg.ups-tlse.fr

Jean-Denis Taupin, LGGE, IRD, jdtaupin@inamhi.gov.ec

Paulo Artaxo, Institute of Physics, University of Sao Paulo, artaxo@if.usp.br

Bernard Dupre, UMR5563, LMTG, CNRS and Universite Paul Sabatier, dupre@lmtg.ups-tlse.fr

A 137 m ice core drilled in 1999 from the summit of Nevado Illimani (16°37' S, 67°46' W, 6350 m asl, Bolivian Andes) allows to study the chemical composition of aerosols from the Western Amazon Basin during the 20th century. The ice core extraction site is downwind from the Amazon Basin. Dating shows the upper 50 m of the ice core correspond to about 80 years of record (1919-1999). Elemental concentrations were determined by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) for 45 chemical species (from Li to U) in 744 ice and snow samples along the 50-m ice core section, providing a database with sub-annual to annual resolution. Several statistical methodologies were used to yield a full chemical characterization of aerosol deposits, their seasonality and long term trends. During austral winter (dry season) elemental concentrations usually reach their highest values, due to reduced removal processes (wet deposition). Average Aluminum concentration was 965 ng/g during dry season and 18.1 ng/g during wet season. Potassium averages range from 388 ng/g in the dry season to 14.3 ng/g in the wet season. Heavy metal concentrations measured in the beginning of the 20th century are generally in accordance with results reported by other authors for the same region. Excess (non-terrigenous) concentrations for several heavy metals show high (4 to 10-fold) enrichments after the second half of 20th century, most probably due to increasing mining exploitation in South America.

24.5-P: Deposition fluxes of trace elements in Western Amazon Basin during 20th century inferred from Illimani ice core, Bolivian Andes

Alexandre Correia, Institute of Physics, University of Sao Paulo, LGGE, CNRS and Universite Joseph Fourier, acorreia@if.usp.br (Apresentador / Presenting)

Robert J Delmas, LGGE, CNRS and Universite Joseph Fourier, delmas@lgge.obs.ujf-grenoble.fr

Remi Freydier, UMR5563, LMTG, CNRS and Universite Paul Sabatier, freydier@lmtg.ups-tlse.fr

Jean-Denis Taupin, LGGE, IRD, jdtaupin@inamhi.gov.ec

Paulo Artaxo, Institute of Physics, University of Sao Paulo, artaxo@if.usp.br

Bernard Dupre, UMR5563, LMTG, CNRS and Universite Paul Sabatier, dupre@lmtg.ups-tlse.fr

A 137m ice core drilled in 1999 from the summit of Nevado Illimani (16°37' S, 67°46' W, 6350 m asl, Bolivian Andes) allows the investigation of effective deposition fluxes of trace elements present in aerosols from Western Amazon Basin. The ice core extraction site is downwind from the Amazon Basin. Dating shows the upper 50 m of the ice core correspond to about 80 years of record (1919-1999). Elemental concentrations were determined by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) for 45 chemical species (from Li to U) in 744 samples. This yielded a full characterization of the aerosol chemical nature, allowing to retrieve estimates of deposition fluxes over the Andes. During austral winter (dry season) the local aerosol source predominates over other sources, making it difficult to detect the deposition of long-range transported aerosol, such as biomass burning plumes from the Amazon Basin. For phosphorous, a key element participating in biogeochemical cycles in the Amazon Basin, the excess (non-terrigenous) average annual deposition rate between 1919-1969 was about $0.016 \times 10^{-6} \text{ kg m}^{-2} \text{ yr}^{-1}$, increasing to about $1.2 \times 10^{-6} \text{ kg m}^{-2} \text{ yr}^{-1}$ after 1970. During the 20th century, non-natural deposition fluxes of trace elements linked to anthropogenic emissions, such as nickel, copper, zinc and cadmium, correspond to the major fraction (75%-91%) of total deposition, indicating the influence of anthropogenic sources such as mining activities, for the inventories of these elements.

24.6-P: O Monitoramento Atmosférico em Rio Branco - AC, uma Contribuição do LBA

Alejandro Fonseca Duarte, UNIVERSIDADE FEDERAL DO ACRE, alejandro@ufac.br (Apresentador / Presenting)

Eduardo Vieira Guedes, UNIVERSIDADE FEDERAL DO ACRE, eronguedes@hotmail.com

Renato Mesquita da Cunha, UNIVERSIDADE FEDERAL DO ACRE, renanto.florestal@bol.com.br

No presente trabalho se esboçam as contribuições que o Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia (LBA) vêm oferecendo nas pesquisas relacionadas com radiação solar, composição da atmosfera, poluição do ar, meteorologia e deposição úmida, em Rio Branco. Alguns dos resultados alcançados são:

Determinação do valor pico da forçante radiativa por aerossóis, para setembro e outubro, época de grande poluição do ar devido às queimadas de biomassa na Amazônia. O valor (-70 W/m^2) foi obtido por estudo das variações mensais e sazonais da espessura óptica de aerossóis medida em terra.

Determinação da tendência das chuvas mediante a análise da série temporal correspondente a um período de 31 anos (1970-2000), o que mostrou uma primeira fase (desequilíbrio) de aumento das precipitações de 4,5 mm/dia para 5,6 mm/dia entre 1970 e 1990; e, a continuação, uma segunda fase (acomodação) de diminuição para 5,2 mm/dia (no ano 2000) e 5,0 mm/dia (quando estendida a análise até o ano 2003). Hipoteticamente, tanto a fase de desequilíbrio inicial, quanto a atual fase de acomodação a um novo regime de chuvas, podem estar relacionadas com o desmatamento estabelecido na Amazônia, em estados ao leste do Acre.

Determinação dos valores de pH da água de chuva, mostrando-se, uma variação entre 4,3 e 5,5. O valor médio é de 4,9. Isso indica uma tendência ácida ($\text{pH} < 5,6$). Esse resultado preliminar precisa ainda da determinação das substâncias presentes na deposição úmida, da localização de suas fontes, além da prolongação da experimentação. É interessante notar que valores médios, em torno de 4,7, já foram observados em outras partes do Brasil e na Amazônia.

Finalmente, como resultado na área de educação, está nascendo uma pequena equipe que beneficia a formação de alunos da Universidade Federal do Acre, através de bolsas financiadas pelo CNPq e pelo LBA.

24.7-P: The Coupled Aerosol and Tracer Transport model to the Brazilian developments on the Regional Atmospheric Modeling System: model description and validation

Saulo Ribeiro de Freitas, CPTEC-INPE, sfreitas@cptec.inpe.br (Apresentador / Presenting)

Marla Maria Longo, CPTEC-INPE, longo@cptec.inpe.br

Maria Assunção Faus da Silva Dias, CPTEC-INPE, IAG-USP, assuncao@cptec.inpe.br

Pedro Leite Silva Dias, IAG-USP, CPTEC-INPE, pldsdias@master.iag.usp.br

Robert Chatfield, NASA-AMES, chatfield@clio.arc.nasa.gov

Paulo Artaxo, IF-USP, artaxo@if.usp.br

The atmospheric transport of biomass burning emissions is studied through a numerical simulation of the air mass motions using the CATT-BRAMS (Coupled Aerosol and Tracer Transport to the Brazilian developments on the Regional Atmospheric Modeling System). CATT-BRAMS is an on-line transport model fully consistent with the simulated atmospheric dynamics. The sources emission from biomass burning and technological activities for several gases and aerosol may be defined from several published dataset and remote sensing. The mass concentration prognoses accounts also for convective transport by shallow and deep cumulus, wet and dry deposition and plume rise. The model has been applied to simulate carbon monoxide (CO) and particulate material PM_{2.5} transport during the SMOCC/RACCI campaign during the 2002 dry season. Comparison between model results and MODIS, MOPITT, AIRS products and local observations are showed. The results from model simulation have good predictability skills for smoke tracers' concentration and allow the understanding of the synoptic controls on the biomass burning emissions transport.

24.8-P: Numerical Simulation of the Influence of the CCN Variability on the Cloud Microphysical Properties in Amazonia Basin During LBA/SMOCC 2002

João Bosco Verçosa Leal Jr., UECE, jblealjr@uece.br (Apresentador / Presenting)

Gerson Paiva Almeida, UECE, gerson@uece.br

Carlos Jacinto Oliveira, UECE, cjacinto@uece.br

Emerson Mariano Silva, UECE, emerson@uece.br

Francisco Geraldo de Melo Pinheiro, UECE, fgmpinheiro@uece.br

Organic compounds are ubiquitous aerosols constituents in the atmosphere and their origin can be attributed to many sources, especially to anthropogenic actions. Burn of biomass in tropical regions is well known to produce large amount of aerosols and give new uncertainties in the weather prediction. In this work we investigate the modification of large scale circulations over the Amazon basin during the LBA/SMOCC 2002, component dry-to-wet. The atmospheric model used in this study is a three-dimensional, cloud-resolving version of the Regional Atmospheric Modeling System (RAMS). A parameterized microphysical scheme which include warm and ice phase distributed on seven categories is used. Different initial conditions are set to represent the wide range of observed cloud condensation nuclei (CCN) concentrations ranging to a very clean to a highly polluted case. Results show that the different CCN can modify the main features of cumulus microphysics observation, specially the water partitioning phases. In high polluted cases the mechanisms responsible of warm rain production are strongly suppressed, leading to an increasing iced rain processes initiation. The effects of the microphysical properties of these clouds on the atmospheric circulation are also evaluated.

24.9-P: Análise Conjunta de Perfis Verticais de Concentração de Partículas de Aerossol de Queimadas e de Variáveis Meteorológicas na Amazônia

Franscielly Aparecida Marquardt, IAG-USP, franscy@model.iag.usp.br (Apresentador / Presenting)

Márcia Akemi Yamasoe, IAG-USP, akemi@model.iag.usp.br

Este trabalho visa a análise conjunta de perfis verticais da concentração de partículas de aerossol na atmosfera e variáveis meteorológicas tais como temperatura, temperatura potencial, umidade relativa, medidas a bordo de aeronaves em experimentos realizados durante as estações secas de 1999 e de 2002 (Dry-to-Wet AMC), na região da Amazônia. O objetivo é estabelecer se é possível definir alguma variável meteorológica que descreva a estrutura vertical da concentração das partículas de aerossol provenientes da queima de biomassa. Os resultados indicam que em alguns casos a concentração numérica de partículas de aerossol apresentam correlação positiva com a umidade relativa e a temperatura potencial equivalente. Em outros observa-se uma correlação negativa entre tais variáveis.

24.10-P: Carbonaceous aerosol in La Gran Sabana, Canaima National Park, Venezuela

Milexi Pacheco, Instituto Venezolano de Investigaciones Cientificas, IVIC, mipachec@ivic.ve (Apresentador / Presenting)
Eugenio Sanhueza, Instituto Venezolano de Investigaciones Cientificas, IVIC, esanhuez@ivic.ve

Due to potential importance in the carbon cycle and global climate, increasing attention has been given to study atmospheric black carbon (BC). Very few estimates of the relative contribution of BC to the different compartments of the carbon cycle are available to date. We selected a remote place in Venezuela, La Gran Sabana, Canaima National Park, located nearby the northern border of the Amazon Forest, to study carbonaceous atmospheric aerosol. Size fractionated particles were collected using a cascade impactor. Total carbon (TC), organic carbon (OC) and BC were quantified by an optimized two steps thermal method. The mean TC was $3.2 \pm 0.5 \text{ ug/m}^3$, which is in the same order of magnitude as those found in remote continental atmospheres. The results show that carbon aerosol is mainly present in the fine fraction. The BC concentration was $1.3 \pm 0.3 \text{ ug/m}^3$; 14%, 29% and 56 % were in large, coarse and fine particle size, respectively. No correlation between nss-K^+ and BC was found, suggesting that BC is not coming from local biomass burning. Comparing with the Amazon forest, relatively low OC concentration was found in La Gran Sabana site, likely due to a low secondary production of organic particles.

24.11-P: Soluble Organic Nitrogen in Airborne Particles and Rains of La Gran Sabana, Canaima National Park, Venezuela.

Milexi Pacheco, Instituto venezolano de Investigaciones cientificas, IVIC, mipachec@ivic.ve (Apresentador / Presenting)
Loreto Donoso, Instituto venezolano de Investigaciones cientificas, IVIC, edonoso@ivic.ve
Eugenio Sanhueza, Instituto venezolano de Investigaciones cientificas, IVIC, esanhuez@ivic.ve

Soluble organic forms of nitrogen are widespread in the atmosphere and their deposition may constitute a substantive input of atmospheric N to terrestrial and aquatic ecosystems. However, only few studies on soluble organic nitrogen (SON) have been made in remote regions. SON was measured in airborne particles and in rainwater at La Gran Sabana, Canaima National Park, a remote place in Venezuela located nearby the northern border of the Amazon Forest. Precipitation was sampled by rain gauges and preserved with chloroform. Suspended particles were collected with a Hi Vol sampler and nitrogen soluble compounds extracted with deionized water using an ultrasonic method. Total soluble nitrogen (TSN) was analyzed in the water solution (particles and rain) as nitrate by the cadmium reduction method after wet chemical oxidation with persulfate. NH_4^+ and NO_3^- , were determined with a selective electrode and ion chromatography, respectively. SON was determined subtracting the inorganic fraction from TSN. In rainwater, the average volume weighted SON was 24 μM (as N), which represents $\sim 90\%$ of TSN. In aerosols $\sim 60\%$ of TSN is in the form of SON. In general, the low levels of the inorganic fraction are responsible for the high contribution of SON to the TSN in this pristine region. Therefore, SON is an important component of the nitrogen budget and its inclusion significantly increases the N nutrient input to the soil-vegetation reservoirs of La Gran Sabana ecosystems.

24.12-P: Aerosol Optical Properties over Amazon Basin

Melina Andrade Paixão, Institute of Physics, University of São Paulo, São Paulo, Brazil, melina@if.usp.br (Apresentador / Presenting)
Paulo Artaxo, Institute of Physics, University of São Paulo, São Paulo, Brazil, artaxo@if.usp.br
Brent Holben, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA, brent@aeronet.gsfc.nasa.gov
Joel Schafer, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA, joel.schafer@gsfc.nasa.gov

Aerosol particles in the Amazon Basin have an important role in the regional radiation budget and climate, in the cloud formation process and precipitation, in the carbon cycle and many others dynamics processes in the atmosphere. They interact with solar radiation and are responsible for its attenuation, scattering and absorption. The purpose of this work was to study aerosol optical properties from Amazonia, by means of comparison between measurements of wet and dry seasons. The sites involved were: Balbina (Manaus), Belterra (Santarém), Rio Branco, Ji Paraná (Rondônia) and Alta Floresta (Mato Grosso). Measurements obtained by AERONET - Aerosol Robotic Network, an internationally, federated, globally distributed network of sunphotometers maintained by NASA - were analyzed for all the sites mentioned. We studied, in 2002 because the SMOCC - Smoke Aerosols, Clouds, Rainfall and Climate -, aerosol optical thickness (AOT), single scattering albedo (SSA) and Angstrom coefficient. We compare results from the biomass burning season (August to November) with wet season (March and April). In Abracos Hill, 60km away from Ji Paraná, in the wet season, AOT was about 0.15 but in biomass burning season the AOT reached a very high value of 3.6. On the other hand, single scattering albedo was about 0.90 in the wet season and 0.94 biomass burning season, showing possible similarities of the aerosol optical properties on this two periods.

24.13-P: Modelling the dynamic behavior of Cloud Condensation Nuclei: case study comparing clean (LBA/CLAIRE 2001) and polluted (LBA/SMOCC 2002) conditions in Amazonia

Theotônio Pauliquevis, Institute of Physics at University of Sao Paulo, Brazil, theo@if.usp.br (Apresentador / Presenting)
Luciana Varanda Rizzo, Institute of Physics at University of Sao Paulo, Brazil, lrizzo@if.usp.br
Paulo Artaxo, Institute of Physics at University of Sao Paulo, Brazil, artaxo@if.usp.br
Meinrat O Andreae, Biogeochemistry Department, Max Planck Institute for Chemistry, Mainz, Germany., andreae@mpch-mainz.mpg.de
Göran Frank, Biogeochemistry Department, Max Planck Institute for Chemistry, Mainz, Germany., gfrank@mpch-mainz.mpg.de
Olga L. Mayol-Bracero, Institute for Tropical Ecosystem Studies, University of Puerto Rico, Puerto Rico, omayol@sunites.upr.clu.edu
Susimar Gonzalez, Institute for Tropical Ecosystem Studies, University of Puerto Rico, Puerto Rico, sgonzale@sunites.upr.clu.edu

The dynamic behavior of an aerosol population into an air parcel under a cooling process, regarding the cloud drops activation properties of these aerosols were investigated. We compared chemical composition and size distribution of clean (CLAIRE 2001) and polluted conditions under biomass burning influence (SMOCC 2002). To perform the simulation we used the MAPS model (Model for Aerosol Process Studies), from NCAR. MAPS is a box model that includes aerosol size distribution and chemical composition, (including organics - fixed 35% soluble).

The results show that under a clean (polluted) situation, where aerosol number concentration was set to 1000(7000) #/cm³ predominating the coarse (fine) mode of aerosols, under a cooling process, maximum supersaturation reached 0.33% (0.19%) and minimum activation diameter was 0.22 um (0.46 um). The liquid water content were the same in both conditions. The results agree with ground experimental data: modeled CCN/CN ratio was 0.28 and experimental was 0.39 ± 0.11 under intermediate smoky conditions.

It shows the higher efficiency in the interaction aerosol - water vapor for the polluted situation, given the lower maximum supersaturation reached. This is also the reason why minimum activation diameter was higher in polluted than in clean situation. Regarding that aerosol number concentration is higher under polluted conditions, smallest droplets formed are less efficient to coalescence and to produce rain in warm clouds. The results corroborate with studies concerning changes in cloud patterns associated to land use change in Amazonia, shifting the rain regime from warm to cold clouds under high aerosol loading situation.

24.14-P: Large-scale measurements of particle size distribution and cloud condensation nuclei during the LBA/SMOCC-2002 experiment in Rondônia

Luciana Varanda Rizzo, Instituto de Física - USP, lrizzo@if.usp.br (Apresentador / Presenting)

Theotonio Mendes Pauliquevis Junior, Instituto de Física - USP, theo@if.usp.br

Paulo Artaxo, Instituto de Física - USP, artaxo@if.usp.br

Meinrat O. Andreae, Max Planck Institute for Chemistry, andreae@mpch-mainz.mpg.de

Göran Frank, Max Planck Institute for Chemistry, gfrank@mpch-mainz.mpg.de

Pascal Guyon, Max Planck Institute for Chemistry, guyon@mpch-mainz.mpg.de

The LBA/SMOCC experiment (Large-scale Biosphere-atmosphere experiment in Amazonia - SMOke, aerosols, Clouds, rainfall and Climate) was aimed at studying aerosol-cloud interactions, and the field campaign was in September - November 2002. The campaign included ground based measurements (at the Fazenda Nossa Senhora, Ouro Preto do Oeste) along with extensive aircraft measurements, totaling up 31 flights. A Bandeirante aircraft was equipped with a scanning mobility particle sizer (SMPS), a condensational particle counter (CPC), a static thermal-gradient cloud condensation nuclei (CCN) counter, and other aerosol instrumentation. Each number size distribution measured by SMPS was log-normally fitted, with the following parameters: geometric mean diameter D_{pg} (70 - 160 nm), geometric standard deviation σ_g (1.5 - 2.2), and total number concentration N (500 - 20,000 cm⁻³). Those parameters were influenced by the amount and kind of biomass burning emissions. The size distributions with the largest geometric mean diameters (120 - 160 nm) also showed low or moderate concentrations (N < 5,000 cm⁻³), typical of background conditions or areas moderately influenced by smoldering smoke. Over areas impacted by flaming smoke, the particle concentration exceeded 5,000 cm⁻³, and the corresponding spectra showed low geometric mean diameters (70 - 120 nm). The fine particle concentrations decreased gradually with increasing altitudes, an indication that the surface acts as a source. At profiles performed over smoke impacted areas, one could see a gradually decrease of D_{pg} from surface up to 1500 m altitude in average, where the influence of surface emissions is lower. Over clean areas, N and D_{pg} parameters remained almost constant with increasing altitudes, indicating a strong vertical mixing. At a supersaturation of 1.2%, the ratio between CCN number and total particle concentration laid between a large range (0.15 and 0.70). At a profile performed over the Fazenda Nossa Senhora, results show that droplet activation is more efficient at 2000 m high, in comparison to 470 m high. This is possibly due to the presence of cloud processed aerosols in higher altitudes.

24.15-P: Estudo numérico do efeito das partículas de aerossol de queimada sobre as taxas de aquecimento/resfriamento da atmosfera

Ricardo Almeida de Siqueira, USP/IAG/ACA, rasiqu@model.iag.usp.br (Apresentador / Presenting)

Durante a estação seca, a região da Amazônia apresenta elevadas concentrações de aerossol devido à maior atividade de queima de biomassa ocasionada principalmente por contribuição antropogênica. Estas queimadas ocorrem principalmente para fins agrícolas ou para manutenção de pastagens para a pecuária localizando-se tanto em áreas de floresta como na de cerrados. As partículas de aerossol oriundas destas queimadas podem ser compostas tanto de compostos orgânicos, sendo eficazes em espalhar a radiação solar, bem como por partículas de black carbon, eficientes na absorção de radiação. Por causa da interação destas partículas com a radiação solar, pode ocorrer aquecimento ou resfriamento da atmosfera com conseqüentes alterações em suas taxas de aquecimento e resfriamento.

Este efeito é denominado como o efeito direto do aerossol no sistema Terra-atmosfera. Este projeto pretende estudar o efeito direto das partículas de aerossol de queimadas na Amazônia sobre as taxas de aquecimento e resfriamento da atmosfera, concentrando-se no sítio de Alta Floresta, MT. Foram realizados cálculos numéricos a partir de dados de índice de refração e de distribuição de tamanho do aerossol obtidos da AERONET para os anos de 1999 a 2002 para o sítio de Alta Floresta. Com a ajuda de um código que utiliza a teoria Mie (código Wiscombe), obteve-se uma caracterização das propriedades ópticas do aerossol de queimadas no espectro solar. De acordo com os resultados obtidos, o código de inversão de Dubovik tende a superestimar a parte imaginária do índice de refração, ocasionando uma subestimação do albedo simples quando estes dados são comparados com os valores obtidos da AERONET, com melhores resultados para o ano de 2002. De posse dos parâmetros ópticos do aerossol de queimadas em vários comprimentos de onda no espectro solar, um código de transferência radiativa está sendo utilizado (SBDART) para se obter os primeiros resultados sobre as taxas de aquecimento e resfriamento da atmosfera em Alta Floresta devidas ao aerossol de queimadas.

[AC_Aerossóis_Radiação_\(AC_Aerosols_Radiation\)](#)

25.1-P: The impact of the direct radiative effect of the aerosol particles on the calculation of the photolysis rates: a case study for an Amazon site during the biomass burning season

Leila Maria Mercê Albuquerque, CPTEC INPE, leilamma@cptec.inpe.br (Apresentador / Presenting)

Karla Longo, CPTEC INPE, longo@cptec.inpe.br

Saulo Ribeiro de Freitas, CPTEC INPE, sfreitas@cptec.inpe.br

Tatiana Tarasova, CPTEC INPE, tatiana@cptec.inpe.br

Carlos Afonso Nobre, CPTEC INPE, nobre@cptec.inpe.br

Aline S. Procopio, IF USP, aline@if.usp.br

Luciana Vanni Gatti, IPEN USP, lvgatti@net.ipen.br

Paulo Artaxo, IF USP, artaxo@if.usp.br

The impact of the direct radiative effect of the aerosol particles on the calculation of the photolysis rates and consequently on the atmospheric chemistry in the regional smoke cloud due to biomass burning over Amazon basin is addressed in this work. The TUV radiation model is used for the photolysis rates calculation considering the layer aerosol optical depth from the CATT-BRAMS. The temperature and pressure vertical profiles used are from radiosondes data of the RACCI/SMOCC-LBA field experiment, during the dry to wet transition season (September-November 2002). Climatological spectral single scattering albedo and asymmetry parameter of scattering phase function of smoke particles are from the three years optical properties retrieval obtained at the Amazon observational site of the AERONET. These intrinsic optical properties are actually a function of the aerosol loading of the atmosphere and so a complex look-up table was generated for them as function of the aerosol optical thickness at 500 nm. A simulation of the ozone production carried out using the one-dimensional photochemical box model OZIPR for FNS RACCI/SMOCC-LBA experimental site is shown. The chemical mechanism used in OZIPR includes reactions that emphasize the processes of tropospheric ozone and its precursor's production. The trace gases emissions were obtained by multiplying the total amount of biomass burned within a grid cell during 24 hours by the respective species' emission factor. The tropospheric ozone production, with the simulated maximum value of 70 ppb ozone reasonably matching the observations, is dominated by the reactions involving HO₂ and NO.

25.2-P: Long term measurements of aerosol radiative forcing in Amazonia

Paulo Artaxo, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, artaxo@if.usp.br (Apresentador / Presenting)

Aline S. Procopio, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, aline@if.usp.br

Carlos Pires, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, capjr@if.usp.br

Melina M. A. Paixão, Instituto de Física, Universidade de São Paulo, São Paulo, Brazil, melina@if.usp.br

Alejandro Duarte, Universidade Federal do Acre, alejandro@ufac.br

Brent Holben, NASA Goddard Space Flight Center, brent@aeronet.gsfc.nasa.gov

Joel Schaefer, NASA Goddard Space Flight Center, joel.schafer@gsfc.nasa.gov

The AERONET network of sun-photometers is measuring aerosol optical thickness (AOT) and radiation fluxes in 6 LBA sites: Santarem, Balbina, Rondonia, Alta Floresta, Rio Branco, and Cuiabá. During the wet season, very low atmospheric aerosol loading is observed, with an average AOT of 0.1 at 500 nanometers. During the dry season, very high atmospheric aerosol loading were observed, with values of AOT up to 3 at 500 nm measured in several sites. These high aerosol loading have several effects to the ecosystem, one of them is the significant drop in surface radiation fluxes. Instantaneous fluxes of up to -300 watts per square meters (w/m²) were observed in Alta Floresta e Rondonia. Average dry season values for 7 years of -28 w/m² were modeled, a value that bring significant changes in the atmospheric radiation budget in large areas of Amazonia. The high aerosol loading enhances diffuse radiation while reduces direct fluxes, in the critical region of photosynthetic radiation. This affects the efficiency of photosynthesis, and the carbon uptake by the Amazonian forest.

25.3-P: Desempenho de Modelos Radiativos na Avaliação de Irradiâncias em Presença de Aerossol de Queimadas

Artemio Plana Fattori, Departamento de Ciências Atmosféricas, IAG-USP; e Departamento de Geofísica, Universidad de Chile, artemio@dgf.uchile.cl (Apresentador / Presenting)

Márcia Akemi Yamasoe, Departamento de Ciências Atmosféricas, IAG-USP, akemi@model.iag.usp.br

Karla Maria Longo, Centro de Previsão de Tempo e Estudos Climáticos, INPE, longo@cptec.inpe.br

A inclusão de processos de interação entre a radiação solar e partículas de aerossol tem sido considerada como relevante no aperfeiçoamento dos modelos meteorológicos mais comumente utilizados para previsão de tempo e clima no mundo. Modelos meteorológicos empregados na previsão de condições ambientais na América do Sul são particularmente sensíveis a uma descrição realista da interação entre a radiação solar e o aerossol de queimadas. Este estudo compara observações de irradiância solar à superfície em presença de aerossol de queimadas e seus respectivos valores teóricos obtidos mediante diferentes modelos radiativos. As observações em questão foram efetuadas em setembro e outubro de 2002 nas proximidades de Ouro Preto d'Oeste (Rondônia), durante a realização do experimento RACCI/SMOCC. Alguns dos modelos radiativos em questão foram concebidos para emprego em modelos meteorológicos e portanto envolvem aproximações mais severas quanto à avaliação dos efeitos de espalhamento e de absorção de radiação solar por uma população de partículas em suspensão na atmosfera. Um segundo grupo de modelos radiativos considera representações mais sofisticadas com vistas à avaliação destes mesmos efeitos, além de permitir cálculos com maior resolução em comprimento de onda. Os resultados incluem testes de sensibilidade sobre a refletância da superfície, sobre a repartição vertical das partículas de aerossol, e sobre as propriedades ópticas do aerossol de queimadas.

25.4-P: Estudo da evolução temporal da estrutura vertical da atmosfera - efeito do aerossol de queimadas em Alta Floresta

Edson Roberto Francischinelli, IAG-USP, erfran@model.iag.usp.br (Apresentador / Presenting)

Márcia Akemi Yamasoe, IAG-USP, akemi@model.iag.usp.br

Com este estudo pretende-se avaliar o efeito das partículas de aerossol sobre a estrutura vertical da atmosfera, por meio de cálculos numéricos a partir do modelo meteorológico de meso-escala RAMS, com validação a partir de comparações com radiossondas reais lançadas em Alta Floresta, MT. As propriedades ópticas das partículas de aerossol são obtidas a partir de medidas realizadas continuamente desde 1999 em Alta Floresta, MT, complementando os esforços do LBA e faz parte da rede mundial de monitoramento de partículas de aerossol em suspensão na atmosfera, a AERONET, idealizada e coordenada pela NASA Goddard Space Flight Center. Para que os modelos numéricos de previsão possam ser aprimorados de forma a reproduzirem os efeitos das partículas de aerossol de queimadas sobre a meteorologia e o clima, é necessário o conhecimento de suas propriedades ópticas e microfísicas e a variabilidade temporal de tais propriedades. Um dos efeitos do aerossol de queimadas cujo estudo será iniciado com este plano de trabalho é sobre as taxas de aquecimento/resfriamento da atmosfera. Dessa forma, também serão analisadas medidas do perfil vertical da atmosfera obtido a partir de radiossondas lançadas no aeroporto de Alta Floresta. Assim como serão realizadas simulações numéricas com o RAMS que reproduzam o observado experimentalmente.

25.5-P: Resultados de um Estudo Estatístico das Propriedades Ópticas das Partículas de Aerossol de Queimadas via AERONET

Marcelo Pinheiro Garcia, Universidade de São Paulo - Instituto de Astronomia, Geofísica e Ciências Atmosféricas (IAG), marcelop@model.iag.usp.br (Apresentador / Presenting)

Márcia Akemi Yamasoe, Universidade de São Paulo - Instituto de Astronomia, Geofísica e Ciências Atmosféricas (IAG), akemi@model.iag.usp.br

Paulo Artaxo, Universidade de São Paulo - Instituto de Física, artaxo@if.usp.br

Este trabalho visa estudar o papel dos aerossóis de queimada durante a estação seca na região Amazônica. Nesse sentido foram desenvolvidas diferentes bibliotecas das propriedades ópticas dos aerossóis para cada local de estudo, em virtude dos tipos distintos de ecossistemas de cada região (desde cerrado até floresta). Os modelos desses parâmetros ópticos foram determinados a partir da utilização de valores médios de índices de refração (partes real e imaginária), distribuição de tamanho, fator de assimetria e albedo simples obtidos através de medidas diretas e indiretas (algoritmo de inversão proposto por Dubovik e King, 2000) dos radiômetros espectrais solares e celestes da rede AERONET. Foram realizadas análises estatísticas dessa base de dados no sentido de se estabelecer o período em que houve queima de biomassa durante os anos de 1999 a 2002, além de fixar valores limites na separação do período seco e de pré-queimada (estação chuvosa). A validação da biblioteca na região espectral do visível será realizada a partir de cálculos com o código radiativo SBDART, de fluxos de radiação fotossinteticamente ativa (PAR) que atingem a superfície, enquanto que no caso do sítio de Cuiabá, através de fluxos radiativos integrados no intervalo espectral correspondente a banda utilizada nos Piranômetros CM21/CM31. Os resultados dos cálculos (modelados) serão comparados com valores de irradiância PAR e solar global medidos simultaneamente nos sítios de monitoramento onde estão instalados os radiômetros.

25.6-P: Impact of aerosols on the Amazon shortwave surface and atmospheric radiation balance

Hongqing Liu, University of Maryland, hql@atmos.umd.edu (Apresentador / Presenting)

Rachel T. Pinker, University of Maryland, pinker@atmos.umd.edu

Hiroko Kato, University of Maryland, hkato@atmos.umd.edu

Information on large-scale radiative fluxes over the Amazon Basin is needed for modeling and predicting the surface hydrological and energy budgets, for ecological modeling, for evaluating climate models, and for estimating net primary productivity. Aerosols are known to have an impact on the accuracy at which such fluxes can be estimated. Most available information on aerosols over land comes from point observations, which do not meet larger scale needs. Over the Amazon, aerosols from biomass burning are characterized by strong absorption and have strong effects on the shortwave radiation balance by weakening the aerosol 'white-house' effect at the top of atmosphere and decreasing the downward solar irradiance at the surface. From July to October strong signals of biomass burning have been detected both from in situ observations and satellite remote sensing, and have already been used for the evaluation of their radiative effect.

In this study an attempt is being made to synthesize available information on aerosol properties from observations and models for the entire Amazon Basin. This information is subsequently built into the surface radiation budget (SRB) model of the University of Maryland and sensitivity studies of the Amazon surface and atmospheric radiation balance to such inputs are conducted, both in the total solar spectrum and in selected spectral intervals of interest to biogeochemical modeling (e.g., the PAR region). Results for an entire annual cycle using observations from GOES satellites will be presented and evaluated against ground observations.

25.7-P: Numerical modelling of the biomass-burning aerosol direct radiative effects on the thermodynamic structure of the atmosphere and convective precipitation

Karla Longo, CPTEC-INPE, longo@cptec.inpe.br (Apresentador / Presenting)

Saulo Ribeiro de Freitas, CPTEC-INPE, sfreitas@cptec.inpe.br

Maria Assunção Faus da Silva Dias, NASA-AMES, assuncao@cptec.inpe.br

Robert Chatfield, CPTEC-INPE, chatfield@clio.arc.nasa.gov

Pedro Leite Silva Dias, CPTEC-INPE, pldsdias@master.iag.usp.br

Paulo Artaxo, IF-USP, artaxo@if.usp.br

The atmospheric transport of biomass burning emissions in South America and the direct radiative effects of the aerosol particles of the regional haze are addressed in this work. This study is carried out through a numerical simulation of the atmospheric motions using the Coupled Aerosol Tracer Transport to the Brazilian Regional Atmospheric Modeling System - CATT-BRAMS. A radiative code that includes the aerosol particle absorption and scattering is fully coupled to the CATT-BRAMS allowing atmospheric model feedback studies. The atmospheric model responds to the presence in the atmosphere of this highly absorber aerosol particles, from the direct radiative point of view, cooling the atmosphere in the lower levels and heating it in the upper levels of the boundary layer. Temperature gradients associated with the presence of the biomass-burning aerosol can reach 2 Celcius degrees over very polluted areas. Consequently, the atmospheric model responds with a reduction of the kinetic turbulent energy, stabilizing the atmosphere and suppressing the convective precipitation.

25.8-P: Spectral Absorption properties of Aerosols in Amazonia during the Wet and Dry Seasons

J. Vanderlei Martins, JCET/UMBC - NASA Goddard, martins@climate.gsfc.nasa.gov (Apresentador / Presenting)
Paulo Artaxo, USP, artaxo@if.usp.br
Yoram J. Kaufman, NASA GSFC, kaufman@climate.gsfc.nasa.gov

The absorption properties of aerosols are responsible for the biggest uncertainties in the climate forcing by aerosols and play major role in both direct and indirect components of the radiative forcing. Large uncertainties commonly found in the standard techniques used today for the measurement of aerosol absorption are addressed in this work and will be discussed. Long term aerosol samples collected in several places in Amazonia were used for the measurement of the aerosol absorption efficiency in the wavelength range between 350-2500 nm. The spectral dependence results show strong evidences of significant absorption by biogenic aerosols, as well as the spectral absorption efficiency for biomass burning and long-range transported dust particles. The absorption spectral dependence was used to characterize the aerosol microphysical model and clearly shows the transition between absorption by very small absorbers, large absorbers, and the combination between small absorbers and larger aerosols. For comparison, results of measurements in samples from several other locations and aerosol types (urban from S. Paulo, US and Israel, dust transported to Israel and US, etc.) will be compared with the Amazonian aerosols.

25.9-P: Effect of Smoke Aerosols over the CO₂ flux in the Amazonia

Paulo Henrique Fernandes de Oliveira, Instituto de Física, Universidade de São Paulo, pauloh@if.usp.br (Apresentador / Presenting)
Paulo Artaxo, Instituto de Física, Universidade de São Paulo, artaxo@if.usp.br

Measurements of radiation flux components and turbulent fluxes of energy and CO₂ were made in a tropical forest site in Southwest Amazonia (Reserva Biológica de Jarú, 10° 05' S and 61° 55' W). The relationship between daily CO₂ flux measurements and the reduction of net radiation received on the top of canopy were analyzed during the period from January 2000 to October 2002. A *fr* index was calculated to evaluate the reduction in the irradiance due aerosols and clouds. The irradiance on background aerosol conditions and in the absence of clouds was evaluated from a software tool that computes plane-parallel radiative transfer (SBDART). We used typical Amazonia aerosol optical properties as inputs for the model. The initial results show that a reduction of net solar radiation of 36% can increase the net ecosystem exchange (NEE) in about 30%. There is a decrease in the NEE for conditions of high reduction in the irradiance (> 40%). To explain such observations, several mechanisms have been postulated. They include increase in diffuse radiation, decrease in the respiration of sunlit leaves and reduction in the vapor pressure deficit (VPD).

25.10-P: Seasonal aspects of atmospheric aerosol optical properties over South America from AERONET measurements

Carlos Alberto Pires Jr, Institute of Physics, University of São Paulo, Brazil, capjr@if.usp.br (Apresentador / Presenting)
Paulo Artaxo, Institute of Physics, University of São Paulo, Brazil, artaxo@if.usp.br
Brent Holben, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA, brent@aeronet.gsfc.nasa.gov
Joel Schafer, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA, joel.schafer@gsfc.nasa.gov

Several works have been conducted over the last years in order to study the optical properties of biomass burning aerosols in the Amazon Basin, and important results were obtained about its effects on local and regional climate. In other hand, more and more transport simulations have led researchers to ask about the conditions and effects of biomass burning aerosol after mid and long range transport over South America. The present study analyzed data from 10 AERONET (Aerosol Robotic Network) sites, distributed over approximately 70% of South America area, from Balbina (01°S,59°W) to Puerto Madryn (42°S,65°W). High significant seasonality was observed, with all sites showing important increases in the values of Aerosol Optical Thickness (AOT), that express the total aerosol loading in the atmosphere, from August to November. This period represents the dry season for most part of the continent, historically related to high levels of biomass burning activities, and the results obtained show that this seasonality appears even for sites located more than 1000 km away from the burning activities regions. The increase on AOT values during dry season varied from 75% (Alta Floresta) to 15% (Puerto Madryn). The statistical analysis applied on AOT were extended for other optical properties, mainly related to particle size, solar radiation absorption and total precipitable water along the atmosphere column. These properties allowed observing seasonality of meteorological parameters of the atmosphere, and made possible to differentiate the characteristics of natural background aerosol from that influenced by biomass burning emissions.

25.11-P: Case studies of high aerosol optical thickness events and transport of biomass burning aerosol over South America from AERONET measurements

Carlos Alberto Pires Jr, Institute of Physics, University of São Paulo, Brazil, capjr@if.usp.br (Apresentador / Presenting)
Paulo Artaxo, Institute of Physics, University of São Paulo, Brazil, artaxo@if.usp.br
Brent Holben, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA, brent@aeronet.gsfc.nasa.gov
Joel Schafer, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA, joel.schafer@gsfc.nasa.gov

Several works have been conducted over the last years in order to study the optical properties of biomass burning aerosols in the Amazon Basin, and important results were obtained about its effects on local and regional climate. In other hand, more and more transport simulations have led researchers to ask about the conditions and effects of biomass burning aerosol after mid and long range transport over South America. This study analyzed data from 3 AERONET (Aerosol Robotic Network) sites: Cordoba (31°S,64°W), Buenos Aires (34°S,58°W) and São Paulo (23°S,46°W), from 2001 to 2003. Significant seasonality was observed, with important increases in the values of Aerosol Optical Thickness (AOT), which express the total aerosol loading in the atmosphere, from August to November. This period represents the dry season for most part of the continent, historically related to high levels of biomass burning, mainly over Amazon and central-western regions. From this period, high AOT events were selected and analyzed with satellite images of cloud covering, local and regional meteorological parameters and air mass trajectories calculation using two different models: HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory), developed by NOAA (National Oceanic and Atmospheric Administration), USA, and CATT-BRAMS (Coupled Atmospheric Tracer Transport - Brazilian Regional Atmospheric Modeling System), developed by INPE (National Institute of Space Research) and University of São Paulo, Brazil. Case studies indicated several events of aerosol transport from regions highly affected by biomass burning to the studied sites, covering more than 1000 km and increasing significantly the aerosol loading for the 3 sites.

25.12-P: Changes in total, direct and diffuse solar and PAR radiation at the surface due to Amazonian biomass burning: a modeled study

Aline S. Procopio, Instituto de Física e Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo, Brazil, aline@if.usp.br (Apresentador / Presenting)
Paulo Artaxo, Instituto de Física da Universidade de São Paulo, Brazil, artaxo@if.usp.br
Lorraine A. Remer, NASA/GSFC, USA, remer@climate.gsfc.nasa.gov
Yoram J. Kaufman, NASA/GSFC, USA, kaufman@climate.gsfc.nasa.gov
Joel S. Schafer, NASA/GSFC, USA, joel.schafer@gsfc.nasa.gov

The Amazon region has been experiencing a large number of forest fires in the past years, mainly in the peak of the dry season, with a considerable increase in the atmospheric aerosol loading. Using the optical properties of these aerosols derived from measurements by the AERONET sun photometer network in Amazonia, the total, direct and diffuse solar and PAR fluxes at the surface were calculated as a function of aerosol optical thickness at 500 nm (AOT), with a temporal resolution of 5 minutes. A considerable reduction of the total downward solar and PAR fluxes at the surface and a significant increase at the diffuse component were found. Consider that for aerosol background conditions, when AOT = 0.10, there are not any reductions of either solar or PAR fluxes at the surface. For AOT = 1.0, the daily reductions of solar and PAR fluxes were found to be 21 % and 28 %, respectively. If AOT = 3.0, for example, the reductions found are 48 % and 61 %, in the same order. The average ratios of diffuse to total radiation, for solar zenith angle between 40° and -40°, increased from 0.12, for AOT = 0.10, to 0.66, for AOT = 3.00; for PAR radiation, this ratio increased from 0.16, for AOT = 0.10, to 0.91, for AOT = 3.00. For AOT = 1.0, these ratios were 0.43 and 0.60, for solar and PAR radiation, in that order. The increase in the diffuse component of the total downward radiation at the surface may cause an impact on the net ecosystem productivity, due to the likely enhancement of carbon assimilation. On the other hand, the reduction of total radiation at the surface might decrease the carbon assimilation, due to the less availability of PAR radiation. The value of AOT that corresponds to the saturation in the enhancement of carbon assimilation due to the reduction of total radiation, should be investigated in details in a future study.

25.13-P: MODIS Cloud Products and Observed Cloud Attenuation of Solar Flux: An Investigation of a Method for Scaling Local Observations to the Regional Level

Joel Schafer, NASA/GSFC, joel.schafer@gsfc.nasa.gov (Apresentador / Presenting)
Brent Holben, NASA/GSFC, brent@aeronet.gsfc.nasa.gov
Tom Eck, NASA/GSFC, teck@ltpmail.gsfc.nasa.gov
Paulo Artaxo, USP, artaxo@if.usp.br

We have observed that the solar flux reductions by clouds are strongly correlated with readily available satellite cloud products such as cloud optical thickness and daytime cloud fraction from MODIS, for instance. We routinely compute monthly averages of daily integrated flux (insolation) for all our sites. Additionally, we use modeled insolation (assuming clear sky, background aerosol) to determine the fraction of expected clear sky insolation received at the surface.

Despite the large distances between our equatorial and southern Amazonian sites, and great difference in predominant cloud regimes, a simple relationship based on data from 2000-2002 was found that could generate satisfactory predictions of monthly averaged daily insolation at all sites for the 2003 observations using only MODIS cloud parameters. This empirical relationship was found to hold even for intervals with moderate smoke levels (Month Average AOT_{500nm} < 0.5), while it tended to over-predict insolation for the few months with the most intense biomass burning, as might be expected. For the 26 months of data from 5 different sites (low to moderate AOT cases), the rms error in predicted daily insolation was 0.7 MJ m⁻², which amounts to about 4% of the typical daily value. The largest error for any month was 10%. The effectiveness of this simple function suggested the potential suitability of its application over the entire study region encompassing our sites (20 x 20 deg box) and demonstrates an empirically based technique for networks of flux

monitoring sites to scale local cloud effects to regional scale flux fields.

25.14-P: Effect of smoke on the vertical profile of photosynthetically active irradiance inside the canopy observed at Rebio Jaru

Marcia Akemi Yamasoe, IAG-USP, akemi@model.iag.usp.br (Apresentador / Presenting)
Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br

During the LBA Wet-to-Dry/AMC and SMOCC field experiments irradiance measurement in the spectral region of photosynthetically active radiation (PAR) was carried out at seven levels inside the canopy at Reserve Jaru, RO. The instruments were mounted on a 60 meter height micrometeorological tower, pointing North, East and West. Sensors pointing up and down were mounted at the top of canopy (39m height) and at 30 m to measure incident and reflected irradiance. At lower levels only sensors pointing up were installed. Aerosol optical properties were determined through measurements performed by a radiometer from AERONET installed at another tower about 800m from the main site. Aerosol optical depth data from a portable sunphotometer from USDA Forest Service and from MODIS aboard Terra and Aqua satellites were also used in this study. Results show that the increase of aerosol loading increases the transmittance of PAR irradiance inside the canopy.

[AC_Geral_\(AC_General\)](#)

26.1-P: Factors controlling acetic and formic acid concentrations in different tropical forests' rainwater

Vanessa Prezotto Almeida, Cena/usp, vpsilvei@cena.usp.br (Apresentador / Presenting)
Luciene Lorandi Lara, Cena/usp, luciene@cena.usp.br
Plínio Barbosa de Camargo, Cena/usp, pcamargo@cena.usp.br

Acetic and formic acid concentrations in rainwater from two tropical forest reserves in the State of São Paulo (Brazil) were measured in order to establish possible correlations with land-use change. The Brazilian Atlantic forest in the State of São Paulo is one of the most threatened ecosystems as only 1.8% of its original coverage is left. Morro do Diabo reserve is an isolated fragment of inland Atlantic tropical forest (tropical semi-deciduous mesophytic broadleaf forest) with low annual rainfall (1000-1500mm) and Intervales reserve is an important fragment of Atlantic tropical forest (ombrophilous dense forest, that shows the highest diversity in Brazil) with high annual rainfall (1700-2000mm). We collected and analyzed rainwater from both reserves during one year (2002-2003). Acetic and formic acid account for a great portion of organic acids in rainwater, showing a similar behavior to that of the Central Amazon. Acetic acid is the major constituent, followed by formic acid, contradicting results from French Guiana's and Venezuela's cloud forests. Significant correlation between DOC and acetate and DOC and H⁺ indicate that there is a combination of inorganic and organic sources of acidity in rainwater in reserves of the State of São Paulo. Land-use changes, direct emissions from biomass burning, agricultural practices, motor vehicle and industrial emissions could be explanations for these results.

26.2-P: Modeling of the Manaus Driven Ozone Plume

Leila Droprinchinski Martins, IAG/USP, leiladro@model.iag.usp.br
Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br
Edmilson Dias de Freitas, IAG/USP, efreitas@model.iag.usp.br (Apresentador / Presenting)
Luciana Vanni Gatti, IPEN, lvgatti@net.ipen.br
Paulo Artaxo, IF/USP, artaxo@if.usp.br
Meinrat O. Andreae, Max Planck, andreae@mpch-mainz.mpg.de
Saulo Ribeiro de Freitas, CPTEC, sfreitas@cptec.inpe.br
Karla Maria Longo, CPTEC, longo@cptec.inpe.br
Maria de Fátima Andrade, IAG/USP, mftandra@model.iag.usp.br

A numerical simulation of a particular case study of the Manaus/Brazil ozone plume was performed with a simplified photochemical module coupled with RAMS. The on-line photochemical model is advantageous in comparison with the traditional off-line simulations of the chemical reactions because of the coupling with the sophisticated turbulence parameterizations available in RAMS and the use of shorter time steps for transferring the meteorological information to the chemical model, besides the guarantee of energy consistency. Industrial and vehicular emissions used in the model were based on those from the Sao Paulo Metropolitan Area with appropriate changes in view of the differences in urban area size. The simulations indicate that the Manaus ozone plume might travel over a distance of the order of 200 km to the west. Maximum concentrations were found to be as high as 30 ppb in a region located approximately 60 km to the west of Manaus by the end of the day at 600 m height. The ozone plume is identified mainly inside PBL, which is up to 1400 m. Numerical diffusion needs a better adjustment since the ozone plume of Manaus spread too much inside model domain. Model validation is based on measurements at the surface and aircraft flights around Manaus. Besides the simplicity of the photochemical model, it is a powerful tool for short-range ozone forecast.

26.3-P: Monitoring the Transport of Biomass Burning Emissions in South America

Saulo Ribeiro de Freitas, CPTEC-INPE, sfreitas@cptec.inpe.br (Apresentador / Presenting)
Karla Longo, CPTEC-INPE, longo@cptec.inpe.br
Maria Assução Faus da Silva Dias, CPTEC-INPE, IAG-USP, assuncao@cptec.inpe.br
Pedro Leite Silva Dias, IAG-USP, CPTEC-INPE, pldsdias@master.iag.usp.br
Robert Chatfield, NASA-AMES, chatfield@clio.arc.nasa.gov
Elaine Prins, NOAA, elaine.prins@ssec.wisc.edu
Alberto Setzer, CPTEC-INPE, asetzer@cptec.inpe.br

The atmospheric transport of biomass burning emissions in the South American and African continents is monitored with the aid of numerical simulation of air mass motions using the tracer transport capability of the atmospheric model RAMS (Regional Atmospheric Modeling System) coupled to an emission model. In this application, the mass conservation equation is solved for carbon monoxide (CO) and particulate material (PM_{2.5}). Source emissions of trace gases and particles associated with biomass burning activities in tropical forest, savanna and pasture are parameterized and introduced into the model. The sources are distributed spatially and temporally and assimilated daily according to the biomass burning locations detected by remote sensing. Advection at grid scale, and turbulent transport at sub-grid scale, are provided by the RAMS parameterizations. A sub-grid transport parameterization associated with moist deep and shallow convection, not explicitly resolved by the model due to its low spatial resolution, is also introduced. Sinks associated with wet and dry removal of aerosol particles and chemical transformation of gases are parameterized and introduced into the mass conservation equation. An operational system was implemented producing daily 48-hour numerical simulations (24-hour forecast) of the mass concentrations for CO and PM_{2.5}, in addition to traditional meteorological fields. Time series of PM_{2.5} measured at the surface are compared with the model results and demonstrate the good forecasting ability of the model.

26.4-P: Seasonality of Isoprene Emissions in the Amazon Basin

Luciana Vanni Gatti, IPEN - Laboratorio de Quimica Atmosferica, lvgatti@net.ipen.br (Apresentador / Presenting)

Carla Roberta Trostorf, IPEN - Laboratorio de Quimica Atmosferica, crtrost@net.ipen.br

Amelia Yamazaki, IPEN - Laboratorio de Quimica Atmosferica, amelia@net.ipen.br

Simone Avino, IPEN - Laboratorio de Quimica Atmosferica, sissa.m@terra.com.br

Carlos Augusto Bauer Aquino, ULBRA- Ji-Parana, paquino@brturbo.com

Lizia Murbach, ULBRA- Ji-Parana, lizia19@ig.com.br

Williams Castro Martins, UFPA - Santarem, williamsmartins@hotmail.com

Alex Guenther, NCAR - Atmospheric Chemistry Division, guenther@acd.ucar.edu

Mark J. Potosnak, DRI - Desert Research Institute, Mark.Potosnak@dri.edu

Volatile organic compounds (VOC) have a major influence on the atmospheric oxidative capacity, greenhouse gas concentration and the formation of aerosols, which implies a crucial role for VOCs in climate forcing. Tropical regions are responsible for the major part of isoprene emissions from the earth's surface. Considering the importance of tropical biomes in global VOC impacts, these regions have been the least investigated to date, and flux estimates have high uncertainties. Usually, the estimates of isoprene emission consider the temperature, PAR, LAI and specific emissions factors for the ecosystem. One year of weekly samples in the Amazon basin in 4 different places shows that the hydrological cycle produces a strong seasonality in isoprene emissions.

The objective was to study the variability during the year (2001/2002) in four different places in Amazônia. In Para state, in the Floresta Nacional do Tapajós, the studies took place in a primary forest site (Km 67 BR 163) and other at a forest where selective logging is taking place, Km 83 of BR 163. In Rondonia state the measurements were made in a primary forest (Reserva biológica do Jarú) and in a pasture site (Abracos tower). The samples were taken at two heights to obtain gradient fluxes (64m and 54m in FLONA-Tapajós towers Km 67 and 83, 60m and 50m in Rebio Jarú tower and 8m and 3m in the pasture site).

High seasonality was observed at all sites. The average concentrations during the wet season, for 50m height in the two primary forests, were 1.8ppb and 4.4ppb, and during the dry season were 3.1ppb and 5.2ppb at the Flona-Tapajós and Rebio Jarú, respectively.

26.5-P: Soil moisture impact on convection and biomass burning pollutants in Roraima, Brazil, during the CLAIRE/1998 Experiment

Rodrigo Gevaerd, Universidade de São Paulo, rodrigo@master.iag.usp.br (Apresentador / Presenting)

Saulo Ribeiro de Freitas, Centro de Previsão de Tempo e Estudos Climáticos, srfreitas@cptec.inpe.br

Marcos Longo, Universidade de São Paulo, marcos@master.iag.usp.br

The aim of this work is to evaluate the relevance of soil moisture spatial distribution on formation and development of a mesoscale convective system occurred on March 18th, 1998 in the Amazon Basin. Previous studies have shown that this convective system imposed strong vertical motion to the pollutants emitted by the huge fire in Northern Roraima State during the same period. Afterwards, the high-level circulation transported the aged smoke towards Suriname which was identified from measurements performed by instrumented aircraft measurements during the CLAIRE-98 experiment.

The soil moisture is obtained from a simple hydrological model, which uses satellite antecedent precipitation estimative as input information. The inclusion of updated vegetation and soil textural classes over the entire domain allowed a better description of both biophysiological and soil features. The atmospheric system simulation was performed by the BRAMS model, which was coupled with a Lagrangian transport model (STILT).

Both system position and structure were more adequately reproduced when spatially heterogeneous soil moisture was available at the start time. Moreover, the trajectories which were derived from the simulation with heterogeneous soil moisture seemed more efficient to explain the measurement found in Suriname, indicating the relevance of having a realistic soil moisture field from the beginning of simulation.

26.6-P: Precipitation chemistry in Amazonia - inorganic components

Mariana Lino Gouveia, Instituto de Física da Universidade de São Paulo. Rua do Matão, Travessa R, 187, CEP05508-900, São Paulo, S.P., Brasil, mariana@if.usp.br (Apresentador / Presenting)

Luciene Lorandi Lara, CENA - Lab. de Ecologia Isotópica, CENA/USP, Av. Centenário, 303 13400-970, Piracicaba, SP, Brasil., luciene@cena.usp.br

Theotônio Pauliquevis, Instituto de Física da Universidade de São Paulo. Rua do Matão, Travessa R, 187, CEP05508-900, São Paulo, S.P., Brasil, theo@if.usp.br

Paulo Artaxo, Instituto de Física da Universidade de São Paulo. Rua do Matão, Travessa R, 187, CEP05508-900, São Paulo, S.P., Brasil, artaxo@if.usp.br

Rainwater chemical composition was measured from 3 long term wet deposition monitoring stations located in Balbina, Amazonas, Santarém, Pará, and Ouro Preto do Oeste, Rondônia. Ionic components were measured using ion chromatography, and trace elements were determined with ICP-MS. Measured concentrations comprehend sulphate, nitrate, phosphate, organic acids, chlorine, sodium, potassium, magnesium, calcium, DOC (dissolved organic carbon), DIC (dissolved inorganic carbon), among others. Ionic balance was achieved for the 3 sites, with the organic components being responsible for most of the ionic strength. Simultaneous aerosol measurements were performed, with the determination of scavenging ratios for some key trace elements for the three sites. For Balbina and Santarém, the sodium-chlorine ratio is about 0.82, with very significant correlation, meaning that sea-salt contributes to rainwater even in the Central Amazon basin. Significant deposition was observed for potassium, nitrogen compounds and organic acids.

26.7-P: Variability of VOC emission capacity and composition during leaf phenology of the tropical tree species *Hymenaea courbaril* and its relation to the carbon budget

Uwe Kuhn, Max Planck Institute for Chemistry, Biogeochemistry Dept., Mainz, Germany, Kuhn@mpch-mainz.mpg.de

Stefanie Rottenberger, Max Planck Institute for Chemistry, Biogeochemistry Dept., Mainz, Germany, rottenbe@mpch-mainz.mpg.de

Thomas Biesenthal, Max Planck Institute for Chemistry, Biogeochemistry Dept., Mainz, Germany, ekkatom@attglobal.net

Annette Wolf, Max Planck Institute for Chemistry, Biogeochemistry Dept., Mainz, Germany, wolfsolf@web.de

Guenter Schebeske, Max Planck Institute for Chemistry, Biogeochemistry Dept., Mainz, Germany, schebi@mpch-mainz.mpg.de

Paolo Ciccioli, Istituto di Metodologie Chimiche, Area della Ricerca del CNR di Montelibretti,, Monterotondo Scalo, Italy, paolo.ciccioli@imc.cnr.it

Juergen Kesselmeier, Max Planck Institute for Chemistry, Biogeochemistry Dept., Mainz, Germany, jks@mpch-mainz.mpg.de (Apresentador / Presenting)

Changes of VOC emission capacity and composition during leaf developmental stages of the tropical tree species *Hymenaea courbaril* were investigated under field conditions at a remote Amazonian rainforest site. With the course of leaf development from young to mature and to senescent leaves the basal emission capacities of isoprene varied considerably from 0.7 $\mu\text{gC} / (\text{g h})$ to 111.5 $\mu\text{gC} / (\text{g h})$. By adjusting the standard emission factors for individual days, the diel courses of instantaneous isoprene emission rates could nevertheless adequately be modelled by a current isoprene algorithm. Besides the isoprene emission variability during early leaf development, light-dependent emissions of considerable amounts of monoterpenes were observed during the period between bud break and leaf maturity. The finding of this temporary change in emission may be of general interest in understanding both the ecological functions of isoprenoid production and the regulatory processes involved. We discuss the profound change in emission composition during this stage as a consequence of resource availability or as a plant's response to higher defense demand of young emerging leaves. The results demonstrate the inadequacy of using one single standard emission factor to represent the VOC emission capacity of tropical vegetation for an entire seasonal cycle. Contrasting the seasonal variation, a strong linear correlation between the isoprene emission capacity and the gross photosynthetic activity covering all developmental stages and seasons is demonstrated. Our results confirm that leaf photosynthetic properties may confer a valuable basis to model the seasonal variation of isoprenoid emission capacity; especially in tropical regions where the environmental conditions vary less than in temperate regions.

26.8-P: Regional gradients in Carbon Dioxide and Carbon Monoxide Concentrations across the Amazon Basin

James William Munger, Dept of Earth and Planetary Sciences, Harvard University, Cambridge, MA USA, jwm@io.harvard.edu

Scott R. Saleska, Dept of Earth and Planetary Sciences, Harvard University, Cambridge, MA USA, saleska@fas.harvard.edu

Bruce C. Daube, Climate Monitoring and Diagnostics Laboratory, NOAA, Boulder, CO USA, bruce.daube@noaa.gov

Steven C. Wofsy, Dept of Earth and Planetary Sciences, Harvard University, Cambridge, MA USA, scw@io.harvard.edu

Volker W.J.H. Kirchhoff, INPE, Sao Jose dos Campos, SP, Brazil, kir@dge.inpe.br (Apresentador / Presenting)

Carbon dioxide and Carbon monoxide concentration measurements have been made at the km 67 tower site in the Tapajos Forest since April 2001. A coastal site at the INPE atmospheric observatory in Maxaranguape north of Natal was added in December 2002. The Maxaranguape measurements supersede the measurements operated by Kirchoff et al [2003] and supplement the weekly whole-air samples that are collected at the site and analyzed at the S. José dos Campos central lab facility. Carbon dioxide sampled from onshore air flow at Maxaranguape measures 375 ± 3 ppmv in February 2004. The corresponding CO concentrations are 40-60 ppbv. Occasional offshore flows at Maxaranguape are easily detected by CO₂ concentrations that increase to near 400 ppmv. The marine air mass does not have a significant diel cycle. Concentrations of CO during the well mixed mid-day period at Tapajos are near 70 ppbv during the wet season and increase to near 300 ppbv during the dry season as burning influence increases. CO₂ concentrations above the forest vary by up to 50 ppmv from day to night. The seasonal variation of mid-day mean concentration is roughly only 5 ppmv. Mid-day mean concentrations for the end of February 2004 are 380 ppmv, a 5 ppmv increase over the coastal concentration seen at Maxaranguape. The regional gradients that are measured provide an important constraint on continental-scale net exchanges of CO₂ and production of CO by urban activity, industry, biomass burning and oxidation of biogenic hydrocarbons. When these data are coupled to a meteorological transport model we can associate the CO₂ and CO enhancements to specific areas of influence.

26.9-P: Measurement of organic ions in the Amazonian precipitation

Luciene Lorandi Lara, CENA - Lab. de Ecologia Isotópica, CENA/USP, Av. Centenário, 303 13400-970, Piracicaba, SP, Brasil., luciene@cena.usp.br (Apresentador / Presenting)

Teotônio Pauliquevis, Instituto de Física, Universidade de São Paulo, Rua do Matão, Travessa R, 187, São Paulo, S.P., Brasil., theo@if.usp.br

Mariana Lino Gouveia, Instituto de Física, Universidade de São Paulo, Rua do Matão, Travessa R, 187, São Paulo, S.P., Brasil., mariana@if.usp.br

Paulo Artaxo, Instituto de Física, Universidade de São Paulo, Rua do Matão, Travessa R, 187, São Paulo, S.P., Brasil.,

artaxo@if.usp.br

As part of the LBA Millennium Institute, rainwater chemistry was measured in 3 long term wet deposition monitoring stations located in Balbina, Amazonas, Santarem, Pará, and Ouro Preto do Oeste, Rondonia. Organic ions were measured using ion chromatography, and trace elements were determined with ICP-MS for 3 years of measurements in each site. Concentrations of formic and acetic acids, sulfate, nitrate, phosphate, chlorine, sodium, potassium, magnesium, calcium, DOC (dissolved organic carbon), DIC (dissolved inorganic carbon) and others were measured. Ionic balance was achieved for the 3 sites, with the organic components being responsible for most of the ionic strength. Formic and acetic acids dominate the pH variability for all the sites. For Balbina, the average pH was 5.0. Significant deposition was observed for potassium, nitrogen compounds and organic acids for all 3 sites.

26.10-P: Introducing MOZART chemical mechanism into CATT-BRAMS: preliminary results

Karla Longo, CPTEC/INPE, longo@cptec.inpe.br (Apresentador / Presenting)

Saulo Ribeiro de Freitas, CPTEC/INPE, sfreitas@cptec.inpe.br

Leila Maria Mercê Albuquerque, CPTEC/INPE, leilamma@cptec.inpe.br

Pedro Leite Silva Dias, IAG-USP, CPTEC/INPE, pldsdias@master.iag.usp.br

Martin Schultz, MPI-Hamburg, martin.schultz@dkrz.de

Guy Brasseur, MPI-Hamburg, brasseur@dkrz.de

The chemical mechanism of MOZART (Model of OZone And Related chemical Traces) has been introduced into CATT-BRAMS (Coupled Aerosol and Tracer Transport model to the Brazilian Regional Atmospheric Modeling System). CATT-BRAMS is an on-line transport model fully consistent with the simulated atmospheric dynamics. The influence of convective transport by shallow and deep cumulus, wet and dry deposition, plume rise, the direct radiative effect of aerosols on the tracers' mass concentrations is accounted for. MOZART is a global chemical transport model designed to simulate the distribution of tropospheric ozone and its precursors, with a detailed chemical scheme for tropospheric ozone-nitrogen oxides-hydrocarbon chemistry, with 63 chemical species. Results of a first step off-line coupling will be shown. Furthermore, the progress of the fully coupled model development will be explored. This case study is based on data collected during the RACCI/SMOCC campaigns during the dry to wet 2002 season.

B (Biogeoquímica) / B (Biogeochemistry)

[B_Geral_\(B_General\)](#)

27.1-P: Relação entre Parâmetros Bioquímicos Foliare e a Reflectância Espectral de Espécies Lenhosas em dois sítios de Cerrado no Parque Nacional de Brasília, DF

Ana Paula Ferreira de Carvalho, UnB, anapaula@unb.br (Apresentador / Presenting)

Mercedes Maria Cunha Bustamante, UnB, mercedes@unb.br

Gregory Paul Asner, Stanford University, gpa@stanford.edu

Birgit Orthen, Universität Munster, orthen@uni-muenster.de

Ester A. de Farias de Albuquerque, UnB, ester.df@terra.com.br

Estudos envolvendo constituintes bioquímicos responsáveis pelas feições de absorção do espectro de folhas vêm sendo desenvolvidos em nível de folhas e de dosséis em regiões temperadas. A aplicação desses estudos em regiões tropicais, onde a diversidade de espécies é muito maior, consiste em um verdadeiro desafio. As savanas do Brasil Central (Cerrado), além da diversidade florística apresentam diversidade estrutural variando de áreas dominadas por gramíneas (campos) a formações com denso estrato arbóreo (cerradão). No presente trabalho comparamos parâmetros bioquímicos foliares em duas comunidades de cerrado com diferentes densidades de espécies lenhosas (cerrado ralo e cerrado sentido restrito) com o objetivo de relacioná-las aos espectros foliares. Uma seleção das espécies lenhosas mais representativas foi feita através de inventários e da classificação das espécies segundo o Índice de Valor de Importância que hierarquiza as espécies de acordo com sua abundância, dominância e frequência relativas. Foram selecionadas 12 espécies na área de cerrado sentido restrito e 11 espécies na de cerrado ralo com 6 espécies comuns entre as duas áreas. Dessas espécies foram coletadas folhas para análises de pigmentos (clorofila a, clorofila b, carotenóides totais e antocianina), conteúdo de água e área foliar específica nos períodos: junho-julho (seca), agosto-setembro (transição seca-chuva), novembro-dezembro (chuva) e março-abril (transição chuva-seca). As diferenças entre os sítios não foram significativas em relação ao teor de umidade. As concentrações de clorofilas a e b e carotenóides diferiram significativamente entre os sítios no período de seca (junho-julho). A concentração de carotenóides totais diferiu significativamente entre os sítios no período de transição (seca-chuva). A concentração dos pigmentos não diferiu significativamente entre os sítios no período de chuva (novembro-dezembro), quando todas as plantas apresentam folhagem em verde mais intenso.

27.2-P: Uso da krigagem ordinária e da cokrigagem para estimar a matéria orgânica em solos de quatro microbacias sob vegetação de floresta no município de Juruena, MT.

Léo Adriano Chig, UFMT, lchig@pop.com.br (Apresentador / Presenting)

Eduardo Guimarães Couto, UFMT, couto@cpd.ufmt.br

Susan Riha, Cornell University, sjr4@cornell.edu

Mark Johnson, Cornell University, msj8@cornell.edu

João Paulo Novaes Filho, UFMT, jpnovaes@terra.com.br

Johannes Lehmann, Cornell University, CL273@cornell.edu

Evandro Carlos Selva, UFMT, evandroc@cpd.ufmt.br

A determinação do estoque de carbono orgânico do solo é crucial dentro dos objetivos do projeto ND-11 do LBA. Os métodos usuais de determinação são demorados e produzem grande quantidade de resíduos para o ambiente. Além disso, muitas vezes, duas propriedades correlacionam-se entre si e no espaço, e podem ser expressas através do semivariograma cruzado, pelo método chamado de cokrigagem. Este método serve para estimar a propriedade mais difícil de ser medida, isto é, estima uma variável primária a partir de uma outra variável secundária (covariável) amostrada mais intensamente, e que possui alta correlação com a variável primária, sendo que a variável secundária deve ser de fácil obtenção, ou de baixo custo. Neste estudo foram utilizados os valores de pH para estimar a distribuição espacial do carbono orgânico dos solos em quatro microbacias sob vegetação de floresta no município de Juruena, MT. A amostragem de solo consistiu da coleta de 185 coletas de amostras na profundidade de 0 - 20 cm em malha de 10 x 20 metros. Os resultados mostraram que houve dependência espacial para os atributos estudados incluindo aquela produzida pelo semivariograma cruzado, possibilitando o uso da cokrigagem para determinação da distribuição espacial do carbono orgânico. Os resultados mostraram que o delineamento das manchas manteve-se similar nas duas situações: (1) onde a estimativa da distribuição espacial da matéria orgânica foi realizada pela krigagem; e (2) onde a estimativa da distribuição espacial da matéria orgânica foi realizada pela cokrigagem, a partir do semivariograma dos valores de pH.

27.3-P: Aplicação da estatística multivariada para identificar diferenças nos atributos de solo em microbacias sob floresta tropical em Juruena-MT

Eduardo Guimarães Couto, UFMT, couto@cpd.ufmt.br (Apresentador / Presenting)

Johannes Lehmann, CORNELL UNIVERSITY, CL273@cornell.edu

João Paulo Novaes Filho, UFMT, jpnovaes@terra.com.br

Mark Johnson, CORNELL UNIVERSITY, msj8@cornell.edu

Evandro Carlos Selva, UFMT, evandroc@cpd.ufmt.br

Luiz Carlos Mattos Rodrigues, UFMT, mattosr@cpd.ufmt.br

Léo Adriano Chig, UFMT, lchig@pop.com.br

Susan Riha, CORNELL UNIVERSITY, sjr4@cornell.edu

Erick Fernandes, CORNELL UNIVERSITY, ecf3@cornell.edu

Um dos principais interesses sobre a variabilidade dos solos é a avaliação integrada de propriedades que permitam identificar as causas da variação em distâncias curtas a partir de coleta sistemática de amostras. Métodos não supervisionados de estatística multivariada são ferramentas poderosas para uma análise integrada das fontes de variação de solo, permitindo extrair muito mais informações sobre os dados disponíveis. Um estudo aplicando esta técnica foi conduzido em quatro microbacias localizadas em Juruena, Noroeste do estado de Mato Grosso. A amostragem de solo consistiu da coleta de 185 amostras na profundidade de 0 - 20 cm em malha de 10 x 20 metros. Foram estudados 14 atributos do solo (Diferença de Nível, pH H₂O, pHCaCl₂, H⁺, Ca²⁺, Mg²⁺, K⁺, Al³⁺, P, C, índice de avermelhamento, argila, silte e areia). Os resultados mostraram que a variação dos dados foi muito influenciada pela profundidade da coleta. Os quatro primeiros fatores explicaram 80,5% da variação total, sendo que o primeiro explicou 38,6% da variação total e se caracterizou principalmente pelos atributos relacionados com a acidez e os níveis de fósforo disponível do solo (pH, Ca²⁺, Mg²⁺, Al³⁺ e P). O segundo fator explicou 23,5 % da variação total e se caracterizou pelos atributos relacionados com granulometria do solo (argila, silte e areia). O terceiro fator explicou cerca de 9,8 % da variação total e se caracterizou pelos atributos relacionados com a fração orgânica do solo (carbono orgânico e H⁺). O quarto fator explicou 8,6% e se relacionou unicamente com a diferença de nível. Apesar dos fatores 2 e 4 explicarem apenas 32% da variação dos dados, a projeção dos escores do primeiro e do quarto fator possibilitou a melhor separação da microbacias entre todas as combinações possíveis, o que nos permite afirmar que os parâmetros relacionados com a textura e a posição da bacia na paisagem (diferença de nível) serviram como indicadores das diferenças entre as microbacias estudadas.

27.4-P: Pre-harvest Tree and Vine Biomass in a Rainforest in NW Mato Grosso, Brazil

Ted R. Feldpausch, Cornell University, Ithaca, NY USA, trf2@cornell.edu (Apresentador / Presenting)

Stefan Jirka, Cornell University, Ithaca, NY USA, sj42@cornell.edu

Susan J. Riha, Cornell University, Ithaca, NY USA, sjr4@cornell.edu

Carlos Alberto Moraes Passos, Universidade Federal de Mato Grosso, Cuiabá, Brazil, capassos@terra.com.br

Johannes Lehmann, Cornell University, Ithaca, NY USA, cl273@cornell.edu

Franklin Jasper, Rohden Indústria Lígnea Ltda, Juruena, Brazil, stuhler@terra.com.br

Erick C.M. Fernandes, The World Bank, ESSD-ARD, Washington, DC USA, efernandes@worldbank.org

Andrew J. McDonald, Cornell University, ajm9@cornell.edu

Selective logging has become a dominant land-use in Brazilian Amazônia. Published data on forest biomass in southern Amazônia is sparse. As part of a larger study to evaluate the effect of reduced impact logging on C dynamics and nutrient stocks, forest structure, and forest regeneration potential, we conducted a pre-harvest campaign to estimate tree and vine biomass in a parcel of managed forest in northwestern Mato Grosso. The diameter at breast height (DBH) of all commercially harvestable trees ≥ 30 cm DBH (40+ native species) was measured in 50x50 m cells in a 1000 ha management unit. We calculated biomass, stem density, and basal area for each cell, and then used kriging interpolation to generate three dimensional wire-frame maps for the area. Potential commercial biomass, 50.2 ± 24.5 Mg ha⁻¹, was highly variable across the 1000 ha area. To more intensively compare pre- and post-logging biomass and forest structure, we used these maps to locate stratified sampling transects (10x1000 m) within the management units and measured all stems ≥ 10 cm DBH. Total tree biomass (≥ 10 cm DBH) was 301.5 ± 50.2 Mg ha⁻¹, with commercial biomass (≥ 30 cm DBH) on average 17% of the total. Tree stems with 10-30 cm DBH, often not measured in biomass estimates, represented 84% of all tree stems and 32% of the total biomass. In nested transects (2x1000 m) we measured DBH of all vines and estimated biomass (13.3 ± 6.5 Mg ha⁻¹) as 4.4% of the total measured biomass. Two non-commercial tree species *Amescla* (*Tratinickia burserifolia* (Mart.) Willd.) and *Breu* (*Protium heptaphyllum* (Aubl.) March.), represented 17% of the total biomass and 37% of the stems. Using geostatistical analysis, we plan to estimate tree and vine biomass as a function of DBH size classes, soil, and landscape position over a larger area of the forest.

27.5-P: Aplicação da geoestatística para identificar a ocorrência de Latossolos e Argissolos em quatro microbacias sob vegetação de floresta no município de Juruena, MT.

João Paulo Novaes Filho, UFMT, jpnovaes@terra.com.br (Apresentador / Presenting)

Eduardo Guimarães Couto, UFMT, couto@cpd.ufmt.br

Susan Riha, Cornell University, sjr4@cornell.edu

Mark Johnson, Cornell University, msj8@cornell.edu

Johannes Lehmann, Cornell University, CL273@cornell.edu

Evandro Carlos Selva, UFMT, evandroc@cpd.ufmt.br

Luiz Carlos Mattos Rodrigues, UFMT, mattosr@cpd.ufmt.br

Léo Adriano Chig, UFMT, lchig@pop.com.br

A possibilidade da aplicação de geoestatística utilizando dados distribuídos espacialmente permite a sua ampla utilização no estudo das propriedades do solo. Neste trabalho, algumas importantes funções da teoria das variáveis regionalizadas, como o semivariograma e a krigagem foram utilizadas para avaliar a estrutura da variação espacial dos atributos argila, relação textural B/A e cor do solo (índice de avermelhamento) em quatro microbacias sob vegetação de floresta no município de Juruena, MT. A amostragem de solo consistiu da coleta de 185 coletas de amostras nas profundidades de 0 - 2 e 40 - 60 cm em malha de 10 x 20 metros. A área representada pelas microbacias se insere na unidade de mapeamento PVd, definida em levantamento pedológico realizado anteriormente na escala de 1:100.000, constituída de Argissolos Vermelhos e Vermelho-Amarelos distróficos plínticos textura média/argilosa com inclusões de Latossolos Vermelho-Amarelos distróficos típicos textura média. Os resultados mostraram que houve dependência espacial nas duas profundidades para os atributos estudados possibilitando o uso da krigagem e a consequente distribuição espacial dos atributos acima citados. A análise conjunta da distribuição espacial dos atributos textura, relação textural B/A e cor do solo permitiu identificar manchas de Latossolos Vermelhos não registrados nos levantamentos pedológicos anteriores além de identificar padrões da distribuição dos componentes da unidade de mapeamento previamente descrita, num detalhamento compatível com a escala de estudos ao nível de microbacias.

27.6-P: Isotopic Composition of Soils and Plants in a Gallery Forest of Cerrado Biome: Effect of Topographic Gradient

Lucilia Parron, Embrapa e UnB, lucilia@tecnolink.com.br (Apresentador / Presenting)

Mercedes Maria Cunha Bustamante, UnB, mercedes@unb.br

Plínio Barbosa de Camargo, CENA-USP, pcamargo@cena.usp.br

Cesar Prado, UPIS, cesarjardim@hotmail.com.br

Luiz Antonio Martinelli, CENA-USP, luizm@stanford.edu

Gallery forests represent 5% of the Cerrado biome (savannas of Central Brazil) but contain 1/3 of its biodiversity. They protect water quality, control soil erosion and are important corridors for the fauna. In Central Brazil, gallery forests are characterized by a high heterogeneity particularly due to topographic variations that determine important variations of the edaphic conditions. In the present study we determine the isotopic composition of carbon and nitrogen in soils and leaves of 15 woody species for the Gallery Forest ecosystems according to variations in the topographic. The experiment was established in a plot of 100 x 100 m in the Gallery Forest of the Córrego Pitoco, in the Reserva Ecológica do IBGE, DF (15°56'41"S and 47°56'07"W). Three sampling lines were established, parallel to the stream and 45 m apart to each other. The lines represent wet community (near the stream), intermediate community and dry community (adjacent to a typical Cerrado area). The foliar $\delta^{13}C$ values increased from the wet to the dry community species. Probably because in the drier sites the water stress leads to a decrease in the ratio c_i/c_a and consequently to a decrease in the foliar $\delta^{13}C$ values. The higher $\delta^{13}C$ values of the soil organic matter in the dry community can be related to the input of a litter with higher $\delta^{13}C$ values or a higher contribution of C4 grasses in the past. The woody species of wet community presented larger values of $\delta^{15}N$ and of N in comparison to the dry community species indicating that denitrification is probably higher in the wet communities leaving behind a ^{15}N enriched organic matter.

27.7-P: Dinâmica do carbono em quatro microbacias sob floresta tropical, no município de Juruena, MT

Evandro Carlos Selva, UFMT, evandroc@cpd.ufmt.br (Apresentador / Presenting)

Mark Johnson, Cornell University, msj8@cornell.edu

Eduardo Guimarães Couto, UFMT, couto@cpd.ufmt.br

Johannes Lehmann, Cornell University, CL273@cornell.edu

Luiz Carlos Mattos Rodrigues, UFMT, mattosr@cpd.ufmt.br

Uma das grandes preocupações atuais é o lançamento de gases para a atmosfera que podem contribuir para o aquecimento global pelo chamado "efeito estufa". Atualmente um dos principais gases que colaboram para esse efeito é o CO₂ gerado principalmente pela queima de combustíveis fósseis, desmatamentos e resíduos florestais. Estudos indicam que os rios da Amazônia são uma importante fonte de CO₂ para a atmosfera resultado da decomposição de material orgânico, que provavelmente está saindo das florestas indo para os córregos e daí para os rios maiores. Portanto, entender melhor as entradas e saídas de carbono nas florestas tropicais via material orgânico tornou-se uma preocupação nos dias atuais. Este trabalho teve como objetivo estudar a dinâmica de produção e perda de carbono via hídrica de quatro microbacias no município de Juruena. Nas microbacias selecionadas, realizou-se um levantamento planialtimétrico para representar a forma e a posição das mesmas na paisagem. Cada bacia foi dividida em três categorias de desnível onde foram instaladas cinco unidades de coletas de liteira (liteira carregada pela água de escoamento superficial), totalizando 15 unidades por microbacia. Cada microbacia contou ainda com quatro unidades coletoras de liteira produzida pelo dossel e um coletor no final da microbacia. As amostras de liteira foram coletadas a cada 15 dias ou após fortes chuvas, no período de setembro de 2003 à janeiro de 2004. A partir da coleta, as amostras foram secadas até obtenção da matéria seca, e em seguida trituradas em moinho. A determinação de carbono total foi realizada pelo método de combustão seca. No final de cinco meses de estudo, os resultados mostraram que a produção média de liteira foi de 0,36 t/ha/mês, sendo que o maior valor encontrado foi no mês de setembro de 2003 na microbacia 1 ($\approx 1,37$ ton/ha). Com relação à massa seca da liteira interceptada pelos coletores, os maiores valores encontrados foram nos meses de setembro e janeiro nas

microbacias 2 e 4. Os conteúdos de carbono exportado foram respectivamente 667, 554, 830 e 465 g de carbono/ha para as microbacias 1, 2, 3 e 4; provavelmente em função da maior precipitação nesses meses. O estudo também mostrou que o conteúdo médio do carbono exportado pela liteira foi de 42,4%, sendo que os menores valores foram encontrados no mês de novembro.

27.8-P: Coarse Woody Debris Remineralization Rates in an Undisturbed Forest and Selective-Logged Areas at the FLONA Tapajos, Santarem

Hudson Silva, University of New Hampshire, Complex Systems Research Center, hsilvaus@yahoo.com (Apresentador / Presenting)

Patrick Michael Crill, University of New Hampshire, Complex Systems Research Center and Stockholm University, Department of Geology and Geochemistry, patrick.crill@unh.edu

Michael M. Keller, University of New Hampshire, Complex Systems Research Center and USDA Forest Service, International Institute of Tropical Forestry, Rio Piedras, Puerto Rico, michael.keller@unh.edu

Coarse woody debris pool (CWD) has a major role on tropical forest carbon fluxes because of high rates of tree mortality and decomposition processes observed in tropical forest. Despite its importance, the dynamics of this pool is poorly understood. The present study aims to capture the efflux rates of carbon dioxide (CO₂) from CWD and the main parameters on controlling that CO₂ flux. An undisturbed area at the FLONA Tapajos is being studied together with a nearby site in the same forest that was selectively logged from 1999 through 2003. In an undisturbed forest located at the km 67 at BR-163, efflux rates from CWD pool averaged $1.95 \pm 1.95 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ wood.s}^{-1}$, $n = 51$ and for selective logged areas at km 83, the fluxes reached $2.61 \pm 1.44 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ wood.s}^{-1}$, $n = 537$. A chronosequence of Five years of selective logging have been studied and flux variation among species was observed as a result of decay processes. Three species of commercial timber with different densities were studied to capture differences in decay rates. Respiration rates from CWD were strongly correlated to wood water content showing a decrease in CO₂ flux with increasing of moisture content and increasing wood densities (0.63, 0.74 and 0.9 g.cm⁻³) seem to have an effect on retarding decay processes.

27.9-P: Carbon, Nutrient, Light Interception and Soil Water Dynamics of Secondary Forests and Agroforestry Systems on Degraded Pastures

Steven A. Welch, Dept. Crop and Soil Sciences, Cornell University, Ithaca, NY 14853 USA, saw16@cornell.edu (Apresentador / Presenting)

Karen A. McAfferly, Dept. Crop and Soil Sciences, Cornell University, Ithaca, NY 14853 USA, kam26@cornell.edu

Erick C.M. Fernandes, Dept. Crop and Soil Sciences, Cornell University, Ithaca, NY 14853 USA, ecf3@cornell.edu

Susan J. Riha, Dept. Earth and Atmospheric Sciences, Cornell University, Ithaca, NY 14853 USA, sjr4@cornell.edu

Elisa Wandelli, Embrapa-Amazonia Occidental, Manaus, Amazonas, Brazil, elisa@cpaa.embrapa.br

In the Brazilian Amazon, primary forest and degraded pastures represent polar extremes of carbon stocks, nutrient cycling, light interception, and deep soil water cycling. Plant succession on degraded pastures is expected to change these values, and the extent to which secondary forest (SF) restores these processes is a high priority research objective. This research quantifies Carbon (C) and nutrient stocks and accrual rates of 4 post-pasture landuses (LU) including 9 yr old SF and 3 agroforestry systems (AFS). All LU had carbon and nutrient stocks greater than values for recently abandoned pastures, but far less than nearby primary forest. Greatest C stocks were sequestered in aboveground biomass by SF (53.8 Mg C/ha) followed by the Palm AFS (41.7), Fruit AFS (34.3), and timber pasture (16). Light interception and soil water dynamics were monitored on these LU and on two additional SF of different ages (6- and 12-yr) and on traditional grazed pasture (GP). Light interception by SF of all ages (LAI 3.3) exceeded all other LU: Palm AFS (3), Fruit AFS (2.7), TP (2.5) and GP (2.2). Soil water content (SWC) dynamics follow the same trend as LAI with deepest SWC depletion by SF, followed by Palm, Fruit and TP AFS. SF 6-yr gained access to deeper SWC during the course of our study which corresponded with the closing of the upper canopy in this parcel. This suggests that in this environment, SF with closed upper canopies have a hydrology distinct from patchier tree canopies. This relationship might prove useful interpreting remotely sensed data.

B_Nutrientes (B_Nutrients)

28.1-P: Influência da puerária (Pueraria phaseoloides), sobre a transformação microbiana de nitrogênio do solo em sistemas agroflorestais do Projeto RECA em Nova Califórnia-RO

Patrícia Miranda Dresch, INPA/MCT, pdresch@uol.com.br

Regina Celi Costa Luizão, INPA/MCT, rcc@inpa.gov.br

Katell Uguen, INPA/MCT, katell@inpa.gov.br

Sonia Sena Alfaia, INPA/MCT, sonia@inpa.gov.br (Apresentador / Presenting)

O estudo teve como objetivo avaliar a influência da puerária (Pueraria phaseoloides), associada ou não à correção da acidez do solo, sobre as transformações de nitrogênio no solo em sistemas agroflorestais, em áreas de pequenos produtores do Projeto RECA (Reflorestamento Econômico Consorciado e Adensado), em Nova Califórnia, na divisa dos Estados de Rondônia e Acre.

Para abranger o efeito da sazonalidade sobre a atividade dos organismos envolvidos nos processos de transformação do N no solo, foram feitas coletas em três diferentes estações do ano. Os tratamentos selecionados foram: sistema agroflorestal; sistema agroflorestal com puerária; sistema agroflorestal com puerária mais adição de calcário; e floresta primária como controle.

O tratamento que recebeu calagem não apresentou mineralização do N e a nitrificação diferenciadas em relação aos outros tratamentos, provavelmente devido a uma boa adaptação dos microrganismos do solo às condições de baixo pH e altas

concentrações de Al nos solos estudados. O tratamento com introdução de puerária também não aumentou a mineralização do N e a nitrificação em relação aos outros tratamentos, provavelmente porque não influenciou as quantidades nem a qualidade da liteira (principalmente os teores de N da fração foliar), nem os principais parâmetros da matéria orgânica do solo, como as concentrações de C e N totais. Nos tratamentos estudados, a diversidade de espécies vegetais parece estar influenciando mais as transformações de N no solo do que os efeitos das opções de manejo adotadas, como a calagem e a introdução de leguminosas herbáceas.

28.2-P: Retorno de Nitrogênio e Fósforo Através de Serrapilheira no Período Úmido em Floresta de Transição Tropical Úmida-Cerrado

Eliane Dias de Almeida, UFMT/CEFET, elianediasdealmeida2003@yahoo.com.br (Apresentador / Presenting)

Vilidiana Moraes Moura, UFMT, vilidiana@bol.com.br (Apresentador / Presenting)

Luciana Sanches, UFMT, lsanches@cpd.ufmt.br

Carla Maria Abido Valentini, UFMT/CEFET, valentini@vspmail.com.br

Segundo Durval Rezende Pereira, UFMT, floresteiro@ibest.com.br

Márcia Martim Pereira Gallon, UFMT, gallon@cpd.ufmt.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

José de Souza Nogueira, UFMT, nogueira@cpd.ufmt.br

Os meios de entrada de nutrientes nas florestas ocorrem através da atmosfera, intemperismo de rochas matrizes, fixação biológica do nitrogênio e adição de fertilizantes.

Através da serrapilheira, os nutrientes absorvidos pelas plantas retornam ao solo, constituindo assim a principal via de retorno, onde a biomassa vegetal é o principal reservatório de nutrientes.

O conhecimento de serrapilheira depositada, a velocidade com que se decompõe e o retorno de nutrientes que esta promove ao solo são informações importantes para o balanço dentro do ecossistema florestal e podem auxiliar na determinação do grau de fragilidade destes ecossistemas.

O objetivo deste trabalho foi avaliar aspectos da ciclagem de nutrientes a partir da estimativa de serrapilheira e da quantificação de macronutrientes: nitrogênio e fósforo produzido num ecossistema de floresta de transição localizada aproximadamente 50 km NE de Sinop, Mato Grosso (11°24.75'S: 55°19.50'O).

A serrapilheira foi coletada num período úmido (novembro/2003 a Janeiro/2004), utilizando coletores de 1 m² e caixas de quadrantes de 25 x 25 cm no solo, em pontos aleatórios entre 20 coletores distribuídos numa área de 1ha.

A quantidade média de serrapilheira foi de 0,32 ton/ha/mês, o folhedo foi a fração mais importante na transferência de nutriente ao solo em função da sua maior concentração. A serrapilheira apresentou taxa de decomposição elevada quando comparada aos meses anteriores em função do período úmido onde a atividade biológica é mais ativa. Quanto a concentração de nutrientes, encontrou-se teores médios de nitrogênio e fósforo na ordem de 56g/Kg/ha e 1,6g/Kg/ha.

28.3-P: Mapping soil micronutrients in a 63 ha low productivity pasture in Rondonia, Nova Vida Ranch

Carlos Clemente Cerri, Centro de Energia Nuclear na Agricultura (CENA), Universidade de Sao Paulo (USP), cerri@cena.usp.br (Apresentador / Presenting)

Martial Bernoux, Institut de Recherche pour le Développement (IRD), mbernoux@cena.usp.br

Carlos Clemente Cerri, CENA-USP, cerri@cena.usp.br

Marisa Cássia Piccolo, CENA-USP, mpiccolo@cena.usp.br

Brigitte J. Feigl, CENA-USP, beduardo@cena.usp.br

Jerry M. Melillo, The Ecosystems Center, Marine Biological Laboratory, jmelillo@mbl.edu

Soils vary widely in their micronutrient content and in their ability to supply micronutrients in quantities sufficient for optimal grass growth. Therefore, rational management of micronutrient fertility and toxicity requires an understanding of how total soil micronutrients vary across the field. A variety of approaches have been used to survey and map the geographic distribution of soil micronutrient content at scales ranging from global to sites within single production fields. The present study investigates the spatial variation of soil micronutrients in a 63 ha pasture area located at Nova Vida Ranch, Rondonia, Brazil. A regular 100 m grid was used for collecting a total of 195 soil samples at the 0-10, 10-20 and 20-30 cm layers. Soil samples were analyzed for Zn, Cu, Fe, Mn contents and also pH, total C, total N, P, K, Ca, Mg, and Al. Conventional statistical methods and geostatistics were performed in order to analyze soil properties spatial dependence. The spatial structure of the studied nutrients was analyzed and variogram models with a nugget component and two spatial components were found to fit the experimental results. Semivariograms were best fitted by spherical and exponential models. Two types of validation (cross and external) were conducted, indicating a lack of bias for the used prediction models. Contour maps made by block kriging allowed to identify micro-regions with significantly high or low extractable nutrient contents. Maps of total soil micronutrient content can show where low micronutrient concentrations may cause deficiencies in plants and in the livestock that subsist on them.

28.4-P: Effects of different land use systems in carbon, nitrogen and phosphorus cycles: comparison between slash-and-burn and chop-and-mulch systems.

Roberta de Fátima Rodrigues Coelho, Bolsista DTI CNPQ/LBA, robpantoja@hotmail.com

André Luiz Cote Roman, Bolsista Programa SHIFT, coteroman@yahoo.com.br

Cláudio José Reis de Carvalho, Embrapa Amazônia Oriental, carvalho.bel@terra.com.br

Ricardo de O. Figueiredo, Embrapa Amazônia Oriental, ricardo@cpatu.embrapa.br (Apresentador / Presenting)

Tatiana Deane de Abreu Sá, Embrapa Amazônia Oriental, tatiana@cpatu.embrapa.br

Danielle Santos Fontenelle, Bolsista ITI, CNPQ/LBA, dfagro@hotmail.com

In the traditional system of small-scale agriculture in Eastern Amazonia, land preparation prior to cropping is done by slashing and burning the fallow vegetation, to have access to nutrients, mainly phosphorus (P), from the ashes. With the intensification of land use the fallow period has been shortened, affecting consequently the biogeochemical functions of secondary vegetation, leading to its degradation. The alternative system, chop-and-mulch of the fallow vegetation, associated to the improvement of the fallow vegetation by planting fast growing leguminous trees, appears as an option to

shorten the fallow period, increasing carbon accumulation (including soil organic matter) and nutrient cycling, while keeping the fallow vegetation roots which act as a barrier to nutrient leaching. The consequences of burning to biogeochemical processes have been reasonably studied, but little is known about the impact on carbon and nutrients accumulation derived from the mulch, and on the mineralization or fixation promoted by the soil biota. To study these processes two plots (2 ha each) were set up with the following treatments: *i*) traditional slash-and-burn system; *ii*) alternative chop-and-mulch system (with fertilizer application). In both maize and cassava were cropped followed by a fallow phase (improved by planting two leguminous tree species in the alternative system). We are evaluating: microbial biomass, C and N, activity of enzymes associated to N and P mineralization, organic carbon accumulation and soil organic matter, NH_4^+ , NO_3^- and P availability, and organic P species, as well as vesicular arbuscular mycorrhizas (VAM) activity. Two years after land preparation, the results show that the measured variables in the alternative system seem to be closer to what is found in the original secondary vegetation.

28.5-P: Response of the Soil Microbial Community to Fertilization Practices in Agricultural and Native Cerrado Systems in Brazil

Marirosa Molina, U.S EPA, molina.marirosa@epa.gov (Apresentador / Presenting)

Laura Tillman Viana, University of Brasilia, lviana@unb.br

Mercedes Maria Cunha Bustamante, University of Brasilia, mercedes@unb.br

Richard G. Zepp, U.S. EPA, zepp.richard@epa.gov

Agricultural practices in the Cerrado (tropical savannah) and Amazon regions in Brazil have increased drastically during the last decade causing dramatic changes in the nutrient and carbon cycling of native areas, and producing changes on the microbial community structure. We compared microbial communities under a range of management practices which included different native areas (savannah and forest), an agricultural site, and a Cerrado area subjected to fertilization treatments (N, P, N+P, Ca) using phospholipid fatty acid analysis (PLFAs) and fungal to bacterial ratios. In the native Cerrado, samples were collected 10, 20 and 40 days after fertilizer application from four plots (15 x15m) per treatment in a completely randomized design. Although the total PLFA concentration did not show significant differences among the sites, principal component analysis indicated that the structure of the microbial community varied as a function of the fertilization treatment and management practice ($p < 0.0001$). In the fertilization experiment, N, P, and N+P treatments had a higher concentration of Gram positive biomarkers than the control and exhibited similar microbial communities. P amendments produced a higher fungal:bacterial ratio after 10 days of fertilization and was the only treatment showing a significant difference in the ratios. Fungal:bacterial ratios were also significantly higher in the pasture site when compared to the ratios observed in the native savannah and Amazon soils. The higher ratio in the pasture site correlated with lower availability of nitrogen and was a function of a decrease in the % composition of bacterial PLFAs. The results suggest a phosphorus limitation on the fungal community inhabiting native Cerrado soils, while in pastures, nitrogen seems to limit the bacterial community, but has no effect on the fungi.

28.6-P: Effect of ash deposition on soil nitrogen availability in burned savannas of the Gran Sabana, Venezuela.

Carlos Luis Méndez, Universidad Simon Bolivar, carlosmendez@etheron.net (Apresentador / Presenting)

Bibiana Alejandra Bilbao, Universidad Simon Bolivar, bibiana_bilbao@hotmail.com

En la Gran Sabana, Parque Nacional Canaima (30000 km²), existe una alta incidencia de incendios, la mayoría de los cuales se inician en reas de sabanas. Los suelos de sabana son pobres, siendo el nitrógeno, uno de los nutrientes mas afectados por el fuego. Este afecta el ciclo del nitrógeno del suelo directamente por calentamiento o indirectamente mediante la adición de cenizas. En este trabajo se estudio el efecto de la deposición de cenizas sobre la dinámica de nitrógeno inorgánico del suelo, a través de incubaciones aerobicas en suelos de sabanas quemadas y no quemadas bajo distintos tratamientos: a) adición de cenizas provenientes de la combustión de biomasa, b) adición de solución de sacarosa, c) no adición de fuente de carbono. Tanto en suelos quemados como no quemados la adición de cenizas no afecto la amonificación, mientras que la desaparición del nitrato parece haber sido estimulada solo en los suelos quemados, como producto quizás, de aumentos en la desnitrificación e inmovilización microbiana. La adición de sacarosa provoco la inmovilización de la mayor parte del nitrógeno inorgánico en el suelo sin quemar, mientras que en suelo quemado solo se inmovilizo el amonio y se produjo un aumento del nitrato. Los resultados muestran una interacción entre la adición de cenizas y la quema, haciendo específico el efecto de las cenizas sobre los procesos transformadores de nitrato, además de evidenciar una limitación del ciclo del nitrógeno por substrato carbonado. Los resultados sugieren que la quema estaría actuando de forma selectiva sobre los grupos funcionales microbianos que transforman el nitrógeno del suelo.

28.7-P: Major Ions Fluxes in Rainfall and Throughfall at Tapajos National Forest . Belterra, Para State

Raimundo Cosme de Oliveira Jr., Embrapa Amazonia Oriental, cosme@cpatu.embrapa.br (Apresentador / Presenting)

Michael M. Keller, US Forest Service, michael.keller@unh.edu

Patrick Michael Crill, Sweden, patrick.crill@unh.edu

William Zamboni de Melo, Universidade Federal Fluminense, zamboni@geoq.uff.br

Jadson Dizencourt Dias, LBA - TG-07, jadson@lbaeco.com.br

Kêmeson Oliveira, LBA - TG-07, kemeson@lbaeco.com.br

Eráclito Rodrigues de Sousa Neto, LBA - TG-07, eraclito@lbaeco.com.br

Sérgio N. da Silva Albuquerque, LBA - TG-07, sergio@lbaeco.com.br

Joelma Dezencourt Dias, LBA TG-07, joelma@lbaeco.com.br

Cleuton Pereira, LBA - TG-07, cleuton@lbaeco.com.br

The Tapajós National Forest -(FLONA Tapajós), an area of 600.000 ha of protected forest, is located 50km south Santarem (Pará, Brasil). The FLONA receives approximately 2000 mm.y⁻¹ of rainfall and the forest is evergreen. The tropical forest nutrient cycle depends upon inputs from the atmosphere and from rock weathering. Internally, throughfall and stemflow transfer nutrients from the vegetation to the ground. Concentrations of the ions Cl⁻, NO₃⁻², PO₄⁻², SO₄⁻², Na⁺, NH₄⁺, K⁺, Mg⁺² and Ca⁺² were analyzed using a Dionex DX-120 ion chromatograph. Ionic fluxes were calculated from volume-

weighted concentrations. The fluxes in precipitation follow the sequence: NH_4^+ (7,1 kg.ha-1.y-1) > Ca^{+2} (6,31 kg.ha-1.y-1) > Na^+ (6,11 kg.ha-1.y-1) > K^+ (4,41 kg.ha-1.y-1) > Cl^- (3,61 kg.ha-1.y-1) > SO_4^{-2} (3,11 kg.ha-1.y-1) > NO_3^{-2} (1,31 kg.ha-1.y-1) > PO_4^{-2} (1,11 kg.ha-1.y-1) > Mg^{+2} (1,01 kg.ha-1.y-1). In the throughfall, the fluxes were in the sequence: NO_3^{-2} (31,8 kg.ha-1.y-1) > K^+ (27,6 kg.ha-1.y-1) > NH_4^+ (25,5 kg.ha-1.y-1) > Na^+ (17,4 kg.ha-1.y-1) > SO_4^{-2} (15,6 kg.ha-1.y-1) > Cl^- (14,5 kg.ha-1.y-1) > Ca^{+2} (12,7 kg.ha-1.y-1) > Mg^{+2} (11,1 kg.ha-1.y-1) > PO_4^{-2} (10,8 kg.ha-1.y-1).

28.8-P: Enzima Fosfatase Ácida: Importância e Dinâmica no Ciclo Biogeoquímico do Fósforo em Vegetações Secundárias do Nordeste do Estado do Pará.

Patricia Chaves de Oliveira, Universidade Federal do Pará, pchaves@ufpa.br (Apresentador / Presenting)

Cláudio José Reis de Carvalho, EMBRAPA-Amazônia Oriental, carvalho.bel@terra.com.br

Tatiana Deane de Abreu Sá, EMBRAPA-Amazônia Oriental, tatiana@cpatu.embrapa.br

As projeções de exaustão das reservas naturais de fósforo (P) daqui a 60-80 anos criam um cenário preocupante quanto à sustentabilidade dos sistemas agrícolas. Na agricultura de subsistência praticada nos solos pobres do Nordeste do Estado do Pará, o P quase sempre é suplementado na forma inorgânica nos cultivos de feijão, milho e mandioca na agricultura. Alternativamente, o uso de fontes orgânicas de P, como o "mulch" oriundo de espécies acumuladoras deste elemento pode ser um modo mais barato de suprir este nutriente. No entanto, o aproveitamento do P orgânico pelas plantas está relacionado à atividade da enzima fosfato monoesterase (fosfatase ácida), exsudada pelos sistemas radiculares de determinadas espécies e por microorganismos do solo em situações de déficit. Com o objetivo de caracterizar a dinâmica desta enzima na rizosfera de espécies acumuladoras de P (*Neea macrophylla* e *Cecropia palmata*) e não acumuladoras (*Casearia arborea*) em solo com baixo teor de P disponível (Mehlich 1) foi determinada a atividade desta enzima pelo método proposto por Tabatabai (1977) em amostras de solo localizadas a 40, 80 e 120 cm de distância do caule e a 20 cm de profundidade. Os resultados mostraram uma variação da atividade da enzima em função da distância para todas as espécies. Porém, a atividade não foi maior no solo próximo às espécies acumuladoras de P como seria esperado. Provavelmente a deficiência de P desencadeia o aumento da produção da enzima em microorganismos e raízes de plantas superiores comuns na Região.

(Projeto Financiado por LBA-Milênio)

28.9-P: Atividade da fosfatase ácida, uréase e micorrizas em uma área de vegetação secundária de Paragominas, Estado do Pará, dois anos após adubação com nitrogênio e fósforo.

Cláudio José Reis de Carvalho, Embrapa Amazônia Oriental, carvalho.bel@terra.com.br (Apresentador / Presenting)

Eric Atlas Davidson, The Woods Hole Research Center, edavidson@whrc.org

Tereza Primo dos Santos, Instituto de Pesquisa Ambiental da Amazônia, tereza@cpatu.embrapa.br

Ricardo de Oliveira Figueiredo, Embrapa Amazônia Oriental, ricardo@cpatu.embrapa.br

Bruno de Oliveira Serrão, Bolsista ITI, CNPQ/LBA, bruno_serrao@hotmail.com

Fábio Carneiro Dutra, Bolsista DTI, CNPQ/LBA, dutrafcb@bol.com.br

Na Amazônia, a área ocupada com vegetação secundária é considerável e aumenta a cada ano. Portanto, o entendimento dos processos que governam a sucessão nestes ecossistemas torna-se importante. Em janeiro de 2000, foi instalado um experimento para avaliar o papel da limitação exercida pela disponibilidade de nitrogênio (N) e fósforo (P) sobre o acúmulo de biomassa da vegetação e recuperação dos ciclos biogeoquímicos, em Paragominas (PA). Usou-se uma área de pastagem degradada, abandonada há seis anos, vegetando sobre um solo pobre em nutrientes, principalmente P (Oxisol argiloso). Foram feitas duas aplicações de fertilizantes (janeiro de 2000 e 2001, 100kg de N e 50kg de P há.ano-1). Em novembro de 2003, foram coletadas amostras de solo, raízes e "litter", para avaliar os efeitos residuais da adubação nos processos ligados a ciclagem de nutrientes. A produção de "litter" total não foi influenciada significativamente pelos tratamentos (estoque de litter fino de 5-6 Mg.ha-1). A adição de N estimulou a atividade da fosfatase ácida no solo (0 a 10 cm), enquanto que com a adição de P a atividade foi inferior a do controle e, a associação com N reduziu somente parcialmente esse efeito. A mesma tendência foi observada no número de infecções micorrízicas nas raízes apogéotropicas, porém o número de esporos foi significativamente maior na interface "litter" solo das parcelas com N somente. Os resultados mostram que mesmo após dois anos, os efeitos da aplicação dos nutrientes ainda influenciam os processos chave de mineralização do N e P no solo.

28.10-P: Lixiviação do Nitrato em Quatro Microbacias Sob Cobertura Florestal no Município de Juruena/MT

Luiz Carlos Mattos Rodrigues, UFMT, mattosr@cpd.ufmt.br (Apresentador / Presenting)

Evandro Carlos Selva, UFMT, evandroc@cpd.ufmt.br

Eduardo Guimarães Couto, UFMT, couto@cpd.ufmt.br

Johannes Lehmann, CORNELL, UNIVERSITY, CL273@cornell.edu

Mark Stephen Johnson, CORNELL, UNIVERSITY, msj8@cornell.edu

João Paulo Novaes Filho, UFMT, jpnovaes@terra.com.br

A forte influência da circulação de nutrientes nos complexos ecossistemas florestais está relacionada com os atributos físicos e químicos do solo, os quais, entre outras funções, têm grande importância na dinâmica do nitrato no perfil do solo. Além disso, os níveis de nitrato no solo têm sido usados como indicadores das mudanças antrópicas na vegetação original. Este estudo foi realizado objetivando identificar a mobilidade do nitrato ao longo do perfil em diferentes posições da paisagem em quatro microbacias localizadas em Juruena, noroeste de Mato Grosso. Foram realizadas três perfurações com profundidade de até 8,0 metros em cada microbacia, distribuídas em diferentes posições da paisagem. Foram coletadas 18 amostras por escavação (0-20, 20-40, 40-60, 60-100, 100-150, 150-200, 200-250, 250-300, 300-350, 350-400, 400-450, 450-500, 500-550, 550-600, 600-650, 650-700, 700-750, 750-800 cm) perfazendo um total de 187 amostras. A movimentação do nitrato está relacionada com o fluxo de água no solo e sua lixiviação para maiores profundidades. Os resultados mostraram que a concentração do nitrato nos perfis estudados apresentou comportamento distinto nas microbacias estudadas. As concentrações oscilaram desde valores não detectados, distribuídos em todas as microbacias e em toda escala da profundidade, com grande frequência na microbacia 1, até o valor de 0,76kg/ha, detectado na

microbacia 4, na profundidade de 60-100 cm. Além disso, outros estudos conduzidos nesta área sugerem que a grande incidência de baixos valores de nitrato encontrados em alguns perfis devem estar associados à heterogeneidade das camadas, favorecendo a presença de lençóis suspensos que facilitam a remoção do mesmo.

28.11-P: Litter Quality of Agroforestry Systems in Central Amazonian

Guilherme Castilho Silva, INPA, gsilva@inpa.gov.br (Apresentador / Presenting)
Regina Luizão, INPA, rccl@inpa.gov.br

The objective of this study was to evaluate the quality of litter in agroforestry systems (AFs). The study was conducted at the EMBRAPA / CCAA field station in Manaus. AFs were established in parcels of 3000m² and in three treatments: AS1, based on palm and fruit trees; AS2, based on fruit and timber trees; and ASP1, based on pastures and timber trees. An area of secondary vegetation of the same age as the AFs was also included as a control. Samples were collected four times: in the dry and rainy seasons and in the rainy-dry and drought-rainy transition periods. Litter with lengths less than 2cm were collected every 2m, using a 625cm² wood square. The samples were composed of five sub-samples. The litter quality was calculated as the ratio between the polyphenol and the nutrient content. The nutrients analyzed include calcium, phosphorus, magnesium, potassium, iron, manganese and zinc. High polyphenol:nutrient ratios indicate slow nutrient mineralization and vice-versa. In general, the area with secondary vegetation showed the largest polyphenol:nutrient ratios and AFs, the AS1 and ASP1 areas had better quality litter, with the smallest values polyphenol:Ca (8:1), polyphenol:Mg (9:1), polyphenol:Zn (8:1) and polyphenol:Mn (7:1) ratios. AS2 showed larger values in those ratios (9:1, 10:1, 9:1 and 8:1, respectively). These variations may be attributed to different specimen compositions of the AFs.

B_Gases_traço (B_Trace_gases)

29.1-P: Herbicide Effect on N Availability and N₂O Fluxes During Pasture Reformation in Rondonia, Brazil.

Janaina Braga Carmo, CENA/USP, janaina@lbaeco.com.br (Apresentador / Presenting)
Diana Cecília Garcia-Montiel, WHRC/USA, dgarcia@nova.whrc.org
Cistiano Alberto Andrade, ESALQ/USP, candrade@cena.usp.br
Carlos Clemente Cerri, CENA/USP, cerri@cena.usp.br
Marisa Cássia Piccolo, CENA/USP, mpiccolo@cena.usp.br

Nitrogen availability for metabolic processes of microorganisms can be an important factor in the control of the emissions of nitrous oxide (N₂O) in tropical soils. To better understand of the dynamics of gas flows in the pastures in the Amazon, the present work sought to explore the N, C and water availability effect in the emission of N₂O in soils with pastures submitted or not to managing practices that seek its maintenance. In this case, herbicide application and the consequent elimination of plants from the soil was one of the observed practices. To better understand the results, the study was accomplished incubating soils from different areas in order to compare them and better interpret the results. In this scope, the chosen areas were: The treatment Control and the treatment Rice of the experiment for pasture recovery, just after herbicide application, a forest area and a pasture area established in 1987 and managed in the traditional way according to the Amazon region. The experiment was accomplished adding nitrate, dextrose, and water in the soil as well as, using the acetylene to block the oxidation of the N₂O for N₂ considering for this, the proportion of N₂ emitted from the soil. The largest flows were observed when nitrate was added to the soil in conditions of high humidity. The dextrose addition elevated the flows in a more intense way in the soil that had received herbicide application, where the availability of N was also larger. With the application of acetylene it was possible to observe that great part of nitrogen lost in the form of gases is as N₂. With that, the denitrification process was dominant in this incubation study and the nitrogen was limiting factor in pasture systems in the Amazon.

29.2-P: Profiles of trace gas concentrations from towers at undisturbed forest in the Brazilian Amazon Region

Janaina Braga Carmo, CENA/USP, janaina@lbaeco.com.br (Apresentador / Presenting)
Patrick Michael Crill, UNH/USA, patrick.crill@unh.edu
Jadson Dizencourt Dias, ESALQ/USP, jadson@lbaeco.com.br
Plínio Barbosa de Camargo, CENA/USP, pcamargo@cena.usp.br
Michael M. Keller, UNH/USA, michael.keller@unh.edu

We measured N₂O, CO₂ and CH₄ profiles at six heights from ground level to tower-top (up to 62 m) in undisturbed and logged forests using automated and manual sampling systems. Automated systems operated continuously at two sites in the Tapajos National Forest south of Santarem using computer-controlled gas chromatographs to sample analyze three gases at half-hourly frequency. At other LBA sites, we have deployed a new portable profile system to measure profiles of CO₂ from sampling tubes in and above the canopy. CO₂ was analyzed on-site using a LiCor IRGA. Samples for N₂O and CH₄ were stored in electro-polished stainless steel flasks and shipped to Santarem for gas chromatographic analysis. We sampled in well mixed conditions during the day and during calm conditions at night when CO₂ concentrations were elevated. Results from the automated sampling suggest that at Santarem there is a small, but potentially significant, source of CH₄ in the forest even though the soil generally consumes CH₄. Results from the manual samplings will be compared to those of the automated system.

29.3-P: NO and N₂O Emissions Related to the Nitrogen Fertilization in a Cornfield Under No-tillage and Tillage Systems

Armanda Moreira de Carvalho, EMBRAPA, UnB, armanda@unb.br (Apresentador / Presenting)

Mercedes Maria Cunha Bustamante, UnB, mercedes@unb.br

Alessandra Rodrigues Kozovits, UnB, kozovits@unb.br

Danielle Matias Sousa, UnB, daniellematias@yahoo.com.br

Laura Tillman Viana, UnB, lviana@unb.br

Leo Nobre de Miranda, UnB, leo@embrapa.cpac.br

The dynamic of nitrogen oxides emissions from Cerrado soils related to the nitrogen fertilization is still not well known, in spite of the intensification of agricultural activities in this region. NO and N₂O emissions were measured immediately and up to five days after nitrogen fertilization in a cornfield, under no-tillage and tillage systems, in the Cerrado region. The experiment was conducted at EMBRAPA-Cerrados (Planaltina-DF), mucuna-preta/corn succession on a Oxisol. Associated with irrigation, 20 kg ha⁻¹ N (at the sowing) and 60 kg ha⁻¹ N-urea (cover) were applied. The experimental design used was random blocks, in no-tillage and tillage systems. The fluxes were determined immediately, one, two, three and five days after nitrogen cover. In each plot, fluxes of NO and N₂O were measured in four and three PVC chambers, respectively.

Higher NO fluxes were found immediately (4 to 6 ng NO-N cm⁻² h⁻¹) and 3 days after N fertilization (3.5 to 5.5 ng NO-N cm⁻² h⁻¹). The lowest fluxes were found after five days (0.7 to 2.7 ng NO-N cm⁻² h⁻¹). In general, the no-tillage block showed higher fluxes soon after the N fertilization compared to the tillage block. On the other hand, the tillage blocks presented higher fluxes in the third day. Most of the N₂O fluxes values were below the detection limit (0.6 ng N₂O-N cm⁻² h⁻¹), except in the first and third day, when higher emissions (2.6 and 0.63 ng N₂O-N cm⁻² h⁻¹) were measured observed in the no-tillage blocks. NO and N₂O emissions were not correlated with air and soil temperature and soil moisture. The results suggest an immediate pulse in the NO emission after fertilization and irrigation, and a second pulse after three days. After five days, the fluxes were reduced to the background levels (around 1.2 ng NO-N cm⁻² h⁻¹).

29.4-P: Mapeamento temporal de áreas alagadas na planície de inundação da Amazônia: "input" para estimativas de emissão de metano

Maycira Costa, University of Victoria/Instituto Nacional de Pesquisas Espaciais, maycira@office.geog.uvic.ca

Dayson J.J. Lima, Instituto Nacional de Pesquisas Espaciais, dayson@ltdid.inpe.br (Apresentador / Presenting)

John Melack, University of California in Santa Barbara, melack@lifesci.ucsb.edu

Denival S. Correa, Universidade do Para - Santarem, denivalsilvacorrea@hotmail.com

Laura Hess, University of California in Santa Barbara, lola@icess.ucsb.edu

Imagens dos satélites RADARSAT e ENVISAT foram utilizadas para o mapeamento temporal de áreas alagadas da planície de inundação em duas localidades na Amazônia, Lago Grande de Monte Alegre e Lago Grande de Curuai. As imagens foram adquiridas em dezembro, 2003, janeiro, fevereiro e março de 2004, com a seguinte configuração: Radarsat - 27o de ângulo de incidência, banda C, polarização HH; ENVISAT - 27o de ângulo de incidência, banda C, polarizações HH e VV. Atividades de campo foram realizadas concomitantes a aquisição das imagens de radar objetivando descrever temporalmente os diferentes tipos de vegetação e biomassa de plantas aquáticas emersas. As imagens de radar foram radiometricamente e geometricamente calibradas, e classificadas segundo um processo de segmentação automática seguido de classificação supervisionada. Os resultados permitiram a geração de mapas temáticos temporais da distribuição espacial de inundação dos diferentes ecossistemas das regiões de estudo.

29.5-P: Trace Gas Emissions From the Soil Related to Land-Use Changes in the Cerrado Region

Alessandra Rodrigues Kozovits, Universidade de Brasília, kozovits@unb.br (Apresentador / Presenting)

Laura Tillman Viana, Universidade de Brasília, lviana@unb.br

Danielle Matias Sousa, Universidade de Brasília, daniellematias@yahoo.com.br

Mercedes Maria Cunha Bustamante, Universidade de Brasília, mercedes@unb.br

Richard Zepp, Environmental Protection Agency, zepp.richard@epamail.epa.gov

The conversion of native Cerrado areas (savannas of central Brazil) into croplands, may change the magnitude and dynamics of soil trace gases emissions. We measured NO, N₂O and CO₂ fluxes, soil moisture, available inorganic N and net mineralization rate in areas planted with corn, soybean and common bean and in adjacent native Cerrado areas. These crops are the most important in the region. Data collection followed the crop management (just before and after each fertilization) and also monthly during the growth season. The study has been conducted at the Fazenda Dom Bosco, about 100 Km from Brasília. Higher NO soil emissions were found in the corn (up to 9.44 ng NO cm⁻² h⁻¹) and bean (up to 8.87 ng NO cm⁻² h⁻¹) areas compared to native Cerrado and soybean areas (1.08 and 0.67 ng NO cm⁻² h⁻¹, respectively) and accompanying the status of available N in the soil. The net N mineralization and net nitrification dynamics were similar in the two legume crops, with immobilisation before the plantation and mineralization just after the sowing. In the native area, there was net mineralization during the dry season and immobilisation with the onset of the rain season. Generally, N₂O was under the detection limit (0.6 ng N₂O cm⁻² h⁻¹). Higher values were observed in the cornfield just after N fertilization (1.84 ng N₂O cm⁻² h⁻¹). In contrast to the N emissions, soil respiration from all studied sites seemed to be closely related to the soil moisture, tending to be higher in the crop areas (2.81 to 6.41 μmolCO₂ m⁻² s⁻¹). The results indicate a clearly increase in the NO emissions with the replacement of native Cerrado areas by fertilized crops. Emissions from the soybean area were similar to the native Cerrado although post-harvest measurements were still not taken.

29.6-P: NO fluxes from savannas of Central Brazil (Cerrado) subjected to nitrogen and phosphorus fertilization

Alessandra Rodrigues Kozovits, Universidade de Brasília, kozovits@unb.br (Apresentador / Presenting)

Laura Tillman Viana, Universidade de Brasília, lviana@unb.br

Danielle Matias Souza, Universidade de Brasília, daniellematias@yahoo.com.br
Alexandre de S. Pinto, Universidade de Brasília, alexandrep@ftb.br
Mercedes Maria Cunha Bustamante, Universidade de Brasília, mercedes@unb.br

The Cerrado biome covers 2 million km², quite as large as Western Europe. It is a species rich wet tropical savanna classified as a hotspot of its large number of endemic species and the vulnerability of this ecosystem. The soils are generally highly weathered and trees and shrubs may present deep root systems. In spite of seasonal rainfall distribution part of the woody vegetation is evergreen. Therefore Cerrado has an important role regulating the regional hydrological cycle. The fragmentation of Cerrado areas and the rapid conversion into agroecosystems may lead to higher nutrient inputs in adjacent native areas. Our objective was to determine the effects of long-term nutrient addition (N and N+P) in native Cerrado area on N oxides fluxes from soil to the atmosphere. The experiment was established at Ecological Reserve of the IBGE, 35 km south of Brasília, Brazil. 12 plots of 15 m x 15 m were randomly delimited with 4 replicates per treatment: (Control): without fertilization, (+N): ((NH₄)₂SO₄) = 100 kg N ha⁻¹ year⁻¹ and (+NP): 100 kg N ha⁻¹ year⁻¹ + 100 kg P ha⁻¹ year⁻¹. Plots were fertilized every year since 1998. Flux measurements of NO and N₂O were taken in March 2004 before the fertilization of this year. High NO soil emissions were measured in the +N plots (6.5 ng NO cm⁻² h⁻¹), although the last fertilization occurred one year ago. Interestingly, NO emissions in the +NP plots were about 12 times lower than those of +N and similar to the values found in non-fertilized Cerrado areas (0.55 ng NO cm⁻² h⁻¹). Generally, N₂O was under the detection limit (0.6 ng N₂O cm⁻² h⁻¹). These results indicate that NO emissions from native cerrado areas are not only influenced by N availability but also by the P availability. The addition of P would enhance N assimilation and retention by plants and less nitrogen would be release by the ecosystem as NO.

29.7-P: Monitoring soil radon-222 flux at selectively logged and primary forest sites in the Tapajós National Forest and in an agricultural field at km77 Santarém-Cuiabá highway (2003).

Risonaldo Leal Lima, Projeto LBA-ECO, risonaldo@lbaeco.com.br (Apresentador / Presenting)
Oswaldo Luiz Leal de Moraes, Universidade Federal de Santa Maria, moraes@mail1.ufsm.br
Christopher Sargent Martens, University of North Carolina, cmartens@email.unc.edu
Howard Mendlovitz, University of North Carolina, mendlovitz@unc.edu
José Mauro Moura, Centro de Energia Nuclear na Agricultura, jmauro@esalq.usp.br
Irrene Cibelle Sampaio, Universidade Federal do Pará, cibelle@lbaeco.com.br

²²²Rn is able to move from its generation sites in the soil to the free atmosphere, where it is transported by various mechanisms such as horizontal winds. ²²²Rn is a radioactive noble gas, chemically inert with a half life of 3.8 days, emitted mostly from the soil behaves conservatively. As a result, it can act as a tracer of the physical processes that influence the biosphere-atmosphere exchange rates of reactive trace gases. ²²²Rn soil-air fluxes are a critical component of the Radon budgets used to study these processes.

Three sites are included in this study: a logged and a primary forest in the Tapajós National Forest, located near Santarém, and an agricultural field undergoing periodic crop rotation (km77).

Ground flux samples were collected three times a week using portable detectors placed on permanent PVC soil collars in areas around the LBA flux towers and record the "soil-air" flux during sequential periods of 60 minutes. These detectors consist of a 15-liter chamber and an electronic part that counts ²²²Rn.

The results from 2003 showed fluxes in primary and logged forest of 1.02 ± 0.47 (n=50) atoms cm⁻² s⁻¹ and 0.85 ± 0.24 (n=63) atoms cm⁻² s⁻¹, respectively. At Km77 site the fluxes were 2.02 ± 1.11 (n=19) atoms cm⁻² s⁻¹ in untilled soil and 2.56 ± 1.77 (n=7) atoms cm⁻² s⁻¹ in soil tilled to an adjacent soybean plantation. In fact, changes in the soil structure associated with its water-holding capacity (moisture) contributed to the differences in flux rate at all sites.

29.8-P: Gas Transport, Production and Consumption Rates in the Tapajós National Forest, Para, Brazil, Determined Using RADON-222 Flux Divergence

Christopher Sargent Martens, UNC-Chapel Hill, cmartens@email.unc.edu (Apresentador / Presenting)
Thomas J. Shay, UNC-Chapel Hill, tshay@email.unc.edu
Howard P. Mendlovitz, UNC-Chapel Hill, mendlovitz@unc.edu
José Mauro Moura, CENA-USP, jmauro@esalq.usp.br
Risonaldo Leal Lima, LBA-ECO Santarém, risonaldo@lbaeco.com.br
Oswaldo Luiz Leal de Moraes, Universidade Federal de Santa Maria, moraes@mail1.ufsm.br
Patrick Michael Crill, University of Stockholm, patrick.crill@unh.edu
W. Stephen Woodward, UNC-Chapel Hill, woodward@unc.edu
Cibelle Gonçalves Sampaio, LBA-ECO Santarém, cibelle@lbaeco.com.br

Radon-222 flux divergence within the forest canopy can be calculated from continuous canopy air profile and campaign-style soil flux measurements with our unique flow-through radon detectors and soil fluxometers. Radon flux divergence can be utilized to quantitatively determine the net rates and canopy vertical distribution of CO₂ or methane and other trace gas production and consumption processes when combined with their soil flux and canopy profile measurements. The radon data can also be utilized to determine canopy air residence times throughout the diel cycle.

We plan to use flux divergence calculations in collaboration with other groups to determine respiration rates versus canopy height and to distinguish the vertical source/sink distribution and net flux of methane from dispersed forest sources

29.9-P: The influence of sediment composition on isotopic variation of CH₄ in the eastern Amazonian streams

José Mauro Sousa Moura, CENA/USP, jmauro@esalq.usp.br (Apresentador / Presenting)
Christopher Sargent Martens, University of North Carolina, cmartens@email.unc.edu
Marcelo Zacharias Moreira, CENA/USP, mmoreira@cena.usp.br
Howard P Mendlovitz, University of North Carolina, mendlovitz@unc.edu
Risonaldo Leal Lima, Projeto LBAECO, risonaldo@lbaeco.com.br
Irene Cibelle Gonçalves Sampaio, Projeto LBAECO, cibelle@lbaeco.com.br

The isotopic composition of methane varies seasonally and spatially between wetland environments as a result of changes in microbial production and oxidation mechanisms. We have been measuring the isotopic composition of CH₄ in Maica and Jamaragua, two different streams in the eastern Amazonia, since Aug/2000. The mean isotopic values found on the methane were in a range of -77.97‰ to -46.14‰, with a significant difference on the delta¹³C between the seasons, mainly during the end of dry season (Oct - Jan), when the difference reaches maximum values of -25‰. In Maica, the delta¹³C-CH₄ varied from -40.72‰ to -69.68‰, at Jamaragua the values varied from -89.05‰ to -54.03‰. In order to explain the differences we will look for heavier delta¹³C values in Maica sediments as results from deposition of grasses which are enriched in ¹³C and we also intend to analyze the composition of organic matter present in the vegetation that grows in these streams and describe the process by which it is decomposed.

We took cores sediment (~35cm) in the open water at each site. The cores were sub-sampled every 5 cm and all samples were dried and processed to be analyzed in a Finnigan Delta Plus mass spectrometer. Samples of litter and vegetation were else collected. Simultaneously, we measured the water temperature and its dissolved oxygen (DO) level. We found little difference in the water temperature, 31.2 °C and 27.3 °C at Maica and Jamaragua, respectively. There was an inverse correlation between the DO against deep in water column at Maica. This trend wasn't observed at Jamaragua. The water content in the sediment samples of Maica was 27.43%, which is 2x smaller than of Jamaragua.

29.10-P: Effects of water-addition on N oxides and CO2 fluxes from soils in pastures of Central Brazil

Alexandre de Siqueira Pinto, University of Brasilia, alexandrep@ftb.br (Apresentador / Presenting)

Mercedes Maria Cunha Bustamante, University of Brasilia, mercedes@unb.br

Laura Tillman Viana, University of Brasilia, lviana@unb.br

Keith Kisselle, USEPA, kisselle.keith@epa.gov

Roger A. Burke, USEPA, burke.roger@epa.gov

Richard Zepp, USEPA, zepp.richard@epa.gov

Planted pastures, mainly *Brachiaria* spp, represent the main land use type in the Cerrado region (savannas of Central Brazil) with an area of approximately 50 million ha. In the Cerrado, ca. 90% of the precipitation falls during the rainy season and this seasonality has marked effects on the trace gas dynamics from soils to the atmosphere. In order to assess the effects of the first rains (transition dry-wet season) on N soil dynamics (available inorganic N, NO and N₂O fluxes) and soil respiration in pastures we performed an artificial water addition experiment (simulating 5 mm rain) in September 2002 (end of dry season). The experiment was carried out in a farm in Planaltina-GO, Brazil (15o 13' S, 47o 42'W). Three areas of cerrado were converted to pasture (*Brachiaria brizantha*) in 1991 and after 10 years these areas showed traits of degradation. The pastures have been managed since 1999 to recover productivity as follow: (1) fertilization with N and P (fertilized plot) or (2) association of *Brachiaria* with the N-fixing legume *Stylosanthes guianensis* (legume-grass plot). A third plot was left without management (traditional plot) and a fourth area of cerrado was converted to pasture in 1999 (young pasture). Trace gas measurements were done 30 min, 24 h and 48 h after water addition. Soil N₂O fluxes were below detection limit in all the plots even after the water addition. A reduction of N-inorganic availability was observed along the experiment only in traditional plot (72.3 to 35.8 mg kg⁻¹). The young and fertilized pastures showed higher increase of soil NO fluxes after water addition (6.8 ng N cm⁻² h⁻¹ and 4.2 ng N cm⁻² h⁻¹ against 1.0 ng N cm⁻² h⁻¹ and 0.1 ng N cm⁻² h⁻¹, respectively, in the dry plots). All pulses were short-lived except in young pasture, where NO flux 48 h after the water addition was three-fold higher than in dry plots (3.0 ng N cm⁻² h⁻¹). Soil respiration in the grass-legume pasture showed the highest increase after water addition (three-fold reaching 8.3 μmol m⁻² s⁻¹). The results indicated that the transition of dry-wet season could be an important period for NO and CO₂ soil emissions in pastures of the Cerrado region.

29.11-P: Soil-Atmosphere Flux of Nitrous Oxide and Methane Measured on Sandy Loam and Clay Soils in Undisturbed Forest at the FLONA Tapajos, Brazil

Eráclito Rodrigues de Sousa Neto, Fundação Floresta Tropical, Santarem, Para, Brazil,, eraclito@lbaeco.com.br (Apresentador / Presenting)

Jadson Dizencourt Dias, Tropical, Santarem, Para, Brazil,, jadson@lbaeco.com.br

Hudson Silva, University of New Hampshire, Complex Systems Research Center, Morse Hall, NH., USA, hsilva@kaos.sr.unh

Sérgio N. da Silva Albuquerque, Fundação Floresta Tropical, sergio@lbaeco.com.br

Kêmeson Oliveira, Fundação Floresta Tropical, kemeson@lbaeco.com.br

Michael M. Keller, USDA, Forest Servics, michael.keller@unh.edu

Patrick Michael Crill, University of New Hampshire, Complex Systems Research Center, Morse Hall, NH., USA, patrick.crill@unh.edu

Raimundo Cosme de Oliveira Jr., EMBRAPA - Amazonia Oriental, Santarem, Para, Brazil, cosme@cpatu.embrapa.br

Nitrous oxide (N₂O) and methane (CH₄) are important greenhouse gases. Tropical forest soils account for the largest natural source of N₂O. Most upland tropical forest soils studied so far consume CH₄. We measured soil-atmosphere flux of N₂O and CH₄ using static chambers during 30 minute long emplacements. Four samples were removed at equal time intervals in nylon syringes and transported to our laboratory in Santarem for analysis within about 24 hours of collection. We analyzed N₂O and CH₄ using gas electron capture and flame ionization gas chromatography. To determine concentrations, integrated sample peak areas were compared to peak areas for commercially prepared standards that had been calibrated against the LBA-ECO standards. We calculated fluxes by linear regression of 3-4 concentration-time pairs. Our sampling points were randomly selected at intervals of 2-4 weeks at mature undisturbed forest sites near the km 83 IBAMA base in the Tapajos National Forest (FLONA Tapajos). Approximately 8 chamber measurements were made during each sampling period on both sandy Ultisols and clayey Oxisols. Soil and air temperature and soil moisture were measured at the same time as gas fluxes.

N₂O emissions from clay greatly exceeded the emissions from sand. Over 2 years of measurement, N₂O emissions from clay soils averaged 7.09 (+ 5.14) ng-N cm⁻² h⁻¹ while emissions from sand soils averaged only 1.67 (+ 1.44) ng-N cm⁻² h⁻¹. Sand soils generally consumed more CH₄ than clay soils (-1.24 (+ 4.16) mg-CH₄ m⁻² d⁻¹ vs. 0.11 (+ 4.23) mg-CH₄ m⁻² d⁻¹). Seasonal variation of both N₂O and CH₄ fluxes appeared to be controlled primarily by soil moisture. For N₂O, wet season (January-June) emissions greatly exceeded dry season (July - December) emissions. In the case of CH₄, fluxes were near zero during the wet season but notably negative (indicating consumption of methane in the soil) during the dry

season.

29.12-P: NOX and CO Emissions from Cerrado Plant Litter

Keith W. Kisselle, Austin College, Sherman, TX USA, KKisselle@austincollege.edu

Richard G. Zepp, US EPA, Athens, GA USA, zepp.richard@epa.gov (Apresentador / Presenting)

Roger A. Burke, US EPA, Athens, GA USA, burke.roger@epa.gov

Marirosa Molina, US EPA, Athens, GA USA, molina.marirosa@epa.gov

Mercedes Maria Cunha Bustamante, Depto. Ecologia U. Brasilia Brasilia, Brazil, mercedes@unb.br

Previous field studies in pastures and native cerrado in central Brazil have indicated that surface plant litter and burn residues can be a major source of NOX [nitric oxide (NO) plus nitrogen dioxide (NO₂)] and carbon monoxide (CO). Here we describe laboratory studies that provide more detailed information on factors that control these emissions. Litter samples were obtained from two native vegetation types in central Brazil, cerrado stricto sensu (20-50% canopy cover) and campo sujo (open scrubland) and from pastures (*Brachiaria brizantha* litter) located at an experimental farm near EMBRAPA Cerrados and at a cattle ranch (Fazenda Rio de Janeiro) that was 110 km north of Brasília. Some of these samples were combusted to produce an ash residue that also was used in the experiments. NOx and CO emissions from the litter and ash samples were investigated using flow-through chambers that were equipped to control the heating and irradiation of the samples. Both illumination under a solar simulator and heating in the absence of illumination (above ambient temperature of 28°C) induced increases in the gas emissions compared to emissions observed at 28°C in the dark. The largest increases were observed from the ash residues. Other experiments indicated that the enhanced NOx emissions under illumination were primarily due to surface heating but the increased CO emissions were mainly caused by UV-induced litter photodegradation. The results indicate that NOx and CO flux measurements with opaque chambers can underestimate the emissions of these gases, especially in open, recently burned sites.

HD (Dimensões Humanas) / HD (Human Dimensions)

[HD_Dados_ET \(HD_Data_ET\)](#)

30.1-P: An Interactive CD-Rom for Teaching Remote Sensing Applied to Amazon Issues and Exemplified by LBA Case Studies.

Nelson W Dias, Indiana State University, nelson@indstate.edu (Apresentador / Presenting)

Getulio T Batista, Universidade de Taubate, getulio@agro.unitau.br

Paul W Mausel, Indiana State University, gemauser@isugw.indstate.edu

Evlyn M Novo, Instituto Nacional de Pesquisas Espaciais, evlyn@ltdid.inpe.br

Dennis L Skelton, Indiana State University, geskelt@isugw.indstate.edu

Thelma Krug, Instituto Nacional de Pesquisas Espaciais, thelma@ltdid.inpe.br

An interactive CD-ROM developed by INPE and Indiana State University with support from NASA LBA-ECO entitled "Sensoriamento Remoto: Aplicações para a Preservação, Conservação e Desenvolvimento Sustentável da Amazônia" has been available for Brazilian university undergraduate and high school education since April 2003. Multimedia products for technology transfer focusing on topics such as remote sensing and its applications have become widely available through NASA sponsored projects. This set includes two CDs, CD1 is divided into three sessions: 1) Introduction to Remote Sensing; 2) Preservation and Conservation Principles; and 3) Amazon Case Studies - LBA Examples. Six remote sensing and GIS datasets cover different Brazilian environmental applications suitable for students to conduct hands-on analysis using INPE's SPRING software are found on CD2. Materials are presented in short texts illustrated by more than 800 figures, accompanying audio, and animations. Navigation is done via menus and an index page controlled by the database. Teachers can customize student use of the materials by selecting portions of the content for a given course. Additional reading and updated information can be accessed by a link to a website hosted by INPE identified in the CD. The expansion of computer facilities in universities and high schools and the advance in Internet technologies have offered new opportunities to deliver instructional materials using digital media. The approach used in this material intends to facilitate easy comprehension of science topics for Brazilian students and support efforts to democratize scientific knowledge by disseminating understandable and conceptualized LBA research results.

30.2-P: The Data and Information System of the Large Scale Biosphere-Atmosphere Experiment in Amazonia - LBA

Luiz M. Horta, Centro de Previsão de Tempo e Estudos Climáticos (CPTEC/INPE), horta@cptec.inpe.br (Apresentador / Presenting)

Merilyn J. Gentry, NASA Goddard Space Flight Center/University of Tennessee, mgentry2@utk.edu (Apresentador / Presenting)

Larry D. Voorhees, Oak Ridge National Laboratory, Distributed Active Archive Center, voorheesld@ornl.gov (Apresentador / Presenting)

Laurindo C. Santos, Instituto Nacional de Pesquisas da Amazonia, lcampos@inpa.gov.br (Apresentador / Presenting)

The Large-Scale Biosphere-Atmosphere Project in Amazonia (LBA) is an international research study led by Brazil. Investigators include field researchers and modelers from the U.S., South America, and Europe. Beija-flor provides a centralized access point to data sets acquired for and produced by LBA researchers and was developed to support:

- Early data exchange among the investigators

- Widely diverse data, in both content and format
- Data discovery and retrieval, using fielded, free-text, geospatial, and temporal searches

Though Beija-flor is a proprietary-based system, its adherence to FGDC metadata standards and the use of XML code allow most of the Beija-flor metadata fields to be understood by other search engines and indexing systems, as well as provide for platform/software-independent creation and maintenance of metadata files.

30.3-P: SIG sem computador: ferramenta para comunidades rurais monitorarem os serviços ambientais no Programa Proambiente

Nara Vidal Pantoja, Universidade Federal do Acre, npantoja@ufac.br (Apresentador / Presenting)
Irving Foster Brown, Universidade Federal do Acre / Woods Hole Research Center, fbrown@uol.com.br
Diogo Selhorst, Universidade Federal do Acre, dselhorst@pop.com.br

O incentivo à manutenção de serviços ambientais é o principal objetivo do Proambiente - Programa de Desenvolvimento Socioambiental da Produção Familiar Rural. Este programa do governo brasileiro busca conciliar o desenvolvimento econômico com conservação do meio ambiente, dando subsídios para propriedades rurais. O Proambiente exige que os serviços ambientais de redução do desmatamento, seqüestro de carbono, recuperação das funções hidrológicas dos ecossistemas, conservação dos solos, preservação da biodiversidade e redução do risco de fogo sejam mantidos pelos produtores rurais para que obtenham a remuneração referente a estes serviços. É necessário avaliar o cumprimento dessas exigências realizando monitoramento das áreas contempladas sendo feito pelos proprietários das áreas. No Estado do Acre quatro municípios fazem parte do programa, os quais serão monitorados conforme a definição de protocolos que padronizem as medições, aumentando a acurácia deste monitoramento. As áreas desmatadas e queimadas possuem protocolos específicos, pois serão monitorados de forma direta. O uso de definições operacionais permite caracterizar o perfil da floresta, área florestada e consequentemente, estimar os estoques de carbono destas. Produtores usam dados de GPS para plotar no campo os mapas das propriedades e quantificar os serviços ambientais. O SIG sem computador se tornou uma ferramenta essencial para a inclusão social de comunidades rurais no programa Proambiente.

30.4-P: Estudos temáticos de Pesquisas do LBA: Uma contribuição para a produção de material Didático-Pedagógico para o Ensino Fundamental.

Aline Heveny Sousa dos Santos, UFPA, aline@lbaeco.com.br (Apresentador / Presenting)
Chieno Suemitsu, UFPA, chieno@netsan.com.br
Thatiana Pereira da Silva, UFPA, thatiana@lbaeco.com.br

Esta proposta é parte integrante do grupo T&E02 do programa LBA, que nesta etapa inicial, pretende caracterizar as condições do ensino de ciências nas escolas de nível fundamental da região oeste do Pará- Brasil. Nosso objetivo é a produção de material didático para o ensino de ciências ambientais nas escolas da região amazônica, tendo em vista as recentes descobertas sobre o funcionamento do ecossistema amazônico pelos pesquisadores do LBA. Neste contexto a caracterização das condições de ensino na região torna-se uma importante base para a produção de um material didático mais eficiente e adequado para a região.

A avaliação do ensino, está sendo feita com base em visitas às escolas, conversa com os professores de ciências e aplicação de questionários. Ainda estão sendo feitas avaliações dos livros e materiais didáticos utilizados pelos professores e alunos. Pretende-se realizar um encontro de professores para debater a questão de ensino de ciências em que serão apresentados os resultados obtidos e analisados.

Até o momento foram visitadas oito escolas e entrevistados vinte e dois professores de ciências de oito municípios da região. Os resultados ainda são preliminares, sendo que a avaliação aponta para uma extrema precariedade das condições do ensino na região oeste do Pará, entre os quais estão: baixos salários, poucas aulas semanais que prejudicam o rendimento dos alunos, dificuldades de acesso a materiais didáticos, irregularidades contratuais que prejudicam o desenvolvimento do professor em sala de aula e na relação aluno-escola-professor.

30.5-P: Avaliação de livros e material didático usado para o ensino de ciências nas escolas de ensino fundamental da região oeste do Pará, Brasil.

Thatiana Pereira da Silva, UFPA, thatiana@lbaeco.com.br (Apresentador / Presenting)
Aline Heveny Sousa dos Santos, UFPA, aline@lbaeco.com.br
Chieno Suemitsu, UFPA, chieno@netsan.com.br

A avaliação de livros é parte integrante da caracterização do ensino fundamental da Região Amazônica-Oeste do Pará, fornecendo subsídios analíticos para a produção de material didático-pedagógico, tendo em vista as recentes descobertas sobre o funcionamento do ecossistema amazônico pelos pesquisadores do LBA. Neste contexto, a análise das condições de ensino da região torna-se uma importante base para a produção de um material didático mais eficiente e adequado para a região, sendo este um dos objetivos do grupo T&E02.

Com informações coletadas nas fontes de distribuição de livros didáticos, secretarias regionais e municipais de ensino e visitas as escolas para conhecer a real utilização do livro, foram avaliados até o momento onze títulos de livros de ciências do ensino fundamental. Desses onze livros avaliados sobre uma planilha elaborada com base no Guia do Livro Didático de Ciências do Ministério da Educação (www.mec.org.br) e nos Parâmetros Curriculares Nacionais, os resultados preliminares foram que: os livros não apresentam contextualização regional, continham conceitos duvidosos causando interpretações equivocadas, apresentam quantidade de informações muito acima da capacidade de realização, em um ano letivo, considerando a carga horária mínima da disciplina de ciências.

Portanto, faz-se necessário que o professorado saiba fazer uma boa escolha do livro que irá utilizar em sala de aula, mesmo consciente das dificuldades que enfrenta quanto à distribuição deste material, uma vez que é insuficiente o número de livros em relação ao número de alunos.

30.6-P: O Ensino dos Ciclos da Água e do Carbono no Ensino Médio em Santarém-PA

Elinei Pinto dos Santos, UFPA, elinei@ufpa.br

Roseilson Souza do Vale, UFPA/LBA, roseilson@lbaeco.com.br (Apresentador / Presenting)

Viviane Pereira Barbosa, UFPA/LBA, vivianepereira@lbaeco.com.br

O relato sobre a importância dos ciclos da água e do carbono na vida das pessoas e para o equilíbrio do clima global, tem chegado cada vez mais ao conhecimento de todos. Para avaliar o quanto estes temas são conhecidos pelos professores de ensino médio de Santarém, foram aplicados questionários nas escolas do município no sentido de avaliar a qualificação do professorado e dos livros didáticos por ele empregado. Os principais resultados mostraram que grande parte dos professores não são formados em ciências e têm dificuldades com os temas. Ainda, que poucos livros didáticos os abordam de maneira adequada. É necessário, portanto, um investimento maior das escolas locais ou da região Amazônica no treinamento de professores e em materiais didáticos-pedagógicos mais adequados e voltados para a realidade local dos alunos, eliminando a visão importada e trazida pelos livros confeccionados no sul e sudestes do país. Por exemplo, poderia ser útil o uso de exemplos locais, como os experimentos do LBA na FLONA-Tapajós, nas escolas da região. Os resultados obtidos revelam uma necessidade de uma adaptação da linguagem técnica dos artigos ou mesmo livros didáticos para uma linguagem mais acessível para alunos, professores do ensino médio e para a comunidade em geral.

30.7-P: The ORNL DAAC: A Source for Biogeochemical and Ecological Data¹

Larry D. Voorhees, Oak Ridge National Laboratory², voorheesld@ornl.gov (Apresentador / Presenting)

Robert B. Cook, Oak Ridge National Laboratory, cookrb@ornl.gov

B. Tim Rhyne, Oak Ridge National Laboratory, rhynebt@ornl.gov

The Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) archives and distributes terrestrial biogeochemical dynamics data collected as part of the NASA's Earth Observing System (EOS) Program. The DAAC's 650+ data sets center around three core activities: (1) field campaigns, (2) validation of remote sensing products, and (3) terrestrial ecosystem modeling. Field campaigns combine ground-, aircraft-, and satellite-based measurements of biogeochemical features in specific ecosystems over a few years. These types of studies, like the LBA-ECO field campaign, focus on a particular issue or set of issues and are crucial to providing an integrated understanding of biogeochemical dynamics that can be extended across spatial and temporal scales. The ORNL DAAC supports the validation of remotely sensed measurements by compiling data, such as net primary productivity (NPP) and leaf area index (LAI), from global test sites for comparison with remote sensing products. Realistic models that simulate ecosystem properties and processes are needed to improve our understanding of the structure and function of these ecosystems. Biogeochemical dynamics data, such as those available from the ORNL DAAC, can be used to parameterize and validate terrestrial ecosystem models at local, regional, and global scales. Although our efforts focus on NASA-funded data products, we also hold selected biogeochemical dynamics data collected by non-NASA researchers worldwide. Data at the ORNL DAAC are available to the global change research community, policy makers, educators, and the general public at no charge.

¹ This work is sponsored by the National Aeronautics and Space Administration.

² Oak Ridge National Laboratory is managed by UT-Battelle, LLC for the U.S Dept. of Energy under contract DE-AC05-00OR22725.

30.8-P: GIS Smart Client: Sharing Intelligence Worldwide

Genong Yu, Indiana State University, gyu@indstate.edu (Apresentador / Presenting)

Ryan R Jensen, Indiana State University, r-jensen@indstate.edu

Paul W Mausel, Indiana State University, gemause@isugw.indstate.edu

Vijay Lulla, Indiana State University, vijay_lulla@mama.indstate.edu

Eduardo Sonnewend Brondizio, Indiana University, ebrondiz@indiana.edu

Emilio F. Moran, Indiana University, moran@indiana.edu

A distributed spatial information system, the Amazon Information System (AIS), was developed under a NASA funded LBA project to distribute a variety of spatial data associated with Amazon ecosystem studies. Built with an object-oriented approach under a .NET framework, the previous release of the AIS completed a three-tier architecture that promises easy versioning management, program-reuse and sharing, distribution over the Internet, and extension support. Based on previous efforts, the following objectives were pursued in the latest AIS version: 1) Expansion of current analysis methods in the client software. Specifically, the work focused on the implementation of intelligence-based access and utilization of data, including multiple layered perceptron, Fuzzy ARTMAP, maximum likelihood estimate, maximum likelihood classifier, multiple-response linear/logistic regression, and neural linear feature extractors; 2) Full exploitation of the flexibility and scalability of the client software is made possible by the three-tier architecture. Given the wide range of user groups that the system targets, the AIS needs to tailor its client side functions to cater to different assortments of interests. With the adoption of spatial standards, including GML (geographical markup language) and SVG (scalar vector graphics), the latest phase of AIS development focuses on the implementation of a smart client that combines the benefits of a thick client model where most analyses are completed on the client side with the thin client manageability where most functions are carried out on the server side.

Keywords: smart client, GML, SVG, .NET, GIS

31.1-P: O Papel da Floresta Amazônica nas Negociações Internacionais sobre Mudança de Clima Global

Luis Antônio Lacerda Aimola, Universidade de São Paulo, aimola@usp.br (Apresentador / Presenting)

O objetivo principal deste trabalho foi o de expor um modelo multi-agentes acoplado a dois outros modelos, um climático global e outro dos ecossistemas amazônicos, que permita investigar alguns cenários futuros sobre a influência mútua entre o processo de ocupação da Amazônia e as políticas internacionais sobre mudança do clima. Especificamente, nosso objetivo foi o de investigar se a Amazônia poderia vir a desempenhar um papel relevante nos novos acordos internacionais sobre mudança climática e se estes acordos poderiam gerar políticas públicas capazes de mudar efetivamente o curso atual do desmatamento na região. O modelo vem sendo desenvolvido pelos autores em com o Centre de Coopération Internationale en Recherche Agronomique pour le Développement - CIRAD. O modelo considera as tomadas de decisões dos principais atores do processo de ocupação e uso do solo da Amazônia e os quadros de tomada de decisão dos governos do Pacto Andino, além da interação entre as políticas públicas e os processos sócio-econômicos de larga escala. O modelo leva também em conta unicamente as decisões da população amazônica sobre uso da terra que acarretam desmatamento, desmatamento evitado, reflorestamento e aflorestamento. Além desse nível regional, está sendo modelado o processo de negociações entre três grandes blocos: os países amazônicos, os países do Anexo I da Convenção Quadro sobre Mudança de Clima e o bloco do Resto do Mundo. As perspectivas e interesses destes três diferentes blocos foram representadas para estudar a interação entre os processos socioeconômicos e políticos regionais e globais da mudança do clima. No processo de decisões e nas negociações foi representado também a evolução do conhecimento dos atores sobre a interação da Amazônia e o Clima Global e para isto estamos utilizando os avanços que o LBA tem produzido a respeito. Além do modelo multi-agentes temos acoplado a ele, um modelo integrado simplificado sobre os sistemas econômico e climático globais e um modelo ecológico da interação da Amazônia com o clima global, permitindo assim simulações das respostas dos ecossistemas amazônicos às mudanças climáticas globais.

31.2-P: Market incentives for environmental law compliance in Mato Grosso: opportunities and limitations to environmental certification of soy and meat in the Amazon.

Oriana T Almeida, IPAM, oriana@ipam.org.br (Apresentador / Presenting)

Daniel Curtis Nepstad, WHRC, dnepstad@whrc.org

Deforestation has increased dramatically in recent years in the state of Mato Grosso, where soil, climate, and infrastructure make ranching and soy production highly competitive. One of the most complex and strict environmental legislations for rural landholders is the Brazilian código florestal for the Amazon. Since 1995, this law requires the maintenance of 80% of the forest on rural properties. Most private owners argue that the law makes productive activities unviable and generally the law is not respected. Although there is this conflict between the possible returns of economic activity and the compliance of the environmental legislation, some producers from the state of Mato Grosso have advanced a new proposal to certify meat and soy. The present work analysed the steps proposed in this new initiative by the private owner, the impact of the environmental law on the economic activity and how the private sectors propose to comply with—and go beyond—environmental legislation.

31.3-P: Population redistribution in the Ecuadorian Amazon in the 1990s

Alisson F. Barbieri, University of North Carolina at Chapel Hill, barbieri@email.unc.edu (Apresentador / Presenting)

Richard E. Bilsborrow, University of North Carolina at Chapel Hill, richard_bilsborrow@unc.edu

Following the opening of roads and large-scale in-migration into the Northeastern Ecuadorian Amazon in the 1970s, the most dramatic forms of population redistribution under way are currently within this frontier area. Rural-urban and rural-rural migration has engendered one of the highest rates of deforestation of any Amazonian nation, and an incipient, but growing urbanization in the Ecuadorian Amazon. However, while very significant in its effects on deforestation, urbanization and regional development, population mobility in the Amazon has hardly been studied at all. Based on a longitudinal data of 249 farm households between 1990 and 1999, this paper uses a multinomial regression model to understand what factors affect rural out-migration to rural or urban destinations. The results show important differentials between rural-rural and rural-urban migrants due to farm household life cycle effects, with rural-rural migration being more responsive to changes in the amount of farmland in forest, and to the number of adults and children living in the farm household. On the other hand, rural-urban migration is associated to changes in the proportion of land in pasture and number of children in the farm household. Important differentials among rural-rural and rural-urban migrants are also explained by human capital characteristics (education and off-farm experience), road accessibility to farms, to changes in farm size, and age and gender of out-migrants. Identifying and measuring these differentials is important to understand the effects of policy-relevant variables on the choice of a particular migration destination.

31.4-P: Fogo Inimigo? As transformações do discurso ambiental na agricultura familiar

Luciana Miranda Costa, Autor, lucianac@amazon.com.br (Apresentador / Presenting)

O discurso ambiental, que coloca a proteção ambiental como prioridade social, individual e coletiva, de caráter necessário e urgente, é a linha condutora das campanhas de prevenção ao fogo acidental implementadas, principalmente a partir de 1998, no Estado do Pará. Este discurso, entendido como prática discursiva, objetiva uma mudança do comportamento dos agricultores familiares a partir de uma “conscientização” dos mesmos e da “naturalização” deste comportamento. Ao tratar do campo ambiental e da sua relação com o subcampo da agricultura familiar, tendo como elemento de intersecção as campanhas, pretendo mostrar como o discurso ambiental, marcado pela proteção à natureza, tem sido dominante na relação que se estabeleceu entre os agentes e instituições destas duas esferas. Isto significa na prática, que às visões de mundo tidas como legítimas pelo campo ambiental estão sendo incorporadas pelo subcampo da agricultura familiar em um ritmo muito mais acelerado do que o inverso, garantindo ao primeiro, um acúmulo muito mais expressivo de poder simbólico. As campanhas estão sendo tomadas como objeto de estudo exatamente porque contém os elementos que

mostram, em um contexto histórico determinado, como as relações entre os dois campos são relações de força marcadas pelo desequilíbrio. Ou seja, retomando o conceito de habitus de Bourdieu, o que se busca ressaltar com esta pesquisa é a possibilidade de que processos de compartilhamento de conhecimentos estejam sendo efetivados através da generalização de visões de mundo presentes no habitus de um dos principais agentes sociais da experiência: pesquisadores e técnicos do campo ambiental.

31.5-P: A escala e o método como bases para análises: tipologias e setorizações

Reinaldo Corrêa Costa, DG/USP, rcorreacosta@yahoo.com.br (Apresentador / Presenting)

Em uma mega região como a Amazônia brasileira com profundas diferenças sociais e marcante heterogeneidade em sua natureza, faz-se necessário preparar um conjunto de procedimentos para um melhor entendimento/análise para uma posterior intervenção baseada no conhecimento das aplicações de ciência.

Faz-se necessário então, entender que não existe Amazônia, existem Amazônias, por exemplo, as áreas urbanas de Belém e Manaus não projetam-se na história da região e do país como a urbanidade de Porto Velho, Macapá ou Rio Branco, entre outras, ou ainda, os processos econômicos e sociais que levaram aos gigantescos desmatamentos no sudeste do Pará não são os mesmos do processo de avanço de desmatamento no sul do Amazonas; chamar todos esses processos de "fronteira", é uma simplificação que empobrece a produção de conhecimento desta região brasileira.

Para criar condições de um maior conhecimento da Amazônia é necessário um zoneamento ecológico e econômico com bases em questões de escala - de cada setor a ser definido - e método - quais os procedimentos, as abordagens para se chegar a tais setorizações. Com base em um cruzamento de informações desde os processos históricos de ocupação humana - paleo-índios, índios, europeus até os movimentos migratórios recentes - acrescidos a isso às dinâmicas da natureza desde a última glaciação até as mais recentes informações dos paleo-climas até as atuais perturbações climáticas da dinâmica geral da atmosfera com os gases, particulados e aerossóis.

Essa setorização, inclusive utilizando tipologias, servirá como base geral para um aprofundamento maior da realidade existente em cada célula espacial identificada, fornecendo informações precisas tanto para a produção de conhecimento (seja acadêmico e/ou para políticas públicas) quanto para a melhoria de vida das sociedades que nela vivem.

31.6-P: A Natureza como Recurso e a (re)criação de Territorialidades

Reinaldo Corrêa Costa, DG/FFLCH/USP, rcorreacosta@yahoo.com.br (Apresentador / Presenting)

No processo de produção do espaço geográfico um foco diferenciador é a constituição de territorialidades. Quando um grupo social apropria-se de um setor da natureza, territorializa-se nele e modifica-o conforme a sua necessidade de reprodução social, nada mais é do que um exemplo da luta de classes, da luta por territórios. Nesse sentido faz-se necessário a produção de natureza, transformar um ambiente natural em artificial, é o que aconteceu com os lagos de reservatórios de hidroelétricas. Quando essa dinâmica ocorre é correto que se investigue a originalidade da área transformada, principalmente a sua configuração social. Isto exige que no processo de análise das transformações da natureza em mercadoria, recurso natural, seja englobado no raciocínio de quais os grupos sociais que entram em confronto pela concordância ou não da transformação ocorrida, pois via de regra, camponeses e índios, são os principais afetados por lagos de hidroelétricas e não são considerados no processo decisório de construção/definição do sítio de barragens. A luta pela sobrevivência torna-se a luta por territorialidades pois e nela que ocorre a prática social e seus efeitos, como por exemplo, as queimadas.

31.7-P: Searching for a place on the Amazonian frontier: the trajectories of invisible rural workers in Acre, Brazil and Pando, Bolivia.

Benedita Esteves, Dept. of History, Federal University of Acre, Rio Branco, AC, benedita_esteves@uol.com.br (Apresentador / Presenting)

The occupation of southwestern Amazonia stimulated by the rubber booms of the last two centuries has created a transnational population largely invisible to national and state policy makers. The objective of this study, based on 260 interviews in both Brazil and Bolivia is to learn the trajectories of these rubber tappers and rural agricultural workers who now confront intensified socio-economic and political pressures that are promoting migration. On the order of ten thousand persons who consider themselves Brazilians live in the Bolivian Department of Pando, many of whom are faced with increased pressure from loggers and government policies to leave their rural homes and return to Acre, Brazil. As a marginalized population, these 'Brasivianos,' created by a geopolitical concept of space, now confront a hierarchical social space divided by status within the class of rural workers. This migratory population faces a double discrimination - as foreigners within Pando and, when returning to Brasil, as rural workers without the legal rights to land such as those living in extractive reserves have within Acre. While some are being absorbed into newly established colonization projects, most of these returning Brasivianos, faced with second-class status, will continue to be without land to call their own. As this invisible population grows more visible, the mounting social pressure will require regional policy makers to make decisions with ramifications for social well-being and land use in southwestern Amazonia.

31.8-P: Institutional Dimensions and Land-Cover Change: Regional and Local Variability in the Lower Amazon

Celia R T Futemma, PROCAM- UNIVERSIDADE DE SAO PAULO, cfutemma@indiana.edu (Apresentador / Presenting)
Eduardo Sonnewend Brondizio, ACT-CIPEC, DEPTO DE ANTROPOLOGIA- UNIVERSIDADE DE INDIANA, ebrondiz@indiana.edu

Type of land and resource ownership--public, private or common has been recognized as a component of conservation and use of forests. We selected 14 areas of the Lower Amazon region to analyze inter- and intra-variations of land-cover changes across property regimes: public (n=3; total area of 490,716 ha), private (n=1,860; total area of 102,769 ha), and common (n=15; total area of 197,499 ha). In this paper we focus on three main issues. First, we look at the influence of different types of ownership upon land-use and land-cover (LUCC) trajectories between 1986 and 1999. Second, we look at variations in LUCC trajectories within each property regime. We examine factors such as rules of use, size of property, time of occupation and social group, and location. Finally, we pursue a methodological question, that is, to examine the

influence of measurement unit upon the interpretation deforestation rates in the region. Particularly, we compare absolute (ha) and relative (%) measurements of deforestation and areas in use in relation to property size. Results show that type of property regime alone does not guarantee conservation of forest. There exists great variability of land-use and land-cover forms across different types of ownership. Behind all types of property regimes, two aspects are important that affect maintenance of forest coverage or facilitate deforestation: adequate and efficient monitoring system and the economic role of forest for different group of actors. To conclude, strong governance in old and new frontiers and across properties--public, private and community--is fundamental to guarantee fairly economic return to local people and maintenance of natural vegetation.

31.9-P: Building Collaborative Networks in LUCC Case Studies in Acre, Brazil

Carlos Valerio A. Gomes, Department of Geography/University of Florida, SETEM/UFAC, valerio@ufl.edu (Apresentador / Presenting)

Thomas Ludewigs, School of Public and Environmental Affairs/Indiana University, tludewig@indiana.edu

Jacqueline M. Vadjunec, Graduate School of Geography/Clark University, jvadjunec@clarku.edu (Apresentador / Presenting)

Environmental issues facing society today often require deeper ways of understanding. Land-use cover-change processes such as tropical deforestation and its direct effects on livelihoods warrant attention from the international research community. The question arises as to how we are to understand such changes, their causes and drivers, as they are multi-temporal and multi-scalar. To meet these challenges, many programs such as the LBA, IGBP, IHDP and HDGEC have pressed for the collaborative and synergistic study of the human dimensions of land-use land-cover change. Although these programs have gained the respect of the international research community, they continue to provoke frustration among many scientists, who strive to apply theoretical knowledge to development issues. This poster presents the collaborative story, benefits and challenges of three doctoral students currently engaged in fieldwork in Acre, Brazil, representing two countries and three different universities. Our common objective is to understand the LUCC dynamics in two types of government sponsored tenure regimes: one extractive reserve and one colonization project and their implications on regional development. By integrating our research, we are able to contextualize the processes occurring within both our individual study areas and a larger framework. We depart from the current 'big science' paradigm and press for such understanding as a means, not an end, in dealing with social and environmental issues. Through collaboration, not only can we reach the deeper understanding called for by LUCC, but we can increase efficiency, resulting in more time for capacity building and the transmission of relevant information to local institutions involved in the development process.

31.10-P: Social Change and Land Cover Change in Santarem, Para State, Brazil.

Alvaro de Oliveira D'Antona, ACT / Indiana University, adantona@indiana.edu

Corey Hayashi Hayashi, ACT / Indiana University, chayashi@indiana.edu (Apresentador / Presenting)

This poster focuses on analyzing the relationship between socioeconomic changes and land cover dynamics taking place in the Santarém region of the lower Amazon, state of Pará, Brazil. The Santarém region has a long history of economic phases starting with exportation of rubber during the end of the 19th century. Through time, small agriculture, cattle farms and logging industries have developed and co-existed. Currently, soybean agriculture, with the push of global market, has become a viable and expanding cash-crop in the region. Socio-economic phases, mechanization and urbanization are changing the landscape from a once rural, forested environment to a more urbanized, mosaic landscape, including large deforested areas. Land cover has significantly changed since colonization and has intensified between the 1970s till the present. These changes are multi-ended with variables such as demographic, aspects of migration; socioeconomic, farmers' decision making process because of the agricultural industry; and property characteristics, aspects of their land concerning plot size, and utilization. The poster characterizes rate and degree of change in these variables and explores their inter-relationships. Data supporting this poster derives from survey-based fieldwork and multi-temporal spatial analysis carried out by a team of researchers at the *Anthropological Center for Training and Research on Global Environmental Change* (ACT) at *Indiana University*. During the summer of 2003, ACT researchers have collected approximately 450 household surveys on the relationships between socioeconomic and land cover changes. These surveys identify decision making processes concerning land use and characterizes the biophysical changes of the landscape. The poster presents socioeconomic and land cover changes compiled from the survey results. Emphasis will be placed on aspects of demographic, socio-economic, and property characteristics reflecting intriguing findings. These include both aggregation and fragmentation of farm-lots and increase rates of migration from rural to urban areas.

31.11-P: Revisiting the livestock and deforestation interplay in the Amazon: The cases of Uruara and southern Para

Pablo Pacheco, CIFOR/IPAM, p.pacheco@cgiar.org (Apresentador / Presenting)

This presentations address some key issues on the relationship between cattle production and deforestation in the Amazon. Looking at two research sites (Uruara in the Transamazon, and Redencao's influence area in the southern Para), based on 200 interviews to small farmers, and about 40 interviews to cattle ranchers, it will analyze the underlying trends driving the pathways of regional development as result of public policy implementation and markets development. Analysis of remote sensing information for the years 1986, 1991, 1996, and 1999/01 helped to understand the implications of regional development on land-use change, specifically deforestation driven by pasture expansion, and determining the influence that different agents (small- versus large-scale landholders) have on land-use change trajectories, and the emerging land-uses. The presentation will make explicit linkages between land-use change, and the diversity of landholders socio-economic conditions, and their interests for expanding livestock as primary source of income. Intra regional and inter household comparison allows for better understanding of trajectories of land-use change, linked to people livelihoods and regional economic growth.

31.12-P: Examination of migration to agricultural frontiers using temporal and spatial cohorts

William Kuang-Yao Pan, Johns Hopkins University, wpan@bios.unc.edu (Apresentador / Presenting)

Clark Gray, University of North Carolina at Chapel Hill, cgray@email.unc.edu

The most salient footprint of human existence on the earth's surface has been the conversion of land to agricultural use. Most forest clearing today occurs within tropical rainforests primarily due to the extensification of small farm plots increasingly into forest and protected areas, threatening to eliminate the planet's most biologically diverse forests within 50 years. Numerous studies and analytical methods have centered human-environment research on clearing patterns, which have identified small farmers as a primary proximate cause of deforestation. However, as research continues to examine the determinants of land use and land cover change (LUCC), key factors often overlooked are the determinants of migration to a given region, settlement to a specific location, and structural effects influencing LUCC. This paper focuses on the latter two-examination of factors influencing settlement to a specific location and structural effects influencing LUCC-since determinants of migration to a given region requires data on origin areas, which we do not currently have available. The aims are both methodological and substantive, with data extracted from a longitudinal study of migrant colonists in Ecuador's Northern Amazon. Spatial and temporal cohorts will be constructed to examine why households migrate to specific farms (i.e., flat, good soils, along a road, proximity to a market, etc.) and what structural factors influence eventual land cover changes. The focus will be threefold: (1) a discussion of the broad foundation of migration / settlement theory followed by a proposed synthesis that extracts specific factors appropriate to the study context; (2) a methodological introduction to statistical and spatial tools that serves to (a) explain the methods, (b) justify their use in linking theory to application, and (c) demonstrate their flexibility in capturing spatial relationships; and finally (3) to report factors involved in household decisions to settle in specific regions of Ecuador's Northern Amazon.

31.13-P: Socio-spatial Processes of Road-building and Land Cover Change: The Case of Sinop, MT

Stephen G Perz, University of Florida, sperz@soc.ufl.edu (Apresentador / Presenting)

Marcellus M Caldas, Michigan State University, caldasma@msu.edu

Robert T Walker, Michigan State University, rwalker@msu.edu

Recent work on land cover and regional climate change in the Amazon features the role of roads and large-scale agricultural establishments, but the processes linking these factors have not been systematically investigated. We report initial fieldwork and present preliminary data products from research conducted in Sinop (MT), an agroindustrial frontier in the southern Brazilian Amazon that is characterized by a highly distinctive road network architecture, many large rural establishments, and a different spatial pattern of forest fragmentation than those seen in colonization zones or other commonly-studied parts of the region. In Sinop, private colonization companies bought land from the state and demarcated properties prior to the arrival of federal highways, which allowed for rapid land purchases, avoided land conflicts seen elsewhere, and facilitated the implementation of large-scale timber, ranching and agroindustrial enterprises. The result has been widespread forest clearing, but in large geometric blocks, alongside large blocks of standing forest. Despite the strong presence of state institutions and limited land conflict, a dense and somewhat irregular road network has facilitated widespread access to land, forest clearing, and carbon emissions.

31.14-P: Basin-Scale Econometric Modeling III: local interactions in deforestation decisions

Juan Robalino, Columbia University, jar101@columbia.edu

Alexander Pfaff, Columbia University, ap196@columbia.edu (Apresentador / Presenting)

Claudio Bohrer, Universidade Federal Fluminense, bohrer@vm.uff.br

Like other activities, an individual choice to deforest may be influenced by the choices of others. Many people will choose, for instance, to go to less crowded shopping centers. In forest clearing, individuals may be more likely to deforest their land, or less, if their neighbors are also clearing.

Such potential spatial interactions can affect the quantity and the spatial pattern of forest and thus affect the ecological services from forest (sequestration, habitat). Further, these external effects affect the social efficiency of land use, including via the potential for an inferior land equilibrium.

This presentation is the third one to report upon the earliest basin-scale research within the project "A Basin-Scale Econometric Model for Projecting Future Amazonian Landscapes". This talk will focus on the empirical identification of such spatial interactions from the observed forest clearing. The crucial issue for identification is controls for other reasons for spatial correlation in clearing. Given such controls, we find evidence that deforestation decisions locally reinforce each other.

While such results have implications for policy, at this point we are demonstrating an approach. Care in identification of interactions is required given the likelihood that both spatially correlated unobservable drivers of deforestation and direct effects of neighboring characteristics are present. Both of these provide explanations other than interactions for spatial correlation in deforestation. However, appropriate instrumentation for neighboring clearing choices eliminates these stories. We discuss appropriate instrument choice and provide robust evidence of positive interactions.

31.15-P: The causes of deforestation in the Brazilian Amazon : Crossing results from economic models and farmers behaviour analysis

Piketty Marie-Gabrielle, CIRAD-USP/FEA, piketty@usp.br (Apresentador / Presenting)

Mertens Benoît, CIFOR - CIRAD/forêt, benoit.mertens@cgiar.org

One of the important issues for the human dimension program is to better understand the complex interactions between socio-economic and agro-ecological variables at the various levels (local, regional, national and international) influencing

the decision process of the various agents with respect to deforestation. In this context, there has been a lot of studies based on economic modeling applied to the Brazilian Amazon, aimed at analysing these complex interactions and their impact on the magnitude of deforestation. Such models are necessarily a simplification of the real world and must only be considered like one of the tools allowing to better understand why agents are deforesting or not. The paper will present a survey of these models methods, results, strengths and limitations and compare their results with empirical studies at a finer scale. Such finer scale studies will focus on farmers behaviour in several contrasted agricultural frontiers of the Amazon. It will allow to better assess what we know today with respect to the sources, the agents, the direct and underlying causes of deforestation in the Brazilian Amazon.

31.16-P: Two stage simulation model of Brazilian Amazon deforestation

Eustáquio J Reis, IPEA, ejreis@ipea.gov.br (Apresentador / Presenting)

Leonardo S. Bastos, IPEA, bastos@ipea.gov.br (Apresentador / Presenting)

The paper presents a two-stage model of Amazon deforestation. The first stage, at município level, is a dynamic model of the socio-economic determinants of major classes of land use (pasture, permanent crop, temporary crop, and forest areas). Estimation of bayesian spatial autocorrelation models based upon panel data of Agricultural an Demographic Censi information from 1970 to 1995 complemented by geo-ecological and transport infrastructure information available for the same period.

The second stage is a static cross section model of the geo-ecological (soil, vegetation, precipitation, etc.) and transport infrastructure (distance, cost, etc.) determinants of the distribution of different land uses among census tracts within each município. Estimation of bayesian autocorrelation models are based upon 1995 Agricultural Census data complemented by the road infrastructure and geo-ecological information available at Census tract level.

The coupling of these models allows the simulation of future land uses and their spatial distribution for different scenarios of infrastructure development.

31.17-P: Study and prediction of malaria distribution at Novo Repartimento municipality-southeast Pará state

Cíntia Honório Vasconcelos, Instituto Nacional de Pesquisas Espaciais (INPE)/USP, cintia@ltid.inpe.br (Apresentador / Presenting)

Evelyn M.L.Moraes Novo, Instituto Nacional de Pesquisas Espaciais (INPE), evlyn@ltid.inpe.br

Climate in the Amazon is connected to the Forest that absorbs solar energy and controls air temperature, atmosphere moisture and in the long run precipitation. Large scale deforestation therefore has been related to evapotranspiration decreases. Forest evapotranspiration is one of the most important sources of water vapor to the atmosphere, and its drastic reduction can lead to less precipitation and to a likely increase in air temperature. These predictions are worrisome, because increases in temperature, promotes the increase in areas apt to the spread of diseases such as malaria. The reduction of atmospheric moisture might inhibit vector proliferation, but surface water availability (rivers, dams) under increased temperature conditions fosters mosquito population outbreak. Malaria is endemic in Amazon and its vector is subject to great ecological diversity displaying a huge adaptation to this diverse environment. As a consequence, climatic changes might result in serious problems in public health. This research, therefore, investigates the relationship between deforestation rates in Novo Repartimento municipality and the risk of acquiring malaria. Malaria incidence for 1996 and 2001 was supplied by National Health Foundation and ground collected data. Based on risk maps produced for 1996 and 2001, a malaria risk prediction map will be produced for the year 2011, simulating several scenarios. LANDSAT 5-TM will be used to map changes in land use and occupation. Temporal distribution of IPA (Annual Parasite Indexes) historical series in Novo Repartimento will be used to determine time trends in malaria incidence and its relationship with land-use changes. Scenario maps will be useful for supporting health public policies in the region, taking into account the lack of human and technical resources available for fighting the disease and the need of focusing those in riskier areas.

31.18-P: A expansão da pecuária na Amazônia Oriental: O papel dos colonos

Jonas Bastos da Veiga, Embrapa Amazônia Oriental, jonas@cpatu.embrapa.br (Apresentador / Presenting)

Jean François Tourrand, UnB/Embrapa/Cirad, Tourrand@aol.com

Marie Gabrielle Piketty, USP/Embrapa/Cirad, piketty@usp.br

Ailce Margarida Alves, Convênio Embrapa/Cirad, AILCEM@aol.com

No início da colonização da Amazônia Brasileira a pecuária foi a principal atividade econômica incentivada pelo governo brasileiro. Assim, nas primeiras décadas de desenvolvimento da região, essa atividade foi a preferida pelos grandes empreendimentos agropecuários ou fazendas, com incentivos fiscais, respondendo por praticamente todo o desflorestamento da região. Com o aumento do fluxo de imigração, tanto por iniciativa oficial como espontaneamente, os colonos entraram em cena, como atores importantes no avanço da fronteira agrícola. No caso da região da Transamazônica, os problemas iniciais com as culturas anuais e perenes (escoamento da produção, distância do mercado, flutuação de preço, custo de manutenção, doenças, etc.) dificultaram o desenvolvimento socioeconômico dos colonos, abrindo caminho para a pecuarização da agricultura familiar, cujo rebanho funcionava como um elemento de estabilidade e segurança das famílias. Durante um projeto de pesquisa financiado pela National Science Foundation, objetivando entender os fatores determinantes da expansão da pecuária na fronteira agrícola da região, foi estudado o papel de diferentes atores nesse processo. Este trabalho apresenta o caso dos colonos do município de Uruará, apontando a importância dos programas de financiamento, da inflação, do comércio desorganizado de matrizes e reprodutores, da aptidão mista do rebanho (bezerro e leite), da experiência e da adoção das tecnologias básicas por parte dos produtores, do sucesso da pastagem de braquiário, do tamanho e da diversificação das propriedades no sucesso desse uso-da-terra. Também apresenta o reflexo desse processo na cobertura florestal da região, onde a pecuária se tornou um elemento-chave da paisagem.

31.19-P: Recuperando áreas de pastagens degradadas por sistemas agroflorestais: serviços ambientais x economia

Elisa Vieira Wandelli, Embrapa, elisa@cpaa.embrapa.br (Apresentador / Presenting)

Erick Mariano Fernandes, Cornell University/WB., efernandes@worldbank.org

Silas Aquino Souza, Embrapa, silasgas@cpaa.embrapa.br

Rogério Perin, Embrapa, perin@cpaa.embrapa.br

Joanne Régis Costa, Embrapa, joanne@cpaa.embrapa.br

Frank Correa Ferreira, Bolsista Milênio/LBA, frank@cpaa.embrapa.br

A vegetação secundária que se estabelece em áreas antropizadas pode desempenhar um importante papel no sequestro de carbono, compensando parte do que foi liberado com a queima da floresta original. Entretanto na Amazônia Central a vegetação secundária que se estabelece em áreas de pastagens degradadas contém poucas espécies vegetais de importância econômica, o que em conjunto com as limitações físicas e químicas do solo dificulta sua reincorporação ao sistema produtivo. Para evitar que novas áreas de florestas primárias sejam derrubadas e queimadas devido à busca dos produtores pela fertilidade do solo, é necessário a adoção de sistemas de uso da terra tolerantes as condições biofísicas das áreas degradadas. Serviços ambientais e econômicos de quatro modelos de sistemas Agroflorestais implantados após a eliminação da vegetação da pastagem abandonada foram comparados com o da vegetação secundária testemunha. Os modelos agroflorestais que tiveram uma composição florística mais diversificada, espécies adequadas às condições bióticas e abióticas e manejo de matéria orgânica com leguminosas adubadoras tiveram maior taxa de acúmulo de carbono e níveis de matéria orgânica e dos nutrientes do solo maior do que o da vegetação secundária testemunha. A adoção de sistemas agroflorestais em substituição a parte das áreas degradadas na Amazônia pode colaborar com o balanço regional de carbono. No entanto a rentabilidade e a maior produtividade (até 3 vezes) dos sistemas agroflorestais em relação aos cultivos convencionais nos indica que tem grande potencial de adoção pelos produtores e por ser um sistemas de uso da terra permanente, poderá ter nesta última característica sua principal contribuição à mitigação da emissão de CO₂ pela queima de florestas.

31.20-P: Economic Aspects of Fire Use and Prevention: a household model for the Brazilian Amazon

Larissa Steiner Chermont, IPAM/UFGA/LSE, l.chermont@lse.ac.uk

Man-made forest ground fires are a crucial cause of the destruction of Brazilian Amazonian forests. Achieving reliable knowledge of household behavior for fire use and fire prevention is the main objective of this work. Primary data was collected through a household survey in two different sites in the Amazon region: Santarém (PA) and Guarantã do Norte (MT), which were chosen for their strong representativeness of the frontier occupation process and recent dynamics of rural production in the region as well as important specificities in terms of household composition. The model focuses on land-user behavior in order to predict both the incidence of fire and farm-level investment in fire prevention and control. This will be tested in an econometric model based on theoretical framework of household behavior modeling and portfolio management decision. A diagnosis of the level of investment made in rural properties and the history of fire occurrence is made in order to contribute to the debate over the economic and environmental aspects of Amazonian development.

[HD_Industria_madeiraira \(HD_Timber\)](#)

32.1-P: Cost functions for harvest, transport, and milling in the timber industry of the Brazilian Amazon

Simone Bausch, Virginia Tech, sbausch@vt.edu (Apresentador / Presenting)

Gregory Amacher, Virginia Tech, gamacher@vt.edu

Frank Merry, Woods Hole Research Center, fmerry@whrc.org

Daniel Curtis Nepstad, Woods Hole Research Center, dnepstad@whrc.org

Economic information on forest management in the Amazon is urgently needed for decision-making by enterprises and policy makers; the existing information is based largely on descriptive statistics and is insufficient to make broad scale policy decisions across the entire region. The results of previous work have been groundbreaking, but are difficult to replicate or are directed towards specific research objectives. In this research we attempt to provide the first empirical estimates of cost functions for timber harvest, log transport, and log processing. We use data from a survey of 527 sawmills spread throughout the region to estimate the results.

32.2-P: Timber Concessions and Public Forests in the Brazilian Amazon: the ITTO Project in the Tapajós National Forest.

Margaret Francis, Fulbright Scholar, Instituto de Pesquisa Ambiental da Amazonia (IPAM), margfrancis@yahoo.com (Apresentador / Presenting)

Maria Rosenildes Guimarães dos Santos, Instituto de Pesquisa Ambiental da Amazonia (IPAM), rosenildes@ipam.org.br (Apresentador / Presenting)

Frank Merry, Woods Hole Research Center (WHRC), Instituto de Pesquisa Ambiental da Amazonia (IPAM), fmerry@whrc.org

Daniel Curtis Nepstad, Woods Hole Research Center (WHRC), Instituto de Pesquisa Ambiental da Amazonia (IPAM), dnepstad@whrc.org

The only timber cutting contract in a national forest of the Brazilian Amazon is in the Tapajós National Forest, near Santarém, Pará. This "pilot project" known as the ITTO project, began in 1999 and allows for logging on 3,222 ha (of 600,000 total in the national forest) with the objective of promoting forest management in public areas. The project was negotiated for over a ten years and highly contested by the local communities living within the forest due to conflicts over

land-use rights. Using the ITTO project as a case study, we are analyzing the socioeconomic and ecological impacts of logging on traditional forest communities near the project in the Tapajós National Forest. Using participatory rural appraisal (PRA) techniques and socioeconomic surveys, we are documenting the history and perceptions of the project of over 100 families in five communities and evaluating its impacts on their livelihood strategies- principally hunting and the collection of non-timber forest products (NTFPs). Preliminary results show that the communities have been excluded from participation in the project and have thus accrued little economic or social benefits. In the PRA meetings, nearly all families have negative perceptions of the ecological consequences of the project, especially in regards to impacts on the abundance of game animals and hunting. As Brazil considers a large-scale shift towards concession-based forestry, it is important to consider social, economic, and ecological implications of this transformation.

32.3-P: The potential of small farm forestry in the economic development of the Transamazon highway.

Eirivelthon Lima, Instituto de Pesquisa Ambiental da Amazonia, elima@ipam.org.br (Apresentador / Presenting)

Frank Merry, Woods Hole Research Center, fmerry@whrc.org

Maria Rosenildes Guimarães dos Santos, Instituto de Pesquisa Ambiental da Amazonia, rosenildes@ipam.org.br

Ailton Alves, Instituto de Pesquisa Ambiental da Amazonia, ailton@ipam.org.br

Daniel Curtis Nepstad, Woods Hole Research Center, dnepstad@whrc.org

Over the past three decades, more than 30,000 families have been formally settled on the Transamazon highway, each with an average lot size of 100 hectares. Informal settlement adds even more families to the total. The forest resources of this group may provide the solution to many of the problems of illegal logging in the region, but yet approved access is difficult. Few methods have been developed for small farm forestry in the Amazon and the families themselves know little of forest management. In this research we begin the process of bridging the gap between the forest industry and the smallholders with the forest stock by identifying where small farm forestry may be possible and providing this information to both the industry and the colonists alike. The preliminary stage of this research is a planning map that shows where such community forestry projects may be feasible. This is based on GIS mapping techniques, the descriptive statistics from a large survey of families along the entire highway (n=2,831), and a survey of the timber industry along the highway (n=83).

32.4-P: O Manejo Florestal e o Uso de Recursos Florestais por Famílias Assentadas: Os Impactos do Projeto Florestas Familiares

Mary Catherine Menton, University of Oxford, IPAM, marymenton@hotmail.com (Apresentador / Presenting)

Frank Merry, Woods Hole Research Center, IPAM, fmerry@whrc.org

Maria Rosenildes Guimarães dos Santos, Instituto de Pesquisa Ambiental da Amazônia (IPAM), rosenildes@ipam.org.br

Nick Brown, University of Oxford, nick.brown@plants.ox.ac.uk

Anna Lawrence, University of Oxford, anna.lawrence@eci.ox.ac.uk

Florestas Familiares é um projeto de manejo florestal realizado através de um contrato entre uma empresa madeireira e famílias assentadas pelo INCRA na região de Santarém, PA, Brasil. Esta pesquisa estuda os impactos deste projeto nos meios de vida das famílias assentadas dentro do conceito de desenvolvimento sustentável, com ênfase no seu uso de recursos florestais. A coleta de dados baseou-se no Diagnóstico Rural Participativa rural (DRP) (200 famílias), aplicação de questionários sócio-econômicos (300 famílias) e cadernos de anotações diárias (60 famílias), realizada em cinco comunidades da região. Resultados preliminares mostram que embora as famílias verifiquem um decréscimo de mais de 50% no sucesso da caça em áreas exploradas (de acordo com os resultados de DRP), tanto o uso quanto o acesso a outros Produtos Florestais Não-Madeireiros (PFNMs) não mudaram significativamente. Compararam-se as estimativas realizadas através de DRP com aquelas dos cadernos de anotações diárias de uso de PFMNs: apesar das perspectivas dos comunitários indiquem uma redução em ambas as taxas de coleta, frutos e caça, suas anotações nos cadernos não demonstram uma diferença significativa. Estes resultados preliminares serão discutidos com ênfase na sua significância para determinar os custos e benefícios da participação das famílias assentadas no projeto Florestas Familiares.

32.5-P: Industrial development on logging frontiers in the Brazilian Amazon

Frank Merry, Woods Hole Research Center, fmerry@whrc.org (Apresentador / Presenting)

Eirivelthon Lima, Instituto de Pesquisa Ambiental da Amazonia, elima@ipam.org.br

Gregory Amacher, Virginia Tech, gamacher@vt.edu

Simone Bausch, Virginia Tech, sbausch@vt.edu

Daniel Curtis Nepstad, Woods Hole Research Center, dnepstad@whrc.org

Whether following or creating new roads, logging is amongst the first economic activities to spring forth on emerging frontiers in the Amazon. This opportunism, however, is not always rewarded. The term "boom and bust" is used continually to describe the process of industrial organization in the forest sector of the Brazilian Amazon, depicting an industry dependant on the predatory harvest of a finite natural resource. This portrayal of the industry is perhaps oversimplified and masks the underlying causes behind dramatic increases in wood production on logging frontiers, and the role of the timber industry in economic development, skewing policy decisions and making solutions to the current mishandling of the forest resource elusive. In this paper we review the concept of forest sector industrialization and technology adoption, looking for reasons that have shaped the organization, or lack thereof, in the Brazilian forest sector. We discuss the need to examine the industry from a multitude of perspectives and to correctly identify the determinants and obstacles to change. We argue that we must be cautious in providing over-simplified answers to what is obviously a complex problem, and must pay careful attention to the recent history of the sector in any policy analysis. To provide a backdrop to the discussion, we update the information of the industry by presenting the results of a large survey (n=527 mills) throughout the Amazon.

32.6-P: Collective action without collective ownership: community associations and formal logging contracts.

Frank Merry, Woods Hole Research Center, fmerry@whrc.org (Apresentador / Presenting)

Gregory Amacher, Virginia Tech, gamacher@vt.edu

Eirivelthon Lima, Instituto de Pesquisa Ambiental da Amazonia, elima@ipam.org.br

Duncan Macqueen, International Institute of Environment and Development, Duncan.Macqueen@iied.org

Maria Rosenildes Guimarães dos Santos, Instituto de Pesquisa Ambiental da Amazonia, rosenildes@ipam.org.br

Among the first steps in the process of economic integration and development on the agricultural frontiers is the formation of local level institutions (community associations). An active and effective community association will provide otherwise scattered individuals with focused representation at local government levels. In addition, a cohesive community may benefit by capturing some economies of scale in, for example, investment of shared machinery or infrastructure (ie, the building of a community school house). The process of integration takes many forms, but the importance and latent potential of self-governance and development in community and local institutions is gradually being acknowledged. In this article we describe a formal logging agreement between smallholders and a logging company that appears to be catalysing the process of community association and organization. This independent, market-based tool is changing the reality of community forestry in the Amazon from small isolated, integrated, and homogeneous groups to a dynamic system based on the massive migration and frontier settlement. These new communities are heterogeneous, spontaneous, and marginalized. Formal logging contracts may create and foment local level institutions, providing access to markets through better infrastructure, and speeding the process of economic development. We use the results of survey of 360 families to empirically test whether formal logging contracts increase participation in and improve participant ranking of community associations.

32.7-P: Emerging smallholder forest management contracts in the Brazilian Amazon: impacts on welfare and labor supplies.

Gregory Amacher, Virginia Tech, gamacher@vt.edu (Apresentador / Presenting)

Frank Merry, Woods Hole Research Center, fmerry@whrc.org

Eirivelthon Lima, Instituto de Pesquisa Ambiental da Amazonia, elima@ipam.org.br

Maria Rosenildes Guimarães dos Santos, Instituto de Pesquisa Ambiental da Amazonia, rosenildes@ipam.org.br

Daniel Curtis Nepstad, Woods Hole Research Center, dnepstad@whrc.org

A formal harvest contract has been developed by a logging company and successfully implemented in two communities in the INCRA settlements Moju I and Moju II near the town of Santarém, in the State of Pará. The settlements contain approximately 1,600 families. The logging company that developed this tool has harvested annual volumes from 2001 to 2003 of 25,000, 35,000 and 43,000 cubic meters, respectively. Of which, approximately 60 percent comes directly from the community lots; approximately 60 families have received either RIL harvest or deforestation income. The success of this program has generated spontaneous interest from approximately 700 families who are in various stages of contract negotiation. This project has recently been identified as a promising alternative in forest management and in this research we formally test whether this contract affects the welfare, labor supplies, and land use decisions of smallholders. We use utility theory to develop a formal economic model of smallholder behaviour and the results of a survey of 360 families to provide to data for empirical estimation of welfare and labor allocation.

CD (Armazenamento e Trocas de Carbono) / CD (Carbon Dynamics)

[CD_Biometria_Dinâmica \(CD_Biometry_Dynamics\)](#)

33.1-P: Biomass and net primary productivity in savannas, Gran Sabana, Canaima National Park, Venezuela

Bibiana Alejandra Bilbao, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, bibiana_bilbao@hotmail.com (Apresentador / Presenting)

Zamira Hasmy, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, zahas@hotmail.com

Alejandra Verónica Leal, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, aveleal@yahoo.com

Carlos Luis Méndez, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, carlosmendez@etheron.net

Eduardo Zambrano, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, ezambrano@usb.ve

José Manuel Moreno, Facultad de Ciencias del Medio Ambiente, Universidad de Castilla- La Mancha, Toledo, España, JoseM.Moreno@uclm.es

In Canaima National Park (30000 km²), Venezuela, the use of fire for hunting and shifting agriculture is a common practice by natives. Stabilization of population at towns and villages has led to increased fire frequency, causing the conversion of many forest areas to open savanna. The patterns of accumulation of biomass in this ecosystem and the productivity processes thereon associated are poorly known. In this study we measured the annual dynamics of net primary productivity (NPP) in a tropical savanna located in Gran Sabana, CNP. During five consecutive years above (AB) and belowground biomass (BB) was periodically harvested. ANPP varied annually, leading to net accumulation or decrease of AB (with maximum of 1100 g DM m⁻²). Positive ANPP ranged between 187 to 537 g DM m⁻² year⁻¹, and was related to the length of the growing season and total annual precipitation. Unlike in other tropical savannas, these low values were not related to the positive annual hydrological balance. No seasonal fluctuations in the decomposition rates (~1.2 mg DM g⁻¹ day⁻¹) were observed, which were rather low. Grasses had the highest species richness; however sedges accumulated

greater AB. Dominant grasses and sedges present a high accumulation of BB (~1214 g DM m⁻²) and a peculiar development of big aerial rhizomes that represent 42 % of AB. In general, these results evidence the low NPP and biomass accumulation capacity of these savannas after fire. One year after fire only 50% of the total biomass is recovered. Thus, fire recurrence can occur only at 2 or more years after fire.

33.2-P: The Effects of Logging and Understory Fires on Biomass in Dense and Transitional Forests

Oswaldo de Carvalho Jr, IPAM - Instituto de Pesquisa Ambiental da Amazônia, oswaldo@ipam.org.br (Apresentador / Presenting)

Ane Alencar, IPAM - Instituto de Pesquisa Ambiental da Amazônia, ane@ipam.org.br

Daniel Curtis Nepstad, Woods Hole Research Center & IPAM - Instituto de Pesquisa Ambiental da Amazônia, dneptad@whrc.org

Sanae Hyashi, IPAM - Instituto de Pesquisa Ambiental da Amazônia, sanae@ipam.org.br

The Amazon forests are becoming more susceptible to fire events depending on the vegetation type, intensity of logging, fragmentation and annual climatic conditions variation. Logging and fire alter the composition and structure of forests by provoking tree mortality. Changes on the biomass of Amazon region forest represent an important component of the global carbon cycle. This study provides an estimate of live aboveground biomass for two sites of dense forest in Para state (Paragominas and Santarém) and one site of transitional forest in Mato Grosso state (Bom Jesus do Araguaia). Field data in forests ranging from intact to logged and logged & burned were collected in plots of 1 ha. Biomass decreased 29, 16 and 12% in logged forest and 67, 54 and 9% in logged and/or burned forest to Paragominas, Santarém and Mato Grosso, respectively. The small differences on biomass among sites located in transitional forest may be showing some adaptability of this biome to coexist with such events.

33.3-P: Distribuição Espacial de Parâmetros Biofísicos da Vegetação na Floresta Nacional do Tapajós - PA

Fernando D. B. Espírito-Santo, INPE, fernando@ltdid.inpe.br (Apresentador / Presenting)

Yosio E. Shimabukuro, INPE, yosio@ltdid.inpe.br

Luiz Eduardo Oliveira Cruz de Aragão, INPE, aragao@ltdid.inpe.br

No sítio experimental da Floresta Nacional do Tapajós (FNT), no Pará, já foram realizados dois grandes inventários florestais (IF's). O primeiro foi executado pela FAO, em 1977, nas florestas de alto platô, e o segundo, pela Universidade Federal de Viçosa, em 1983, nas áreas de flanco e de declive. Esses levantamentos obtiveram informações de uma área de 231 ha de floresta, ou 0,0385 % dos 590.000 ha da FNT, utilizando amostragens por conglomerados (4 transectos de 0,25 ha). O objetivo do presente trabalho foi espacializar os parâmetros biofísicos, tais como: área basal (AB), volume comercial de madeira (VCM) e biomassa aérea (BA) da vegetação da FNT, pela modelagem espacial de uma extensa base de dados de IF's. Para isso, foram recuperados os dados de AB das 55.804 árvores desses IF's. O VCM e BA foram estimados através de equações alométricas. Os 231 pontos de IF's foram espacializados sobre a FNT com base em um mapa produzido na época desses levantamentos. Esses pontos foram interpolados pela técnica geoestatística denominada krigagem. Foram identificados quatro sítios florestais bem definidos dentro da FNT: (1) AB entre 14 a 19 m²×ha⁻¹ e BA de 150 a 200 ton×ha⁻¹; (2) AB entre 19 a 21 m²×ha⁻¹ e BA de 200 a 250 ton×ha⁻¹; (3) AB entre 21 a 24 m²×ha⁻¹ e BA de 250 a 300 ton×ha⁻¹; e (4) AB entre 24 a 31 m²×ha⁻¹ e BA de 300 a 400 ton×ha⁻¹. Utilizando um mosaico de imagens RADARSAT-1, de 01/02/2002, foi possível relacionar os locais de relevo mais dissecado com as florestas de menor estrutura biofísica, e o alto platô com sítios florestais de maior fitomassa aérea.

33.4-P: If we understand how trees are constructed we could explain why tree growth rate is higher in the west Amazon

Sandra Patiño, Max-Planck Institute for Biogeochemistry, spatino@bgc-jena.mpg.de (Apresentador / Presenting)

Timothy R. Baker, Max-Planck Institute for Biogeochemistry, t.baker@geog.leeds.ac.uk

Lina Maria Mercado, Max-Planck Institute for Biogeochemistry, lmercado@bgc-jena.mpg.de

Romilda Maria Quintino, INPA, romilda@inpa.gov.br

Carlos Alberto Quesada, Universidade Nacional de Brasília, quesada@unb.br

Oliver L. Phillips, University of Leeds, o.phillips@geog.leeds.ac.uk

Yadvinder Singh Malhi, Oxford University, ymalhi@ed.ac.uk

Jonathan James Lloyd, Max-Planck Institute for Biogeochemistry, jon.lloyd@bgc-jena.mpg.de

It is known that tree hydraulic architecture limits transpiration, carbon gain, tree size and tree growth and that high plant hydraulic conductance is necessary for high productivity in forest trees. Recent results coming from data of a network of 1 ha permanent sample plots across the Amazon basin suggest that tree growth rates are higher in the Western part of the Amazon than in the Eastern part. In this study we hypothesised that differences in the tree growth rates across the basin are mostly due to the hydraulic construction of the tree species adapted to each Amazonian formation.

We sampled more than a thousand trees across the basin, studied few hydraulic properties and explored some theoretical relationships between plant hydraulic, tree size and tree performance to scale from branch to tree and from tree to the whole canopy the productivity of each plot formation and extrapolated it to the region.

We found that indeed tree hydraulics could be one of the main causes of the differences in tree growth across the basin with significant correlations between hydraulics and nutrient uptake, wood characteristics and performance of each species within different Amazonian formation.

33.5-P: Relating secondary forest characteristics to time series of Landsat-derived reflectances

Stephen Hagen, University of New Hampshire-EOS-CSRC, steve.hagen@unh.edu (Apresentador / Presenting)

William Salas, Applied Geosolutions, wsalas@agsemail.com

Lucas Fortini, University of Florida, lfortini@ufl.edu

Mark Ducey, University of New Hampshire-NR, mjducey@cisunix.unh.edu

Jianguo Qi, Michigan State University, qi@msu.edu

Daniel Zarin, University of Florida, zarin@ufl.edu

Joanna Tucker, University of Florida, jmtucker@ufl.edu
Diogenes Alves, IMPE/DPI, dalves@dpi.inpe.br

As part of an integrated study aimed at modeling and mapping forest regrowth potential for the Amazon region, we conducted extensive field measurements of secondary forest structure in three areas across Amazonia and collected time series of remote sensing data from these same areas. We present preliminary results linking these field measurements and an annual timeseries of Landsat reflectance data. We compare the rates of succession of the stands by examining the stand level trajectories of reflectance over time. We also explore the feasibility of establishing a structural index created from the Landsat observations that is related to a combination of field-measured structural attributes. The thick and variable atmospheric conditions complicate the creation of a standard time series of reflectances from the Landsat data.

33.6-P: Stocks and Fluxes of Coarse Woody Debris in Southwestern Amazon forests

Eurídice Honorio, Instituto de Investigaciones de la Amazonía Peruana, Iquitos, Perú, ehonorio@iip.org.pe
(Apresentador / Presenting)

Timothy R. Baker, Max Planck Institute of Biogeochemistry, Jena, Germany and Earth and Biosphere Institute, School of Geography, Leeds, UK, t.baker@geog.leeds.ac.uk

Phillips Oliver, Earth and Biosphere Institute, School of Geography, Leeds, UK, O.Phillips@geog.leeds.ac.uk

Martin Jim, Environmental & Natural Resource Sciences, Fleming College, USA, JIMARTIN@flemingc.on.ca

Coarse woody debris is an important, but little-studied, component of the total carbon stocks of tropical forests and is potentially significant for understanding the overall carbon balance of a stand. Here, we present estimates of the stocks, and annual inputs from tree mortality for eleven, 1 ha plots in southwestern Amazonia. Total stocks are low (mean 6.4 ± 1.5 Mg C ha⁻¹), and annual inputs high (mean 2.7 ± 0.3 Mg C ha⁻¹ yr⁻¹) compared to other studies. The short turnover time (2.5 ± 0.7 yrs) implies a decomposition rate at least double that reported for central Amazonian forests. Taken together with studies showing lower biomass, higher productivity and higher rates of tree mortality and recruitment in these forests, this study emphasises the distinctive, high-speed nature of carbon cycling in western Amazonia.

33.7-P: Relationships between Forest Composition and Soil and Hydrological Characteristics in a Tropical Forest in NW Mato Grosso

Stefan Jirka, Cornell University, sj42@cornell.edu (Apresentador / Presenting)

Ted R Feldpausch, Cornell University, trf2@cornell.edu

Andrew J McDonald, Cornell University, ajm9@cornell.edu

Susan J Riha, Cornell University, sjr4@cornell.edu

Carlos Alberto Moraes Passos, UFMT, capassos@terra.com.br

Léo Adriano Chig, UFMT, lchig@pop.com.br

Eduardo G Couto, UFMT, couto@cpd.ufmt.br

Maria José de Souza Noquelli, UFMT, snoquelli@ibest.com.br

Elucidating the factors that contribute to spatial dynamics in forest composition and structure can help inform forest management protocol. In this study we analyzed the soil and landscape controls affecting forest attributes. Transects were established in a 25,000 ha reduced-impact logging concession in the southwestern Amazon Basin. All trees ≥ 10 cm DBH and all lianas ≥ 1 cm DBH were measured, identified and geo-referenced. Soils were sampled every 25 m along transects and landscape position was recorded. High variability exists across the study area in tree and liana biomass (301 ± 50 Mg ha⁻¹ and 13 ± 7 Mg ha⁻¹, respectively) as well as soil chemical and physical properties. Three major forest types differentiated by tree species composition and biomass (*cerrado*, palm and upland *terra firme*) are present. Landscape attributes (slope, topography, drainage class and elevation) were derived from a digital elevation model and compared to transect data. Within the study area, landscape features include gently sloping uplands (the major attribute) dominated by *terra firme* forests, steep ravines, and low-lying seasonally inundated areas typically associated with palm forests. Elevation ranges from 220-310 m a.s.l. with a higher proportion of poorly drained landscape units and low slope classes located in lower elevations which are typically characterized by coarser textured soils. Tree biomass is significantly greater (51 Mg ha⁻¹) in upland positions while liana stem density is higher in lowland positions possibly due to increased frequency of disturbance. Relationships of soil properties to forest attributes will be discussed.

33.8-P: Variation of Aboveground Biomass in the Forest of Bananal Island, Tocantins State

Dariusz Kurzatkowski, Instituto Ecológica, Palmas-TO; LBA Tocantins, kurzatkowski@hotmail.com (Apresentador / Presenting)

Divaldo Rezende, Instituto Ecológica, Palmas-TO; LBA Tocantins, divaldoecologica@uol.com.br

Humberto Ribeiro da Rocha, IAG/USP, humberto@model.iag.usp.br

Erich Collicchio, UNITINS-AGRO, Palmas-TO, ecollicchio@uol.com.br

Rita da Mata Ribeiro, LBA- Escritório Regional, Palmas-TO, rrmribeiro@ruralnet.com.br

ABSTRACT: Bananal Island is a region of great ecological importance in Brazil. The biomass in the tropical forest represents an important component of the global carbon budget. We installed 29 plots 50 x 50m (2500 m²), covering an area of 7.25 hectares of seasonal flooded forest and measured all trees with a diameter at breast height (DBH) greater than 6.3 cm. There were 7760 individual trees recorded with their scientific name, DBH and total height. We observed the flood level over a 3 year period and classified the study plots in to three flood level categories: low (0-0.5m), middle (0.5-1.5m) and high (>1.5m). We observed the variation of the forest structure and the aboveground biomass. We quantified the aboveground biomass and carbon stock. We compared the biomass stock in the forest of the Bananal Island region with another site in the Amazon. In the forest with the lowest flood level, the largest number of trees with DBH >35cm and height >20m were observed. The highest biomass stock (153,69 ton per ha) and carbon (76,85 ton per ha) was found in the low flooded forest. In the forest with the high flood level the biomass was found to be 14% lower than that of the low flooded forest. In all study areas the highest aboveground biomass was stocked by the trees with DBH of 15 to 20cm. The highest volumes of biomass for the different flooded level: low, middle and high were represent by Protium SP, Mouriri

guainensis Aubl. and *Alibertia sessilis* Schuman respectively.

33.9-P: Diversidade Florística e Biomassa em Cronosequência de Florestas Secundárias no Leste do Pará, Amazônia Oriental

Eliane Constantinov Leal, Museu Paraense Emílio Goeldi, ecleal@museu-goeldi.br (Apresentador / Presenting)

Ima Célia Vieira, Museu Paraense Emílio Goeldi, ima@museu-goeldi.br

Arlete Silva de Almeida, Museu Paraense Emílio Goeldi, arlete@museu-goeldi.br

Eric A. Davidson, The Woods Hole Research Center, edavidson@whrc.org

Mário dos Santos Jr., Museu Paraense Emílio Goeldi, mrsj@museu-goeldi.br

Embora na Amazônia brasileira se encontre a maior cobertura de floresta tropical do mundo, no leste do Pará a floresta primária foi substituída por uma paisagem fragmentada, onde as florestas secundárias (capoeiras) têm importante papel como reserva de biodiversidade e de biomassa. O objetivo da pesquisa é avaliar os padrões de estrutura e florística e estabelecer os estoques de fitomassa aérea das capoeiras no município de Capitão Poço, Pará. Foram selecionadas três capoeiras de cada idade 6, 10, 20 e 40 anos. Em cada capoeira foram instaladas 2 parcelas de 20 x 50 m. Para o levantamento florístico foram medidos e marcados todos os indivíduos com diâmetro de ≥ 5 cm de DAP. Nas capoeiras de 6 anos registrou-se em média 62 indivíduos, na de 10 anos 119 indivíduos, nas de 20 anos 130 indivíduos e nas de 40 anos, 126 indivíduos. Foram encontrados, em média, 13 espécies nas capoeiras de 6 anos, 21 espécies nas de 10 anos, 25 espécies nas de 20 anos e 35 espécies nas de 40 anos. As espécies mais abundantes nas capoeiras jovens (6 e 10 anos) foram *Vismia guianensis* e *Rollinia exsucca*, enquanto as mais velhas (20 e 40 anos) tiveram baixa dominância de espécies e maior diversidade específica. Quanto ao estoque de fitomassa aérea encontrou-se $10,33 \pm 6,23$ t/ha nas capoeiras de 6 anos, $31,81 \pm 15,92$ t/ha, nas de 10 anos, $89,21 \pm 57,22$ t/ha nas de 20 anos e $86,63 \pm 57,22$ t/ha nas de 40 anos.

33.10-P: Taxa incremento diamétrico de árvores e estoque de carbono de uma floresta primária na FLONA Tapajós, Santarém-Pará.

Raimundo Sousa Lima Jr., LBA/UFPA, junior@lbaeco.com.br (Apresentador / Presenting)

Plínio Barbosa de Camargo, CENA/USP, pcamargo@cena.usp.br

Chieno Suemitsu, UFPA, chieno@ufpa.br

Lucy Hutyrá, Harvard University, lhutyra@fas.harvard.edu

A vegetação e clima coexistem num equilíbrio dinâmico, que pode ser alterado por grandes perturbações em qualquer um dos dois componentes. Segundo o relatório do IPCC de 1994, o saldo balanço entre a emissão e consumo do carbono atmosférico é 4,6 Gt/ano, porém medidas reais resultam em aproximadamente 3,2 Gt/ano. Pesquisas do LBA relacionadas a dinâmica do carbono buscam saber onde desaparecem os outros 1,4 Gt/ano e apontam a floresta tropical como possível sumidouro. Determinar os estoques de carbono é fundamental para avaliar se a Floresta Primária está realmente se comportando como sorvedor ou exportador de carbono. Portanto, estudos em escala regional das taxas de ciclagem de carbono de populações arbóreas são essenciais para compreender o papel da região amazônica no balanço global do carbono. Este trabalho foi desenvolvido na Floresta Nacional do Tapajós numa área de 20 hectares de floresta primária, compreendido entre os anos de 2000 a 2002. Para a determinação das taxas de incremento foram feitas medidas dendrométricas mensais em cerca de 1.000 árvores. Dados referentes a biomassa foram obtidos utilizando-se a equação alométrica de Chambers. Notou-se que os indivíduos pertencentes às classes de menor tamanho (DAP entre 10-30 cm) apresentaram menores taxas de incremento e os indivíduos maiores (DAP > 50 cm) apresentaram as maiores taxas. A quantidade de biomassa total acumulada pela floresta foi de 281 Mg C/ha. Conclui-se que o incremento e o acúmulo de biomassa estão diretamente relacionados aos períodos de maior precipitação.

33.11-P: Spatial patterns in forest carbon dynamics, biomass and biomass change across the Amazon basin.

Yadvinder Singh Malhi, Oxford University Centre for the Environment, University of Oxford, ymalhi@ed.ac.uk (Apresentador / Presenting)

Oliver L. Phillips, Earth and Biosphere Institute, School of Geography, University of Leeds, o.phillips@geog.leeds.ac.uk

Timothy R. Baker, Earth and Biosphere Institute, School of Geography, University of Leeds, t.baker@geog.leeds.ac.uk

Sandra Patiño, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Cra. 7 No.35-20, Bogotá DCCOLOMBIA, spatino@bgc-jena.mpg.de

Jonathan James Lloyd, Max Planck Institut fuer Biogeochemie, jon.lloyd@bgc-jena.mpg.de

We report results on forest structure, composition and dynamics from over 100 forest plots in eight Amazonian countries. We find that (i) forest wood productivity and turnover is lowest in lowland central and eastern Amazonia, and up to three times higher in western Amazonia; (ii) this gradient in productivity appears to be driven by soil fertility rather than climate; (iii) mean wood density is inversely correlated with productivity, and is highest in lowland eastern Amazonia; (iv) forest basal area declines with increasing dry season length; (v) forest biomass appears highest in central Amazonia, where both basal area and wood density are at an optimum; (vi) the rate of growth and death of forest trees has greatly accelerated in recent decades, (viii) there appears to be a net accumulation of biomass in old growth Amazonian forests. We arrive at new estimates of the wood productivity, biomass and carbon residence time of the Amazonian forest. We also report on initial findings of variations in leaf area index and soil and leaf nutrient content across Amazonia.

33.12-P: Application of Remote Sensing Tools to Identify Forest Composition and Seasonal Dynamics in NW Mato Grosso

Andrew J. McDonald, Cornell University, ajm9@cornell.edu (Apresentador / Presenting)

Stefan Jirka, Cornell University, sj42@cornell.edu

Ted R. Feldpausch, Cornell University, trf2@cornell.edu

Susan J. Riha, Cornell University, sjr4@cornell.edu

Carlos Alberto Moraes Passos, UFMT, capassos@terra.com.br

Johannes Lehmann, Cornell University, cl273@cornell.edu

Positioned at the transition zone between the *cerrado* and upland *terra firme* forest, Northwest Mato Grosso contains a diverse mosaic of natural vegetation communities. At our study site in the Rohden Forest near the town of Juruena, *cerrado*, palm, and typic *terra firme* eco-types occur over short distances, although the latter type predominates. Floristic heterogeneity can have substantial consequences for ecosystem processes such as net primary productivity (NPP) and standing biomass accumulation. Documenting the extent of areas dominated by each community should improve estimates of the regional carbon balance and also the post-logging recovery potential of specific land units. Initial analysis of floristic composition patterns suggests that vegetation type distribution in the study area is not random. Field surveys indicate that differences in soil water status are a central factor for shaping vegetation composition and that edaphic hydrology is governed jointly by intrinsic soil characteristics and landscape placement. In this study, we combine a digital elevation model (ASTER-derived) with remotely sensed vegetation indices (MODIS 250m Enhanced Vegetation Index) to investigate hydrologic controls on seasonal productivity dynamics and the occurrence of specific floristic communities in the landscape. Results reveal significant seasonal changes in EVI (~0.65 summer to 0.45 winter, mean forest values). Time-series EVI analysis was able to distinguish large areas of *cerrado* vegetation by segregating areas that evidence distinct patterns of decline with the onset of the dry season. Identification of minor areas of *cerrado* and palm vegetation within the *terra firme* matrix was enhanced by the application of finer-resolution LANDSAT TM+ (30 m) imagery.

33.13-P: Séries de Estereo-Fotografias para Quantificar a Biomassa da Vegetação do Cerrado

Roger D Ottmar, US Forest Service, Pacific Wildland Fire Sciences Laboratory, rottmar@fs.fed.us
Robert E Vihnanek, US Forest Service, Pacific Wildland Fire Sciences Laboratory, bvihnanek@fs.fed.us
Heloisa S Miranda, Universidade de Brasília, hmiranda@unb.br (Apresentador / Presenting)
Margarete N Sato, Universidade de Brasília, naomi@unb.br
Saulo M Andrade, Universidade de Brasília, saulo@unb.br

As séries de estereo-fotografias para o Cerrado representam uma variação de formas fisionômicas do Cerrado, incluindo campo limpo, campo sujo, cerrado ralo, cerrado sensu stricto e cerrado denso. As áreas incluem fotografias grande angular e um par de estereo-fotografias complementadas com informações sobre o combustível vivo e morto, a estrutura e composição da vegetação. Estas séries de estereo-fotografias são uma importante ferramenta de manejo, que pode ser usada na avaliação de paisagens através da estimativa do combustível vivo e morto, bem como da estrutura da vegetação. Dados de inventário como os fornecidos nestas séries podem ser usados como variáveis para, por exemplo, a avaliação de "habitats" de animais e insetos, ciclagem de nutrientes, microclima e estimativas de sequestro de carbono. Aqueles que trabalham com pesquisas em fogo encontrarão dados importantes para a predição de consumo de combustível, produção de fumaça e efeitos do fogo durante incêndios florestais e queimadas prescritas.

33.14-P: Efeito de tratamentos silviculturais na estrutura de floresta tropical Ombrófila Aberta, na Amazônia Meridional

Carlos Alberto Moraes Passos, Universidade Federal de Mato Grosso, capassos@terra.com.br (Apresentador / Presenting)
Johannes Lehmann, Universidade de Cornell, cl273@cornell.edu
Susan Riha, Universidade de Cornell, sjr4@cornell.edu
Elenara Gandini, Universidade Federal de Mato Grosso, gandini.nara@pop.com.br
Maria José de Souza Noquelli, Universidade Federal de Mato Grosso, snoquelli@ibest.com.br
Péricles Aquino Botelho, Universidade Federal de Mato Grosso, periclesbotelho@hotmail.com
Silvana Fuhr, Universidade Federal de Mato Grosso, sil.fu@unversiaibrasil.net
Erick C.M. Fernandes, Universidade de Cornell, ecf3@cornell.edu
Ted R. Feldpausch, Universidade de Cornell, trf2@cornell.edu
Stefan Jirka, Universidade de Cornell, sj42@cornell.edu

O objetivo foi avaliar o efeito de tratamentos silviculturais na estrutura de uma floresta tropical Ombrófila Aberta Submontana, com Palmeiras, localizada no município de Juruena, MT. Foi estudada uma parcela de 100 ha, sendo aplicado manejo florestal de impacto reduzido (MFIR), em 50 ha, em 1998, dos quais 25 ha com corte de cipó (MFIRCC) e 25 ha sem corte de cipó (MFIRSC), e 50 ha sem intervenção (testemunha). As árvores e palmeiras foram agrupadas em seis estratos: (RNi) altura < 1,0 m; (RNii) 1,0 m < altura < 3,0 m; (RNiii) altura > 3,0 m e DAP < 10 cm < DAP < 30 cm; (ii) 30 cm < DAP < 45 cm; e (iii) DAP > 45 cm. A coleta de dados foi em janeiro de 2004 e a amostragem para cada tratamento e estrato foi de: 6 parcelas, com 4 m² (2 x 2 m), 25 m² (5 x 5 m) e 50 m² (5 x 10 m), respectivamente para os estratos (RNi), (RNii) e (RNiii); 15 parcelas de 25 x 20 m (7.500 m²) para os estratos (i) e (ii) e 3 parcelas 250 x 20 m (15.000 m²). Nos estratos superiores a densidade de árvores tendeu a MFIRCC>MFIRSC>Testemunha e reduziu com a classe de tamanho. A riqueza de espécies também tendeu a MFIRCC>MFIRSC>Testemunha porém a diversidade pelo coeficiente de mistura foi maior na floresta não alterada. As duas espécies com maiores IVIA foram amescla (Burseraceae) e cega-corrente (Moraceae) nos três tratamentos.

33.15-P: Estimativas de volume de madeira na Amazônia Central: efeitos de irregularidades do fuste e ocos

Euler Melo Nogueira, INPA - Programa de PG em Ciências de Florestas Tropicais, eulerquait@inpa.gov.br
Bruce Walker Nelson, INPA - Ecologia, bnelson@internext.com.br (Apresentador / Presenting)

O método convencional de estimar área basal e volume de florestas amazônicas presume que o fuste é um sólido de revolução. Devido às irregularidades do fuste e a presença de ocos, tal presunção acarreta superestimativa destes atributos, mesmo quando as medidas são tomadas acima de sapopemas. O erro foi avaliado utilizando 310 árvores com DAP entre 5 e 106 cm, distribuídas em floresta primária densa da Amazônia Central, sobre platôs de latossolo. A amostra inclui 23 árvores com DAP acima de 50cm. Para todas as árvores foram retirados discos transversais: um na altura de 1,36m ou acima das sapopemas, e outro no final do fuste, abaixo do espessamento associado com o primeiro galho grosso. Os discos foram desenhados por mapeamento, os desenhos fotografados e a área de cada seção com casca determinada em imagem digital. Extrapolando para inventários, a área basal/ha pelo método convencional foi

superestimada em 12,4% e o volume em 12,3%, para todas as árvores acima de 5 cm DAP. O efeito da presença de ocos sobre o volume é de apenas 0,7%, o restante sendo consequência da forma irregular do fuste. Para as árvores com DAP acima de 50cm, a área basal/ha é superestimada em 36% pelo método convencional e o volume em 21,9%. Isto corresponde a uma superestimativa de 20 m³/ha para o volume de fuste com casca, para as árvores com DAP acima de 50cm. Entretanto, os erros provavelmente não influenciarão as estimativas de biomassa baseadas em volume de fuste.

33.16-P: Effects of wood density and the height-x-diameter relationship on biomass differences between three widespread Amazonian forest types

Bruce Walker Nelson, INPA-Ecologia, bnelson@internext.com.br (Apresentador / Presenting)

Mabiane Batista França, INPA- Curso de PG em Ciências Florestas Tropicais, Mabiane.Batista-Franca@Uhb.Fr

Euler Melo Nogueira, INPA- Curso de PG em Ciências Florestas Tropicais, eulerquait@inpa.gov.br

Átila Cristina Oliveira, INPA - Curso de PG em Ecologia, atilaoli@inpa.gov.br

Spatial models of the distribution of carbon stocks across Amazonia rely ultimately on allometric regressions relating tree biometric variables to tree or stand biomass. Regressions for individual trees developed in Amazonian primary forest, using diameter at breast height or above buttress (DBH), have been derived only for dense forests on infertile soil. Carbon emissions will be overestimated if such models are applied to open forests or to dense forests on more fertile soils, both of which are common in the Amazonian Arc of Deforestation. In a central Amazon dense forest, where commonly used allometric models were developed, trees are taller at any given DBH than in two southwest Amazon forests. Wood density with bark at breast height is 0.712 +/- 0.119 (average +/- 1 std dev; n=310), greater than both SW Amazon open (0.512 +/- 0.176; n=92) and SW Amazon dense (0.600 +/- 0.160; n=97) forest types. Effects on biomass, of lower wood density and shorter stem height, were devised in small calibration inventories then applied to larger inventories where only DBH is available. The wood density correction alone reduces estimated above-ground stand biomass (trees over 5 cm DBH) by 28% in the SW Amazon open forest and by 16% in the SW Amazon dense forest. When tree height effects are also considered, accumulative reduction of estimated biomass in these two forest types is 40% and 22%, respectively.

33.17-P: Isotopic composition of plant and soil nitrogen on a precipitation gradient in the Brazilian Amazon Forest

Gabriela Bielefeld Nardoto, CENA/USP, gbnardot@carpa.ciagri.usp.br

Jean Pierre Ometto, CENA/USP, jpometto@cena.usp.br (Apresentador / Presenting)

James Ehleringer, University of Utah, jim@biology.utah.edu

Luiz Antonio Martinelli, CENA/USP, martinelli@cena.usp.br

Soil and foliar 15N-natural abundance and N concentration were evaluated in three terra-firme forests over Oxisols with annual rainfall ranging from 1950 mm to 3300 mm along the Brazilian Amazon Basin. The studied sites are located at FLONA-Tapajós (Santarém, PA - 2,85 S; 54,95 W), ZF-2 Reserve (Manaus, AM - 2,50 S; 60,0 W) and National Park of Pico da Neblina (São Gabriel da Cachoeira, AM - 0,48 N; 66,50 W). Regardless the site, a large increase in delta15N values was observed in the first 50 cm deep of soil. There was a significant positive correlation between foliar delta15N and N concentration. Soil and foliar delta15N values systematically decreased with increasing mean annual precipitation. The pattern of higher soil and foliar N concentration in the drier site (Santarém), together with the progressively enriched delta15N signature in vegetation, suggest that nitrogen cycling is more open at the drier site where an increasing fraction of ecosystem N losses should be probably 15N-depleted forms (NO₃, N₂O and NO). Ecosystems under higher precipitation regime appear to be more efficient in the recycling and conserving of mineral N. The difference between delta15N(foliar) and delta15N(soil) increased with increasing mean annual precipitation, suggesting a systematic change in the source of plant-available N (NH₄ versus NO₃) with climate. Nitrogen isotopes can reflect time integrated measurements on the controls of N storage in undisturbed areas that are critical for predictions of how these ecosystems would respond to human-mediated disturbances of the global N cycle.

33.18-P: Necromass Density Estimates from Two Brazilian Amazonia Forests

Michael William Palace, University of New Hampshire, palace@kaos.sr.unh.edu (Apresentador / Presenting)

Michael M. Keller, University of New Hampshire, USDA Forest Service, International Institute of Tropical Forestry, michael.keller@unh.edu

José Natalino Macedo Silva, EMBRAPA-Amazonia Oriental, natalino@cpatu.embrapa.br

Gregory Paul Asner, Department of Global Ecology, Carnegie Institution of Washington, Stanford University, gpa@stanford.edu

Coarse woody debris (CWD) can make up a large proportion of the carbon pool in a tropical forest. Knowledge of this pool and the fluxes related to it is vital for understanding terrestrial ecosystem processes. The density of CWD is important in accurately quantifying the CWD mass from volume estimates. We measured the densities of CWD in two Brazilian forests, Tapajós National Forest, Para, and Juruena, Mato Grosso, Brazil. Measurements were conducted in logged forest and undisturbed forest. CWD density was calculated from the density of wood plug samples and adjusted for void space. Density of wood was determined using a unique plug extraction technique for large CWD (>10 cm diameter) in 5 decay classes from fresh (1) to rotten (5) and two smaller diameter classes; 2-5cm and 5-10 cm. Estimates of plug density for decay classes 1 to 5 are 0.61, 0.71, 0.63, 0.58, and 0.32 g cm⁻³ at Tapajós. Densities for smaller classes were 0.36 g cm⁻³ for 2-5cm and 0.45 g cm⁻³ for 5-10 cm at Tapajós. Juruena estimates of density for decay classes 1 to 5 are 0.71, 0.68, 0.64, 0.60, and 0.45 g cm⁻³. Juruena densities for smaller classes were 0.51 g cm⁻³ for 2-5cm and 0.47 g cm⁻³ for 5-10 cm. Currently, we are examining the void estimation and adjusted densities between the two sites. Since this study indicates little difference in density across decay class between sites, these density estimates may be more generally applicable in other areas of the Amazon.

33.19-P: A Portable Lidar System for Rapid Determination of Forest Canopy Structure

Geoffrey Parker, Smithsonian Environmental Research Center, parkerg@si.edu (Apresentador / Presenting)

David Harding, NASA Goddard Space Flight Center, David.J.Harding@nasa.gov

Michelle Berger, Smithsonian Environmental Research Center, bergerm@si.edu

Significant functional characteristics of forests are related to the organization of their canopies. However, understanding of the relation between canopy structure and function has been limited by a lack of methods to determine structure at scales consistent with the footprints of function measurements. We describe a portable system, assembled from commercially-available components, for acquiring measurements of distances to overhead plant surfaces that can be aggregated to assess canopy structure at scales of ecological interest. Deployed by a person from the forest floor, the system includes a narrow-beam, rapidly-pulsed, first-return laser rangefinder coupled with a data recording system.

From tests in an age-sequence of broad-leaved, closed-canopy forests we found the system provides results significantly more rapidly than previous methods, at spatial scales as small as 1 m in all dimensions. The estimated mean vertical canopy structure is consistent with that found from more laborious, manual approaches, such as the "Foliage Height Profile" method. The system has some biases due to beam width and range averaging but from a variety of tests we found these have relatively little effect on the structure estimates. Various field sampling schemes and methods of aggregating the measurements yield a variety of representations of structure, including mean profiles, tomographic sections, three-dimensional distributions of canopy surface density, and maximum height surfaces. Derivable summary measures include canopy cover and area index, porosity, the size distribution of overhead openings, and indices of structural complexity. Moreover, the approach can provide estimates of spatial variability and covariance not previously obtainable. Portable LIDAR systems such as the one we describe provide a new tool for measurement of small-scale forest structure useful in various canopy research and forest management applications.

33.20-P: Monitoramento da Taxa de Incremento Diametral em Biomassa de Carbono em Floresta Primária na Floresta Nacional do Tapajós

Kleber da Costa Portilho, UFPA/CD-15 LBAECO, kleber@lbaeco.com.br (Apresentador / Presenting)

Daniel Nunes Figueiredo, FIT/CD-15 LBAECO, danielnunes@lbaeco.com.br

Marcos Heil Costa, UFV CD15, mhcosta@ufv.br

As florestas tropicais desempenham um papel destacado no ciclo global de carbono, estocando em sua vegetação cerca de 40% do carbono encontrado na biomassa terrestre. A fotossíntese realizada pela vegetação florestal absorve uma quantidade enorme de carbono da atmosfera a cada ano. Foi implantado no Km 67 da BR 163 Santarém Cuiabá, na Floresta Nacional do Tapajós Santarém Pará, (54°88'W; 2°51'S), um experimento de monitoramento do crescimento das árvores, desenvolvido no período de Dezembro de 2003 até Junho de 2004, afim de saber a taxa de incremento diametral de biomassa de carbono. Foram inventariados árvores com diâmetros a partir de 10 cm.

Inicialmente foi inventariada uma área de 5 x 5 km dividida em três transectos, sendo que dois transectos mediam 1 km e outro de 500 metros, ambos subdivididos em 50 parcelas de 25 x 25 metros. Na qual foram instaladas 1.300 anéis dendrométricos, esses anéis foram instalados a uma altura padrão de 1,30 m.

A biomassa na floresta estudada foi estimada em torno de 209 t C ha ano. Ainda é cedo para se calcular o incremento diametral na floresta estudada, pois os dados de monitoramento perfazem apenas três meses de mensuração. No entanto, segundo alguns autores a metodologia utilizando parcelas permanentes e a medida diamétrica dos troncos distribuídos em classes diamétricas e grupos funcionais é eficiente para determinar o crescimento em diâmetro dos indivíduos de uma comunidade florestal.

33.21-P: Effect of contrasting irradiances on the carbon balance and biomass partition in Brazilian savanna (Cerrado) woody seedlings

Carlos Henrique Prado, Universidade Federal De São Carlos, caique@power.ufscar.br (Apresentador / Presenting)

Carlos Cesar Ronquim, Universidade Federal De São Carlos, pccr@iris.ufscar.br

The photosynthetic capacity of Cerrado woody species is not low (6-17 mmol m⁻² s⁻¹). Besides, around a half of biomass in Cerrado woody species is allocated belowground in order to overcome soil deficiency, fire, and drought. Considering this behavior and the vast Cerrado's area (similar to East Europe) this biome could be an important continental sink to CO₂. On the other hand, the responses facing specific constraints (e.g. shade, mineral deficiency) must be quantified in order to estimate the real capacity of each Cerrado species to act as a carbon sinker. Studying several levels of organization at same time it was possible to point out how phenotypic plasticity operates in three young Cerrado woody species submitted to different irradiance and under transitory increasing of atmosphere CO₂ availability. Under full irradiance, photosynthetic capacity, leaf area, and carboxylation efficiency increased at least two times in comparison to same species growing in shade (under Cerradão irradiance attenuation). As a consequence, biomass production was always greater (p<0.05) under full irradiance (FI) till 570 days after sowing (DAS). Photosynthetic capacity under 1600 ppm of CO₂ was at least two times higher in comparison to regular CO₂ availability irrespective of the irradiance treatment. In addition to leaf physiological alterations, height, stem diameter and specific leaf mass values were also significantly lower in all species in shade. These physiological and morphological alterations could enable some Cerrado woody species to survive under Cerradão irradiance attenuation working as a carbon sinker even in the densest Cerrado physiognomy.

33.22-P: Interactions Between Soil Fertility and Forest Dynamics in the Bolivian Amazon Forest.

Carlos Alberto Quesada, Max-Planck Institute for Biogeochemistry, Jena, Germany., quesada@unb.br (Apresentador / Presenting)

Jonathan James Lloyd, 1Max-Planck Institute for Biogeochemistry, Jena, Germany., jon.lloyd@bgc-jena.mpg.de

Sandra Patiño, 1Max-Planck Institute for Biogeochemistry, Jena, Germany., spatino@bgc-jena.mpg.de

Oliver L. Phillips, University of Leeds, Leeds, England, o.phillips@geog.leeds.ac.uk
Yadvinder Singh Malhi, University of Edinburgh, Edinburgh, Scotland., ymalhi@ed.ac.uk
Almuth Arneht, Max-Planck Institute for Biogeochemistry
Luzmilla Arroyo, Museo Nacional Noel Kempf Mercado, Santa Cruz de la Sierra, Bolívia, luzmillaarroyo@hotmail.com
Timothy Killeen, Museo Nacional Noel Kempf Mercado, Santa Cruz de la Sierra, Bolívia, t.killeen@conservation.org

This study aimed to understand the influence of soil fertility on forest dynamics in the Bolivian Amazon. Nine permanent plots of 1 ha were recensused in 2001 with soil and leaves sampled for subsequent chemical analysis in order to detect possible correlations between site fertility and parameters as basal area (BA), above ground biomass (B), basal area increment (Bi) and net primary production (NPP). Foliar analysis indicated that Ca and Mg were dependent on soil availability and almost certainly deficient in two of the nine plots. These highly weathered oxisol soils may have a nutrient status below that required for optimal forest growth. By contrast, for other macro and micro elements, foliar concentrations were independent of soil availability.

Canonical Correlation Analysis reveal that, for the studied areas, the BA, B and productivity were correlated with soil fertility, especially with with pH, and available Ca and Mg.

33.23-P: Estimativa do estoque de carbono em distintos materiais e coberturas vegetais no noroeste da Amazônia Legal

Segundo Durval Pereira Rezende, UFMT, floresteiro3@pop.com.br (Apresentador / Presenting)
Yves-Marie Gardette, ONF Brasil, onfbrasil@terra.com.br
Pedro Correto Priante, UFMT, pedropri@terra.com.br
Nicolau Priante Filho, UFMT, nicolaup@terra.com.br
Eliane Dias de Almeida, UFMT/CEFET-MT, elianediasdealmeida2003@yahoo.com.br
Carla Maria Abido Valentini, UFMT/CEFET-MT, valentini@vspmail.com.br
Vilidiana Moraes Moura, UFMT, vilidiana@bol.com.br

O objetivo foi verificar a quantidade de carbono estocado em diferentes materiais, capim, serrapilheira, regeneração natural (arbustos), solo, madeira morta e amostras destrutivas, possibilitando a determinação do material que possui maior quantidade de carbono, em uma propriedade de aproximadamente 10.000 ha, com distintas coberturas vegetais. Este estudo foi realizado entre os dias 23/08/03 à 04/09/03, pela primeira vez na fazenda São Nicolau, localizada na MT-170, Km 01, zona rural, em Cotriguaçu-MT, Brasil. Foram criados alguns protocolos para coletas de diferentes materiais vegetais na determinação da taxa de carbono em amostras destrutivas das árvores de regeneração natural e dos plantios. Nas coletas de sub-parcelas, regeneração natural no plantio de reflorestamento período 2002/2003, capoeira empregou-se quadrados de 1 x 1m. Para a amostra de madeira morta encontrada na pastagem empregou-se a coleta no espaço de 2 x 7m.

Das coletas realizadas nos quadrados 1 x 1m foram retirados capim, serrapilheira, regeneração natural quando presente, e foram realizadas amostras de solo nas profundidades de 5, 15 e 25cm. Na área de capoeira, foram identificadas todas as árvores que apresentavam circunferência maior que 8cm na delimitação de 5 x 50m. As amostras coletadas foram encaminhadas para o laboratório de solos da FAMEV-UFMT para análise quantitativa de carbono.

Serão apresentados os resultados obtidos e também detalhes operacionais desse método de quantificação do estoque de carbono. Os resultados contribuirão para os projetos em andamento com ênfase no seqüestro de carbono, principalmente por abranger o estoque de carbono em distintos materiais e coberturas vegetais.

33.24-P: Padrões Estruturais e Alométricos em Florestas Alagáveis na Região da Ilha do Bananal, Estado do Tocantins

Rita da Mata Ribeiro, Escritório Regional LBA Palmas - TO, rmribeiro@ruralnet.com.br (Apresentador / Presenting)
Dariusz Kurzatkowski, Escritório Regional LBA-TO/Instituto Ecologica Palmas - TO, kurzatkowski@hotmail.com (Apresentador / Presenting)
Divaldo Rezende, Instituto Ecologica/ Palmas - TO, divaldoecologica@uol.com.br
Humberto Ribeiro da Rocha, IAG/USP, humberto@model.iag.usp.br
Erich Collicchio, UNITINS AGRO/ Palmas - TO, ecollicchio@uol.com.br

Resumo: A região da Ilha do Bananal está classificada como Ecótono, com importância biológica extremamente alta. As áreas de estudo foram localizadas na região de transição entre a Floresta Amazônica e o Cerrado, no sul do Parque Estadual do Cantão. A inundação anual durante o período de dezembro a maio pelo Rio Javaés determina as características da floresta na região. O nível de enchente na floresta foi monitorado durante o período de 3 anos, o que possibilitou diferenciar as áreas de estudo em três categorias: nível de enchente baixa (1,5m). Nas medições biométricas realizadas numa área total de 7,25 ha, foram incluídas todas as árvores com circunferência superior a 20cm (DAP > 6,3 cm). Foram feitas medições do DAP e da altura total em 7.760 indivíduos. Todas as árvores foram identificadas pelo nome científico e pela família. O número médio das árvores em três áreas de enchente encontrado foi de aproximadamente 1000 indivíduos por hectare. Na floresta com enchente de nível baixo observou-se um maior número de árvores altas onde encontrou-se 27 indivíduos com o DAP>35cm e 9 indivíduos por hectare com altura superior a 20 m. A altura máxima das árvores na área de enchente baixa, alta e média foi de 28,5, 27 e 25 m, respectivamente. Na floresta com nível de enchente baixa e média foi observada o predomínio da espécie *Protium sp* onde foram encontradas cerca de 350 e 215 indivíduos por hectare. As espécies mais freqüentes na área de enchente alta foram representadas pelas espécies *Inga laurinia* Willd e *Alibertia sessilis* Schuman onde foram encontrados 218 e 215 indivíduos por hectare, respectivamente.

33.25-P: Distribution of coarse and fine root biomass in native ecosystems and planted pasture in the Cerrado of Central Brazil

Patricia Rodin, UnB, prodin@unb.br (Apresentador / Presenting)
Carlos Augusto Klink, UnB, klink@unb.br

Flavia Pinto, INPA e PDBFF, flavia@inpa.gov.br
Thiago Andre, INPA, thiago@inpa.gov.br

The depth and distribution of roots have important implications for ecosystems, as they define the input of carbon into the soil by senescent roots. Our objective was to estimate the coarse and fine root (< 2mm diameter) distribution in three native Cerrado ecosystems and one planted pasture in Brasilia. We dug 3 deep shafts (up to 8 m deep) in each ecosystem to determine coarse root distribution. The soil was collected at 0-10, 10-50, 50-100 cm intervals and then at 1m intervals. Fine roots were sampled with an auger up to 3m depth (N = 10 per ecosystem). The soil was collected at 10 cm intervals up to 50 cm depth and then at 50cm intervals. Roots were washed and oven dried at 70°C for 72 hours and weighed. We fitted the depth coefficient \hat{a} to the data of coarse and fine root biomass of each ecosystem. \hat{a} is a numeric index of rooting distribution based on an asymptotic equation $Y=1-\hat{a}^d$, where Y = the cumulative root fraction from the soil surface to depth d (cm). In all ecosystems root biomass declined sharply with depth. All ecosystems showed deeper rooting profiles, for coarse and fine root, and a positive increase of coefficient \hat{a} with density of woody vegetation. \hat{a} for coarse root biomass varied between 0.970 in pasture to 0.985 in cerrado *stricto sensu*; for fine roots, \hat{a} varied between 0.964 in pasture to 0.985 in cerrado denso. Conversion of native ecosystems into pasture affects distribution of root biomass, which may affect net carbon storage in the soil, and carbon recycling in the Cerrado.

33.26-P: Carbon dynamics and Landscape-scale vegetation patterns in an old-growth Amazonian rainforest

Gregory W. Santoni, Harvard University, santoni@fas.harvard.edu (Apresentador / Presenting)
Lucy Hutyra, Harvard University, lhutyra@fas.harvard.edu
Simone Aparecida Vieira, USB,CENA, savieira@cena.usp.br
V.Y. Chow, Harvard University, vchow@fas.harvard.edu
Raimundo Sousa Lima Jr., UFP, junior@lbaeco.com.br
Dulcyana F. Marques, FIT, dulcyana@hotmail.com
Kadson Oliveira Silva, UFP, kadson@lbaeco.com.br
Elizabeth Hammond-Pyle, Harvard University, pyle@fas.harvard.edu
Scott R. Saleska, Harvard University, saleska@fas.harvard.edu (Apresentador / Presenting)
Plínio Barbosa de Camargo, USP,CENA, pcmargo@cena.usp.br
Steven C. Wofsy, Harvard University, scw@io.harvard.edu

Here we present preliminary results from spatially-distributed ground-based measurements of vegetation structure to assess (1) variability of landscape-scale disturbance patterns (including distributions of woody material across live and dead pools) and (2) representativeness of eddy flux measurement sites in context of the broader landscape.

Previous work (Rice et al. 2004) in a well-drained old-growth upland forest (near the km 67 access road of the Tapajós National Forest near Santarém, Pará, Brazil) in the footprint of an eddy covariance tower showed significantly elevated coarse woody debris (CWD) stocks and small-tree recruitment rates, both indicators of recent disturbance. To assess variability of such indicators of disturbance at the landscape-scale, we established four new 10 hectare transects near km-72 and km-117 access roads in the Tapajós forest.

The five sites (km 67 and the four new sites) have similar biomass but appear to have different disturbance histories. Three of five sites, including km 67, show signs of recent disturbance expressed by the presence of more recently downed wood. This work shows that disturbance states are variable at the landscape scale, and further supports the hypothesis that the km 67 site is currently recovering from disturbances in the recent past.

33.27-P: Análise Florística e Estrutural de uma Floresta Ombrófila Aberta Primária no Hotel de Selva Cristalino, Alta Floresta-MT

Vanessa Aparecida Santos, UNEMAT - Universidade do Estado de Mato Grosso, vanessafloresta@yahoo.com.br (Apresentador / Presenting)
Rubens Marques Rondon Neto, UNEMAT - Universidade do Estado de Mato Grosso, rubens.rondon@bol.com.br
Kelli Cristina Aparecida Munhoz, UNEMAT - Universidade do Estado de Mato Grosso, kwmm@terra.com.br
Higo José Dalmagro, UNEMAT - Universidade do Estado de Mato Grosso, hjdalmagro@bol.com.br
Leandro Gomes de Almeida, UNEMAT - Universidade do Estado de Mato Grosso, leaeiou@hotmail.com
George Sanches Suli, UFMT - Universidade Federal de Mato Grosso, suli@terra.com.br
Nicolau Priante Filho, UFMT - Universidade Federal de Mato Grosso, nicolaup@terra.com.br
José de Souza Nogueira, UFMT - Universidade Federal de Mato Grosso, nogueira@cpd.ufmt.br
George Louis Voullitis, Califórnia State University San Marcos, georgev@csusm.edu
Cléia Rosana Dal Bem, UNEMAT - Universidade do Estado de Mato Grosso, clay@vsp.com.br

Para verificar o estágio em que as florestas se encontram e as alterações que estas sofrem, foi realizada uma análise estrutural da vegetação existente em uma floresta Ombrófila Aberta Primária localizada no Hotel de Selva Cristalino, situado a aproximadamente 39 km do município de Alta Floresta - MT, com coordenadas (9°35'56,04"S, 55°56'11,76"O). O objetivo deste trabalho foi analisar os aspectos florísticos e estruturais desse tipo de vegetação, a fim de oferecer subsídios comparativos para futuros trabalhos que possam visar a preservação e conservação dessa floresta. Em uma área de 1 ha (20 x 500m) foram instaladas 25 parcelas de 20 x 20m, onde todos os indivíduos com diâmetro a altura do peito (DAP) igual ou superior a 10cm tiveram sua circunferência a altura do peito (CAP) medida com fita métrica. As espécies foram identificadas e foram estimados os parâmetros estruturais absolutos e relativos de frequência, densidade e dominância, além do índice de cobertura e o valor de importância.

33.28-P: Relação da Precipitação Pluviométrica com a Taxa de Crescimento de Espécies Arbóreas com Diâmetro Entre 60 e 70 cm da Amazônia, em Área de Parcela Permanente da Flona Tapajós, Santarém.

Kadson Oliveira Silva, LBA, kadson@lbaeco.com.br (Apresentador / Presenting)
Plínio Barbosa de Camargo, CENA-USP, pcmargo@cena.usp.br

Scott R. Saleska, Harvard University, saleska@fas.harvard.edu

Dárcio Raimundo Batista da Cruz, Instituto Luterano de Ensino Superior/Universidade Luterana do Brasil (ILES/ULBRA Santarém), darcio@ibaeco.com.br

A estrutura da vegetação é um fator importante para os estudos de ecossistemas. Segundo estimativas, 41% das florestas tropicais úmidas se encontram no Brasil, armazenando na vegetação de 150 a 200 t C há⁻¹. O incremento arbóreo é um dos fatores que contribui para as estimativas de biomassa, conseqüentemente para o armazenamento do carbono. O objetivo deste estudo foi verificar a relação entre a precipitação pluviométrica com o incremento arbóreo de espécimes com diâmetro entre 60 e 70 cm, durante o período de fevereiro de 2002 a fevereiro de 2003. De 1000 árvores selecionadas em uma área de 20 ha no km 67 da FLONA do Tapajós, selecionou-se a classe de maior incremento arbóreo (4%, N = 40) formada por 25 espécies diferentes de valor comercial ou não. Foram mensurados mensalmente os incrementos de biomassa, através de cintas dendrométricas e, concomitantemente, medida a precipitação pluviométrica. Através da análise de correlação verificou-se que houve um maior acréscimo quando da precipitação entre 100 e 500 mm. O incremento está diretamente relacionado com a taxa fotossintética que por sua vez depende de valores ótimos de umidade do solo para suprir a quantidade de água utilizada na captura do "C". Frente a esses resultados, conclui-se que existe significativa correlação entre os índices analisados, que é refletido no ganho de biomassa no ambiente estudado e que em precipitações < 100 mm, há uma diminuição acentuada no incremento de biomassa.

33.29-P: Efeito da exploração seletiva de madeira no crescimento e respiração do tronco em floresta de terra-firme na região de Manaus.

Liliane Martins Teixeira, INPA, liliane@inpa.gov.br (Apresentador / Presenting)

Jeffrey Q. Chambers, Tulane University, chambers@tulane.edu

Edgard S. Tribuzy, INPA, estribuzy@yahoo.com.br

Roseana P. da Silva, INPA, rose@inpa.gov.br

Rosana M. Rocha, INPA, rocha@inpa.gov.br

Alberto M. Pinto, INPA, amartins@inpa.gov.br

Niro Higuchi, INPA, niro@inpa.gov.br

Susan E. Trumbore, University of California, setrumbo@uci.edu

Plínio Barbosa de Camargo, CENA/ESALQ, pcamargo@cena.usp.br

João dos Santos, INPA, joca@inpa.gov.br

Entender a resposta da floresta aos impactos da exploração madeireira é importante para explicar o seu funcionamento e participação nas trocas gasosas com a atmosfera. Em uma área de floresta tropical de terra-firme manejada com três diferentes intensidades de exploração seletiva de madeira, realizou-se um estudo para acompanhar o efeito da exploração seletiva no crescimento sazonal e na respiração do caule. Para essas árvores, o crescimento em diâmetro do caule foi acompanhado mensalmente durante 11 meses utilizando bandas dendrométricas e, a respiração do caule, com um analisador de gás infravermelho (IRGA), durante 5 meses. A sazonalidade influenciou a produção de tecido lenhoso, especialmente em parcelas exploradas, entretanto, não mostrou grande influência para os fluxos respiratórios desses tecidos, cujas taxas foram significantes e independentemente relacionadas às taxas de produção do tecido lenhoso e ao diâmetro do caule ($p < 0.0001$). Isto sugere que, para as mesmas taxas de crescimento, árvores com diâmetros maiores possuem mais tecidos vivos por unidade de área do caule, correspondendo a altos custos de respiração de manutenção. A eficiência do uso do carbono quando relacionada à taxa de crescimento do caule mostrou que no máximo 75% de todo o carbono alocado para os tecidos lenhosos é usado para construção de madeira e que no mínimo cerca de 25% é utilizado para a respiração. Então, árvores que crescem rápido, mesmo com mínima perturbação na floresta, são mais eficientes para construir tecidos, mesmo com baixas taxas de respiração.

33.30-P: Análise da Biomassa utilizando método "direto" para pastagem em Rondônia.

Fabrizio Berton Zanchi, IAG/USP, fabricio@model.iag.usp.br (Apresentador / Presenting)

Maarten J. Waterloo, Vrije Universiteit-Holanda, watm@geo.vu.nl

Humberto Ribeiro da Rocha, IAG/USP, humberto@model.iag.usp.br

Fernando Luiz Cardoso, UNIR, cardoso@unir.br

Paulo Renda Anderson, UNIR, paulorenda@ibest.com.br

Leonardo J. G. Aguiar, UNIR, veraneiro@hotmail.com

Juliano Alves de Deus, UNIR, julianoalde@yahoo.com.br

Kécio Gonçalves Leite, UNIR, keciog@yahoo.com.br

Anderson Teixeira Telles, UNIR, mecanicatelles@ibest.com.br

Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br

A Biomassa total, Índice de Área Foliar (IAF), Área Específica da Folia (SLA), Material vivo e morto foram coletados numa pastagem de Rondônia. A Pastagem é formada de 99% de *Brachiaria brizantha* e 1% de *brachiaria umidicula*, os dados foram medidos no período de fevereiro de 1999 a abril de 2003 na Fazenda Nossa Senhora Aparecida (FNS), a biomassa total, IAF, SLA, material morto e vivo, cujas médias para o período analisado foram respectivamente, 4853 kg ha⁻¹, 1,77 (-), 18,47 m² kg⁻¹, 2028 kg ha⁻¹ e 2748 kg ha⁻¹. Os dados sugeriram uma tendência sazonal do material morto similar a biomassa total, já o material vivo não teve tanta similaridade devido a possível influência do gado que pastou por um longo tempo. Os valores mensais do SLA atingiram entre 14 e 25 m² kg⁻¹, com valores muito significativos para os períodos secos. Notou-se boa similaridade no IAF para mudanças sazonais atingindo valores entre 1 a 2,8, estes valores alternaram diminuindo no período seco e aumentando no chuvoso. Os valores foram bem significativos apesar da metodologia ser destrutiva mesmo assim foram coerentes com a literatura para pastagens tropicais.

34.1-P: Internal carbon cycling in native Cerrado and a pasture in Central Brazil

Roberto Engel Aduan, Empresa Brasileira de Pesquisa Agropecuária, aduan@cpac.embrapa.br (Apresentador / Presenting)

Carlos Augusto Klink, Universidade de Brasília, CARLOSKLINK@aol.com.br

Eric Atlas Davidson, The Woods Hole Research Center, edavidson@whrc.org

During the past decade, the increasing knowledge about the effects of natural and cultivated ecosystems on regional and global climate raised the importance of terrestrial ecosystem to function either as carbon source or sink. The aim of this study was to measure the most important pools and fluxes of the internal carbon cycling in two native Cerrado vegetation types, that differ in tree density (cerrado denso and cerrado stricto sensu) and one planted pasture, in an effort to produce a synthesis of our knowledge about Cerrado carbon cycling. The native Cerrado ecosystems are located in the Reserva Ecológica do Roncador (RECOR/IBGE), in Brasília, DF, Brazil, while the planted pasture (*Brachiaria brizantha*) is located in the experimental fields of Embrapa-Cerrados, in Planaltina, DF, Brazil.. Synthesis of estimations of the main pools and fluxes were made by combining direct field measurements, data from the literature, and modeling results. The native ecosystems showed very similar pools and fluxes. Pools in living tissues of pasture were much smaller than natural ecosystems, while soil organic matter was slightly larger in the pasture. The fluxes were faster in the pasture. The intensity of fluxes intensity in the pasture, makes the carbon dynamics of this ecosystem very sensitive to management practices.

34.2-P: Photosynthetic rates and nitrogen use efficiencies in plants of different functional groups in the open savannas of Gran Sabana, Canaima National Park, Venezuela

Bibiana Alejandra Bilbao, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, bibiana_bilbao@hotmail.com (Apresentador / Presenting)

Carlos Luis Méndez, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, carlosmendez@etheron.net

Eduardo Zambrano, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, ezambrano@usb.ve

Rosana Castillo, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, rosanacastillo@cantv.net

Mercedes Jaffé, Departamento de Estudios Ambientales, Universidad Simón Bolívar, Caracas, Venezuela, mechejaffe@yahoo.com

José Manuel Moreno, Facultad de Ciencias del Medio Ambiente, Universidad de Castilla- La Mancha, Toledo, España,, JoseM.Moreno@uclm.es

The Gran Sabana, Canaima National Park (30000 km²), Venezuela, is a region characterized by a mosaic of forest, shrubs and savannas. The presence of open savannas has been attributed to the Holocene dry climatic phases, but more recently anthropogenic fires have become the prevailing factor. Among the dominant herbaceous savanna species we find *Axonopus anceps* and *Trachypogon plumosus* (Poaceae, C4), *Lagenocarpus rigidus* and *Hypolytrum pulchrum* (Cyperaceae, C4), among woody plants, *Byrsonima verbascifolia* (Malpighiaceae) (C3, a stemless tree). A question of interest in this particular type landscape is to evaluate to what extent fires interact with soil nutrient deficiencies to result in different seasonal net photosynthesis (P_n) and N use efficiencies (NUE) between different herbs and trees and in relation to their C4/C3 nature. The highest P_n were observed in grasses *T. plumosus* and *A. anceps* (20-25 and 15-20 micromol CO₂ m⁻² s⁻¹ respectively). All other species had P_n values lower than 14 micromol CO₂ m⁻² s⁻¹. The sedges (group with higher biomass in the savannas) showed comparable values of P_nW (P_n expressed in weight bases: micromol CO₂ g⁻¹ s⁻¹) and NUE, in respect to the C3 woody species. Although all species had similar low values of leaf nitrogen contents, the sedges and the woody species displayed lower SLA than grasses. Our results support the idea that the expansion of savannas (promoted by fire) over the forest, plus the low performance of the herbaceous components in CO₂ assimilation, could have a deep impact on the C balance in the region.

34.3-P: Plant Community Phenological Responses to Simulated Drought Stress: Preliminary Results from a Partial Throughfall Exclusion Experiment

Paulo Brando, Instituto de Pesquisa Ambiental da Amazônia (IPAM), pbrando@ipam.org.br (Apresentador / Presenting)

David Ray, Woods Hole Research Center (WHRC), dray@whrc.org

Daniel Curtis Nepstad, Instituto de Pesquisa Ambiental da Amazônia (IPAM); Woods Hole Research Center (WHRC), dnepstad@whrc.org

Lisa Curran, Yale School of Forestry & Environmental Studies, lisa.curran@yale.edu

Paulo Moutinho, Instituto de Pesquisa Ambiental da Amazônia (IPAM), moutinho@ipam.org.br

Droughts associated with El Niño Southern Oscillation (ENSO) and possibly deforestation-driven reductions in rainfall may alter flowering and fruiting in Amazonian rainforests. We hypothesized that persistent drought stress would: (1) initially increase, but ultimately diminish flower and fruit production; and, (2) alter timing of flowering and fruiting among 30 species. The study consists of two 1-ha plots: a dry-plot from which 50% of incoming precipitation is diverted from the soil during the 6 month wet season, and a wet-plot that receives natural inputs. Beginning in Jan-2001, phenological surveys of 30 species were conducted monthly in both plots. At each census, we quantified the presence or absence of reproductive structures. These analyses are restricted to individuals that flowered or fruited at least once during the period. Additionally, beginning in April-2000, flower and fruit production was measured every 15 days in 100 litter traps (0.6 x 0.8 m) in each plot. Our preliminary results indicate 42% greater fruit production in the dry-plot relative to the wet-plot from Jan-2001 to Feb-2004, despite a 5% decrease in flower production. The greatest difference was observed in 2002 when average monthly fruit production was 0.028 g.m⁻² wet; 0.061 g.m⁻² dry (p=0.008). However, the following year flower and fruit

production in the dry plot was 12% and 27% lower than in the wet-plot, respectively, supporting our first hypothesis. In 2003 we detected some evidence of temporal shift in the peak of flowering and fruiting between plots.

34.4-P: Drought-tolerance of an eastern Amazon forest, recovery of canopy water status: results from a throughfall exclusion experiment.

Gina Knust Cardinot, UFRJ/IPAM, cardinot@ipam.org.br (Apresentador / Presenting)

Daniel Curtis Nepstad, WHRC/IPAM, dneptad@whrc.org

N. Michele Holbrook, Harvard University, holbrook@oeb.harvard.edu

David Ray, WHRC, dray@whrc.org

Evergreen forest canopies are able to persist during the extended dry season in east central Amazonia because a favorable water balance can be maintained. However, the adaptations that make this possible are not well understood. Over the past four years we have been monitoring changes in predawn leaf water potentials (Y_p ; 7 paired species), leaf area index (LAI), and plant available soil water (PAW) in the rainfall exclusion experiment (Santarem, Para, Brazil). The study consists of two 1-ha plots, a control and treatment plot from which rainfall wet season (6-mos) water inputs have been reduced by 50% since 2000. Strong differences in Y_p were first detected during the 2001 dry season, when average Y_p values were more negative (-1.62 MPa) in the treatment plot, approximately 2 times that of the control plot (-0.85MPa). By this time PAW from 0-11 m deep had declined by 55%, and LAI by 13%, in the treatment relative to the control plot. A response in Y_p of similar magnitude was observed during the following dry seasons (2002/03), even as PAW became further depleted. LAI was 25% lower in the treatment than control plot during the 2003 dry season. Surprisingly, Y_p has consistently recovered to background levels in treatment plot during each subsequent wet season. In addition to reducing total LAI, trees in the treatment plot have produced smaller leaves, and we have detected some evidence of water uptake via leaf surfaces, suggesting some mechanisms this vegetation relies on to cope with drought stress.

34.5-P: Efeitos do estresse hídrico sobre a condutividade hidráulica foliar do xilema em *Coussarea racemosa* e *Eschweilera pedicellata* em uma área de floresta tropical úmida amazônica.

Williams Martins Castro, UFPA-IPAM, williams@ibaeco.com.br (Apresentador / Presenting)

Gina Knust Cardinot, UFRJ-IPAM, cardinot@ipam.org.br

Daniel Curtis Nepstad, IPAM- Woods Hole Research Center, dneptad@whrc.org

N. Michele Holbrook, Harvard University, holbrook@oeb.harvard.edu

Variantes ambientais como a estação seca prolongada, interferem diretamente nos padrões fisiológicos das plantas, entre eles a condutividade hidráulica do xilema. Sob condições de estresse hídrico surgem agravantes físicos como o fenômeno de cavitação. Estudos recentes têm demonstrado que espécies arbóreas da Amazônia têm alta tolerância à seca. Contudo tem-se igualmente observado que, sob estresse hídrico, há alterações significativas na produção e na queda de folhas. Segundo a teoria de segmentação, as folhas seriam as estruturas com maior vulnerabilidade à cavitação. Por outro lado, a manutenção dos processos vitais, sobretudo a fotossíntese, dependeriam da condutividade da água através de seus vasos. Por este motivo torna-se importante entender: (1) a que nível de estresse hídrico as folhas começam a perder condutividade; (2) quais espécies têm maior vulnerabilidade à cavitação. Nossa hipótese é que espécies de sub-bosque tenha menor vulnerabilidade à cavitação. Com o objetivo de determinar parte da capacidade da floresta de resistir à seca, foi aliada a condutividade hidráulica foliar (KL) de duas espécies frequentes na área de floresta primária da Floresta Nacional do Tapajós-Pará: *Coussarea racemosa* (Rubiaceae) e *Eschweilera pedicellata* (Lecythidaceae), espécies de sub-bosque e dossel, respectivamente. Parâmetros de relações hídricas estão sendo gerados utilizando a curva de pressão e volume de cada espécie. Equacionando estes parâmetros, é possível a determinação do KL em um gradiente de estresse hídrico, identificando o ponto de restrição de KL que resulta no fechamento estomático. Estamos na fase final de coleta de dados e objetivamos compará-los aos dados coletados dentro do experimento Seca Floresta, permitindo uma melhor compreensão dos efeitos da seca sobre a floresta e suas estratégias de tolerância a este distúrbio.

34.6-P: Dry events, forest fires occurrences, Human displacement in Amazon and changes in carbon cycle during the upper Holocene

Renato Campello Cordeiro, Programa de Geoquímica UFF, rccordeiro@geoq.uff.br (Apresentador / Presenting)

Bruno Turcq, IRD/UFF, bturcq@geoq.uff.br

Abdelfettah Sifeddine, IRD, sifeddin@umich.edu

In this work, we present evidences of fire occurrences during the Late Holocene recorded in two regions of the Amazon basin Carajas (PA) and Manaus (AM). These data will be compared with existing palynological and archeological records in Amazonia and CO₂ record in Taylor Dome Antardida. In Carajas region charcoal deposition were estimated in lacustrine sediment records from South and North plateaus. In Manaus biomass and radiocarbon measurements of soil charcoal samples were investigated in a transect from upland to lowland areas of a tropical forest reserve. The fluxes of charcoal in the Lake N4 of the North Carajás plateau suffer increase at 1260, 730, 320-430, 140 yr 14C BP. High microcharcoal particles sedimentary fluxes were also observed in two cores of South Carajas plateau: in the lake 9, peaks of microcharcoal accumulation were observed at 1570, 930-820, 670 yr 14C BP. In the Lake 8, peaks were observed at 1040, 830-730 and 150 yr 14C BP. In the records obtained through quantification of the biomass and datation of the soil charcoals in the Manaus region, high charcoal biomass was dated at 1430, 1170, 890-340 yr 14C BP. Absy in a palynological study of five Amazon watershed lakes, showed the occurrence of dry periods in the latte Holocene sediments at around 4500 yr 14C BP, 2100 yr 14C BP, 1400 yr 14C BP and 1200 yr 14C BP, a marked dry phase around 700 yr 14C BP and a minor phase around 400 yr 14C BP. Archaeological studies across the Amazonian lowlands show discontinuities in cultural sequences, represented by different ceramic traditions at ca. 1400, 900, 650, 500 yr 14C BP. These events were coincident with changes in the CO₂ variations recorded in Antartica ice core in the upper Holocene.

34.7-P: Evaluation of Observing and Modeling requirements for the Balanço Atmosférico Regional de Carbono na Amazônia (BARCA) Project

Scott A. Denning, Colorado State University, denning@atmos.colostate.edu (Apresentador / Presenting)

Marek Uliasz, Colorado State University, marek@atmos.colostate.edu

Marcos Longo, Universidade de São Paulo, marcos@master.iag.usp.br

Saulo Ribeiro de Freitas, Universidade de São Paulo, sfreitas@cptec.inpe.br

Ian Baker, Colorado State University, baker@atmos.colostate.edu

Pedro Leite Silva Dias, Universidade de São Paulo, pldsdias@master.iag.usp.br

Maria Assunção Faus da Silva Dias, Universidade de São Paulo, assuncao@cptec.inpe.br

A study of basin-wide carbon balance for Amazonia (Balanço Atmosférico Regional de Carbono na Amazônia -- BARCA) is being planned, involving systematic observations of variations of trace gas mixing ratios, simulation analysis of atmospheric transport, and regional flux estimation by inverse methods. In addition to proposed campaign observations to be made by aircraft, a longer-term program of ongoing trace gas measurements may provide information about the time-mean carbon budget. We have conducted a series of observing system simulation experiments using a coupled model of meteorology, atmospheric transport, and surface exchanges of energy/water/carbon (SiB-BRAMS). Observations of atmospheric trace gas mixing ratio were simulated in the model by releasing imaginary "particles" into an adjoint of the simulated transport field using a Lagrangian Particle Dispersion Model (LPDM) driven from the SiB-BRAMS meteorology. Backward-in-time transport was calculated by the LPDM from each hypothetical sample according to model parameterizations of advection, turbulence, and vertical motion associated with both deep and shallow convective clouds. Samples were specified hourly from each LBA eddy covariance site, twice weekly as profiles from two locations (Santarem and Fortaleza) using light aircraft, and weekly from the existing global flask network. Results show that time-mean fluxes over much of the Amazon Basin can be strongly constrained by such a sampling network, but highlight uncertainties associated with model transport and the treatment of diurnal and synoptic variations of surface fluxes. An analytical framework is recommended in which surface fluxes are divided into components due to photosynthesis, ecosystem respiration, and a time-mean flux by unspecified processes. Balanced component fluxes due to photosynthesis and respiration can be constrained using eddy covariance data, satellite imagery, and regional meteorology, and time-mean fluxes constrained by observed variations in atmospheric composition. Transport model error, especially related to turbulent and convective processes, must also be treated in the analysis.

34.8-P: The effect of warming on tropical forest gas exchange.

Chris Eric Doughty, UC Irvine, cdoughty@uci.edu (Apresentador / Presenting)

Michael L. Goulden, UC Irvine, mgoulden@uci.edu

Further research is required to understand the sensitivity of tropical forest to climate warming. Previous research has shown that tropical forest photosynthesis decreases and respiration increases at high leaf temperatures and that tree growth is reduced in years with higher average air temperatures (Clark et al 2003). Models indicate that the climate related destruction of the Amazon forest will amplify global warming by 1.5° C, resulting in a mean temperature increase of 5.5° C, as compared with 4° C without this carbon cycle feedback (Cox et al 2000). These studies demonstrate the importance of temperature on tropical forest gas exchange. I propose research within NASA's LBA experiment to better understand how tropical forests respond to high temperatures at several spatial and temporal scales. I propose field measurements at the LBA Tapajos km 83 site to determine what controls tropical leaf temperature and how temperature affects photosynthesis and respiration. I will conduct a warming experiment that will raise the temperature of leaves by 2°-3°, and will allow me to determine if leaves acclimate to higher temperatures. I will compare the results of the leaf level studies to data from a nearby eddy flux tower to determine if the response to temperature is similar at both the leaf and canopy levels. I will use MODIS Land Surface Temperature images to quantify the spatial and seasonal patterns of forest temperatures and see whether deforestation warms nearby intact forests. Finally, I will incorporate the results of these studies into the CLM (common land model) to determine how warming affects tropical forest CO₂ and water vapor exchange.

34.9-P: Variação Sazonal da Área Foliar em Três Extratos da Floresta Amazônica na Região de Sinop

João Areis Ferreira Barbosa Jr., UFMT, johnareis@pop.com.br (Apresentador / Presenting)

Francisco de Almeida Lobo, UFMT, f_a_lobo@cpd.ufmt.br

Vinícius Buscioli Capistrano, UFMT, vinibc@cpd.ufmt.br

Segundo Durval Pereira Rezende, UFMT, floresteiro3@pop.com.br

Eduardo Jacusiel Miranda, UFMT, aquaviva@zaz.com.br

Marcelo Sacardi Biudes, UFMT, biudes@cpd.ufmt.br

O índice de área foliar de todo o dossel da floresta amazônica, na região de Sinop-MT, varia sazonalmente com o regime hídrico, alcançando valores em torno de 6,0 em dezembro, no período chuvoso, e em torno de 2,5 em julho, no período da seca. Essa variação sazonal, contudo, não é proporcionalmente uniforme na estrutura vertical do dossel. Assim sendo, a contribuição dos extratos situados nas camadas inferiores (entre 1 e 10 m e entre 10 e 20 m) sobre o índice de área foliar global aumenta no período da seca, chegando a ser de 66,9% do total, enquanto que diminui a do extrato superior (entre 20 e 28 m de altura), o qual no período das chuvas alcança valores de 50,5% do total. Porém, dado a que o extrato superior é aquele que sempre primeiramente é atingido pela radiação solar, a interceptação da radiação fotossinteticamente ativa que nele ocorre é sempre superior às dos demais extratos, variando de 74% em julho a 94% em dezembro.

34.10-P: Medição de Área Foliar Através da Reflectância Espectral em Espécies Diversificadas na Floresta Nacional do Tapajós, Santarém-Pará - Brasil

Daniel Nunes Figueiredo, LBA-eco, danielnunes@lbaeco.com.br (Apresentador / Presenting)

Kleber da Costa Portilho, LBA-eco, kleber@lbaeco.com.br
Marcos Heil Costa, LBA-eco, mhcosta@ufv.br

A composição e estrutura de um ecossistema dependem basicamente da taxa de acúmulo de carbono (produção primária líquida) e da taxa de mortalidade. A camada florestal é mantenedora do imenso ecossistema nela existente e sua conservação implica no acúmulo do carbono que é sensível a vários fatores de controle dentre elas: clima, topografia, solos, plantas, características microbianas, distúrbios, e impactos antropogênicos. Uma vez que o cenário mais provável nas próximas décadas apresenta fortes modificações no meio ambiente global (incluindo aumento de CO₂ e outros gases-traço na atmosfera, mudanças climáticas e intensificação dos impactos do homem), supõe-se que essas alterações causem importantes modificações na composição, estrutura e distribuição dos ecossistemas pelo planeta. Considerando o exposto, o presente trabalho tem como objetivo principal determinar a distribuição espacial da produção primária líquida de uma floresta tropical amazônica na estação seca. O sítio experimental da floresta tropical Amazônica localiza-se na Floresta Nacional (Flona) do Tapajós, pertencente ao IBAMA em Santarém (PA), próximo à confluência dos rios Tapajós e Amazonas. No km 67 desta rodovia, está a entrada para o local onde existem duas torres instaladas, sendo uma micrometeorológica e a outra de observações para medições complementares. Nesta área foram selecionadas aproximadamente 1.400 árvores sem cultura específica em ambiente sem modificação, que serão analisadas durante 6 meses. As medidas do índice de área foliar e da reflectância espectral das diversas culturas florestais estão sendo analisadas através do Plant Canopy Analyser LAI-2000, instrumento utilizado para medição sendo feito coletas mensais com três equipamentos em pontos diferentes, uma unidade fixa acima do dossel e duas unidades móveis abaixo do dossel. Após ter os dados coletados acima-dossel e do abaixo-dossel, a unidade de controle executa todos os cálculos e os resultados estão disponíveis para a inspeção no local imediata.

34.11-P: Recuperação e Valor de Resgate para o Seqüestro do Carbono Atmosférico em Ecossistemas Manguezais

Sérgio Mattos Fonseca, APREC Ecossistemas Costeiros, sergiomf@usp.br (Apresentador / Presenting)
Sonia MF Giancesella, USP Universidade de São Paulo, soniag@io.usp.br

A atenção sobre os possíveis efeitos provocados por mudanças no clima do planeta vem aos poucos ganhando destaque e atenção, deixando as páginas dos artigos científicos em direção ao noticiário mundial. Autoridades de todas as nações vêm se reunindo anualmente em conferências de partes da Convenção - Quadro das Nações Unidas em torno de estudos sobre cenários futuros e medidas de mitigação para o efeito estufa antrópico. A partir da reunião em Quioto (1997), na direção da consolidação de um mercado de comércio de certificados de redução das emissões de gases do efeito estufa, uma proposta brasileira procura estabelecer mecanismos para um desenvolvimento limpo. Dentre esses, o apoio a atividades de projetos sobre o uso do solo, sobre a mudança do uso do solo e florestamentos abre um leque de possibilidades para a recomposição de diversos biomas desflorestados em muito pelo crescimento da economia humana, desconhecendo as leis e a importância da economia da natureza que a contém.

Os manguezais são ecossistemas tipicamente tropicais estando representados em quatro continentes e seis regiões geográficas do planeta. As regiões de maior ocorrência são América Central e Caribe, Índia, Península da Indochina, Brasil e Austrália. Hoje em dia existe um incipiente reconhecimento por parte dos Estados e agências internacionais de fomento ambiental que os manguezais estão sendo destruídos de maneira inaceitável. Por outro lado, as comunidades tradicionais locais demonstram preocupação pela destruição dos recursos naturais dos quais eles dependem para garantir a sua subsistência. Para se harmonizar esses ideais busca-se um modelo de sistema de manejo, agregando conhecimentos científicos na busca da melhoria da qualidade dos manguezais, de sua população de entorno, e inserção da recuperação das florestas de manguezais na geração de créditos para o mercado de redução das emissões de gases do efeito estufa. O presente estudo pretende avaliar a contribuição para o seqüestro do carbono atmosférico dos ecossistemas de manguezais de forma holística, ou seja, considerando os componentes terrestre, aquático e atmosférico, com o objetivo de contribuir para a quantificação do valor sócio - econômico - ecológico desses ecossistemas.

34.12-P: Atmospheric CO₂ Budget over Amazon Basin: The Role of the Convective Systems

Valdir Inácio Herrmann, USP, valher@model.iag.usp.br (Apresentador / Presenting)
Saulo Ribeiro de Freitas, CPTEC-INPE, srfreitas@cptec.inpe.br
Robert Chatfield, NASA, chatfield@clio.arc.nasa.gov

This work studies the CO₂ budget in the atmosphere on Amazon basin focusing the role of the shallow and deep convective systems. The vertical redistribution of the CO₂ by these systems is numerically simulated using a Eulerian transport model coupled to a regional atmospheric model (RAMS). The transport model includes advection at grid scale, diffusion in the planetary boundary layer (PBL) and convective transport by sub-grid shallow and deep moist convection. We explore also two different approaches for the CO₂ biogenic surface fluxes. The simulation is carried out with 6 tracers whose mass conservation equation is resolved including or not the moist convective deep and shallow transport. In that way, the role of these systems is clearly showed. The rectifier effect is also depicted through the transport to the free troposphere of PBL air masses with low CO₂ concentration due to activity of assimilation by the vegetation in the period between the noon and end of the afternoon, when this process and the convective activity are in the apex. The model is applied to July 2001 with a 30 km grid resolution covering the north portion of the South America. For this case, we compare the model results with CO₂ observations collected on Amazon basin during CLAIRE experiment.

34.13-P: Ecosystem Demography Model (ED)

Paul R. Moorcroft, Harvard University, paul_moorcroft@harvard.edu
George Hurtt, University of New Hampshire, george.hurtt@unh.edu (Apresentador / Presenting)
Steve Pacala, Princeton University, steve@eno.princeton.edu

The Ecosystem Demography Model (ED) is a new terrestrial biosphere model designed to incorporate the effects of fine-scale physiological and ecological processes on large-scale ecosystem structure and function. The core of ED is a stochastic, individual-based, model of vegetation dynamics driven by climate, soil and land-use inputs. The growth,

mortality, and recruitment dynamics of individuals are specified from a mechanistic leaf-level description of carbon, water, and nitrogen fluxes. Coupled to the dynamics of the above-ground plant canopy are dynamics of decomposition, nitrogen cycling and hydrology. The components of ED draw heavily on established sub-models formulated over the past two decades and on published data. The large-scale behavior of the ecosystem is captured using a system of size and age-structured moment equations that approximate the mean behavior of the underlying stochastic processes operating within each grid cell. ED has been implemented over a region of tropical and sub-tropical South America (15N to 15S).

34.14-P: Ecosystems responses to seasonal variation and different land use in Amazon Basin using the isotope approach

Francoise Yoko Ishida, Esalq (CENA/USP), fyishida@cena.usp.br (Apresentador / Presenting)

Jean Ometto, CENA/USP, jpometto@cena.usp.br

Jim Ehleringer, University of Utah, ehleringer@biology.utah.edu

Tomas Domingues, University of Utah, domingues@biology.utah.edu

Luiz Antonio Martinelli, CENA/USP, martinelli@cena.usp.br

Plínio Barbosa de Camargo, CENA/USP, pcamargo@cena.usp.br

Joe Berry, University of Stanford, joeberry@stanford.edu

Edmar Mazzi, CENA/USP, eamazzi@cena.usp.br

Haroldo Jackson Silva, Federal Univesity of Para, haroldo@lbaeco.com.br

This study was conducted in four different sites in Santarém region (PA) that characterize two distinct physiological group of plants (C4 and C3) and different land use: pasture; primary forest, primary forest with logging, and primary forest with simulation of El Niño/La Niña events, respectively. Carbon and oxygen isotope ratio ($^{13}\text{C}/^{12}\text{C}$ and $^{18}\text{O}/^{16}\text{O}$) of CO_2 were measured in the canopy vertical profile, soil respiration (with and without litter), dead wood decomposition and leaf organic composition were also collected monthly during the year of 2003. Keeling plot technique and Farquhar's leaf model were used to distinguish the physiological drives to changes in the isotopic composition of the several components in the system as well as the response of this components associate to the land cover. The carbon isotopic ratio of the leaf organic matter was similar at lower canopy and understory in all forest sites, but upper canopy has shown heavier signal associated to the water exclusion treatment at the Seca, which reflects on the c_i/c_a ratio of these leaves. The seasonal variation of the respired CO_2 is higher than the forests intrasite comparison, and at the pasture (C4 grass) the variation can be associated to a neighbor forest. Litter input is an important component on the isotopic signal of the soil efflux CO_2 .

34.15-P: Modeling Studies of Carbon Cycling at the Tapajos National Forest using the NASA-CASA Ecosystem Model

Steven Klooster, California State University Monterey Bay, sklooster@mail.arc.nasa.gov (Apresentador / Presenting)

Christopher Potter, NASA Ames Research Center, cpotter@mail.arc.nasa.gov

Raimundo Cosme de Oliveira Jr., Embrapa Amazônia Oriental, Belem, Para, cosme@cpatu.embrapa.br

Cláudio José Reis de Carvalho, Embrapa Amazônia Oriental, Belem, Para, carvalho.bel@terra.com.br

Marc Kramer, California State University Monterey Bay, mkramer@mail.arc.nasa.gov

The NASA-CASA model is being compared to measurements of energy, water, and carbon exchange at Tapajós National Forest (TNF) tower sites. Daily and monthly model estimates of plant water flux and soil water content, ecosystem productivity, biogeochemical processes, trace gas emissions, and net carbon sequestration are evaluated here for prediction errors and seasonal trends. High resolution (< 1-km) land cover images for 'footprint' areas of LBA tower sites are being used to define ecosystem model estimates and validation of predictions against measured tower fluxes of carbon and water exchange. Potential linkages to field measurements of aqueous carbon export from the TNF watershed are presented.

34.16-P: Annual carbon cost of stem CO_2 flux in an old growth tropical forest

Evilene Lopes, Complex System Research Center, Institute for the Study of Earth, Ocean and Space, University of New Hampshire, Durham, NH, USA, evilene@kaos.sr.unh.edu (Apresentador / Presenting)

Patrick Michael Crill, Department of Geology and Geochemistry, Stockholm University, Stockholm, Sweden, patrick.crill@unh.edu

Michael M. Keller, USDA Forest Service, International Institute of Tropical Forestry, Rio Piedras, Puerto Rico, michael.keller@unh.edu

Ruth Varner, Complex System Research Center, Institute for the Study of Earth, Ocean and Space, University of New Hampshire, Durham, NH, USA, Ruth.varner@unh.edu

In woody stems, CO_2 is a product of metabolism in the living cells of the xylem parenchyma, cambium and phloem. Stem CO_2 efflux is an important component of the carbon balance of an ecosystem. Total respiration, including the foliage and soil components, would be expected to nearly equal photosynthesis in a mature forest. Stem CO_2 flux was measured at the Tapajos National Forest (TNF) using dynamic chambers and an infrared gas analyzer (IRGA) system. The average efflux of stem CO_2 for the Tapajos National Forest (TNF) was 1.72 (± 1.36) $\mu\text{mol m}^{-2}$ (wood) s^{-1} . Stem respiration was scaled to a ground area basis using wood surface area. Surface area was estimated during the dry season of 2003 on selectively logged trees at the km 83 site of TNF. We measured 90 fallen trees with diameter at breast height varying between 15 and 150 cm. We approximated the area of bole to a frustum of a cone and used diameter of the tree base, top, and height of tree bole. For the trees selected wood surface area resulted in a wood area index of 0.7 m^{-2} wood/ m^{-2} ground. The above-ground woody-tissue CO_2 flux estimated for the TNF is 456 gC m^{-2} (ground) yr^{-1} using stem surface to extrapolate the fluxes. This represents between 15% - 20% of the gross photosynthesis in this ecosystem.

34.17-P: The influences of mesoscale circulations and River CO₂ effluxes on regional carbon balance in the Tapajos Region, Para, Brazil.

Lixin Lu, Department of Atmospheric Science, Colorado State University, lixin@atmos.colostate.edu (Apresentador / Presenting)

Scott A. Denning, Department of Atmospheric Science, Colorado State University, denning@atmos.colostate.edu

Maria Assução Faus da Silva Dias, CPTEC & University of Sao Paulo, assuncao@cptec.inpe.br

Pedro Leite Silva Dias, CPTEC & University of Sao Paulo, pldsdi@master.iag.usp.br

Marcos Longo, University of Sao Paulo, marcos@master.iag.usp.br

Saulo Ribeiro de Freitas, University of Sao Paulo, sfreitas@cptec.inpe.br

Jeffrey E. Richey, university of Washington, jrichey@u.washington.edu

Sassan Saatchi, NASA JPL, saatchi@congo.jpl.nasa.gov

We have investigated mesoscale variations of atmospheric CO₂ over a heterogeneous landscape of forests, pastures, and large rivers during Santarem Mesoscale Campaign (SMC) during August 2001. We simulated the variations of surface fluxes and atmospheric concentration of CO₂ using the CSU Regional Atmospheric Modeling System (RAMS) on a 4-level nested grids which including a 1-km finest grid centered on the Flona Tapajos. Surface fluxes of CO₂ were prescribed in the model using idealized diurnal cycles over forest and pasture vegetation, and over surface water using a value suggested by in-situ measurements in the Amazon river. Heterogeneous vegetation types were derived from the 1-km International Geosphere-Biosphere Programme (IGBP) land-cover dataset version 2.0. Our simulation ran from 1 through 15 August 2001, which was concurrent with our SMC. The model evaluation against flux tower observations and SMC field measurements shows that, in many aspects, our model is doing good job of simulating observed meteorological variables and CO₂ concentrations. The results also demonstrated that the local topography and landscape features, along with the differences in roughness length between water and land, the "T" shape juxtaposition of Amazon and Tapajos Rivers, and the resulting horizontal and vertical wind shears, all facilitated the generation of local mesoscale circulations. The mechanisms producing the lower level convergence line on the east bank of Tapajos River during the strong trade-wind days is also explored. Meanwhile, we investigated the effects of surface water CO₂ effluxes on the regional carbon balance. The simulations with and without specifying CO₂ fluxes from the rivers and inundated land were performed. The result demonstrated that surface water CO₂ fluxes modifies simulated CO₂ concentrations, especially at night. Our modeling study not only help us to understand the current debate on the role of Amazon as carbon sources and sinks, but also help us to evaluate and identify the possible sources and systematic bias of aircraft and tower measurements.

34.18-P: Understanding the effects of drought upon carbon allocation and cycling in tropical forest.

Daniel Metcalfe, University of Edinburgh, U.K., d.b.metcalfe@sms.ed.ac.uk (Apresentador / Presenting)

Tropical forests form an important component of the global climate system. The drastic rise in atmospheric CO₂ since the industrial revolution has been partially offset by an increased rate of carbon accumulation in plants. However, additional global warming and drought may cause large areas of forest to become a net source of CO₂. Future climate forecasts depend largely upon the response of forests to climate change, in terms of carbon dynamics. A key uncertainty is how drought will affect the amount and distribution of carbon within ecosystems, and what any changes may mean for the overall flux of CO₂ into the atmosphere.

My research aims to quantify the amount of carbon stored in different components of a tropical forest, and the pattern of carbon transfer between components. The effects of drought will be inferred by comparing a one hectare plot where rainfall has been excluded with a similar, but un-droughted, control plot at an undisturbed Amazonian rainforest site. This information will be used to generate a model of ecosystem carbon cycling under droughted and normal conditions. The model results will advance our understanding of the interactions between the terrestrial biosphere and climate, and improve current estimates of future atmospheric CO₂ levels.

34.19-P: First results from a new high precision trace gas analysis system for air analysis within Brazil

John Miller, NOAA/CMDL, john.b.miller@noaa.gov (Apresentador / Presenting)

Luciana Vanni Gatti, LQA/IPEN, lvaggi@net.ipen.br

Andrew Crotwell, NOAA/CMDL, Andrew.crotwell@noaa.gov

Pieter Tans, NOAA/CMDL, pieter.tans@noaa.gov

Paulo Artaxo, Institute of Physics, USP, artaxo@if.usp.br

Monica Tais Siqueira D'Amelio, LQA/IPEN, monicatais@yahoo.com

Since December 2000 we have measured vertical profiles of CO₂, CH₄, CO, H₂, N₂O, SF₆, δ¹³C and δ¹⁸O above Santarem and Fortaleza. Samples are collected aboard light aircraft between the surface and either 4 km (Santarem) or 5 km (Fortaleza) using the NOAA/CMDL portable flask package (PFP). The PFP's are sent from Boulder, Colorado to Brazil, where they are filled, and then sent back to Colorado for analysis.

Starting in May 2004, non-isotopic species from these samples will be measured routinely in Brazil. This change in strategy was necessary to increase the frequency of measurements, which was severely hampered due to problems inherent in shipping samples between Brazil and the United States. In order to accomplish this, Dr. Luciana Gatti from IPEN visited NOAA during July and August of 2003 to begin the process of building a replica of the NOAA/CMDL trace gas analysis system. That system was completed in 2003 and recently arrived in Brazil where it will soon be installed. During tests of the system at NOAA, the precision of measurements obtained met or exceeded those of the original system. Specifically, the analytical precision is as follows: CO₂, 0.03 ppm; CH₄, 1.5 ppb; CO, 1.3 ppb; H₂, 1.3 ppb; N₂O, 0.17 ppb; SF₆, 0.03 ppt.

Perhaps more important than the high analytical precision is the fact that the system is designed around rigorous calibration of all measurements to references directly traceable to the scales used by NOAA/CMDL. This helps to ensure that all the measurements made by the new Brazilian system will be compatible with the existing NOAA/CMDL measurements. As extra levels of quality control, the two labs will regularly measure air collected at the same time and the system in Brazil will routinely analyzed air from a high-pressure "surveillance" tank. This tank is a reference tank with known values for all trace gases that will be treated as an unknown, so that any systematic errors can be identified. The

final step in our plan to have all species analyzed in Brazil will be to have PFP's analyzed for isotopic ratios at USP/CENA, transferring technology from the University of Colorado, Stable Isotope Laboratory. We hope to start this by the end of 2004. Analyzing samples in Brazil and thus avoiding import and export of PFP's should allow us to dramatically increase the frequency of our measurements.

34.20-P: Ecophysiological distinction of plant functional groups in Central Amazonian primary forest

Tomas F. Domingues, Univ. of Utah, domingues@biology.utah.edu
Françoise Y. Ishida, Univ. São Paulo/CENA, yoko@lbaeco.com.br
Jean P.H.B. Ometto, Univ. of Utah, Univ. São Paulo/CENA, jpometto@cena.usp.br (Apresentador / Presenting)
Luiz Antonio Martinelli, Univ. São Paulo/CENA, zebu@cena.usp.br
Joseph A. Berry, Carnegie Institution of Washington, joeberry@stanford.edu
James R. Ehleringer, Univ. of Utah, ehleringer@biology.utah.edu

Plant communities influence carbon and water cycling through ecosystems by controlling photosynthetic and respiratory processes. In order to characterize photosynthetic gas exchange capacity of primary forest in Santarém PA, we have adopted a plant functional type approach consisting of four groupings: lianas at the top of the canopy, top canopy trees, mid canopy trees, and understory trees.

We characterized plants on the basis of different physiological characteristics, including leaf mass to area ratio (SLA), leaf nitrogen content (N_{area}) and leaf stable carbon isotope ratio ($d^{13}C$). In addition, we measured leaf photosynthetic characteristics, including the photosynthetic dependence on light, CO_2 , and relative humidity. These response curves were used to calculate maximum assimilation rates (A_{max}), stomatal conductance to water vapor (g), the ratio of internal to external carbon dioxide concentration (C_i/C_a). We used a Farquhar-based biochemical model to extract carboxylation rates (V_{cmax}) from the photosynthetic response curves.

SLA showed that liana and top tree groups are not different, but they differ from both mid trees and understory. SLA also showed that mid tree is different from understory. Identical pattern was obtained for $d^{13}C$ values. N_{area} showed no difference between liana and up tree, but both were different from mid tree and understory. N_{area} showed no difference between mid tree and understory groups. Liana was distinct from the other groups based on C_i/C_a values. The only possible distinction based on V_{cmax} , was top tree and understory. No distinction among functional groups could be made based on A_{max} and g.

34.21-P: Comparação de Dois Métodos Para Determinação da Radiação Fotossinteticamente Ativa Interceptada Pelo Dossel

Pedro Correto Priante, UFMT, pedropri@terra.com.br (Apresentador / Presenting)
Segundo Durval Pereira de Resende, UFMT, floresteiro3@pop.com.br
João Areis Ferreira Barbosa Jr., UFMT, johnareis@pop.com.br
Eduardo Jacusiel Miranda, UFMT, aquaviva@zaz.com.br
Vinicius Buscioli Capistrano, UFMT, vinibc@cpd.ufmt.br
Franco de Almeida Lobo, UFMT, f_a_lobo@cpd.ufmt.br
Nicolau Priante Filho, UFMT, nicolaup@terra.com.br
George Louis Vourlitis, CSUSM, georgev@csusm.edu

A quantificação da radiação fotossinteticamente ativa (RFA) interceptada pelo dossel é empregada na determinação do coeficiente de extinção, do índice de área foliar, da eficiência no uso da radiação e em análises das alterações nas propriedades físicas e morfológicas das folhas para adaptação à luz. Assim, métodos exatos e práticos para tal quantificação contribuem, em muito, para a obtenção de resultados fiéis à realidade. No método clássico, tem-se o registro contínuo das densidades de fluxo fotossinteticamente ativo instantâneos (DFFA) que chegam nos limites superior e inferior do dossel, que se queiram considerar. Um método alternativo, sugerido por Charles-Edwards e Lawn (1984), permite estimar a radiação interceptada pelo dossel, com apenas uma determinação pontual das DFFA's nos limites do dossel considerados, realizada exatamente ao meio dia solar. Esse método alternativo possibilita o estudo de casos particulares, com deslocamento dos aparelhos de medição para mais de um ponto de observação, aumentando a praticidade do sistema. O objetivo deste trabalho foi o de comparar os resultados obtidos pelos dois métodos para o dossel da floresta amazônica, na região de Sinop-MT, durante o ano de 2003. Neste caso particular, não se verificou qualquer similaridade entre os resultados obtidos pelos diferentes métodos, quer seja considerando a interceptação da RFA pelo dossel como um todo, quer seja considerando apenas os extratos de 20 a 28 m, 10 a 20 m e 1 a 10 m de altura. Conclui-se que, para a floresta, ainda o método clássico permanece como sendo aquele a deva ser tomado como referência.

34.22-P: Fraction of Photosynthetically Active Radiation Absorbed by Amazon Tropical Forest: A Comparison Among Estimates Based on in situ Measurements, Modeling and Remote Sensing.

Mônica Carneiro Alves Senna, Universidade Federal de Viçosa, monica@vicosu.ufv.br (Apresentador / Presenting)
Marcos Heil Costa, Universidade Federal de Viçosa, mhcosta@ufv.br (Apresentador / Presenting)

In this work we compare three different estimates of the fraction of absorbed photosynthetically active radiation (FAPAR) by an Amazonian tropical rain forest. The estimates are based on in situ measurements, modeling and remote sensing. The field measurements were taken in the Tapajós National Forest, Santarém, State of Pará, Brazil. The model used is IBIS, which simulates the fluxes in the soil-vegetation-atmosphere system considering two vegetation layers. The monthly FAPAR product of MODIS, from Boston University, is used. FAPAR based on field observations is calculated from incoming and reflected PAR measurements taken above the canopy, and downward PAR at 15 m height, and is corrected to be representative of the entire canopy. The annual mean value obtained from these field measurements is 0.91. FAPAR simulated by IBIS has an average value of 0.76. The average FAPAR estimated by MODIS is 0.85. The in situ measurements are consistent with the literature. The values obtained by

IBIS, although smaller than the other two, agree with the results of another similar model, the Common Land Model.

34.23-P: Evaluation of Multi Sensor Satellite Data for Macrophyte Population Assessment at the Amazon Floodplain

Thiago Sanna, INPE - Instituto Nacional de Pesquisas Espaciais, thiago@ltd.inpe.br (Apresentador / Presenting)
Evelyn Márcia Leão de Moraes Novo, INPE - Instituto Nacional de Pesquisas Espaciais, evlyn@ltd.inpe.br
André Lima, INPE - Instituto Nacional de Pesquisas Espaciais, andre@ltd.inpe.br

Wetland ecosystems nowadays have been attracting increasing attention from the scientific community, due to its peculiar ecological features, and specially to its function in the global carbon cycle. The Amazon river floodplain is one of the most extensive areas of wetlands in the planet, being responsible for significant contribution to the global methane flux to the atmosphere. Currently, the accomplishment of more accurate estimates of CH₄ emission is limited by the uncertainties resulting from little knowledge concerning the sazonal and interannual dynamics of the flooded areas and its habitat types. It is known, however, that areas of macrophyte growth present some of the highest methane emission values. Considering the overwhelming dimensions of the water bodies in the Amazon floodplain, the use of remote sensing data is presented as the most adequate tool for the study of macrophytes communities dynamics. With the advent of new sensor systems, such as MODIS and CBERS, new possibilities arise for mapping of such Amazon floodplain habitats. The combined use multiple sensor images, in different spectral bands and with different characteristics represents a promising strategy for addressing those questions. The present study aims to assess the use of three optical remote sensing systems (TM, MODIS, CBERS) for the detection and monitoring of macrophyte population. Field observations and multivariate statistical analysis will be applied for determining the influence of main sensor parameters, such as spatial, temporal and spectral resolution, in the sensor ability to differentiate macrophyte stands from diverse land cover types, and in estimating spatial and biophysical vegetation parameters.

34.24-P: Efeito da Exclusão Artificial de Chuvas no Fenômeno de Autopoda de Galhos em Perebea Mollis (Poepp. & Endl.) Huber Subsp. Mollis (MORACEAE).

Wanderley Rocha da Silva, IPAM, wanderley@ipam.org.br (Apresentador / Presenting)
Moacyr Dias-Filho, EMBRAPA, moacyr@cpatu.embrapa.br
Daniel Curtis Nepstad, WHRC, IPAM, dneptad@whrc.org

Perebea mollis, se destaca por apresentar o fenômeno da auto-poda de seus galhos, isto é, os galhos são perdidos naturalmente. Como a manutenção de galhos mais velhos pela planta é responsável pelo consumo de recursos, seria possível inferir que *P. mollis* use essa estratégia como economia, principalmente em períodos de estresse, como o estresse hídrico. O objetivo do presente estudo é comparar a auto-poda entre plantas de *P. mollis*, em áreas naturais, com e sem exclusão de chuvas. A área de estudo fica na FLONA do Tapajós, Pará. Selecionaram-se duas parcelas, sendo que em uma delas a chuva foi parcialmente excluída durante os meses de maior precipitação, com painéis plásticos localizados abaixo do dossel. Na outra parcela, não houve exclusão das chuvas. Para cada área de estudo, selecionamos três indivíduos semelhantes. A coleta dos galhos é feita quinzenalmente. A massa seca dos galhos auto-podados é determinada para cada árvore. Paralelamente a essa avaliação, acompanha-se a quantidade de água no solo (TDR) e são feitos estudos fenológicos nas plantas, com o auxílio de torres. As avaliações iniciaram em julho de 2002. Os dados coletados até agora permitem inferir que a intensidade do fenômeno da auto-poda estaria positivamente relacionada com diminuição da incidência das chuvas na área o que aumentaria o déficit hídrico sofrido pela planta.

34.25-P: Estimating scalar sources, sinks and fluxes in tropical forests using inverse models

Mario B. Siqueira, Nicholas School of the Environment and Earth and Oceans Sciences, Duke University, mbs4@duke.edu (Apresentador / Presenting)
Humberto Ribeiro da Rocha, Departamento de Ciências Atmosféricas, Universidade de Sao Paulo, humberto@model.iag.usp.br
Michael L. Goulden, Department of Earth System Science, University of California Irvine, mgoulden@uci.edu
Scott Dennis Miller, Department of Earth System Science, University of California Irvine, sdmiller@uci.edu
Renato Ramos da Silva, Department of Civil and Environmental Engineering, Duke University, renato@duke.edu
Katul G. Gabriel, Nicholas School of the Environment and Earth and Oceans Sciences, Duke University, gaby@duke.edu

The estimation of scalar source and sink distribution and vertical fluxes within canopies is critical to quantifying biosphere-atmosphere mass and energy exchange rates. Direct measurements of the source/sink strength are impractical at scales larger than a single leaf. On the other hand, measurements of scalar concentration profiles are routinely performed in many field experiments. Since scalar source/sink distributions are directly related to scalar concentration by continuity and turbulent transport equations, "inverse modeling" can be used to infer these distributions from the routinely measured mean scalar concentration profile. Over the past decade, several inverse models have been proposed and utilized Lagrangian, Eulerian, and hybrid approaches. Although these models have been successfully used in temperate and boreal forests, they were not tested for tropical forests known to have complex canopy morphology and strong density gradients within the canopy. Measurements suggest that in closed tropical forests, a persistent stable layer near the forest floor exists. The dynamics of this layer presents a major challenge for these inverse models given that they were originally derived for neutral atmospheric stability with semi-empirical corrections to boundary conditions for non-neutral stability. This shortcoming was addressed theoretically via a revised Eulerian approach for heat exchange; however, this approach has not been extended to other scalars. Here, we propose to extend and test this Eulerian method to water vapor and CO₂ using data collected at LBA FLONA Tapajós Logged Forest Tower Site in Santarem, PA, Brazil. This site was chosen because of the availability of long-term temperature, water vapor, and CO₂ concentration profiles along with fluxes of CO₂, latent heat and sensible heat.

34.26-P: Resposta do índice de área foliar à radiação fotossinteticamente ativa refletida pelo dossel de ecótono floresta tropical úmida cerrado

Jonas Spolador, UFMT, jonaspolador@ig.com.br (Apresentador / Presenting)

Luciana Sanches, UFMT, lsanches@hotmail.com

Vinicius Buscioli Capistrano, UFMT, vinibc@cpd.ufmt.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

George Louis Vourlitis, CSUSM, georgev@csusm.edu

O presente trabalho teve o objetivo de verificar a resposta do índice de área foliar e da produção de liteira em uma floresta de transição em Sinop-MT e a sua relação com a radiação fotossinteticamente ativa incidente e a refletida pelo dossel.

As experiências foram realizadas no sítio experimental próximo da Cidade de Sinop, Norte de Mato Grosso (11°24.75'S: 55°19.50'O), em uma região de transição entre a floresta tropical úmida e o cerrado. Essa região apresenta uma precipitação média anual de 2000 milímetros, com uma estação seca de junho a setembro, e uma estação chuvosa de dezembro a fevereiro. Foi construída uma torre de 41 m de altura onde foram instalados equipamentos de medidas micrometeorológicas, coletadas por um sistema de aquisição de dados e as médias de 30 min armazenadas em módulos de memória, no período de janeiro a dezembro de 2003. Quinzenalmente os dados desses módulos foram coletados e transferidos para planilhas eletrônicas para serem analisados. As medidas de radiação PAR incidente no dossel (PARi) e a refletida pelo mesmo (PARr) foram feitas a 41 m de altura. Aproximadamente a 100m da torre, houve o acompanhamento da produção de liteira empregando-se 20 coletores de 1 m² cada, com coletas efetuadas semanalmente. As amostras foram separadas em folhas, galhos, flores e frutos, e determinadas suas respectivas massas secas. Estimou-se o índice de área foliar pela Lei de Beer, através dos dados obtidos pelos sensores PAR.

As análises indicaram que o IAF e a produção de liteira em pontos diferentes da área de estudo não apresentaram uma resposta à radiação fotossinteticamente ativa refletida pelo dossel.

34.27-P: Drought Effects on Plant Mortality, Forest Structure, and Dead Biomass Pools in an Eastern-Central Amazonian Rainforest: Results of a Partial Throughfall Exclusion Experiment

Ingrid Marisa Tohver, Instituto de Pesquisa Ambiental da Amazonia, marisa@ipam.org.br (Apresentador / Presenting)

David Ray, Woods Hole Research Center, dray@whrc.org

Daniel Curtis Nepstad, Woods Hole Research Center, dneptad@whrc.org

Paulo Roberto Moutinho, Instituto de Pesquisa Ambiental da Amazonia, moutinho@ipam.org.br

Elevated levels of plant mortality in tropical rainforests provoked by severe droughts during El Niño years has important implications for the global carbon cycle due to substantial carbon stores in their biomass. This study reports on plant mortality (stems ≥ 2 cm dbh) following four years of simulated drought in a throughfall exclusion experiment in an east-central Amazon forest. Fifty percent of incoming precipitation was excluded from the soil of an 1-ha dry plot (D) during the 6 month wet season, and was compared to the 1-ha wet plot (W). Plant available water in the upper 11 m of the soil profile was reduced to <10% of capacity in the D plot. Community wide mortality rates, 2.72% yr⁻¹ (W) and 3.77 % yr⁻¹ (D), indicate a 38% increase due to the treatment (P<0.001). Trees ≥ 30 cm dbh endured higher levels of drought-induced mortality (W=1.74% yr⁻¹, D=9.47% yr⁻¹; P=0.005) than stems 2-5 cm dbh (W=2.77% yr⁻¹, D=3.16% yr⁻¹; P=0.126). Woody vines suffered higher drought-induced mortality rates (W=3.78% yr⁻¹, 6.78% yr⁻¹; P=0.004) than either trees or palms. Mortality rates of overstory canopy tree species were over twofold in the dry plot (W=1.75% yr⁻¹, D=3.80% yr⁻¹; P<0.001), whereas mid-canopy and understory species remained unaffected. Stems ≥ 10 cm dbh accounted for 90% of the pre-treatment live aboveground biomass in both plots (278 Mg ha⁻¹). Our measurements indicate that drought-induced mortality of large trees resulted in a net increase of 7.0 Mg C ha⁻¹ yr⁻¹ (~5% of aboveground standing biomass) of committed emissions to the atmosphere.

34.28-P: Modeling optimum temperature of leaves of canopy tree species in the Central Amazon

Edgard Siza Tribuzy, ESALQ/CENA/USP-INPA, estribuzy@yahoo.com.br (Apresentador / Presenting)

Jeffrey Quintim Chambers, University of Tulane, chambers@tulane.edu

Susan E. Trumbore, University of California - Irvine, setrumbo@uci.edu

Plínio Barbosa de Camargo, CENA, pcmargo@cena.usp.br

Cristina Aledi Felseburgh, INPA, crisalefel@hotmail.com

Tatiane da Silva Reis, INPA, tatis_reis@hotmail.com

Niro Hguchi, INPA, niro@inpa.gov.br

Joaquim dos Santos, INPA, joa@inpa.gov.br

In this study we present the leaf photosynthetic responses to CO₂ (Ci), temperature (T) and light (PAR) (A-Ci-T-PAR) curves for top in canopy trees within the Experimental Station of Tropical Forest (ZF-2) of National Institute of Amazon Research (INPA) at 70 km north of Manaus. Measurements were performed with the Licor photosynthesis system LI -6400. The optimum temperature (Topt) for photosynthesis was defined using the Farhquar's model. The results have shown that mean value for the optimum temperature is 30.83 Celsius (oC), with a maximum of 36.64 oC and a lower of 25.45 oC. The stand variation for the analysis is 2,59.

34.29-P: Can satellite images track the seasonal dynamics of leaf emergence, leaf aging and litterfall in seasonal tropical evergreen forests?

Xiangming Xiao, University of New Hampshire, xiangming.xiao@unh.edu (Apresentador / Presenting)

Qingyuan Zhang, University of New Hampshire, qzhang@eos.sr.unh.edu

Lucy Hutyrá, Harvard University, lhutyra@fas.harvard.edu

Scott R. Saleska, Harvard University, saleska@fas.harvard.edu

Plínio Barbosa de Camargo, Universidade de Sao Paulo, pcmargo@cena.usp.br

Stephen Boles, University of New Hampshire, stephen.boles@unh.edu
Steven C. Wofsy, Harvard University, scw@io.harvard.edu
Berrien Moore III, University of New Hampshire, b.moore@unh.edu

Seasonal dynamics of net ecosystem exchange of CO₂ between tropical forests and the atmosphere is determined by the seasonal dynamics of photosynthesis and ecosystem respiration. A recent CO₂ eddy flux study suggested that seasonal wet-dry tropical evergreen forest had high gross primary production (GPP) in late dry season (Saleska et al., 2003). Our hypothesis is that the forest evolves two adaptive mechanisms (deep roots and leaf phenology) under the environment of large seasonal dynamics of light (Xiao et al., 2004). Tropical evergreen forests have abundant species composition and complex structure, which makes it difficult to conduct ground observations of leaf phenology. Advanced optical sensors have provided systematic and consistent observations on the Earth since 1998. Here we investigated the potential of satellite images for tracking the seasonal dynamics of leaf phenology (new leaf emergence, leaf aging and leaf-fall) of seasonal tropical evergreen forest. We used 10-day composite images from the VEGETATION sensor onboard SPOT-4 satellite, and 8-day composite images from MODIS sensor onboard Terra satellite. We calculated Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI) and Land Surface Water Index (LSWI). We compare NDVI, EVI, and LSWI for the forest flux tower sites in the Amazon. Litterfall data are used to correlate with vegetation indices. We will also report a basin-wide analysis of vegetation indices with an objective to provide improved geospatial dataset of leaf phenology in Amazon basin, which would facilitate scaling-up of CO₂ flux data from eddy flux tower sites and evaluating process-based biogeochemical models.

34.30-P: Daily courses isotopic analysis of plant tissues and water vapor at Seca Floresta experiment, Santarem, PA.

Haroldo Jackson Silva, Universidade Federal do Pará, haroldo@lbaeco.com.br (Apresentador / Presenting)
Jean Ometto, CENA/USP, jpometto@cena.usp.br
James Ehleringer, University of Utah, ehleringer@biology.utah.edu
Luiz Antonio Martinelli, CENA/USP, martinelli@cena.usp.br
Joe Berry, university of Stanford, joeberry@stanford.edu
Francoise Yoko Ishida, ESALQ/CENA/USP, fyishida@cena.usp.br
Tomas Ferreira Domingues, University of Utah, domingues@biology.utah.edu
Edmar Mazzi, CENA/USP, eamazzi@cena.usp.br
Sebastiao Lopes, Universidade Federal do Pará, seblopes@yahoo.com.br

Several studies have shown a good tolerance of the Amazon forest to severe droughts, although a long deficit in the soil water content can induce significant stress and loss of productivity to the primary forests vegetation. Therefore, understanding the physiological responses to drought conditions is a challenge to pursue in tropical forests ecosystems. In this context, leaves and stems tissues were collected in the canopy profile in both drought and control plot of the Seca Floresta experiment. The oxygen isotopic composition (d18O) of the leaf water reflects the intensity of evaporation and stomata conductance to water when compared to the source water. The d18O of the source water can be identified through analysis of stem water, since no evaporation, and consequently isotopic fractionation, occurs during water uptake in plants. The expected results shall reflect different stomatal control on water loss among plants located in the dry and control experimental plots. In addition to that a seasonal variation on this response may occur. Preliminary results from the 2003 wet season showed just a slight difference between plots. Results from the dry season are being analyzed and more significant differences are expected to be found.

[CD_Micrometeorologia \(CD_Micrometeorology\)](#)

35.1-P: Fluxos de massa e de energia em área de reflorestamento, obtidos pelo método de covariância de vórtices turbulentos, a partir de diferentes tempos de amostragem

Renata Gonçalves Aguiar, Universidade Federal de Mato Grosso, rgaguiar@cpd.ufmt.br (Apresentador / Presenting)
Vinícius Buscioli Capistrano, Universidade Federal de Mato Grosso, vinibc@cpd.ufmt.br
João Areis Ferreira Barbosa Jr., Universidade Federal de Mato Grosso, johnareis@pop.com.br (Apresentador / Presenting)
Leonardo J. G. Aguiar, Universidade Federal de Rondônia, veraneiro@hotmail.com
Paulo Cesar Nunes, Programa das Nações Unidas para o Desenvolvimento, pnud@juruea.com
Nicolau Priante Filho, Universidade Federal de Mato Grosso, nicolaup@terra.com.br
José de Souza Nogueira, Universidade Federal de Mato Grosso, nogueira@cpd.ufmt.br
George L. Vourlitis, California State University, georgev@csusm.edu

A região amazônica tem despertado o interesse de pesquisadores que buscam entender a interação da biosfera-atmosfera e os impactos do desmatamento sobre o clima regional e/ou mundial. Um dos principais aspectos estudados pelo Programa Experimentos em Grande Escala na Biosfera-Atmosfera da Amazônia (LBA) são os fluxos de massa e energia em ecossistemas naturais e em ecossistemas que sofreram ação antrópica. O método de covariância de vórtices turbulentos é um dos mais utilizados para o cálculo dos fluxos turbulentos nos sítios experimentais do LBA. A partir dessas medidas estes fluxos são processados utilizando médias móveis com diferentes tempos de amostragem. Autores sugerem que para minimizar erros na estimação de fluxos turbulentos é necessário usar constantes de tempo mais longas. Com base nisso, a maior parte dos sítios experimentais do LBA têm efetuado os cálculos dos referidos fluxos com tempos de amostragem de 800 segundos. Entretanto, devido a limitações em softwares instalados em sítios experimentais do LBA em Mato Grosso, os artigos publicados com dados destes, utilizaram fluxos turbulentos processados com tempos de amostragem de 200 segundos.

Este trabalho teve por objetivo verificar se existem diferenças significativas quando os fluxos de dióxido de carbono, calor sensível e latente são processados com tempos amostragem de 200 e 800 segundos, com dados obtidos em uma área de pastagem que está sendo reflorestada, localizada em Cotriguaçu-MT, no período de março de 2002 a setembro de

2003. Para a comparação foi utilizado o teste T de Student para amostras pareadas a um nível de significância de 0,05. Os resultados indicaram que não houve diferenças significativas para os fluxos de dióxido de carbono e calor latente. Observou-se, entretanto, diferença significativa entre os fluxos de calor sensível.

35.2-P: Fluxos de CO₂ num Ecossistema de Manguezal em Bragança-PA

Vanda Sales Andrade, Universidade Federal de Viçosa-MG, vanda007@yahoo.com (Apresentador / Presenting)
Jose Maria Nogueira da Costa, Universidade Federal de Viçosa-MG, jmnrcosta@ufv.br
Antônio Carlos Lôla da Costa, Universidade Federal do Pará, lola@ufpa.br
Rommel Benicio Costa Silva, Universidade Federal de Viçosa-MG, rbcsilva@yahoo.com.br
Yadvinder Singh Malhi, IERM/UEdim, edimburgo, Escócia-UK, ymalhi@ed.ac.uk
Patrick Meir, IERM/UEdim, edimburgo, Escócia-UK, pmeir@ed.ac.uk
Julia Clarinda Paiva Cohen, Universidade Federal do Pará, jpc Cohen@ufpa.br

Medições de fluxos de CO₂ em ecossistemas de manguezal são ainda muito escassos. O objetivo deste trabalho foi de quantificar os fluxos de CO₂ durante o período diurno e noturno num ecossistema de manguezal no Estado do Pará. O sítio experimental está localizado no município de Bragança-PA (01°03'S; 46°45'W e 29m de altitude) a nordeste do Estado do Pará. As medições foram feitas continuamente durante vinte e quatro dias do mês de fevereiro de 2003, mês típico da estação chuvosa. Os fluxos de CO₂, foram medidos usando-se a técnica de covariância dos vórtices turbulentos, usando-se o sistema Edisol(MONCRIEFF et al., 1997). Os dados de saldo de radiação, radiação solar global, temperatura, umidade do ar e precipitação foram obtidos de uma estação meteorológica automática instalada no topo de uma torre micrometeorológica de 29 m de altura no sítio de manguezal. Os fluxos de dióxido de carbono durante o período diurno apresentaram valores médios de - 7,72 mmol.m⁻² s⁻¹ à 9:00 h, atingindo um máximo ao meio dia com valor médio de - 15,57 mmol.m⁻² s⁻¹, e um fluxo médio de -5,42mmol.m⁻² s⁻¹ à 16:00 h. O fluxo médio de CO₂ durante o período diurno de 9:00 às 16:00 h, foi de - 11,44 mmol.m⁻² s⁻¹. Os fluxos médios de CO₂ durante o período noturno (19:00h - 05:00 h), que representam as taxas de respiração do ecossistema foram de 9,92 ± 0,85 mmol.m⁻² s⁻¹. A dependência entre os fluxos de CO₂ e o saldo de radiação, durante o período diurno foi bem estabelecida.

35.3-P: Energy closure test in central Amazon: sensitivity to the angle of attack corrections

Alessandro Carioca de Araujo, Vrije Universiteit Amsterdam, arau@geo.vu.nl (Apresentador / Presenting)
John H. C. Gash, CEH, jhg@ceh.ac.uk
Jan A Elbers, Alterra, Jan.Elbers@wur.nl
Albertus Johannes Dolman, Vrije Universiteit Amsterdam, han.dolman@geo.falw.vu.nl
Maarten J Waterloo, Vrije Universiteit Amsterdam, watm@geo.vu.nl
Bart Kruijt, Alterra, Bart.Kruijt@wur.nl
Eddy Moors, Alterra, Eddy.Moors@wur.nl
Celso Von Randow, Alterra, celso.vonrandow@wur.nl
Antonio Donato Nobre, INPA, anobre27@yahoo.com

Nowadays, the eddy covariance technique is being used worldwide by several projects, e.g. Ameriflux, AsiaFlux, Euroflux, LBA, SiberiaFlux, aiming to cover the main terrestrial ecosystems and their responses to climate change. Regarding the partitioning of the net available energy (R_n) at the surface into the fluxes of sensible (H) and latent heat (LE), in the majority of the sites the energy balance do not close. The energy closure tests is 80%, in average. Since June 1999, H and LE fluxes have been measured at two meteorological towers in the same forest ecosystem, in the Manaus-LBA site, using the Gill sonic anemometer to measure the 3D wind components. Recently, Gash et al. (2004) evaluated that this type of sensor may produce different responses according to its angle of attack, which can affect the fluxes. Prior to this study, the energy closure test for Manaus were 75% and 81%, for K34 and C14 towers, respectively. The AltEddy software, which now contains the Gash's correction, was used to reprocess the raw data. Comparisons were made to evaluate the a priori and a posteriori fluxes. The energy closure test and carbon dioxide flux increased by 6-8%, in average. It seems that the H and LE fluxes are clustered in two areas, one at relatively low R_n values, and other at high R_n values.

35.4-P: Carbon dioxide concentrations within a tropical forest canopy in Central Amazon: spatial and temporal variability in a topographic gradient.

Alessandro Carioca de Araujo, Vrije Universiteit Amsterdam, arau@geo.vu.nl (Apresentador / Presenting)
Bart Kruijt, Alterra, Bart.Kruijt@wur.nl
Antonio Donato Nobre, INPA, anobre@ltid.inpe.br
Juliana Silva de Souza, INPA, souzajs@hotmail.com
Albertus Johannes Dolman, Vrije Universiteit Amsterdam, han.dolman@geo.falw.vu.nl
Maarten Johannes Waterloo, Vrije Universiteit Amsterdam, watm@geo.vu.nl
Eddy Moors, Alterra, Eddy.Moors@wur.nl

Long-term estimates of net ecosystem exchange (NEE) using the eddy covariance method often underestimate the nocturnal emission of CO₂ from forest during calm nights. A commonly used approach to limit this underestimation is to add to the eddy CO₂ flux a term accounting for the CO₂ storage changes in the layer between the ground and the measurement height. This approach can give rise to errors as the storage term is usually evaluated only at one location. Also, it does not take into account the heterogeneity in the source distribution or possible horizontal air movement, such as drainage flows associated with topography. At the LBA K34 site near Manaus, AM, it has been reported that soil respiration differs along a topographical gradient from the plateau to the valley bottom. This together with lateral drainage flows may lead to a heterogeneous storage pool in the flux footprint. It is interesting to investigate whether the vertical [CO₂] profiles in a topographic gradient follow the soil respiration pattern. During two consecutive days, in the dry season of 2002, three vertical [CO₂] profiles -one for each topographical section- were used to sample canopy air, which was analyzed with an IRGA. Emphasis was given to the nighttime and early morning periods. The vertical [CO₂] profiles on the slope and in the valley showed higher concentrations than on the plateau, suggesting a rapid build up in those sections. This may cause differences in the storage pools that seem to be measured by both eddy covariance and storage systems at different times.

35.5-P: Comparação entre os fluxos de calor sensível e de calor latente em áreas de pastagem e de floresta de transição, no noroeste de Mato Grosso

Jose Carlos Arruda, UFMT, jcarruda@cpd.ufmt.br (Apresentador / Presenting)

Fernando Reiter, UNEMAT, raitersn@terra.com.br

Vinicius Buscioli Capistrano, UFMT, viniabc@cpd.ufmt.br

Marcelo Sacardi Biudes, UFMT, biudes@cpd.ufmt.br

George Sanches Suli, UFMT, suli@terra.com.br

Francisco de Almeida Lobo, UFMT, f_a_lobo@cpd.ufmt.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

George Louis Vourlitis, CSUSM, georgev@csusm.edu

Neste trabalho foi feita a comparação entre os fluxos de calor sensível e latente (evapotranspiração), medidos em áreas de pastagem e de floresta de transição na região de Sinop-MT, localizada ao noroeste de Mato Grosso. O desmatamento para a implantação de pastagem é comum na região estudada e não se conhecem ainda os impactos que a essa prática pode ter no regime de chuvas e na alteração da temperatura ambiente. Os fluxos foram estimados pelo método da Razão de Bowen utilizando-se as medidas de psicrômetros e net radiômetros instalados em torres de 3m e de 40m, na pastagem e na floresta de transição, respectivamente. As medições foram feitas em outubro e novembro de 2003, período de transição entre estação seca e úmida daquela região. Nesse período os resultados obtidos indicaram que, para a floresta de transição, o saldo de radiação foi dissipado de modo semelhante na forma de calor latente e de calor sensível. Entretanto, no período do experimento na pastagem, 70% do saldo de radiação foi dissipado na forma de calor latente (evapotranspiração). Esse comportamento indica que, na transição entre as estações seca e úmida, a chuva causa aumento mais rápido na evaporação e na transpiração da pastagem do que na floresta. Sendo assim, embora em média a evapotranspiração da floresta seja maior que a da pastagem, pode-se observar, em curtos períodos do ano, que esse comportamento se inverte. Serão apresentados também os resultados dos fluxos de energia na pastagem e na floresta, obtidos até junho de 2004.

35.6-P: Automatic calibration of energy-water and carbon exchange processes in the SiB2 model for tropical forest before and after selective logging.

Rafael Rosolem, Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ - USA / Departamento de Ciências Atmosféricas, IAG, Universidade de São Paulo, São Paulo, SP - B, rafael@hwr.arizona.edu

W. James Shuttleworth, Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ - USA, shuttle@hwr.arizona.edu

Eleanor J. Burke, Met Office, Hadley Centre for Climate Prediction and Research, Exeter - UK / Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ - USA, eleanor.burke@metoffice.com

Luis A. Bastidas, Department of Civil and Environmental Engineering, Utah State University, Logan, UT - USA, luis.bastidas@usu.edu (Apresentador / Presenting)

Humberto Ribeiro da Rocha, Departamento de Ciências Atmosféricas, IAG, Universidade de São Paulo, São Paulo, SP - Brasil, humberto@model.iag.usp.br

Luis G. Gonçalves, Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ - USA, gustavo@hwr.arizona.edu

Scott Dennis Miller, Department of Earth System Science, University of California Irvine, Irvine, CA - USA, sdmiller@uci.edu

Michael L. Goulden, Department of Earth System Science, University of California Irvine, Irvine, CA - USA, mgoulden@uci.edu

Attempts to model surface-atmosphere interactions with greater physical realism have resulted in complex land surface schemes (LSS) with many parameters. While the parameterizations of the LSS models have been designed with the idea that it should be possible to estimate reasonable values for parameters from measurable characteristics of the land surface, recent studies have demonstrated that (even manually) adjustment of a few model parameters can result in significant improvements in model performance. Arguably, understanding of difference between preferred parameters before and after selective logging can provide background information on changes in some of the (physiological, soil physical, morphological) properties of the ecosystem. In the second-generation of the Simple Biosphere Model (SiB2), representation of carbon exchange process was introduced. This work explores specification of parameter sets for SiB2 for a tropical rainforest biome using optimization techniques (automatic calibration) in two cases, before and after selective logging. The data used were from the km 83 Cuiabá-Santarém Highway site (Floresta Nacional do Tapajós) LBA site. Optimization of the parameters in SiB2 was made by minimizing the Root Mean Square Error (RMSE) between time series for three objective functions, latent heat flux, and sensible heat flux and carbon exchange.

35.7-P: Comparação entre os fluxos de calor sensível e de calor latente em áreas de floresta tropical úmida e de floresta de transição, no sudoeste da Amazônia

Vinicius Buscioli Capistrano, UFMT, viniabc@cpd.ufmt.br (Apresentador / Presenting)

Higo José Dalmagro, UNEMAT, hjdalmagro@bol.com.br

Fernando Raiter, UFMT, raitersn@terra.com.br

Wander Hoeger, UFMT, wander_hoeger@yahoo.com.br

Kelli Cristina Aparecida Munhoz, UNEMAT, kwmm@terra.com.br

Vanessa Aparecida Santos, UNEMAT, vanessafloresta@yahoo.com.br

Marcelo Sacardi Biudes, UFMT, biudes@cpd.ufmt.br

Luciana Sanches, UFMT, lsanches@hotmail.com

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

José de Souza Nogueira, UFMT, nogueira@cpd.ufmt.br

George Louis Vourlitis, CSUSM, georgev@csusm.edu

As regiões de Sinop-MT e Alta Floresta-MT caracterizam-se por serem áreas com um índice de biodiversidade elevado, e têm estado sujeitas a umas das taxas mais altas de desmatamento durante os recentes projetos de colonização governamental e programas de reforma de agrária. Pouco se sabe sobre os efeitos de conversão de solo nas trocas de massa e de energia na mata de transição. Neste trabalho foi feita a comparação entre os fluxos de calor sensível e latente (evapotranspiração), medidos em áreas de floresta tropical úmida, na região de Alta Floresta-MT (11°24'45"S: 55°19'30"O) identificada neste trabalho como Floresta Amazônica, e de floresta de transição, na região de Sinop-MT (11°24'45"S: 55°19'30"O). Nestas regiões, estão instaladas torres de coleta de dados micrometeorológicos, com 41 e 50m, na floresta de transição e Amazônica, respectivamente. Embora tenham sido instalados sistemas de covariância de vórtices turbulentos em ambas as torres, as análises apresentadas neste trabalho utilizam o método da Razão de Bowen, devido a problemas ocorridos com o anemômetro sônico instalado em Alta Floresta. As medições foram feitas em agosto e novembro de 2003, abrangendo o final da estação seca e o início período de transição entre estação seca e úmida nas regiões consideradas. Os resultados obtidos indicaram que a maior parte da radiação líquida foi dissipada na forma de calor latente nos dois ecossistemas estudados. Em média a evapotranspiração na floresta tropical úmida foi 30% maior que a da floresta de transição, no período diurno.

35.8-P: Seasonality in water and energy fluxes in the Tapajos

Lucy Hutyra, Harvard University, lhutyra@fas.harvard.edu (Apresentador / Presenting)

Scott R. Saleska, Harvard University, saleska@fas.harvard.edu

Steven C. Wofsy, Harvard University, scw@io.harvard.edu

Plínio Barbosa de Camargo, CENA/USP, pcmargo@cena.usp.br

To assess the role of Amazonia as a source or a sink for atmospheric CO₂, we are using ground-based biometry measurements together with whole-system CO₂ and energy fluxes (via eddy covariance) to explore the ecological and climatic controls on the carbon balance at an old-growth Amazon forest (Tapajos National Forest, Santarem, Para, Brazil). Closure of the energy budget represents a critical validation for eddy covariance studies since net ecosystem exchange of CO₂ is the residual of large positive and negative fluxes. The closure of the energy budget is sensitive to micrometeorological corrections and averaging methods. We report a distinct seasonality in energy and water fluxes which is directly coupled to ecosystem respiration and tree growth.

35.9-P: Effects of Intra-Biome Variations in the Tropical Rainforest Biophysical Parameters on the Fluxes Between the Surface and the Atmosphere

Hewlley Acioli Imbuzeiro, Department of Agricultural Engineering, Federal University of Viçosa, hewlley@vicosa.ufv.br (Apresentador / Presenting)

Gleudson Charles Botelho Baleeiro, Department of Agricultural Engineering, Federal University of Viçosa, gcbb@nobugs.ufv.br

Marcos Heil Costa, Department of Agricultural Engineering, Federal University of Viçosa, mhcosta@ufv.br

It is well known that fluxes of water, energy and carbon between tropical rainforests and the atmosphere vary considerably from site to site. This variation may be the result of climate variations only, or could be the result of a combination of different climate and vegetation characteristics at each site. In this work, we propose a modeling experiment to evaluate what are the sources of fluxes variations among tropical rainforest sites. The methodology consists of calibrating an ecosystem model (IBIS) using data collected at five micrometeorological sites in areas of primary forest. The model is initially calibrated using data from each individual site, and then re-calibrated using data from all sites. By comparing the biophysical parameters obtained in the individual calibration with the parameters obtained in the multi-site calibration, we can determine whether vegetation biophysical parameters are significantly different among sites, and to what extent their intra-biome variability is responsible for the variations on the fluxes between the surface and the atmosphere. In addition, these results will allow an estimate of which errors are expected when a vast biome like the Amazon tropical rainforest is represented by a single set of parameters in large-scale dynamical ecosystem models or in the context of climate models.

35.10-P: Mangrove forests: what mechanism(s) underly seasonal changes in productivity and evapotranspiration? Evidence from plant physiology and eddy covariance studies.

Patrick Meir, University of Edinburgh UK, pmeir@ed.ac.uk (Apresentador / Presenting)

Jose Maria Nogueira da Costa, Universidade Federal de Vicosa, jmcosta@ufv.br

Mathew Williams, University of Edinburgh UK, mat.williams@ed.ac.uk

Yadvinder Singh Malhi, University of Edinburgh UK, ymalhi@ed.ac.uk

Rosie Alice Fisher, University of Edinburgh UK, rosie.fisher@ed.ac.uk

Antônio Carlos Lôla da Costa, Universidade Federal de Para, lola@ufpa.br

João Athaydes Silva Jr, Universidade Federal de Para, athaydes@ufpa.br

Vanda Andrade, Universidade Federal de Vicosa, jmcosta@ufv.br

Rommel Benicio Costa Silva, Universidade Federal de Vicosa, rbcsilva@yahoo.com.br

Raquel Lobo do Vale, Instituto Superior de Agronomia, Portugal, raquelvale@isa.utl.pt

Rafael Costa, Museu Paraense Emilio Goeldi, Para, jmcosta@ufv.br

Luiz Eduardo Oliveira Cruz de Aragão, INPE, aragao@ltid.inpe.br

Eleneide Doff Sotta, University of Gottingen, Germany, esotta@gwdg.de

Paulo Jorge Oliveira, Universidade Federal Rural da Amazonia, pj@ufra.edu.br

Very few eddy covariance studies have been made over mangrove forest and yet mangroves line up to 75% of tropical coastlines. We present a measurement and modelling analysis of the first such measurements from S. America, obtained by our UFV- and UFPA-led team from a site affected by seasonal changes in Amazon outflow, near Braganca, in Pará, NE Brazil. We combine this information with plant physiological data on the exchange of water and carbon by leaves and whole trees, using leaf gas exchange and sap flux measurements. Tree-level sapflux data are upscaled to calibrate our soil-plant-atmosphere model, SPA, which permits us to run SPA and estimate gross primary production (GPP) as well as the transpiration flux from mangrove forest. Successful calibration of SPA also allows us to probe the mechanisms of

seasonal changes in forest physiology. We compare the outputs of our upscaled sap flux data and our SPA output with eddy covariance data for the same site. Eddy flux data at this site are relatively 'clean' because of the relatively high turbulence experienced during the night as well as the day, which encourages strong canopy-atmosphere coupling. The eddy data show clear increases in NEE and GPP during the transition from dry season to wet season. In contrast, the sap flow data and SPA model output do not show significant increases in transpiration and GPP. This contrast in results leads to an analysis using additional leaf physiological (photosynthetic biochemistry and stomatal conductance), canopy structural and water salinity data. We discuss the evidence available to us, which suggests that the increase in GPP reflects a biochemical response in photosynthetic capacity in conjunction with wet-season reductions in water salinity. Mechanistic representation of this response will improve our ability to model mangrove forest - atmosphere exchanges of mass and energy.

35.11-P: Rates of Energy Storage and Stem Heat Fluxes in a Terra Firme Forest in Central Amazonia

Alessandro Augusto Michiles, Instituto Nacional de Pesquisas Espaciais, alemichiles@bol.com.br (Apresentador / Presenting)

Ralf Gielow, Instituto Nacional de Pesquisas Espaciais, ralf@cptec.inpe.br

To obtain the rate of energy storage (**RES**) in a "Terra Firme" forest during the dry season, an experiment was effected in Central Amazonia. Thus, the temperatures in three heights and several radial depths of 4 stems of dominant species among the 670 trees of an 1 hectare site selected at the Estação ZF-2 (02°36'45" S, 60°12'40" W), plus the air temperatures and moistures, were measured. To compute the **RES**, all components which store energy during the day were considered: litter, minor components (palm trees and lianas), stem, branches, twigs, leaves and air. To obtain the **RES** of the stems, three methods were used. The first one uses all stem temperature measurements. The other ones, which are based on an analytical solution of the heat conduction equation, depend only on the temperature measurements in one radial depth of a tree with the average characteristics of the complete set. The **RES** of the other components was determined with the air and the average tree stem surface temperature measurements, plus the air moisture. One third of the **RES** of the forest is due to the stems, while other third is due to the air; finally, the last one is divided among the other parts. During the night and the transition periods, the **RES** of the forest (**S**) may constitute a sizable fraction of the net radiation (**R_n**), or even exceed it. On a daily basis, the values of **S** were observed between 1 and 10% of **R_n**, depending on the weather conditions.

35.12-P: Comparação Entre Trocas Gasosas Medidas Pontualmente e Pelo Método de Vórtices Turbulentos na Região de Sinop

Eduardo Jacusiel Miranda, UFMT, aquaviva@zaz.com.br (Apresentador / Presenting)

Durval Rezende, UFMT, floresteiro@ibest.com.br

Clovis Lasta Fritzen, UFMS, cfritzen@ceuc.ufms.br

Pedro Correto Priante, UFMT, pedropri@terra.com.br

Moacir Lacerda, UFMS, mlacerda@ceuc.ufms.br

José Holanda Campelo, UFMT, jcampelo@terra.com.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

George Vourlitis, California State University, San Marcos, georgev@csusm.edu

Medidas de fluxo de CO₂(NEE) e de vapor de água estão sendo realizadas em uma torre de 40m instalada em uma área de floresta de transição na região de Sinop, pelo método de correlação de vórtices turbulentos. Nesta mesma área, também estão sendo feitas medidas diretas de fotossíntese e de respiração do solo. O objetivo deste trabalho é comparar os fluxos de CO₂ obtidos de medidas pontuais de respiração do solo (efluxo) e de fotossíntese líquida (**A_{net}**) com aqueles medidos com os equipamentos da torre. As medidas de respiração do solo foram efetuadas em 20 pontos distribuídos homogeneamente em 10.000 m². Já as de fotossíntese foram realizadas em cinco espécies (nas proximidades da torre) que são: *Quiina pteridophylla*, *Tovomita cf. schomburgkii*, *Dinizia excelsa*, *Brosimum lactescens* e *Psychotria sp.*, que juntas representam mais de 29% das espécies da área de abrangência da torre. Essas medidas foram divididas em 3 extratos que são: de 0 a 10m, de 10 a 20m e de 20 a 28m. Com estimativas do índice de área foliar (IAF) calculou-se o **A_{net}** de cada extrato, somando-os encontrou-se o **A_{net}** total do dossel que subtraída do efluxo resultou em uma estimativa de NEE a partir de medidas pontuais. Comparando os dados encontrou-se uma mesma tendência qualitativa ao longo do ano ao comparar o NEE medido pela torre e a **A_{net}** medida pontualmente. O NEE obtido através de medidas pontuais não diferiu muito da estimativa de NEE feita através do método de vórtices turbulentos.

35.13-P: Is the similarity theory adequate to describe turbulent surface fluxes at the LBA-ECO agricultural site in Santarém?

Oswaldo Luiz Leal de Moraes, UFSM, Santa Maria, RS, Moraes@mail1.ufsm.br (Apresentador / Presenting)

Otávio Costa Acevedo, UFSM, Santa Maria, RS, otavio@smail.ufsm.br

David Roy Fitzjarrald, SUNY at Albany, NY, fitz@asrc.cestm.albany.edu

Ricardo Kendi Sakai, SUNY at Albany, NY, sakai@asrc.cestm.albany.edu

Hans Rogério Zimmermann, UFSM, Santa Maria, RS, hans@w3.ufsm.br

Rodrigo da Silva, UFSM, Santa Maria, RS, rodrigo@asrc.cestm.albany.edu

Matthew J. Czirkowsky, SUNY at Albany, NY, matt@asrc.cestm.albany.edu

Ralf M. Staebler, SUNY at Albany, NY, ralf.staebler@ec.gc.ca

Vagner Anabor, UFSM, Santa Maria, RS, anabor@tutopia.com.br

The description of the Surface Boundary Layer (SL) is usually described in terms of similarity theories. Although the atmospheric boundary layer over land evolves continuously in response to the heating and cooling of the earth's surface, it does have distinct states that can be described in fairly simple terms. The picture that emerged from the research activity is that the general behavior of the boundary layer is described in terms of simple empirical statistics if the large-scale weather patterns are specified and the topography is not too complicated. Usually these theories have been used to

described dynamics and thermodynamics parameters and only few studies have focused in the statistics of the Carbon flux and Carbon concentration. The purpose of this paper is the analysis of the turbulence statistics (standard deviations) as well as mean profiles of velocities, temperature, humidity and CO₂ in terms of the appropriate scales derived from surface layer similarity theory. Data were collected in an agricultural field in eastern Amazon (3.012oS; 54.537oW). A 20 m micrometeorological tower with an eddy covariance system and an infrared gas analyzer (installed at 8.75m) have been used for turbulence measurements. Slow response sensors located at various heights have been used for profiles measurements. Preliminary results show that good results are obtained after appropriate data analysis.

35.14-P: Comparação dos Fluxos de Dióxido de Carbono e Energia em uma Área de Transição Entre a Floresta Amazonica e o Cerrado Matogrossense no Norte de Mato Grosso

João Paulo Novaes Filho, UFMT, jpnovaes@terra.com.br (Apresentador / Presenting)

Vinícius Buscioli Capistrano, UFMT, viniibc@cpd.ufmt.br (Apresentador / Presenting)

George Sanches Suli, UFMT, suli@terra.com.br

Renata Gonçalves Aguiar, UFMT, rgaguiar@cpd.ufmt.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

George Louis Vourlitis, CSUSM, georgev@csusm.edu

As áreas de florestas nativas, principalmente, as regiões de transição entre floresta tropical úmida e o cerrado(a savana brasileira) têm despertado interesse dos pesquisadores que pretendem entender a interação biosfera-atmosfera na Amazônia e sua conseqüente influencia sobre o clima regional e/ou mundial. Um dos aspectos estudados pelo Programa Experimentos em Grande Escala na Biosfera-Atmosfera da Amazônia (LBA) são os fluxos de CO₂ e energia em ecossistemas naturais de transição. O sistema de covariância de vórtices turbulentos é o mais utilizado para o cálculo dos fluxos turbulentos nos sítios experimentais do LBA. O objetivo deste trabalho ao utilizar dados obtidos em uma área de transição entre a floresta amazônica e o cerrado matogrossense, localizada próxima a cidade de Sinop-MT, no período de 2002 a 2003 é verificar se existem diferenças significativas entre os fluxos de CO₂, quando estes são processados com tempos de amostragem de 200 e 800 segundos; como para os fluxos de energia processados com os mesmos tempos de amostragem. Para comparação foi utilizado o teste t de Student para amostras pareadas com margem de significância de 0,05. Os resultados obtidos indicaram que não existem diferenças significativas para dados dos fluxos de CO₂ e de energia processados com os tempos de amostragem de 200s e 800s. A importância deste trabalho de comparação dos fluxos de massa e da comparação dos fluxos de energia reside na constatação de que não existiram prejuízos quando calculou-se os fluxos, tanto de massa como de energia, com médias móveis de 200s em relação às médias móveis de 800s sugeridos pela literatura.

35.15-P: Comportamento dos Fluxos Noturnos de CO₂ Atmosférico em um Ecossistema de Manguezal da Amazônia

Paulo Jorge Oliveira, Universidade Federal Rural da Amazônia, pj@ufra.edu.br (Apresentador / Presenting)

Yadvinder Singh Malhi, University of Edinburgh, ymalhi@ed.ac.uk

Jose Maria Nogueira da Costa, Universidade Federal de Viçosa, jmncoستا@ufv.br

Edson José Paulino Rocha, Universidade Federal do Pará, eprocha@ufpa.br

João Batista Miranda Ribeiro, Universidade Federal do Pará, jbmrr@ufpa.br

Julia Clarinda Paiva Cohen, Universidade Federal do Pará, jpcpcohen@ufpa.br

Rafael Ferreira da Costa, Universidade Federal do Pará, rfcostampeg@bol.com.br

Marco Antonio Vieira, Universidade Federal do Pará, marco.98@bol.com.br

Realizou-se um estudo sobre o comportamento médio dos fluxos de CO₂ Atmosférico em uma área de Manguezal localizada no leste do estado do Pará, utilizando uma torre micrometeorológica de 27 metros de altura, na qual foram instalados um sistema eddy covariance e uma estação meteorológica automática. Encontrou-se uma forte sazonalidade nos fluxos de CO₂ neste ecossistema, entre o período chuvoso e seco da região, onde a máxima taxa de fotossíntese sob saturação de radiação PAR variou de -10µmol.m⁻².s⁻¹ a -15µmol.m⁻².s⁻¹, respectivamente. Levando-se em consideração a amostragem de dados usados, o ecossistema de manguezal funciona como sorvedouro de carbono em ambas as estações, com uma taxa média de 2,8 T C.ha⁻¹.ano⁻¹, no período seco, e 5,2 T C.ha⁻¹.ano⁻¹, no período chuvoso. Apesar destes resultados variarem sazonalmente, não podemos afirmar que o Balanço de Carbono no Manguezal está em equilíbrio, pois o ecossistema esta continuamente crescendo, e uma parte do carbono é levada para fora da área durante eventos de enchentes. Tanto no período chuvoso como no seco, as medidas realizadas pelo sistema eddy correlation durante a noite, são feitas fora das condições de vento calmo. Na estação seca, cerca de 100% das medidas noturnas foi realizado sob condições de velocidade de fricção superiores a 0,2 m.s⁻¹, enquanto que no período chuvoso este valor diminui para 86%. Além desses resultados será feita uma outra análise para verificar a necessidade de aplicação de correção nestes fluxos noturnos, e descobrir em quanto essa correção vai influenciar na retirada de carbono pelo ecossistema.

35.16-P: Solução de problemas técnicos em sistemas para medidas de "eddy covariance".

Jean Reinildes Pinheiro, UFMT - ICET, jean@cpd.ufmt.br (Apresentador / Presenting)

Jorge Luiz Brito de Faria, UFMT - ICET, hulk@cpd.ufmt.br (Apresentador / Presenting)

Marcelo Biudes, UFMT - ICET, biudes@cpd.ufmt.br (Apresentador / Presenting)

Kelli Cristina Aparecida Munhoz, UFMT - ICET, kwmm@terra.com.br

Fernando Raiter, UFMT - Campus Sinop, raiter@cpd.ufmt.br

José de Souza Nogueira, UFMT - ICET, nogueira@cpd.ufmt.br

Nicolau Priante Filho, UFMT - ICET, nicolaup@terra.com.br

Devido ao interesse sobre o impacto ambiental da floresta amazônica no balanço climático global, vários trabalhos têm sido feitos para compreender os efeitos da variação da quantidade total de CO₂ e água proveniente deste ecossistema

sobre o clima e como se processa o mecanismo deste ciclo de carbono. Atualmente utiliza-se o método de "eddy covariance" para se obter os gradientes de CO₂ e água entre a superfície e a uma altura acima do dossel suficiente para desconsiderar os efeitos do regime de fluxo turbulento. Este método permite quantificar esses gradientes através da média temporal em alta frequência (10Hz) da correlação das flutuações desses constituintes com as flutuações da velocidade do vento no sentido vertical. Basicamente o sistema para medição de "eddy covariance" consiste de um anemômetro do tipo sônico (para flutuações da ordem de 10 Hz), um analisador de gás CO₂/H₂O de ciclo aberto e um sistema de aquisição, registro e processamento de dados (um conversor/controlador analógico/digital e um computador portátil). Devido a diversos fatores, muitas vezes por praticidade ou economia, utiliza-se na montagem deste sistema aparelhos de versões ou até fabricantes diferentes, o que implica em algumas incompatibilidades de conexão, comutação de dados, interpretação de sinal, etc. Este trabalho visa divulgar a experiência em se conectar um anemômetro sônico modelo SATI-3R da Applied Technologies Inc. com saída digital do tipo RS-232 e um sistema de análise de gás LI-7500 da Scientific Campbell Inc. com saída analógica a um "empacotador de dados" DATA-PACKER também da Applied Technologies Inc. com saída digital RS-232 e este por fim a um computador tipo Palmtop modelo HP-200LX, com um programa escrito devidamente para o registro e análise de dados. Também será discutida a utilização de um programa emulador de terminal (PCCOMM+) para a configuração dos equipamentos digitais bem como os procedimentos para solução de problemas neste tipo de sistema.

35.17-P: Monitoring Carbon, Heat, and Water Vapor turbulent fluxes over an Agricultural Field in Santarém.

Ricardo K. Sakai, Jungle Research Group, UAlbany, SUNY, sakai@asrc.cestm.albany.edu (Apresentador / Presenting)
David Roy Fitzjarrald, Jungle Research Group, UAlbany, SUNY, fitz@asrc.cestm.albany.edu
Oswaldo Luiz Leal de Moraes, Dept. Física, UFSM, Santa Maria RS, moraes@mail1.ufsm.br
Matthew J. Czikowsky, Jungle Research Group, UAlbany, SUNY, matt@asrc.cestm.albany.edu
Otávio C. Acevedo, Dept. Física, UFSM, Santa Maria RS, otavio@smail.ufsm.br
Rodrigo da Silva, Dept. Física, UFSM, Santa Maria RS, rodrigo@asrc.cestm.albany.edu
Eleazar Brait, LBA-ECO Escritório e Laboratório de Apoio em Santarém, brait@lbaeco.com.br
Valdelírio Miranda, LBA-ECO Escritório e Laboratório de Apoio em Santarém, miranda@lbaeco.com.br

Interest in the impact of deforestation on climate in Amazon has been shown in several models and projects. Previous studies concentrated on the transformation from forest to pasture. However, in recent years, there has been an increase in the area of rice and soy bean plantation in the Amazon. In the Large scale Biosphere-Atmosphere experiment in Amazonia (LBA) there is a continuing effort to understand the effects of this consequence of deforestation by generating a nearly continuous flux data set. This study presents the results of turbulent flux measurements of carbon, heat, and moisture using the eddy correlation system over an agricultural site in the Eastern Amazon region. During the last 5 years this field has been transformed from a pasture to a rice and soy bean plantation. We will show the changes in turbulent fluxes (CO₂, H₂O, and heat), radiative parameters (albedo and PAR-albedo) due to changing landscape from a pasture to crop fields. We also will show the impact of burning and plowing techniques on these parameters.

35.18-P: Horizontal Advection of CO₂ in the Old Growth Forest: LBA preliminary results

Julio Tota da Silva, INPA, tota@lbaeco.com.br (Apresentador / Presenting)
David Roy Fitzjarrald, SUNNY Albany, fitz@asrc.cestm.albany.edu
Ralf M. Staebler, CD-03, ralf.staebler@ec.gc.ca
Ricardo K. Sakai, SUNNY Albany, sakai@asrc.cestm.albany.edu

At night, under low wind speed conditions and radiational cooling, a shallow thermal inversion develops near the ground surface and deepens with time. If the terrain is not level, a drainage flow (katabatic wind) will develop. In the forest ecosystem the flow above the canopy becomes decoupled from the flow just above and within the canopy. Therefore, drainage flow will carry respiration from foliage, boles, and soil downslope. Eddy covariance systems above the canopy will not detect this flux and subcanopy sensors are likely to grossly underestimate it. A horizontal gradient in CO₂, coupled with a persistent flow in a specific direction, can create non-zero horizontal advection terms of the form $(u)(dc/dx)$, which are commonly assumed to be zero. We collect data at Flona Tapajos Old Growth Site with a net system during July and August 2003 continuously.

In this presentation, we will show preliminary results from horizontal CO₂ advection measurements, which may explain the missing vertical CO₂ fluxes on calm nights, when the eddy covariance technique fails to properly detect nocturnal respiration. The aim is to measure these advection terms and determine their significance. We will be present to discuss aspects of spatial and temporal variability.

35.19-P: Avaliação e comparação de fluxos de CO₂ e H₂O em duas torres em Manaus

Julio Tota da Silva, CD-03, tota@lbaeco.com.br (Apresentador / Presenting)

Medidas contínuas de fluxos de água, CO₂ e energia tem sido realizadas na Reserva Biológica do Cuires a 80 km de Manaus. Alguns trabalhos de curta duração neste site tem criticado a estrutura da torre ZF2 (C14), em virtude dos efeitos da estrutura metálica nas medidas desses fluxos. Tendo em vista a verificação desses efeitos, foi montada uma pequena torre de aproximadamente 15 metros no topo da antiga torre, visando a verificação desses efeitos. Nesta apresentação serão mostrados e discutidos padrões do ciclo diurno dos fluxos de água, energia e CO₂, de ambas as torres por estarem agora numa mesma altura de medidas, aproximadamente 55 metros acima do solo e 15 metros acima da copa da vegetação.

35.20-P: Measuring subcanopy CO₂ advection in the FLONA Tapajós.

Julio Tóta, LBA Project Office, INPA, Manaus AM, tota@lbaeco.com.br (Apresentador / Presenting)
David Roy Fitzjarrald, Jungle Research Group, University at Albany, SUNY,, fitz@asrc.cestm.albany.edu
Ralf M. Staebler, ARQP, Meteorological Service of Canada, Toronto ON., ralf.staebler@ec.gc.ca
Ricardo K. Sakai, Jungle Research Group, University at Albany, SUNY,, sakai@asrc.cestm.albany.edu

At night, a shallow thermal inversion develops near the surface and deepens with time, under low wind speed conditions

and radiational cooling. If terrain is not level, a drainage flow can develop. Above forests the flow above the canopy becomes decoupled from the flow just above and within canopy. It is possible that the drainage flow will carry respiratory CO₂ from foliage, boles, and soil downslope. If this flow advects CO₂ away from observation tower, some CO₂ emission goes unmeasured. Eddy covariance systems above canopy will not detect this flux. A horizontal gradient in CO₂ coupled with a persistent flow in a certain direction, can create non-zero horizontal advection terms of the form $(u)(dc/dx)$, terms commonly assumed to be zero. We report preliminary results from measurements of the horizontal advection of CO₂, which may explain the "missing" vertical CO₂ fluxes on frequent calm nights, when the eddy covariance technique fails to detect nocturnal respiration properly. The aim is to actually measure this term to determine its significance.

35.21-P: Perfis Noturnos de Temperatura, Umidade e CO₂ utilizando Balão Cativo, em dois sítios do LBA-ECO em Santarém, PA.

Rodrigo da Silva, Universidade Federal de Santa Maria, rodrigo@asrc.cestm.albany.edu (Apresentador / Presenting)
Oswaldo Luiz Leal de Moraes, Universidade Federal de Santa Maria, moraes@mail1.ufsm.br
Otavio C. Acevedo, Universidade Federal de Santa Maria, otavioa@yahoo.com
Hans R. Zimmermann, Universidade Federal de Santa Maria, hans@w3.ufsm.br
David Roy Fitzjarrald, State University of New York at Albany, fitz@asrc.cestm.albany.edu
Ricardo K. Sakai, State University of New York at Albany, sakai@asrc.cestm.albany.edu
Matthew J. Czikowsky, State University of New York at Albany, matt@asrc.cestm.albany.edu

Nos últimos anos os estudos na camada limite planetária têm se voltado à compreensão dos fluxos turbulentos em condições espaciais e temporais não homogêneas. Entretanto, as medidas de fluxos turbulentos em condições de transição temporal ainda são pouco investigadas. A compreensão do comportamento dos fluxos turbulentos nestas condições é muito importante para obter-se uma descrição mais realista da interação entre a superfície e a atmosfera, e conseqüentemente, melhorar a descrição da dinâmica da camada limite planetária. Particularmente, as primeiras horas da manhã são ideais para observar a convergência de temperatura e umidade próximo à superfície, devido à rápida evolução da altura da camada limite convectiva e devido às variações observadas destas grandezas serem relativamente grandes em razão desta camada em formação ainda ser rasa. O acúmulo de CO₂ próximo à superfície é observado ao longo do período da noite. Neste trabalho, perfis de temperatura, umidade e CO₂ são utilizados para estimar os fluxos nas primeiras horas da manhã através da convergência da temperatura, umidade e CO₂. Os dados foram obtidos de sondagens feitas com Balão Cativo em dois sítios experimentais do Projeto LBA-ECO na região de Santarém, sítios do Km77 e Km83. A metodologia para obtenção dos fluxos consiste na análise de duas sondagens subseqüentes a partir das quais determina-se a altura da convergência da temperatura potencial, umidade específica e CO₂. Integrando-se a variação temporal destas quantidades, para esta altura, obtém-se os fluxos turbulentos. Ainda, estes fluxos foram comparados com os obtidos pelas torres de fluxos "eddy correlation".

35.22-P: Fluxos de Calor Latente, Calor Sensível e Saldo de Radiação em um Ecossistema de Manguezal do Estado do Pará

Rommel Benicio Costa Silva, Universidade Federal de Viçosa-MG, Brasil, rbcsilva@yahoo.com.br (Apresentador / Presenting)
Vanda Maria Sales Andrade, Universidade Federal de Viçosa-MG, Brasil, vanda007@yahoo.com
Jose Maria Nogueira da Costa, Universidade Federal de Viçosa-MG, Brasil, jmcncosta@ufv.br
Antônio Carlos Lôla da Costa, Universidade Federal do Pará-PA, Brasil, lola@ufpa.br
Julia Clarinda Paiva Cohen, Universidade Federal do Para-PA, Brasil, jcpcohen@ufpa.br
Yadvinder Singh Malhi, IERm-UEdim, Edimburgo, Escócia-UK, ymalhi@ed.ac.uk
Patrick Meir, IERm-UEdim, Edimburgo, Escócia-UK, pmeir@ed.ac.uk

O presente trabalho pretende suprir uma carência de informações em ecossistemas de manguezal ao quantificar as magnitudes dos fluxos de calor latente, calor sensível e saldo de radiação. As medições dos fluxos de energia foram feitos em Bragança-PA (01°03'S; 46°45'W e 29 m de altitude). Os fluxos de calor latente e calor sensível foram medidos durante 24 dias do mês de fevereiro de 2003, usando-se a técnica de covariância dos vórtices turbulentos. O saldo de radiação foi medido por um saldo radiômetro, modelo REBS, instalado a 29 m de altura. A variação do saldo de radiação durante o período diurno (9:00 h - 16:00 h) foi de 192 W.m⁻² às 9:00h, atingindo um máximo de 462 W.m⁻² às 13:30 h, decrescendo para o valor de 202 W.m⁻² às 16:00 h. O valor médio do saldo de radiação durante o período diurno nos 24 dias analisados foi de 343 W.m⁻². A variação diurna do fluxo de calor latente foi de 90 W.m⁻² às 9:00 h, atingindo um valor máximo às 12:00 h com um valor médio de 232 W.m⁻², decrescendo para 98 W.m⁻² às 16:00 h. O valor médio do fluxo de calor latente durante o período diurno foi de 163 W.m⁻², representando 48% do valor médio do saldo de radiação. A variação média diurna do fluxo de calor sensível foi de 60 W.m⁻² às 9:00 h, com um valor máximo de 199 W.m⁻² às 14:00 h, decrescendo para 89 W.m⁻² às 16:00 h. O valor médio diurno do fluxo de calor sensível no período estudado foi de 144 W.m⁻², correspondendo a 42% do saldo de radiação.

35.23-P: Fluxos de CO₂ Entre a Vegetação e a Atmosfera em Áreas de Pastagem e Floresta em Rondônia

Anderson Teixeira Telles, UNIVERSIDADE FEDERAL DE RONDÔNIA, andersong3@ibest.com.br (Apresentador / Presenting)
Fernando Luiz Cardoso, UNIVERSIDADE FEDERAL DE RONDÔNIA, cardoso@unir.br
Fabricio B. Zanchi, UNIVERSIDADE FEDERAL DE RONDÔNIA, faberzanchi@hotmail.com
Paulo Renda Anderson, UNIVERSIDADE FEDERAL DE RONDÔNIA, paulorenda@hotmail.com
Juliano Alves de Deus, UNIVERSIDADE FEDERAL DE RONDÔNIA, julianoalde@yahoo.com.br
Leonardo J. G. Aguiar, UNIVERSIDADE FEDERAL DE RONDÔNIA, veraneiro@hotmail.com
Kécio Gonçalves Leite, UNIVERSIDADE FEDERAL DE RONDÔNIA, keciog@yahoo.com.br

Atualmente, há uma grande preocupação científica com o aumento dos gases estufa, como Dióxido de Carbono(CO₂), devido as suas contribuições para o aumento da temperatura global. O sumidouro de carbono da floresta amazônica exerce uma influência decisiva no ciclo global do mesmo, e qualquer alteração poderá causar um impacto significativo no clima regional e global. Serão utilizados neste trabalho dados coletados ,desde 1999, na Reserva Biológica do Jaru (100 5 S,610 55 W ,120m) e na Pastagem da Fazenda Nossa Senhora de Aparecida (100 45 S,620 22 W ,220m). Os instrumentos instalados nestes dois sítios vêm medindo continuamente as variáveis climáticas convencionais e os fluxos de calor sensível, água e CO₂ entre o ecossistema e a atmosfera. O método utilizado para avaliar o transporte de carbono é pela técnica de Vórtices Turbulentos, que permite que fluxos de gases ou calor, entre uma ecossistema e a atmosfera, sejam medidas diretamente, com sensores localizados em um único ponto acima da superfície. Estas medidas são feitas com dados de alta frequência (10Hz) coletados por um Anemômetro Sônico tridimensional (Gill AR12A) juntamente com um Analisador de Gás no infravermelho (LICOR 6262), que são instalados a 60 metros de altura na Reserva Biológica do Jaru e 5m acima do solo na Fazenda Nossa Senhora.

35.24-P: Variação do efluxo de CO₂ no solo em uma floresta de transição no noroeste de Mato Grosso

Carla Maria Abido Valentini, UFMT/CEFET-MT, valentini@vspmail.com.br (Apresentador / Presenting)

Luciana Sanches, UFMT, lsanches@hotmail.com (Apresentador / Presenting)

Eliane Dias de Almeida, UFMT/CEFET-MT, elianediasdealmeida2003@yahoo.com.br

Segundo Durval Pereira Rezende, UFMT, floresteiro3@pop.com.br

Vinícius Buscioli Capistrano, UFMT, vinibc@cpd.ufmt.br

Sérgio Roberto de Paulo, UFMT, sergio@cpd.ufmt.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

José de Souza Nogueira, UFMT, nogueira@cpd.ufmt.br

O presente trabalho estudou a variação do efluxo de CO₂ em função da temperatura e umidade do solo, precipitação, e produção de decomposição de liteira em uma floresta de transição, no noroeste de Mato Grosso (11°24.75'S: 55°19.50'O). Nessa região foi instalada uma torre de 40 m de altura com equipamentos de medidas micrometeorológicas. Nas proximidades desta torre houve o acompanhamento semanal da produção de liteira através de 20 coletores, e acúmulo de liteira no solo. As medidas do efluxo de CO₂ foram feitas mensalmente usando-se os aparelhos Licor-6400 e EGM-1/WMA-2 próximas às caixas coletoras, e após a medida do efluxo de CO₂ foram coletadas no mesmo local o acúmulo de liteira, com o uso de quadrantes de 25x25cm. As amostras de produção e acúmulo de liteira coletadas foram separadas em frações de folhas, galhos, flores e frutos, secas em estufa a 70 °C por 72 horas, e posteriormente realizadas suas pesagens. Os dados de temperatura do solo foram coletados com termômetro no mesmo instante das coletas de efluxo de CO₂. Os dados de umidade foram coletados por sensores próximos à torre, e os de precipitação com pluviômetros instalados na torre, e armazenados em módulos de memória com médias de 30 minutos. Os resultados mostram que houve correlações positivas entre o efluxo de CO₂ e as variáveis: temperatura e umidade do solo, e a precipitação, e correlações negativas com a produção de liteira.

35.25-P: Low frequency transports in the atmospheric surface layer over Amazon forest

Celso Von Randow, Alterra, The Netherlands, celso.vonrandow@wur.nl (Apresentador / Presenting)

Bart Kruijt, Alterra, The Netherlands, bart.kruijt@wur.nl

Bert Holtslag, Wageningen University, The Netherlands, bert.holtslag@wur.nl

Leonardo Deane de Abreu Sá, MPEG, Belém, ldsa@museu-goeldi.br

Antonio Ocimar Manzi, INPA, Manaus, manzi@inpa.gov.br

Alessandro Carioca de Araujo, Vrije Universiteit, The Netherlands, arau@geo.vu.nl

Antonio Donato Nobre, INPE, Sao Jose dos Campos, anobre@ltd.inpe.br

The eddy correlation method is being used in a number of towers in the Amazon forest to study the surface energy and carbon exchange processes which take place over this region. However, recent studies have been indicating the limitations and conceptual uncertainties associated with the method, when applied over complex surfaces such as tall forests or hilly terrain. Especially in the Amazon forest areas, 'low frequency' processes such as deep convection large eddies, roll vortices and local circulations by topography or surface heterogeneity can significantly contribute to the forest-atmosphere total exchange. Two aspects of the problem should be considered. On one hand, we should include all the low frequency motions that carry significant amount to the total mass and energy exchanges in order to close the balances. But, on the other hand, we should study the processes related with the 'local surface' separately: the contribution of the mean flow to the total transport is considered as an advective flux, which is assumed to behave deterministically, while that of the turbulence is regarded as an eddy flux and analysed statistically. Also, to relate the fluxes with the local mean wind shear and temperature stratification (similarity theory, for instance), ideally we would only include the transports on turbulence scales and exclude mesoscale and larger motions. In this work the use of some relationships from surface-layer physics and vegetation physiology is evaluated as potential constraints to separate "locally meaningful" fluxes from mesoscale and other larger processes.

[CD_Solos_Liteira \(CD_Soil_Litter\)](#)

36.1-P: Soil respiration in native Cerrado and a pasture in Central Brazil: Seasonal variation and deep soil contribution on total flux

Roberto Engel Aduan, Empresa Brasileira de Pesquisa Agropecuária, aduan@cpac.embrapa.br (Apresentador / Presenting)

Carlos Augusto Klink, Universidade de Brasília, CARLOSKLINK@aol.com.br

Eric Atlas Davidson, The Woods Hole Research Center, edavidson@whrc.org

Soil respiration is perhaps one of the most important in the many different processes of the carbon cycling in natural and

cultivated ecosystems. The aim of this study was to measure intensively the soil respiration fluxes in two native Cerrado vegetation types, that differ in tree density (cerrado denso and cerrado stricto sensu) and one planted pasture, measuring total annual fluxes and their seasonal variation. The effect of environmental variables (temperature and rainfall) and the role of deep soil on superficial emissions were also assessed. The native Cerrado ecosystems are located in the Reserva Ecológica do Roncador (RECOR/IBGE), in Brasília, DF, Brazil, while the planted pasture (*Brachiaria brizantha*) is located in the experimental fields of Embrapa-Cerrados, in Planaltina, DF, Brazil. Soil respiration was measured with the dynamic chamber IRGA technique. Deep soil fluxes were estimated from soil atmosphere samples taken at different depths, and the CO₂ flux on each soil layer was calculated using a gas diffusivity model. The total annual emissions were greater in the pasture, with sharper seasonal variation when compared to the native ecosystems, which were very similar. For all ecosystems, fluxes were closely correlated with soil temperature, and with cumulative precipitation in different timescales. In all three ecosystems (for several occasions), we found a significant CO₂ production in the deeper layers of the soil, especially in the depth of 75-100 cm.

36.2-P: População Microbiana, Carbono e Nitrogênio Microbiano Como Indicador de Biomassa Microbiana de um Solo de Terra Firme sob a Floresta Nacional de Caxiuanã Experimento LBA, na Estação Científica Ferreira Pena, Melgaço-Pará.

Eric Bruno Silva Batista, Museu Paraense Emilio Goeldi - MPEG, marajuar@supridad.com.br (Apresentador / Presenting)

Maria de Lourdes Pinheiro Ruivo, Museu Paraense Emilio Goeldi - MPEG, ruivo@museu-goeldi.br

Maria de Lourdes Oliveira, Universidade do Estado do Pará, mroliveira@uepa.com.br

Elessandra Laura Nogueira Lopes, Museu Paraense Emilio Goeldi - MPEG, enogueira@museu-goeldi.br

Brenda Costa Guimarães, Museu Paraense Emilio Goeldi - MPEG, brguimaraes@museu-goeldi.br

A biomassa microbiana do solo representa o componente mais ativo na ciclagem da matéria orgânica, atuando diretamente na disponibilidade de nutrientes para as plantas e no equilíbrio da ciclagem destes, de tal importância, que é considerada um bioindicador da qualidade do solo. Com vista conhecer melhor essa microbiota, a biomassa microbiana foi avaliada através de sua população, carbono e nitrogênio microbiano em um solo sob floresta na Estação Científica Ferreira Pena, Melgaço-Pará. As determinações foram feitas em um solo de terra firme (Latosolo Amarelo), onde as avaliações da população foram realizadas em duas épocas (chuva e seca), e em 04 profundidades (00-05; 05-10; 10-25 e 25-50), já as avaliações de C e N microbiano foram realizadas em 03 etapas. Sendo a determinação da população feita com a técnica "Pour Plate" de contagem em placas de Petri, seguida de identificação através de análise micromorfológica, e os valores de C e N microbiano foram analisados pelo método de fumigação-extração. A população de bactérias foi superior a de fungos na época das chuvas, com uma média de 46 x10⁶ UFC/g de solo de bactérias e o inverso ocorreu na época da seca, com uma média de 67 x10³ UFC/g de solo de fungos, sendo encontrado uma grande gama de gêneros destes. Os valores de C e N microbiano não ultrapassaram os valores de 144,46 mg kg⁻¹ e 0,046 g.kg⁻¹, respectivamente.

36.3-P: Soil organic matter dynamics and physico-chemical properties of intensively-managed Eucalyptus plantations compared to native forests in the Brazilian Amazon

Troy Patrick Beldini, NASA-LBA ECO project, Santarém, Brazil, beldini@lbaeco.com.br (Apresentador / Presenting)

Kenneth L. McNabb

B. Graeme Lockaby

Felipe G. Sanchez

Eucalyptus species have been promoted as an industrial plantation tree due to superior growth rates, biomass yield and pulp quality. Increasing forest management intensity has been forwarded as a strategy to slow deforestation in the Brazilian Amazon. However, the effects of intensive management and multiple rotations on soil structure and function are poorly understood. Assuming that long-term site productivity is controlled by soil organic matter maintenance, this research investigated soil organic matter dynamics as an indicator of sustainability.

The carbon cycling dynamics of Eucalyptus plantation soils were compared to identical, adjacent undisturbed primary forest soils on the Jarí Plantation in the Brazilian Amazon.

Forest types were compared on clay and sandy soils. Total soil carbon stocks to one-meter depth on each soil type were equal in native and plantation forests, indicating that successive rotations of Eucalyptus have not depleted carbon stocks. No differences in soil bulk density across one meter were found during several measurement seasons. Physical soil fractionation results have quantified a shift in carbon from labile soil particle-size fractions to less labile fractions in the plantation on the sandy soil, indicating a possible decline in soil quality. Litterfall and root biomass in each plantation were significantly lower than in the adjacent native forests, and air and soil temperatures were significantly greater in each plantation. These results indicate a reduction in carbon inputs into the plantation soils and a potential for increased rates of soil carbon decomposition processes due to a more extreme air and soil temperature regime.

36.4-P: An Approach to Deal with Sources of Data Uncertainty in Dissolved Organic Carbon Dynamic

Virginia Brilhante, Computing Science Department, Federal University of Amazonas - UFAM, Manaus-AM, Brazil, virginia@dcc.fua.edu.br

J. L. Campos dos Santos, The National Institute for Amazon Research - INPA, Manaus-AM, Brazil, lcampos@inpa.gov.br (Apresentador / Presenting)

Uncertainty is an intrinsic feature of complex simulation model. Given that it is not possible to rid the models from uncertainty we are left with taking notice of it for consideration in model-based decision making. Traditional ecological modeling methods and tools do not support explicit account of model uncertainty. LBA experiments that investigate dissolved organic carbon dynamic for different forest compartments (rainfall, throughfall, groundwater, freshwater) also have to deal with data uncertainty before any simulation methods take place, since it utilize the same calibration of one compartment to all others compartments. This work gives a contribution towards making known, or bringing to the surface, sources of uncertainty that are embedded in ecological models. The sources of uncertainty are related to the model's supporting data and equations. A metadata standard is integrated to specify data-related sources of uncertainty,

such as publisher, coverage, date, place, etc. In the technique implemented, models are described and simulated using logic, which allows the sources of uncertainty to be represented, propagated and combined during a simulation process. The combined sources of uncertainty can then be presented to data brokers to assess their impact on models outputs and tune up his confidence in the model for decision making.

36.5-P: Flutuação Temporal e Espacial da Liteira Sobre o Solo e da Umidade da Camada Superficial do Solo

Adriana Castro da Conceição, INPA, andreaoran@ig.com.br (Apresentador / Presenting)

Flavio J. Luizão, INPA, fluizao@inpa.gov.br

A liteira é de vital importância na manutenção da fertilidade dos solos da região, caracterizada por solos quimicamente pobres. Além disso, tem papel vital na proteção física do solo, influenciando na umidade e, conseqüentemente, nos processos bioquímicos na camada superficial do solo. O presente trabalho tem como objetivo avaliar a dinâmica da camada de liteira sobre o solo em diferentes coberturas vegetais e períodos climáticos (estação seca e transição), quantificando e avaliando a qualidade da camada de liteira sobre o solo, na estação seca e de transição. O estudo foi conduzido na Estação Experimental da Embrapa/ CPAA localizada no km 53 da rodovia BR-174 (Manaus-Boa Vista-RR) (em parcelas de pastagem abandonada, capoeira e sistemas agroflorestais - SAFs) e na Reserva Biológica do Cuieiras (parcelas de floresta primária). Os componentes da liteira de decomposição mais rápida (folhas e material reprodutivo), nos período seco e de transição, apresentou diferenças significativas entre as diferentes coberturas vegetais (pastagem, capoeira, floresta e SAFs) ($p < 0,05$). Já o material lenhoso, de decomposição mais lenta, só mostrou diferença significativa, no período seco, entre pastagem e SAFs ($p < 0,05$), enquanto que, no período de transição, o material de decomposição mais lenta mostrou diferenças significativas entre capoeira, floresta e SAFs ($p < 0,05$). No entanto, nas duas estações estudadas (seca e transição), não foi detectada uma relação positiva entre o estoque de liteira e a umidade do solo dentro de cada tipo de vegetação.

36.6-P: Soil-Atmosphere Carbon Dioxide Fluxes Measured with Automated Chambers at the Tapajos National Forest

Ruth Varner, Complex Systems Research Center, University of New Hampshire, ruth.varner@unh.edu

Patrick Michael Crill, Department of Geology and Geochemistry, Stockholm University, patrick.crill@unh.edu (Apresentador / Presenting)

Michael M. Keller, International Institute of Tropical Forestry, USDA Forest Service, michael.keller@unh.edu

Raimundo Cosme de Oliveira Jr., EMBRAPA, Amazônia Oriental, cosme@cpatu.embrapa.br

Eráclito Rodrigues de Sousa Neto, Fundação Floresta Tropical, eraclito@lbaeco.com.br

Jadson Dizencourt Dias, Fundação Floresta Tropical, jadson@lbaeco.com.br

Hudson Silva, Complex Systems Research Center, University of New Hampshire, hsilva@kaos.sr.unh.edu

Kêmeson Oliveira, Fundação Floresta Tropical, kemeson@lbaeco.com.br

Sérgio N. da Silva Albuquerque, Fundação Floresta Tropical, sergio@lbaeco.com.br

Jess Alexander, Complex Systems Research Center, University of New Hampshire, jessa@kaos.sr.unh.edu

We measured the soil-atmosphere exchange of carbon dioxide (CO_2) from 18 chambers randomly deployed over approximately 0.4 ha in the Tapajos National Forest (km 67) undisturbed forest site. Chambers have been automatically controlled and continuously operated since installation in April 2001. CO_2 mixing ratio is measured by a Licor infra-red gas analyzer checked with zero and span gases at 5 hour intervals. A set of 8 high frequency chambers were sampled about 5 times daily and the remaining 10 chambers were sampled about once daily. Soil-atmosphere fluxes ranged from less than 0.2 to greater than 10 micro-mol $\text{CO}_2 \text{ m}^{-2} \text{ s}^{-1}$. A seasonal signal is apparently related to precipitation, soil moisture dynamics, and temperature. Greater emissions occur during the wet season than during the dry season despite higher temperatures in the dry season. After prolonged dry periods, soil fluxes can increase very quickly following small precipitation events. There is a diel variability in the soil emission of CO_2 possibly related to temperature and/or humidity changes. The flux of CO_2 from the soil to the atmosphere is about 10 Mg-C $\text{ha}^{-1} \text{ y}^{-1}$.

36.7-P: Decomposição de folhas de espécies em uma Floresta de Transição Amazônia Cerrado e uma Floresta Amazônia em período de transição seco-úmido

Higo José Dalmagro, Unemat, higodalmagro@hotmail.com (Apresentador / Presenting)

Luciana Sanches, UFMT, lsanches@hotmail.com

Kelli Cristina Aparecida Munhoz, Unemat, kwmm@terra.com.br

Vanessa Aparecida Santos, Unemat, vanessafloresta@yahoo.com.br

Leandro Gomes de Almeida, Unemat, leaeiou@hotmail.com

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

José de Souza Nogueira, UFMT, nogueira@cpd.ufmt.br

George Louis Voullitis, California State University, georgev@csusm.edu

O processo de decomposição é essencial para a manutenção dos solos por produzir a reciclagem de elementos, liberando os nutrientes contidos na liteira para o solo, estando diretamente relacionado com os fatores ambientais. O objetivo deste trabalho foi avaliar a decomposição de espécies de relevância em uma Floresta de Transição Amazônia - Cerrado e em Floresta Amazônica, em período seco-úmido.

O estudo realizou-se em uma área de Floresta de Transição ($11^{\circ}24'45''\text{S}$: $55^{\circ}19'30''\text{O}$) e em uma área de Floresta Amazônica ($9^{\circ}35'56,04''\text{S}$, $W 55^{\circ}56'11,76''\text{O}$), caracterizadas por um clima tropical úmido com acentuadas variações sazonais. Nestas regiões, estão instaladas torres de coleta de dados micrometeorológicos, com 41 e 50m, na Floresta de Transição e Amazônica, respectivamente. Foram utilizados bolsos de nylon ("litter bags") de dimensão 30 x 30 cm com malha de 2,5 x 2,0 mm cada, preenchidas com peso seco entre 2 a 5 g de folhas das espécies mais abundantes de cada área, *Tovomita schomburgkii* e *Brosimum lactescens* para Floresta de Transição, e *Guarea sp.* e *Tetragastris sp.* para Floresta Amazônica. As bolsos de nylon foram instaladas em vinte pontos de amostragem, e em cada ponto 7 bolsos. O experimento teve a duração de 129 e 118 dias, na Floresta de Transição e Amazônica, respectivamente.

A perda de matéria seca foi de 23,23% e 55,95%, em 129 e 118 dias, na Floresta de Transição e na Amazônica,

respectivamente. Em ambos experimentos, se obtiveram correlações satisfatórias entre o tempo de exposição do material e o percentual de material remanescente na área em estudo. A velocidade de decomposição na Floresta Amazônica, onde a precipitação é maior, foi significativamente maior que a da Floresta de Transição devido a atividade dos microorganismos decompositores ser maior na região mais úmida.

36.8-P: Influência da Quantidade de Biomassa de Liteira Comparada ao Efluxo de CO₂ do Solo Para uma Floresta em Ji-Paraná, RO.

Juliano Alves de Deus, UNIR - Fundação Universidade Federal de Rondônia, julianoalde@yahoo.com.br (Apresentador / Presenting)

Fabrcio Berton Zanchi, IAG - USP, fabricio@model.iag.usp.br

Jorge Luiz Nepomuceno de Lima, UNIR - Fundação Universidade Federal de Rondônia, jlnlima@hotmail.com

Fernando Luiz Cardoso, UNIR - Fundação Universidade Federal de Rondônia, cardoso@unir.br

Kécio Gonçalves Leite, UNIR - Fundação Universidade Federal de Rondônia, keciog@yahoo.com.br

Leonardo J. G. Aguiar, UNIR - Fundação Universidade Federal de Rondônia, veraneiro@hotmail.com

Paulo Renda Anderson, UNIR - Fundação Universidade Federal de Rondônia, paulorenda@ibest.com.br

Anderson Telles, UNIR - Fundação Universidade Federal de Rondônia, andersong3@ibest.com.br

Humberto Ribeiro da Rocha, IAG - USP, humberto@model.iag.usp.br

Antônio Ocimar Manzi, INPA, manzi@inpa.gov.br

A quantidade de biomassa acumulada no solo e o tipo de dossel são importantes fatores para o entendimento da influência dos fluxos de carbono na natureza. Os fluxos de carbono, por sua vez, são um dos parâmetros para a compreensão dos fenômenos que caracterizam a variabilidade climática regional e global.

Este trabalho tem por objetivo a análise e o monitoramento da produção de folheto e galhos em áreas de floresta, para a quantificação da biomassa que chega ao solo comparada à variação do efluxo de CO₂ do solo. O sítio experimental é uma floresta primária localizada na Fazenda Itapirema, em Ji-Paraná-RO.

Para a coleta de biomassa foram confeccionados quinze coletores de madeira e tela de área 1 m x 1 m distribuídos ao redor da área experimental. Para a medição do efluxo de CO₂ do solo estão sendo utilizadas 05 câmaras de solo fechadas automáticas acopladas a um analisador de gás por infra-vermelho. As medidas de umidade de solo estão sendo feitas por sensores FDR (refletômetro por domínio de frequência) e as medidas de temperatura do solo com termômetros distribuídos ao longo do experimento.

A análise preliminar dos dados coletados durante o ano de 2003, mostrou uma forte correlação entre a respiração do solo e a quantidade de biomassa amostrada para o período analisado.

36.9-P: Leaf Area Index (LAI) and Litter Production Before and After Selective Logging in a Tropical Forest, Eastern Amazônia, Santarém-PA.

Adelaine Michela Figueira, Projeto LBA/Santarém-Pará (Bolsista CNPq/ RHA), michela@lbaeco.com.br (Apresentador / Presenting)

Cleilim Albert Dias de Sousa, Projeto LBA/Santarém-Pará (Bolsista CNPq/ RHA), albert@lbaeco.com.br

Augusto Rodrigues Maia, Projeto LBA/Santarém-Pará (Bolsista CNPq/ RHA), agosto@lbaeco.com.br

Michael L. Goulden, UCI, mgoulden@uci.edu

Scott Dennis Miller, UCI, sdmiller@uci.edu

Humberto Ribeiro da Rocha, IAG/USP, humberto@model.iag.usp.br

Mary Catherine Menton, IPAM, marymenton@hotmail.com

Carbon and water fluxes over ecosystem depend on the canopy architecture and the amount and distribution of biomass. Not much is known about the relationship between the dynamics of biomass and atmospheric fluxes for tropical forests. A complicating factor is that the Brazilian National Forests, may be opened for exploration and logging, as little is known about the potential impacts arising from it. This work reports the temporal dynamics of litter production and leaf area index (LAI) over a primary tropical forest at the Floresta Nacional do Tapajós, before and after the selective logging of commercial species. Litter production before logging (September 2000 to July 2001) was 4,41 MgC ha⁻¹, after logging (August 2001 to August 2002) was 3,96 MgC ha⁻¹, which suggested a reduction of about 10%. The seasonality observed in the litter production was notable for having two maxima, a main one in July (at the end of wet season), and a secondary one in December (at the end of dry season), characterizing a bimodal distribution. Litterfall accumulated over a year before logging showed the LAI equal to 5,3 m²m⁻², which was reduced to 4,4 m²m⁻² in the year after logging. These values are lower than the maximum expected at the site (6,3 m²m⁻²). Both reductions in LAI and litter production are expected after the clearings opened during logging near the experimental area.

36.10-P: Efeito da Exclusão de Água do Experimento ESECAFLOR Sobre a Abundância dos Díptera Presentes na Liteira de uma Floresta de Terra Firme

Ivaneide da Silva Furtado, Museu Paraense Emílio Goeldi-MPEG, neidesf@yahoo.com.br (Apresentador / Presenting)

Michele de Azevedo Pinto, Museu Paraense Emílio Goeldi-MPEG, michazevedo@yahoo.com.br

Marlúcia Bonifácio Martins, Museu Paraense Emílio Goeldi-MPEG, marlucia@museu-goeldi.br

Os dípteros possuem um papel importante no processo de decomposição da matéria orgânica, sendo fundamental para a estruturação e composição do solo. Este projeto, o qual está vinculado ao Experimento Esecafloor/Programa LBA (que consiste na tentativa de estimar possíveis efeitos do "El niño" na floresta de Caxiuanã), pretende analisar se alterações microclimáticas podem afetar a distribuição e abundância dos Dípteros presentes na liteira do solo. As coletas foram realizadas na Reserva Florestal de Caxiuanã-Melgaço-Pará. Os organismos foram coletados através de Armadilhas Pitfall. As coletas iniciaram em junho de 2001, sendo realizadas duas coletas antes da exclusão de água (Junho e Novembro de 2001), e três coletas no período de exclusão de água (abril, julho, novembro de 2002). Os dados demonstram que a Ordem Díptera apresentou um aumento no número médio estimado de indivíduos no período de exclusão de água em ambas as parcelas, porém, não apresentou diferença significativa pelo teste F (F=0,4944 e P=0,5073) ao longo das

coletas, entre as parcelas controle e experimento. As famílias Phoridae (F=0,9812 e P=0,6470), Cecidomyiidae (F=1,6371 e P=0,2355), Drosophilidae (F=1,6530 e P=0,2334) e Sciaridae (F=0,0078 e P=0,9292), também não apresentaram diferença significativa. Dessa forma, até o presente momento não é possível inferir sobre a influência do experimento sobre a abundância dos Dípteros ao nível de Família, devido a uma alta variação sazonal apresentada pelos indivíduos de cada família nas parcelas, ao longo das campanhas. Propõe-se para a continuidade do trabalho, realizar uma identificação taxonômica até o nível de espécie.

36.11-P: Biomassa de raízes em sistemas agroflorestais implantados em áreas de pastagens degradadas na Amazônia central

Jorge Luis Enrique Gallardo Ordinola, Instituto Nacional de Pesquisas da Amazonia, ilegos@hotmail.com (Apresentador / Presenting)

Flavio Jesus Luizão, Instituto Nacional de Pesquisas da Amazonia, fluizao@inpa.gov.br

Erick Fernandes, Cornell University, ecf3@cornell.edu

Elisa Wandelli, Embrapa-CPPA, elisa@cpaa.embrapa.br

O objetivo desse trabalho foi estimar a massa de raízes e a distribuição de carbono e nutrientes na biomassa de raízes sob diferentes espécies de árvores e entre duas formas de uso da terra (sistemas agroflorestais e capoeira). Utilizou-se o método da trincheira (Bhöm, 1979): em cada uma das trincheiras delimitadas, a cada 10 cm, até um metro de profundidade, foi coletado todo o solo existente na camada correspondente. As raízes foram separadas do solo, por espécie de planta e por classe de diâmetro (2-5 mm; 5-10 mm e >10 mm). A massa de raízes acima de 2 mm foi significativamente maior ($P < 0,05$), na CAP (20,8 Mg.ha⁻¹ ± 13,2) do que no ASP1 (5,33 Mg.ha⁻¹ ± 3,58). Não houve diferença estatística entre a capoeira e o AS1 (13,1 Mg.ha⁻¹ ± 6,3), devido à grande variabilidade dos valores encontrados. A biomassa de raízes apresentou diferenças estatísticas significativas entre as espécies: as espécies *Vismia* sp. da capoeira (27,32 Mg.ha⁻¹ ± 16,03) apresentaram maior massa de raízes ($p < 0,01$) do que as espécies de árvores dos SAFs. No sistema AS1, formado principalmente pelas palmeiras, a pupunha foi a espécie que produziu maior massa de raízes por metro quadrado. 4,93 Mg.ha⁻¹ ± 3,10, seguida pelo açaí com 3,0 ± 1,97 Mg.ha⁻¹, colubrina 2,73 ± 0,81 Mg.ha⁻¹, e o cupuaçu com 2,50 ± 0,15, Mg.ha⁻¹. Embora CAP e suas espécie dominante, *Vismia* sp., tenham apresentado maiores biomassas de raízes, estas se concentram nas classes de diâmetros maiores, em princípio contribuindo pouco para a estruturação e melhoria do solo.

36.12-P: Influência da temperatura e umidade do solo e do ar na produção e acúmulo de serrapilheira em floresta de transição tropical úmida - cerrado

Márcia Martim Pereira Gallon, UFMT, gallon@cpd.ufmt.br (Apresentador / Presenting)

Marcia Elisabete Klein, UFMT, meklein@cpd.ufmt.br (Apresentador / Presenting)

Eliane Dias de Almeida, UFMT, elianediasdealmeida2003@yahoo.com.br (Apresentador / Presenting)

Marina Meira Coelho, UFMT, mmeira@cpd.ufmt.br (Apresentador / Presenting)

Luciana Sanches, UFMT, lsanches@hotmail.com

Carla Maria Abido Valentini, UFMT, valentini@vspmail.com.br (Apresentador / Presenting)

Sérgio Roberto de Paulo, UFMT, sergio@cpd.ufmt.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

José de Souza Nogueira, UFMT, nogueira@cpd.ufmt.br

A natureza e a magnitude das estações climáticas podem interferir na produção e acúmulo de serrapilheira no solo. O objetivo principal deste trabalho foi avaliar a influência da temperatura e da umidade do solo e do ar, e da precipitação na produção e acúmulo de serrapilheira.

Este estudo foi desenvolvido em uma área localizada a aproximadamente 50 km NE de Sinop, Mato Grosso, Brasil (11°24.75'S; 55°19.50'O). Essa área é constituída por uma transição entre floresta tropical úmida e cerrado onde se localiza uma torre de monitoramento de dados micrometeorológicos. As coletas de produção de serrapilheira foram realizadas ao longo dos anos de 2001 a 2003, empregando-se 20 coletores de 1m² cada, recolhidas semanalmente. Para estimar o acúmulo de serrapilheira nos anos de 2002 e 2003, foram coletados aleatoriamente em quadrantes de 25 x 25 cm a serrapilheira do solo, realizadas mensalmente. O monitoramento dos fatores ambientais foi feito através de equipamentos de medidas micrometeorológicas (HMP-35, Vaisala, Inc., Helsinki, Finland; 2501 Sierra-Misco, Inc., Berkeley, CA, USA, Licor-6400).

A análise estatística de correlação linear indicou que a produção de serrapilheira estava correlacionada significativamente com a precipitação e a umidade relativa do ar. O acúmulo de serrapilheira não apresentou correlação com os fatores ambientais analisados.

A umidade do solo esteve correlacionada significativamente com precipitação e com a temperatura do solo.

A produção de serrapilheira apresentou influência sazonal de alguns fatores ambientais.

36.13-P: Fluxos de carbono orgânico dissolvido em microbacias pareadas(floresta x pastagem)no estado de Rondônia.

Sérgio C. Gouveia Neto, CENA - Centro de Energia Nuclear na Agricultura - USP. Laboratório de Ecologia Isotópica. CP 96. Cep: 13400-970. Piracicaba/SP - Brasil, sneto@cena.usp.br (Apresentador / Presenting)

Adriana L. Castellanos B., CENA - Centro de Energia Nuclear na Agricultura - USP. Laboratório de Ecologia Isotópica. CP 96. Cep: 13400-970. Piracicaba/SP - Brasil, alcbonil@esalq.usp.br

Alexandra Ayres Montebelo, CENA - Centro de Energia Nuclear na Agricultura - USP. Laboratório de Ecologia Isotópica. CP 96. Cep: 13400-970. Piracicaba/SP - Brasil, nandaymo@bol.com.br

Alex V. Krusche, CENA - Centro de Energia Nuclear na Agricultura - USP. Laboratório de Ecologia Isotópica. CP 96. Cep: 13400-970. Piracicaba/SP - Brasil, alex@cena.usp.br

Chris Neill, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, Massachusetts MA 02543, cneill@mbl.edu

Helmut Elsenbeer, University of Potsdam, helsenb@rz.uni-potsdam.de

A Amazônia se caracteriza por uma extensa rede de drenagem, na qual os pequenos rios constituem a ligação direta com os ecossistemas terrestres, recebendo destes nutrientes, materiais dissolvidos e particulados. O ambiente terrestre amazônico passa por importantes transformações, principalmente a conversão de áreas cobertas por florestas em pastagens ou cultivos agrícolas. Os impactos destas transformações sobre os ambientes aquáticos são ainda pouco conhecidos. Pouco se sabe, por exemplo, sobre o impacto destas alterações nos fluxos de carbono orgânico dissolvido (COD). Neste contexto, o presente trabalho objetiva avaliar os fluxos de COD em microbacias pareadas com florestas ou pastagens, no estado de Rondônia. Para tal, foram realizadas coletas nos meses de janeiro e fevereiro de 2004, no período caracterizado como chuvoso, com amostragens de águas de chuva, subterrânea, sub-superficial, do dossel da floresta e do canal principal das microbacias, nos quais estão sendo determinadas as concentrações de COD. A partir destas informações e das medidas de fluxos de água, calculadas no canal principal das microbacias, serão estimados os fluxos, inferindo as possíveis alterações nos mesmos devidas às mudanças na cobertura vegetal.

36.14-P: Relação entre efluxo de CO₂ do solo e o relevo

Brenda Rocha Guimaraes, Museu Paraense Emílio Goeldi, b_rock1202@hotmail.com (Apresentador / Presenting)

Eleneide Doff Sotta, Universidade de Goettingen, esotta@gwdg.de

Maria de Lourdes Pinheiro Ruivo, Museu Paraense Emílio Goeldi, ruivo@museu-goeldi.br

Edzo Veldkamp, Universidade de Goettingen, eveldka@gwdg.de

O objetivo deste trabalho foi determinar a influência do relevo na respiração do solo. O experimento foi desenvolvido na Estação Científica Ferreira Penna localizada dentro da floresta nacional de Caxiuanã, no Pará. As florestas desta região são de terra firme e os solos são predominantemente do grupo dos Latossolos, variando de bem a excessivamente drenados e a textura varia de arenosa a argilosa. Foram identificados quatro declives na floresta onde foram estabelecidas quatro parcelas compostas de quatro tratamentos: platô, alto declive, baixo declive e baixio. Medições de respiração, umidade e temperatura do solo foram realizadas a cada três meses para consideração de mudanças sazonais no período de abril de 2002 a julho de 2003. Os resultados indicam que a temperatura e a umidade explicam respectivamente 36% e 35% do efluxo de CO₂ do solo. O efluxo médio para o platô foi 3,27±0,20 µmol CO₂.m².s⁻¹, para o alto declive foi 3,49±0,30 µmol CO₂.m².s⁻¹, para o baixo declive foi 3,68 ±0,30 µmol CO₂.m².s⁻¹ e para o baixio foi 3,44±0,30 µmol CO₂.m².s⁻¹. Não houve diferença significativa entre as posições do relevo (P>0,05, n=5). Os fluxos de abril de 2002 e abril de 2003 foram sazonalmente diferentes quando relacionados com o relevo, indicando uma forte influência das condições climáticas sobre a posição no relevo.

36.15-P: Internal and external fluxes of dissolved organic carbon in forested headwater Amazonian catchments: Near-surface and aboveground controls on DOC exports.

Mark S. Johnson, Cornell University, msj8@cornell.edu (Apresentador / Presenting)

Johannes Lehmann, Cornell University, CL273@cornell.edu

Eduardo Guimarães Couto, Universidade Federal de Mato Grosso, couto@cpd.ufmt.br

Susan Riha, Cornell University, sjr4@cornell.edu

Mara Abdo, Universidade Federal de Mato Grosso, maraabdo@hotmail.com

Evandro Carlos Selva, Universidade Federal de Mato Grosso, evandroc@cpd.ufmt.br

Erick C.M. Fernandes, Cornell University, ecf3@cornell.edu

Fluxes of dissolved organic carbon (DOC) were determined for throughfall, surface runoff, leaching water, groundwater seeps, and stream water during base and storm flows in four headwater catchments in an undisturbed forest near Juruena, Mato Grosso in the seasonally dry, southern Amazon. During the dry-to-wet season transition, DOC concentrations in overland flow were found to decrease from 53.8 ± 18.1 mg/L at the beginning of the rainy season to 13.7 ± 4.8 mg/L by the middle of the rainy season (avg. value of all watersheds ± 1 std. dev.). Throughfall concentrations also decreased during this period from 16.3 ± 1.0 to 5.5 ± 1.1 mg/L. Stream flow DOC concentrations from weekly grab-samples of the four streams decreased over the period of study from 4.43 ± 1.45 to 1.57 ± 0.19 mg/L. Groundwater seep DOC concentrations were found to be relatively constant.

The seasonality of these forests appears to be the driving factor resulting in the temporal variability of DOC concentrations observed. The leaching out of the dry season litterfall and new leaf growth following the first rains supplies fresh DOC to streams via throughfall and surface runoff, while DOC in infiltrating water is subjected to sorption within the profile. This leachate decreased in concentration from about 7 mg/L at 10 cm depth to concentrations of about 0.2 mg/L in emergent groundwater.

Storm flow was sampled at discharges approximately 5 times and 10 time base flow discharges. DOC concentrations in storm flow samples were consistently higher than base flow, with DOC concentrations on average five times higher than base flow. Considering the differences between DOC values for base flow and storm flow in light of the tremendous differences between DOC in surface runoff and groundwater indicates an important coupling of surficial processes with exports of DOC from headwater catchments.

36.16-P: Terra Preta de Indio of the Amazon: opportunity to study black carbon dynamics in soil

Johannes Lehmann, Cornell University, CL273@cornell.edu (Apresentador / Presenting)

Biqing Liang, Cornell University, bl93@cornell.edu

Terra Preta de Indio are very fertile soils that can be found throughout the Amazon Basin. They are particularly rich in carbon, phosphorus, calcium and micronutrients and possess higher cation exchange capacity (CEC) per unit C than surrounding soils. It has been established that these soils are anthropogenic dating from 500-2500 B.P., but it is still unclear whether they are the result of habitation or intentional soil management by Amerindian populations. The key to their high and stable C content and nutrient retention is the large amounts of black C. Soils near Manaus were found to have 5-10 times more black C than adjacent Oxisols. The occurrence of soils rich in black C neighboring soils with low amounts of black C is an ideal opportunity to study black C dynamics in soil. This has relevance for soils on a global scale, since black C was found in all soils where the appropriate analyses have been performed. While the longevity of black C is

not yet clear, the changes in properties are virtually unknown. We investigated the properties of black C using synchrotron-based C (1s) Near-Edge X-ray Absorption Fine Structure (NEXAFS) spectroscopy to detect structural changes of black C over long periods of time. NEXAFS provides the opportunity to study the surface properties of black C particles that are as small as 10-40 micrometer. Stack spectra of cross-sectional areas revealed more carboxylic groups on surfaces of black C than in the center. A higher oxidation of surfaces would explain the greater CEC found in these soils. However, the amount of carboxylic groups on black C surfaces did not exceed those found on non-black C particles. A relatively high aromaticity after thousands of years of exposure to microbial and abiotic oxidation is an indication for the high structural stability of black C even under humid tropical conditions.

36.17-P: Carbono e Nitrogênio Orgânico no Solo e Carbono e Nitrogênio da Biomassa Microbiana em Solos com Gradiente de Umidade, Caxiuana - PA.

Elessandra Laura Nogueira Lopes, MPEG, enogueira@museu-goeldi.br (Apresentador / Presenting)
Maria de Lourdes Pinheiro Ruivo, MPEG, ruivo@museu-goeldi.br
Eric Bruno Silva Batista, MPEG, marajuar@supriadad.com.br
Brenda Rocha Guimarães, MPEG, brguimaraes@museu-goeldi.br
Rejane Rocha Costa, MPEG, rcosta@bol.com.br

Este trabalho teve como objetivo avaliar as alterações sazonais do teor de carbono e nitrogênio orgânico do solo e carbono e nitrogênio da biomassa microbiana, em áreas de terra firme (Latosolo Amarelo) e igapó (Gleissolo). O experimento foi desenvolvido na Estação Científica Ferreira Penna localizada dentro da floresta nacional de Caxiuana, PA. Foram coletadas amostras de solo em quatro períodos climáticos, durante o ano de 2003: duas no período chuvoso (meses de março e maio) e duas no período seco (agosto e novembro) em 5 plotes: LBA-Experimento, LBA-Controle, Terra Firme-PNOPG, Igapó-Norte e Igapó-Sul com cinco repetições, todas estas com vegetação de floresta típica das áreas. A coleta de solo foi realizada em cinco pontos, na profundidade de 0-20 cm, a partir de uma transecção nas áreas. As amostras de solo foram armazenadas a uma temperatura de 4°C até o momento da realização das análises. Depois de homogêneas e passadas por uma peneira de malha 4 mm os resíduos de plantas e raízes foram removidos do solo cuidadosamente. Os maiores valores de C-org foram encontrados nos Gleissolos norte e sul (43,33 e 57,54 g C kg⁻¹ de solo, respectivamente) na estação seca. Os plotes igapó norte e sul apresentaram valores de C-BMS superiores (1010,59 e 974,36 mg C kg⁻¹ de solo, respectivamente), em relação as demais áreas. Entretanto, no presente estudo, o C e N da BMS foram maiores na estação seca em todas as áreas estudadas. Os resultados sugerem que as variações sazonais, interferem na estrutura da comunidade microbiana do solo, aliada a mudança de umidade no status de umidade do solo através do stress hídrico.

Termos de indexação: carbono e nitrogênio, biomassa microbiana, umidade, Latossolo Amarelo, Gleissolo.

(1). MPEG - Coordenação de Ciências da Terra e Ecologia/Museu Paraense Emílio Goeldi.

36.18-P: Soil Carbon Stocks and Dynamics in Acre: Contrasts with the Remaining Brazilian Amazon

Antonio Willian Flores de Melo, Centro de Energia Nuclear na Agricultura - USP/Parque Zoobotânico - UFAC, awfmelo@cena.usp.br (Apresentador / Presenting)
Plínio Barbosa de Camargo, Centro de Energia Nuclear na Agricultura - USP, pcamargo@cena.usp.br
Cleber Ibraim Salimon, Centro de Energia Nuclear na Agricultura - USP, clebsal@cena.usp.br
Eric A. Davidson, The Woods Hole Research Center, edavidson@whrc.org
Susan E. Trumbore, University of California, setrumbo@uci.edu
Judson Ferreira Valentim, Centro de Pesquisa Agroflorestal do Acre - Embrapa, judson@cpafac.embrapa.br

Soils are an important carbon reservoir, and Amazonian soils store about 66 Pg C. Acre soils, which are under the influence of the on-going uplift of the Andes, are distinct from the most dominant soils in Brazilian Amazonia. Soils in Acre are mostly Inceptisols, Alfisols, and Ultisols, and are frequently eutrophic, pedogenetically young, and comparatively unweathered. Little is known about the impacts of land use change on soil organic matter under these circumstances. The present study focused on: (1) the effect of land-use change on carbon stocks and delta 13C, and (2) estimating carbon stocks of the most common soils occurring in the state. We determined the C content, delta 13C and bulk soil density in pastures of 5, 12-15, and 20 years and in 2 intact forests in depths from 0 to 100 cm, on Ultisols (well drained) and Alfisols (poorly drained). A carbon stock map was created using a soil map (scale 1:1.000.000) and also data from previous soil surveys. Soils in Acre store about 1 Pg C to 1m depth. Eutrophic soils contain smaller C stocks than dystrophic soils within the same soil order. The rate of decomposition of carbon in Alfisols is lower than in Ultisols, but the mean residence time of organic matter is longer. The Ultisols tend to lose more carbon with land-use change. Based on soil carbon data, the productivity of *Brachiaria brizantha* cv. Marandu pastures is probably lower on Alfisols, indicating that, in addition to soil fertility, other characteristics such as soil drainage affect pasture productivity and carbon dynamics.

36.19-P: Transporte de carbono e nutrientes da liteira para o igarapé em uma pequena bacia hidrológica de Terra-Firme na Amazônia central

Terezinha Ferreira Monteiro, INPA, mont@inpa.gov.br (Apresentador / Presenting)
Flavio Jesus Luizão, INPA, fluizao@inpa.gov.br

TRANSPORTE DE CARBONO E NUTRIENTES DA LITEIRA PARA O IGARAPÉ EM UMA PEQUENA BACIA HIDROLÓGICA DE TERRA FIRME NA AMAZÔNIA CENTRAL

RESUMO: A quantidade de material particulado grosso (liteira) transportado pelo igarapé de uma pequena bacia hidrográfica (Igarapé Asu), foi correlacionada com a descarga do igarapé. O objetivo foi estudar a produção da liteira pela floresta circundante e avaliar a dinâmica do carbono e nutrientes em dois períodos sazonais (chuvoso e seco), com ênfase para o carbono orgânico dissolvido nas águas do igarapé. Esse material foi coletado utilizando uma rede amostradora com uma cerca em parte do igarapé, efetuando-se duas campanhas intensivas de 15 dias cada: a primeira no mês de fevereiro

(período chuvoso), e a segunda no mês de julho (período seco). As amostras são secas ao ar, e são triadas para a separação de folhas inteiras (L), folhas quebradas ou fermentadas (F) e material lenhoso (W). Todo material coletado é pesado, moído e processado para posterior análise química. Na primeira campanha (período chuvoso), a maior produção de liteira foi 26,0 mg/m³ (dia chuvoso) e a menor 9,0 mg/m³ (dia seco). A quantidade transportada pela planície de inundação após uma forte chuva foi de 4,0 mg/m³. Na seqüência, pretende-se estudar a dinâmica do C e nutrientes, correlacionando-os com o carbono orgânico dissolvido (DOC) encontrado nas águas do igarapé.

PALAVRAS-CHAVE: Liteira fina; descarga; igarapé; transporte de carbono.

36.20-P: Relações entre a produção de liteira e os componentes do balanço hídrico na Estação Científica Ferreira Penna, Melgaço-PA.

Rosecélia Moreira Silva, Universidade Federal de Viçosa, rmoreira@vicosa.ufv.br (Apresentador / Presenting)
Jose Maria Nogueira da Costa, Universidade Federal de Viçosa, jmcosta@ufv.br (Apresentador / Presenting)
Samuel Soares Almeida, Museu Paraense Emílio Goeldi, samuel@museu-goeldi.br
Antônio Carlos Lôla da Costa, Universidade Federal do Pará, lola@ufpa.br
Patrick Meir, Universidade de Edinburgo, pmeir@ed.ac.uk
Maria de Lourdes Pinheiro Ruivo, Museu Paraense Emílio Goeldi, ruivo@museu-goeldi.br

A importância da quantificação da produção de liteira associada com os parâmetros que afetam sua variação é amplamente reconhecida para a compreensão da dinâmica de ecossistemas. O presente estudo visa identificar as variáveis do balanço hídrico climático mais correlacionadas com a produção de liteira. A área de estudo foi a Floresta Nacional de Caxiuanã-Melgaço-Pará (10 42'S, 51 0 31'W) em uma parcela de 1 hectare. A liteira total foi amostrada mensalmente, durante o período de janeiro a dezembro de 2002, nas frações folhas, gravetos e elementos reprodutivos. A produção de liteira ocorreu durante todo o período de observação, com os maiores valores ocorrendo na estação menos chuvosa. O mês de maior produção de liteira foi agosto, sendo que a queda de folhas contribuiu com 73% do total. Os picos da produção de gravetos e as partes reprodutivas ocorreram em dezembro e novembro, respectivamente. O mês que apresentou a menor ocorrência de queda de liteira foi março, coincidindo com o mês de maior precipitação. A contribuição das folhas para o total de liteira nesse mês foi de 55%. As menores ocorrências de gravetos e partes reprodutivas ocorreram em junho. A produção média mensal de liteira na área experimental foi de 77,8 kg.ha⁻¹, distribuída em folhas (49,23 kg.ha⁻¹), gravetos (12,10 kg.ha⁻¹) e partes reprodutivas (16,47 kg.ha⁻¹). As variáveis do balanço hídrico climático mais correlacionadas com a produção de liteira, baseadas no coeficiente de correlação linear foram: evapotranspiração potencial ($r = 0,64$), precipitação ($r = - 0,63$) e deficiência hídrica ($r = 0,54$).

36.21-P: Influence of soil texture on the dynamics of dissolved organic carbon in soil solution of a primary forest in the Amazon ZF2, Manaus

Vania Neu, CENA - Centro de Energia Nuclear na Agricultura, vneu@esalq.usp.br (Apresentador / Presenting)
Alex Vladimir Krusche, CENA - Centro de Energia Nuclear na Agricultura, alex@cena.usp.br
João Ferraz, INPA - Instituto Nacional de Pesquisas da Amazônia, jferraz@inpa.gov.br

The Amazon Rain Forest is characterized by several types of relief, vegetation, and soils. The biomass of this forest can be understood through its biochemical cycles. Within this context, carbon cycle is necessary for the maintenance of the Amazonian ecosystem. This study was conducted in a primary forest along a transect of gradient elevation at the ZF2 reserve INPA, Manaus. The main objective was the assessment of carbon dynamics, using soil solution, sampled weekly from March to August 2003. Tension lysimeters were installed at depth of 20 and 100 cm. Soil solution samples were preserved with HgCl₂ and dissolved organic carbon (DOC) concentrations determined in a Shimadzu Total Organic Carbon Analyzer, model 5000A. Preliminary results show correlation between DOC concentrations in soil solution and soil texture. The lowest DOC concentrations were found in Oxisols on the plateaus with the highest content of clay in the transect. These low concentrations may result from adsorption of DOC to clay. The highest concentrations were observed in Spodosols of sandy lowlands, which probably results from higher permeability combined to low adsorption capacity. On the hillside, Ultisols of medium texture presented intermediate concentration when compared to the previous sites. COD migration is observed in all soil profiles, which is highlighted by higher concentrations of DOC in low lands at the 100 cm depth.

36.22-P: Concentrações carbono e nitrogênio em folhas de árvores em duas florestas de terra firme na Amazônia brasileira, sobre solos de fertilidade contrastante.

Romilda Maria Quintino Paiva, Instituto Nacional de Pesquisas da Amazônia, romilda@inpa.gov.br (Apresentador / Presenting)
Flavio Jesus Luizão, Instituto nacional de Pesquisas da amazônia, fluiuzao@inpa.gov.br

O objetivo deste trabalho foi verificar se as concentrações de nitrogênio e carbono, bem como a relação C:N nas folhas varia em dois locais de estudo, com solos de fertilidade química natural contrastante: Acre e Pará. Este trabalho está sendo desenvolvido em florestas de terra firme na Amazônia brasileira, comparando duas localidades: uma de solo mais fértil (Acre) e outra de solo mais pobre (Pará). Foram instaladas três parcelas de 1 ha cada, em cada localidade. As folhas foram coletadas na parte superior da copa das árvores, em vinte indivíduos adultos por parcela; as folhas amostradas foram secas em estufa e tiveram suas nervuras centrais retiradas, antes das análises químicas. Houve diferença significativa entre as localidades: as folhas coletadas no Estado do Acre (Amazônia ocidental) apresentaram maiores concentrações de N foliar ($p < 0,01$), porém menores concentrações de C ($p < 0,001$), do que no Estado do Pará (Amazônia oriental). A relação C:N foi significativamente maior nas folhas do Pará ($p < 0,001$). Portanto, a maior fertilidade natural dos solos foi refletida nas maiores concentrações de N foliar e numa menor relação C:N, o que indica a produção de uma liteira com melhor qualidade nutricional, favorecendo uma rápida decomposição e liberação de nutrientes ao solo.

36.23-P: Fluxo de CO₂ e CH₄ em pastagens abandonadas, sistemas agroflorestais e floresta primária na Amazônia Ocidental

Juliete Tomé Queiroz, CD-403 (Artaxo), jmtq@bol.com.br (Apresentador / Presenting)

Lucerina Trujillo Cabrera, CD-403 (Artaxo), lucerina@inpa.gov.br

Flavio Jesus Luizão, CD-403 (Artaxo), fluizao@inpa.gov.br

A conversão das áreas florestais, em larga escala, na região Amazônica levará a um aumento de temperatura, com sérias mudanças no balanço global de CO₂ (Fearnside et al., 1993), e possivelmente também de NO, N₂O e CH₄. Para ajuda a reverter essa situação, pesquisas na Amazônia têm sugerido os sistemas agroflorestais (SAFs) como alternativas ecológicas e econômicas para tornar produtivas as áreas abandonadas e/ou degradadas, ao mesmo tempo diminuindo as emissões de gases do efeito estufa. A proposta deste estudo foi de monitorar as emissões de CO₂ e CH₄ em diferentes usos da terra. O estudo foi realizado na Embrapa/CPAA, localizado no km 53 da BR-174 (Manaus/Boa Vista) e na Reserva Biológica do Cuieiras (INPA). Houve uma diferença significativa no fluxo de CO₂ nos diferentes usos da terra e nas diferentes estações do ano. A floresta secundária e a floresta primária foram as áreas com maior fluxo de CO₂ (5,94 e 6,40 μmol CO₂ m⁻²s⁻¹, respectivamente), e o período de maior fluxo foi o período chuvoso (6,63 μmol CO₂ m⁻² s⁻¹, na floresta secundária). O maior teor de umidade no solo foi encontrado na floresta secundária (41,4%) e o menor nas pastagens (29,8%).

36.24-P: Soil Aluminium Influence Over Tree Species Distribution in the Bolivian Amazon Forest

Carlos Alberto Quesada, Max-Planck Institute for Biogeochemistry, Jena, Germany., quesada@unb.br (Apresentador / Presenting)

Jonathan James Lloyd, Max-Planck Institute for Biogeochemistry, Jena, Germany., jon.lloyd@bgc-jena.mpg.de

Sandra Patiño, Max-Planck Institute for Biogeochemistry, Jena, Germany., spatino@bgc-jena.mpg.de

Oliver L. Phillips, University of Leeds, Leeds, England, o.phillips@geog.leeds.ac.uk

Yadvinder Singh Malhi, University of Edinburgh, Edinburgh, Scotland, ymalhi@ed.ac.uk

Almuth Arneth, Max-Planck Institute for Biogeochemistry

Luzmilla Arroyo, Museo Nacional Noel Kempf Mercado, Santa Cruz de la Sierra, Bolívia, luzmillaarroyo@hotmail.com

Timothy Killeen, Museo Nacional Noel Kempf Mercado, Santa Cruz de la Sierra, Bolívia, t.killeen@conservation.org

Soils and leaves samples were collected at nine recensused permanent plots allowing the identification of several new aluminium accumulating (Ac) plant species and their distribution as affected by soil conditions in the Bolivian Amazon. Soil exchangeable Al concentration showed large variations, ranging from 0,08 mmol kg⁻¹ to 79,56 mmol kg⁻¹. This gradient in soil Al had strong influence over tree species composition of the areas with Ac plants being dominant in areas where soil exchangeable Al was abundant and markedly less abundant in areas of lower soil Al availability.

For the soil with highest exchangeable Al concentration, Aluminium accumulating species accounted for 37% of the tree species present, but only Aluminium accumulators contributed to only 3% of the species in relatively fertile soil. Across all nine sites sampled a Pearson correlation between a dominance index for Ac plants and soil exchangeable Al concentration was very high at 0,947 (p<0,01).

36.25-P: Decomposição de folhas de espécies em uma Floresta Tropical de Transição em Sinop/MT em períodos de transição úmido- seco e seco-úmido

Fernando Raiter, UFMT, raitersn@terra.com.br (Apresentador / Presenting)

José de Souza Nogueira, UFMT, nogueira@cpd.ufmt.br

Segundo Durval Pereira Rezende, UFMT, floresteiro@pop.com.br

Wander Hoeger, UFMT, wander_hoeger@yahoo.com.br

Jansen Luiz Trierweiler, UFMT, jansentrierweiler@ig.com.br

Luciana Sanches, UFMT, lsanches@hotmail.com (Apresentador / Presenting)

George Sanches Sulli, UFMT, suli@terra.com.br (Apresentador / Presenting)

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

Francisco de Almeida Lobo, UFMT, f_a_lobo@cpd.ufmt.br

Em termos de biomassa, as folhas de liteira representam uma parcela substancial da produção de liteira no solo, apresentando velocidade de decomposição mais elevada que a dos galhos e outros materiais, contribuindo em grande parte com o retorno de nutrientes para o solo. O objetivo deste trabalho foi verificar a decomposição de folhas de espécies de *Tovomita schomburgkii* e *Brosimum lactescens*, nos períodos de transição úmido-seco e seco-úmido. Este estudo foi desenvolvido em uma área localizada a 50 km aproximadamente de Sinop, Mato Grosso (11°24.75'S: 55°19.50'O), caracterizada por um clima tropical úmido com acentuadas variações sazonais. Nesta região foi instalada uma torre de 41 metros para a coleta de dados micrometeorológicos. Foram utilizadas bolsas de nylon ("litter bags") de dimensão 30 x 30 cm com malha de 2,5 x 2,0 mm cada, preenchidas com peso seco entre 2 a 5 g de folhas das espécies mais abundantes de cada área, *Tovomita schomburgkii* e *Brosimum lactescens*. As bolsas de nylon foram instaladas em vinte pontos de amostragem, e em cada ponto 5 e 6 bolsas, respectivamente nos períodos de transição úmido-seco e seco-úmido. A perda média de massa do material no período úmido-seco foi de 28,1% e no período seco-úmido foi de 23,2%, em 91 e 129 dias, respectivamente. Em ambos períodos, se obtiveram correlações satisfatórias entre o tempo de exposição do material e o percentual de material remanescente na área em estudo. Comparando-se os valores médios acrescidos dos respectivos desvios padrões para os dois períodos estudados observou-se que a velocidade de decomposição foi maior no período úmido-seco. Conclui-se que o uso da regressão para determinar a decomposição foi um bom indicador para o modelo regional.

36.26-P: Aumento da Produção de Liteira em um Período de El Niño em Floresta de Terra Firme na Amazônia Central

Fabiana Rocha Pinto, INPA, biabolivia@bol.com.br (Apresentador / Presenting)

Flavio J. Luizão, INPA, fluizao@inpa.gov.br

Regina C.C. Luizão, INPA, rccl@inpa.gov.br

Este estudo visa verificar as respostas da produção de liteira, em florestas primárias, ao fenômeno climático El Niño e ao enriquecimento de CO₂ na atmosfera, que podem determinar um aumento na liteira produzida através do prolongamento da época seca e da fertilização foliar com CO₂. O estudo foi realizado na Reserva do Cuieiras, do INPA, 70 km ao norte de Manaus. Foram utilizados 60 coletores fixos (10 em cada sub-parcela) medindo 50x50 cm, distribuídos ao acaso em duas posições topográficas distintas (platô e baixio), nos períodos seco e chuvoso do ano. A produção média mensal de liteira situou-se na faixa de 0,27-1,64 t.ha⁻¹ no platô e 0,22-1,51 t.ha⁻¹ no baixio, com uma maior produção no período seco, em ambas as posições topográficas, e maior no platô do que no baixio. Os valores anuais estimados de produção de liteira foram de 8,9 t.ha⁻¹.ano⁻¹ e 7,5 t.ha⁻¹.ano⁻¹, para o platô e baixio, respectivamente. No ano 2002/03, quando houve um El Niño moderado, a produção de liteira na estação seca foi 60% maior do que no mesmo período nos anos de 1979-82 e 59% maior do que no ano mais chuvoso subsequente ao El Niño. Conclui-se que o fenômeno El Niño estaria induzindo uma maior queda de liteira na floresta, e há evidência preliminar de um aumento sustentado na produção de liteira com o aumento de CO₂ na atmosfera.

36.27-P: Capacidade de Água Disponível no Solo e Suas Relações com a Fauna do Solo e as Funções Reprodutivas Vegetal: Experimento LBA Esecaflor- Caxiuanã/PA

Maria de Lourdes Pinheiro Ruivo, Museu Paraense Emílio Goeldi,, ruivo@museu-goeldi.br (Apresentador / Presenting)

Marlúcia Bonifácio Martins, Museu Paraense Emílio Goeldi, marlucia@museu-goeldi.br

Samuel Soares Almeida, Museu Paraense Emílio Goeldi, samuel@museu-goeldi.br

Eleneide Doff Sotta, Universidade de Goettingen, esotta@gwdg.de

O estudo foi realizado nas parcelas do Experimento LBA-Esecaflor em Caxiuanã, Pará: Sítios A (controle) e B (experimental). Foram realizadas análises físico-hídricas e micromorfológicas, em amostras de solo indeformadas, até a profundidade de 50 cm. Avaliou-se a população e diversidade da microbiota e da mesofauna e as funções reprodutivas vegetal. As análises de umidade mostram variação no conteúdo de água no solo entre os sítios. As parcelas A e B são contíguas e apresentam o mesmo tipo de solo (Latossolo Amarelo), com características texturais e micromorfológicas semelhantes (textura média, teores médios de carbono variando de 6, 2 g/kg (A) a 6,6 g/kg (B) e predominante presença de macroporos arredondados). Os resultados mostram que na parcela B (0,102mm) a capacidade de água disponível (CAD), é menor que na parcela A (0,141mm), provavelmente pela ação da exclusão de água no solo. Os resultados indicam uma interação entre o clima, a produção primária e o funcionamento do solo. A menor disponibilidade de água na parcela B, aliada a variação sazonal, pode ser a responsável por pequenas mudanças na microbiota e mesofauna do solo, assim como na função reprodutiva vegetal com reflexos na distribuição, produção e transporte dos gases no solo. No entanto, é necessária a continuação do estudo, principalmente, considerando a variação sazonal e incluindo mais algumas parcelas com gradiente de umidade e na textura do solo.

36.28-P: Assessing the impact of land-use change on soil organic carbon dynamics in Central Panama using physical soil fractionation and stable carbon isotopes

Luitgard C Schwendenmann, University of Wyoming, lschwenn@uwyo.edu (Apresentador / Presenting)

Elise Pendall, University of Wyoming, pendall@uwyo.edu

Tropical ecosystems play an important role in the global carbon budget. About 44% of global soil organic carbon (SOC) is located in tropical areas. Forest clearing in tropical regions is estimated to contribute about 23% to human-induced CO₂ emissions. We use stable C isotopes coupled with soil fractionation techniques to evaluate SOC dynamics following forest clearing in Central Panama. Soil samples were taken at 0-5, 5-10, 10-15, 15-20, 20-30, 30-40 and 40-50 cm depths from an undisturbed forest site and an adjacent clearing where the forest was cut approximately 80 years ago. Carbon concentration throughout both profiles is highest in the macro-aggregate fraction (0.250-2 mm). ¹³C values of the macro-aggregate fraction of the undisturbed forest ranged from -28.3‰ in the topsoil to -23.5‰ in the subsoil. Carbon in the topsoil of the clearing was more enriched in ¹³C (-20.6‰), reflecting the input of C₄ vegetation with ¹³C values of -19.1‰. The macro-aggregate fraction at both sites showed comparatively high ¹³C values in the subsoil, suggesting that microbial fractionation enriched the older/deeper soil organic carbon. Particle-size and density fractionation will help elucidate this pattern. The values of ¹³C for soil organic carbon will be used to determine the soil carbon pool sizes and to calculate the turnover time of soil organic carbon in this moist humid ecosystem. These experiments will contribute to parameterization of carbon cycle models for tropical ecosystems.

36.29-P: The influence of water in the relationship between CO₂ efflux and soil chemical properties in a terra firme forest

Juliana Silva de Souza, INPA, souzajs@hotmail.com (Apresentador / Presenting)

Regina Costa Luizão, INPA, rccl@inpa.gov.br

Flavio Jesus Luizão, INPA, fluizao@inpa.gov.br

The relationship between soil CO₂ efflux and soil humidity and/or temperature have been extensively explored in the literature. However, studies showing relationship between soil CO₂ efflux and soil chemical properties are still few. Taking into account that soil CO₂ efflux varies in function of the canopy coverage which in turn is affected by the soil, the use of

soil chemical properties in the flux models can be useful. This study aimed to evaluate the relationship between soil chemical properties and the soil CO₂ flux in three different portions of the topographic gradient (plateau, slope and valley) in a terra firme forest near Manaus. In the plateau, there was significant relationship between soil CO₂ efflux and the C (p<0.01; r²=0.373), N (p<0.05; r²=0.175), C:N ratio (p<0.05; r²=0.228), available P (p<0.001; r²=0.518), exchangeable K (p<0.001; r²=0.489), exchangeable Mg (p<0.05; r²=0.171) and potential acidity (p<0.001; r²=0.281). In the valley soil, it was observed significant relationship between soil CO₂ efflux and exchangeable K (p=0.054; r² = 0.226), exchangeable Ca (p<0.05; r²=0.271) and base saturation (p<0.05; r²=0.364). No significant relationships were observed in the slope soils. All the relationships observed in the plateau soil were positive, contrasting with the inverse relationships observed in valley soils, which can be a consequence of the variation in soil water content in the last case, with a ground water nearest from surface.

36.30-P: Carbono e nutrientes na interface solo-liteira em plantios florestais e florestas nativas de terra firme na Amazônia peruana

Sandra Celia Tapia-Coral, INPA, sandra@inpa.gov.br (Apresentador / Presenting)

Flavio Jesus Luizão, INPA, fluizao@inpa.gov.br

Dennis del Castillo, IIAP, dennis@iiap.org.pe

Foram determinadas a massa de liteira acumulada sobre o solo e as concentrações e estoques de carbono e nutrientes no solo e na liteira, em plantios florestais de Cedrelinga catenaeformis e Simarouba amara; floresta primária; e, floresta secundária de terra firme. O trabalho foi desenvolvido no "Centro de Investigaciones de Jenaro Herrera" (CIJH/IIAP), 200 km acima da cidade de Iquitos (Loreto-Perú). A precipitação anual é de 2674 mm e a temperatura média mensal de 26°C. A floresta primária apresentou a maior quantidade de liteira acumulada sobre o solo, o que estaria garantindo as maiores concentrações e estoques de carbono e nutrientes no solo. As concentrações de carbono na liteira da floresta primária e secundária foram mais baixas do que nos plantios florestais, principalmente na época chuvosa, quando a queda de liteira parece ser uma importante fonte de fósforo, potássio e cálcio nestes sistemas. Os estoques de carbono foram maiores na floresta primária, principalmente na época chuvosa, decrescendo nos quatro tipos de vegetação na época seca. Os plantios florestais de Cedrelinga catenaeformis e Simarouba amara apresentaram maiores concentrações de carbono no solo do que a floresta primária e secundária, principalmente na época seca. O plantio florestal de Cedrelinga catenaeformis apresentou altas concentrações e estoques de nitrogênio, possivelmente devido à fixação biológica de nitrogênio.

36.31-P: Variação sazonal da biomassa microbiana-C e da umidade do solo sob diferentes coberturas vegetais na Amazônia central

Lucerina Trujillo-Cabrera, INPA, lucerina@inpa.gov.br (Apresentador / Presenting)

Flavio J. Luizão, INPA, fluizao@inpa.gov.br

As mudanças na cobertura vegetal e o manejo inadequado dos solos na Amazônia provocam o desgaste das propriedades físicas, químicas e da atividade biológica destes solos, contribuindo para o aumento das áreas degradadas na região. O objetivo deste trabalho foi relacionar as variações da biomassa microbiana-C e umidade do solo nos períodos seco, transição seco-chuvoso e chuvoso, sob floresta nativa, capoeira, sistema agroflorestal (SAF) e pastagem. O estudo foi desenvolvido na estação experimental da Embrapa/CPAA, no km 53 da Rodovia Manaus-Boa Vista, e na Reserva Biológica de Cuieiras, localizada a 80 km ao norte de Manaus. Coletaram-se cinco amostras compostas de solo na profundidade de 0-10 cm, em cada parcela de 40 x 100 m (n=3), das diferentes coberturas vegetais. Para quantificar o C da biomassa microbiana, foi utilizado o método de fumigação-extração, utilizando o extrator K₂SO₄ 0,5 M e posterior determinação pelo método de Walkley-Black. Para avaliar a umidade gravimétrica do solo, foram pesadas 10 g de solo, que foram colocadas na estufa a 1050C durante 48 horas. Os maiores valores da biomassa microbiana-C foram encontrados na transição do período seco-chuvoso, sendo maiores (p>0,05) na floresta (792 µg/g) do que nos demais tipos de vegetação. Os menores valores foram encontrados na pastagem (406 µg/g), que não apresentou diferenças significativas entre os períodos seco e chuvoso (p>0,05). A umidade gravimétrica do solo não apresentou relação direta com a biomassa microbiana do solo (r=0,27).

36.32-P: Carbon distribution in particle size fractions of soil organic matter under primary forest and agroforestry systems on two soil types in western Amazonia

Katell Uguen, INPA, katell@inpa.gov.br (Apresentador / Presenting)

Thierry Desjardin, IRD/UFRA, desjardi@ufra.edu.br

Sonia Sena Alfaia, INPA, sonia@inpa.gov.br

Flavio Jesus Luizão, INPA, fluizao@inpa.gov.br

The aim of the work was to evaluate the carbon distribution in particle size fractions of soil organic matter under primary forest and 12-years old agroforestry systems (AFS) in order to understand the carbon storage mechanisms as soil organic matter (SOM). The study was carried out in six smallholder properties of the RECA Project (Reflorestamento Econômico Consorciado e Adensado) in western Amazonia. Two soil types were compared: Red Oxisol (Latossolo Vermelho) and Yellow-Red Inceptisol (Cambissolo). Soil samples were taken in 10- cm layers up to 50 cm deep, but the particle size fractionation was only performed in the 0-10 cm layer. After dispersing the soil with resin, SOM was sorted into five particle-size fractions: coarse sand (200-2000 µm), fine sand (50-200 µm), coarse silt (20-50 µm), fine silt (2-20 µm), and, clay (0-2 µm). Red Oxisols are clayer (> 60% of clay) and present higher carbon concentrations in the upper soil layer (23.8 mgC. g⁻¹) than the Inceptisols (36% of clay and 13.8 mgC.g⁻¹). The coarse sand fraction had the highest carbon concentrations for both soil types; however, about 60% of total soil carbon was in the clay fraction. No significant differences have been observed in carbon concentrations of the different fractions between natural forest and agroforestry system. Nevertheless, the study on carbon quality, such as the C/N ratio, could reveal differences in SOM between the two land use systems.

36.33-P: Medição do Efluxo de CO₂ do Solo com Câmaras Automáticas Sobre Floresta em Rondônia.

Fabício Berton Zanchi, IAG/USP, fabricio@model.iag.usp.br (Apresentador / Presenting)
Humberto Ribeiro da Rocha, IAG/UPS, humberto@model.iag.usp.br
Helber Custódio de Freitas, IAG/USP, helbercf@model.iag.usp.br
Bart Kruijt, ALTERRA, Bart.Kruijt@wur.nl
Juliano Alves de Deus, UNIR, julianoalde@yahoo.com.br
Fernando Luiz Cardoso, UNIR, cardoso@unir.br
Paulo Renda Anderson, UNIR, paulorenda@ibest.com.br
Leonardo J. G. Aguiar, UNIR, veraneiro@hotmail.com
Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br

No balanço global de carbono os fluxos de CO₂ atmosféricos à superfície sobre ecossistemas têm se tornado um objeto de relevante interesse científico. O entendimento desses processos está vinculado ao papel da biosfera no controle da evapotranspiração e da emissão/remoção de gases estufa, o que desta forma está relacionado à questão de variabilidade climática regional e global. Neste trabalho foi explorada uma metodologia de medição do efluxo de CO₂ (respiração do solo), utilizando-se câmaras de solo automáticas acopladas a analisador de gás no infra-vermelho (CIRAS-SC). Os dados de respiração do solo e sua correlação com a temperatura do solo, umidade do solo, quantidade de liteira e precipitação foram estimadas à partir de dados coletados em uma área de floresta tropical na Fazenda Itapirema, Ji-Paraná-RO, no ano de 2003. Os resultados deste trabalho sugeriram dependências significativas durante todo o ano em função de umidade e temperatura do solo. Na escala do ciclo diurno e sazonal, a respiração do solo e das variáveis físicas mostraram um padrão bem definido que permitiu distinguir uma variabilidade característica em cada escala de tempo. Foram utilizados modelos matemáticos simples da respiração do solo para correlacionar a respiração com a temperatura e a umidade do solo, que se mostraram razoavelmente ajustados para o conjunto de dados.

SH (Hidrologia e Química das Águas) / SH (Surface Hydrology and Water Chemistry)

[SH_Biogeoquímica \(SH_Biogeochemistry\)](#)

37.1-P: Balanço de Nitrogênio em Microbacias Pareadas (Floresta vs. Pastagem) no Estado de Rondônia, Brasil

Adriana L. Castellanos B., PPGI - Ecologia de Agroecossistemas CENA/ESALQ - USP, Piracicaba - SP, alcbonil@esalq.usp.br (Apresentador / Presenting)
Alex V. Krusche, Centro de Energia Nuclear na Agricultura - USP, Piracicaba - SP, alex@cena.usp.br
Christopher Neill, Marine Biology Laboratory, Woods Hole, MA, USA, cneill@mbl.edu
Sérgio C. Gouveia, PPGI - Ecologia de Agroecossistemas CENA/ESALQ - USP, Piracicaba - SP, sneto@cena.usp.br
Sonja Germer, University of Potsdam, Germany, sgermer@rz.un-potsdam.de
Alexandra Ayres Montebelo, Centro de Energia Nuclear na Agricultura - USP, Piracicaba - SP, nandaymo@bol.com.br
Marcos A. Bolson, PPGI - Ecologia de Agroecossistemas CENA/ESALQ - USP, Piracicaba - SP, mbolson@zipmail.com.br

O desmatamento de florestas nas regiões tropicais, para usos agrícolas ou pastagens, é uma das principais atividades que podem alterar o ciclo do nitrogênio nos ecossistemas aquáticos da região. No entanto, a maioria dos estudos referentes a ciclos biogeoquímicos têm sido desenvolvidos nas regiões temperadas e em rios de ordem superior. Por este motivo, este trabalho visa fornecer informações sobre possíveis alterações nas espécies de nitrogênio transportadas por pequenos igarapés, após a conversão de floresta em pasto em regiões tropicais. Para tal, selecionaram-se duas microbacias de tamanho e características fisiográficas similares, sendo uma com cobertura vegetal original (floresta) e outra desmatada e ocupada por pastagem, ambas localizadas na região central do estado de Rondônia (Cacaulândia). Em ambas será feito um balanço das formas e quantidades de nitrogênio transportadas da terra para a água. Para quantificar o volume de água que se desloca pelo ecossistema foi instalado um vertedouro tipo H, um coletor de chuva tipo "wet only" e coletores de chuva no pasto e "throughfall" na floresta. As coletas se realizaram durante a estação chuvosa, de 21 de Janeiro a 27 de fevereiro de 2004. As concentrações das espécies inorgânicas de N (NO₃⁻, NO₂⁻, NH₄⁺) estão sendo determinadas por cromatografia líquida, em equipamento da marca Dionex, modelo DX500. As concentrações de nitrogênio dissolvido total serão determinadas por colorimetria, em equipamento Foss Tecator, modelo FIAstar 5000, após digestão com persulfato de potássio. As concentrações e composição isotópica do nitrogênio particulado estão sendo determinadas em analisador elementar, acoplado a espectrômetro de massa.

37.2-P: The role of suspended sediments in the metabolism and nutrient concentrations in river waters of Rondonia.

Michelle Cristine Cogo, CENA - Centro de Energia Nuclear na Agricultura, mccogo@esalq.usp.br (Apresentador / Presenting)
Alexandra Ayres Montebelo, CENA - Centro de Energia Nuclear na Agricultura, nandaymo@bol.com.br
Alex Vladimir Krusche, CENA - Centro de Energia Nuclear na Agricultura, alex@cena.usp.br
Anthony K Aufdenkampe, Stroud Water Research, aufdenkampe@stroudcenter.org

In the last decade there was a significant increase on the land cover transformations of forests into pastures in the State of Rondonia. These transformations can lead to an increase in the load of materials carried by the rain in the erosive process. Presuming that rivers are integrators of processes occurring in the watershed, these alterations interfere directly in their physical and chemical parameters. The objective of this study is to evaluate the controlling mechanism of respiration rates in rivers and possible changes in nutrient concentrations in two paired watersheds of Rondonia. The study was conducted

at Igarapés; Boa Vista in areas of forest and pasture. Samples were collected with a submersible pump, a plankton sieve and a Millipore ultra-filtration system equipped with 0.1 µm membranes, the coarse and fine sediments present in these waters were concentrated 4 to 7 times. The concentrated solutions were added to bottles containing in natura samples from the rivers, and incubated in the dark for 24 and 48 hours. The respiration rates were calculated from oxygen consumption in these incubations. The concentrations of dissolved oxygen were determined by Winkler titration. Also, the following concentrations were analyzed: respiration rates, nitrate, nitrite, ammonium, and phosphate. Preliminary results exhibit an alteration on respiration rates and concentrations of these compounds from the addition of fine and coarse suspended sediment. Therefore, it is possible that the adsorbed elements in the sediments, such as carbon and other nutrients, are determinant factors of respiration rates of these aquatic ecosystems.

37.3-P: Estudo das Variáveis Físico-química, Química e Bacteriológica de Igarapés das Bacias Hidrográficas de São Raimundo, Educandos e Tarumã.

Hilandia Brandao Cunha, INPA - Instituto Nacional de Pesquisas na Amazonia, hilandia@inpa.gov.br (Apresentador / Presenting)

Na Amazônia os igarapés naturais são importantes não somente como componentes do ecossistema, mas também para o cotidiano do homem da região, uma vez que servem como vias de locomoção, fontes de alimento, água para consumo, uso doméstico e lazer. O crescimento desordenado das cidades geralmente é acompanhado de deficiências na infra-estrutura sanitária, resultando na degradação dos mananciais para onde são canalizados esgotos sanitários, muitas vezes em áreas próximas à captação de água para abastecimento. Governos de todo o mundo reconhecem a importância de caracterizar e estabelecer padrões de qualidade de água. No Brasil, a resolução do CONAMA 20/86 estabelece valores dos parâmetros quando se pretende avaliar a qualidade de um curso de água. O objetivo deste foi avaliar variáveis físico-químico, químico e bacteriológico das águas de superfícies das Bacias hidrográficas do município de Manaus-AM. Com base nos resultados verificou-se que as áreas consideradas naturais por não haver tantas mudanças, possuem suas características diferenciadas das estações urbanizadas, devido à existência da cobertura vegetal, que influencia na temperatura da água que está diretamente relacionada com o aumento da condutividade elétrica e até com o oxigênio dissolvido; Matéria orgânica intimamente associada ao pH, onde em regiões naturais o pH se mostra ácido, também por essa relação com a MO. Os trechos onde o adensamento populacional é maior existem alterações drásticas nos ambientes aquáticos. Há a necessidade urgente do controle da poluição para a melhoria das águas, através da implantação de saneamento básico com redes de tratamentos de esgotos domésticos e efluentes industriais.

37.4-P: Determinação dos Parâmetros Físico-Químico e Bacteriológico de Poços Rasos cacimbas da Região Leste da Cidade de Manaus.

Hilandia Brandão Cunha, Coord. Pesquisas em Clima e Recursos Hídricos-CPCR/INPA, hilandia@inpa.gov.br (Apresentador / Presenting)

José Rodrigues Rocha Neto, Bolsista CNPq-PIBIC/INPA, hilandia@inpa.gov.br

A cidade de Manaus vem passando, nos últimos 25 anos, por um período de grande desenvolvimento devido à instalação da Zona Franca, o que gerou um intenso fluxo de imigração e um exagerado êxodo rural. Atraídos pelas ofertas de emprego, essas pessoas começaram a instalarem-se afastadas do centro da cidade, nas chamadas invasões, onde as redes de saneamento são muito precárias ou inexistentes. Esse problema social levou as pessoas a furarem poços de maneiras inadequados, com risco de contaminação das águas subterrâneas já que suas características químicas é o reflexo dos meios por onde perolam. Este projeto teve como objetivo caracterizar através de análises físico-química, química e bacteriológica as águas dos poços rasos "cacimbas" da Zona Leste de Manaus, a fim de determinar se as mesmas se encontravam contaminadas por substância provenientes das fossas. Após a obtenção dos resultados, verificou-se que os parâmetros físicos-químicos dos poços profundos (> 80 m) da Zona Leste da Cidade de Manaus mostraram-se isentos de microorganismos considerados poluidores, e que são os únicos com características potáveis, estando de acordo com os parâmetros estabelecidos pela Organização Mundial da Saúde - OMS. Para os resultados bacteriológicos, também não foram encontrados nenhum sinal de contaminação em nenhuma das amostras, realizados em poços de grande profundidade. Os poços rasos "cacimbas" apresentam parâmetros físico-químicos bastante diferenciados, destacando-se dois poços no bairro do Jorge Teixeira, que apresentaram indícios de poluição por apresentarem valores de nitrito e nitrato fora dos padrões recomendados pela Organização Mundial da Saúde - OMS.

37.5-P: Stream size influences the biogeochemistry of nitrogen in pasture stream channels.

Christie L. Haupert, Marine Biological Laboratory, chauPERT@mbl.edu (Apresentador / Presenting)

Linda A. Deegan, Marine Biological Laboratory, ldeegan@mbl.edu

Christopher Neill, Marine Biological Laboratory, cneill@mbl.edu

Alex V. Krusiec, Centro de Energia Nuclear na Agricultura/USP, alex@cena.usp.br

Reynaldo L. Victória, Centro de Energia Nuclear na Agricultura/USP, reyna@cena.usp.br

Victoria R. Ballester, Centro de Energia Nuclear na Agricultura/USP, vicky@cena.usp.br

Small streams act as receptors for nutrients arriving from adjacent upland areas, and subsequently transform, retain or release these nutrients to larger rivers. To understand how deforestation and conversion of Amazon forest into pasture alters stream function, we evaluated geomorphology, organic matter stocks and biogeochemical processes of a small (30 L/s) and large (100 L/s) pasture stream in central Rondônia. We conducted two 21-day ¹⁵N-ammonium additions to trace transformations and downstream transport of nitrogen and organic matter turnover. The small stream was on average deeper (60-cm) and wider (600-cm) than the large stream (40-cm deep, 350-cm wide). The small stream was bordered by *Paspalum* grasses that stretched into the stream channel and had organic rich sediments. The large stream was primarily bordered by high soil/sand banks with few grasses growing in the stream channel and had sandy sediments. Grasses growing within 1-m of the edge of both stream channels acquired large amounts of the added ¹⁵N (30-130 per mil). Grasses growing further than 1-m from the stream channel border were only present in the small stream and were labeled between 15-30 per mil. Benthic organic matter from the small stream acquired half as much ¹⁵N as the large stream. ¹⁵N was released from organic matter of both streams at the same rate suggesting organic matter in both streams turned over

at roughly equal rates. The small stream retained more nitrogen than the large stream suggesting that alterations in adjacent landscape can have different effects on stream channel biogeochemical processes depending on stream size.

37.6-P: Towards a Large-Scale Aquatic Carbon Model for the Amazon Basin

Erica Akiko Howard, University of Wisconsin - Madison, Center for Sustainability & the Global Environment, eahoward@wisc.edu (Apresentador / Presenting)

Michael T. Coe, University of Wisconsin - Madison, Center for Sustainability & the Global Environment, mtcoe@wisc.edu

Jonathan A. Foley, University of Wisconsin - Madison, Center for Sustainability & the Global Environment, jfoley@wisc.edu

Marcos Heil Costa, Universidade Federal de Viçosa, mhcosta@ufv.br

The work of Richey et al. (2002) has focused attention on the importance of carbon dioxide efflux to the atmosphere from waters of the Amazon basin. We are taking steps toward quantifying this flux on the scale of the whole basin. Our approach uses a combination of an ecosystem land surface model (IBIS - Foley et al. 1996, Kucharik et al. 2000), a hydrological routing model (HYDRA - Coe 2000, Coe et al. 2002), and a new aquatic carbon processing module that we are incorporating into HYDRA.

Here, we describe the current state of this C model and our future plans for development. We drive the model with IBIS-derived estimates of surface and groundwater from the terra firme, várzea, and igapó, and with empirically-derived estimates of C inputs. To allow for seasonal fluctuations in the aquatic-terrestrial transition zone, for each timestep HYDRA simulates the volume of water contained in each of four chemically-distinct zones in each grid cell: pelagic (open water), littoral (near-shore), floodable lowland, and terra firme (upland). With this information the model simulates the dynamics among six different pools of aquatic C: autotrophs, coarse particulate organic carbon (CPOC), fine particulate organic carbon (FPOC), dissolved organic carbon (DOC), dissolved inorganic carbon (DIC), and sediment. Water and C are explicitly advected to downstream grid cells. The amount of CO₂ efflux from the water surface is calculated for each grid cell, in each timestep. This model is being calibrated with empirical data from the CAMREX project and LBA sources. As the model is developed, it will eventually be driven with a combination of annual climate datasets, soils and topographical data, and remote-sensing-based maps of wetland extent.

37.7-P: Controls on stream DOC flux and composition in the Amazon region, Tapajos national forest

Marc Gerald Kramer, NASA Ames / CSUMB, mkramer@mail.arc.nasa.gov (Apresentador / Presenting)

Christopher Potter, NASA, cpotter@mail.arc.nasa.gov

Raimundo Cosme de Oliveira Jr., Embrapa, cosme@cpatu.embrapa.br

Steven Klooster, NASA Ames/ CSUMB, sklooster@mail.arc.nasa.gov

Venessa Brooks, NASA Ames / CSUMB, vbrooks@mail.arc.nasa.gov

To improve predictive capabilities of water, carbon and nitrogen gas fluxes in the Amazon region, we are examining the influence of land cover, topography and soil on stream dissolved organic carbon (DOC) flux and composition. Using 90-m SRTM digital elevation (DEM) data and land cover/land use maps derived from Landsat-TM we have selected several catchments in the Tapajos national forest drainage area with contrasting land use, topography, and soils. Field sampling of throughfall, lysimeter and stream water components will provide insight into flow path dynamics and a better understanding of the chemical nature of DOC under contrasting land use patterns. DOC samples will be characterized and compared using Nuclear Magnetic Resonance (NMR). In addition to parameterizing model simulations of carbon and nitrogen dynamics, monitoring of DOC flux across select streams will be used for model validation.

37.8-P: Riparian control of carbon dynamics in streams of Rondônia

Alex Krusche, CENA-USP, alex@cena.usp.br (Apresentador / Presenting)

Maria Victoria Ballester, CENA-USP, vicky@cena.usp.br

Reynaldo Luiz Victória, CENA-USP, reyna@cena.usp.br

Linda Deegan, MBL, ldeegan@mbl.edu

Christopher Neill, MBL, cneill@mbl.edu

We sampled two paired watersheds in the Western Amazon (Fazenda Nova Vida, Ariquemes, RO) for carbon fractions (coarse and fine particulate and dissolved) at various stages of the hydrograph between years 1998 and 2000. At each watershed, one of the streams drained forest, and the other pastures established 20 years ago. Also, in one of these watersheds, we followed the distribution of C fractions along its course from first to fourth order reaches. We found a significant increase in both dissolved and particulate C at the pasture streams, which was related to the invasion of its waters by naturally growing Paspallum grass. This increase in C availability resulted in important shifts in aquatic metabolism, from oxic conditions in the forests to quasi-anoxic in the pastures. The isotopic composition of riverine C fractions provided evidence of the presence of this grass-derived organic matter in transport. However, along its course from first to fourth order reaches, at one of these paired watersheds, this "signal" of forests to pasture conversion in C dynamics was not evident. Although at the higher reaches streams drained mostly pastures, riverine C resembled that of the forest reaches. Our findings show that, for these streams of the Amazon, in-channel processes and riparian structure are more important than those predominating at the watershed, thus challenging, at least partially, the concept that rivers integrate the processes occurring at their basins.

37.9-P: The Biogeochemistry of Ji-Paraná River, Rondonia

Nei Kavaguichi Leite, CENA/USP, nkleite@esalq.usp.br (Apresentador / Presenting)

Alex Vladimir Krusche, CENA/USP, alex@cena.usp.br

Reynaldo Luiz Victória, CENA/USP, reyna@cena.usp.br

Maria Victoria Ramos Ballester, CENA/USP, vicky@cena.usp.br

Jeffrey E. Richey, University of Washington, jrichey@u.washington.edu

Land use changes that occurred in the state of Rondonia in the last decades transformed the landscape of this region. Mainly along the road BR-364, what was almost all forest before is now covered with extensive pastures, with impacts in the aquatic systems that are still not known. This work aims the identification of the relative importance of the natural and anthropogenic characteristics of the basin in the biogeochemistry of the Ji-Paraná river and its main tributaries, assuming that the chemistry of river waters reflects what happens in its basin. To achieve that, a comparative approach was used, in which differences between systems with distinct soils and land use/cover were analyzed, as well as seasonal variations during the period of this study (1999-2002). Regarding spatial variations, the lowest concentrations of ions were found in rivers draining areas with sandy and less fertile soils, whereas the highest ones were found in rivers located in the central part of the basin, draining soils with higher clay content and more fertile. In relation to seasonal variations, it was observed that rivers draining basins in which forests predominate show positive correlations between discharge and ionic content, while rivers draining basins with large areas of pastures, showed inverse correlations between discharge and concentrations of ions. These results indicate that the natural characteristics of these basins might be the main controlling factor of river biogeochemistry. However, variations in nutrient concentrations, such as C, N and P, also indicate that human influences are already present in these systems.

37.10-P: Relação Entre Carbono Orgânico Dissolvido e Condutividade Elétrica na Bacia Asu, Amazônia Central, Brasil

Sylvia Mota de Oliveira, Instituto Nacional de Pesquisas da Amazonia, smoli@inpa.gov.br (Apresentador / Presenting)

Antônio Donato Nobre, Instituto Nacional de Pesquisas da Amazonia, anobre@ltd.inpe.br

Maarten Waterloo, Vrije Universiteit Amsterdam, watm@geo.vu.nl

Luz Adriana Cuartas Pineda, Instituto Nacional de Pesquisas Espaciais, adriana@cptec.inpe.br

Javier Tomasella, Instituto Nacional de Pesquisas Espaciais, javier@cptec.inpe.br

Martin George Hodnett, Instituto Nacional de Pesquisas Espaciais, mhodnett@lineone.net

Antônio Huxley Melo Nascimento, Instituto Nacional de Pesquisas da Amazonia, huxley@inpa.gov.br

Glauco Siqueira Gonçalves, Instituto Nacional de Pesquisas da Amazonia, glauco@inpa.gov.br

A dinâmica de carbono na Floresta Amazônica encontra-se fortemente ligada ao ciclo da água. A bacia Asu, com cerca de 6.37 Km², é formada por igarapés de água negra, em uma floresta de terra firme não perturbada na Amazônia Central. A relação entre carbono orgânico dissolvido e condutividade elétrica foi monitorada continuamente durante 18 meses, através de um espectrofotômetro de UV-VIS e um condutivímetro que registram e armazenam dados a cada trinta minutos. A concentração média de DOC para todo o período foi de 8.5 mg/l ($s=3.0$), com ampla variação, abrangendo valores até 26.2 mg/l. A concentração de DOC no igarapé é significativamente maior durante a estação chuvosa. A condutividade elétrica apresentou-se, em média, igual a 16.1 mS/cm, variando de acordo com a variação de DOC e atingindo um pico de 35.2 mS/cm. Este fenômeno ocorre devido ao aporte de ácidos húmicos e fúlvicos da zona saturada do solo para o igarapé, tanto em situações de escoamento base quanto em eventos de chuva. Estes compostos e ainda uma grande variedade de íons orgânicos são os principais responsáveis pela variação da condutividade elétrica da água, considerando as baixas concentrações de íons inorgânicos medidas. O aumento de DOC gera um aumento da condutividade elétrica cuja relação pode ser expressa pela fórmula $y = 0.58x + 2.38$. O coeficiente de correlação entre os parâmetros é de 0.55. Situações nas quais a alteração da concentração de DOC não é seguida de uma alteração na condutividade elétrica provavelmente refletem uma mudança na composição química da água proveniente do lençol freático.

37.11-P: Availability of Nutrients in Solutions in a Gallery Forest of Cerrado Biome

Lucilia Parron, Embrapa e UnB, lucilia@tecnolink.com.br (Apresentador / Presenting)

Mercedes Maria Cunha Bustamante, UnB, mercedes@unb.br

Daniel Markewitz, University of Georgia, dmarke@smokey.forestry.uga.edu

Cesar Prado, UPIS, cesarjardim@hotmail.com.br

Gallery forests represents 5% of the Cerrado biome (savannas of Central Brazil) but contains 1/3 of its biodiversity. They protect water quality, control soil erosion and are important corridors for the fauna. In Central Brazil, gallery forests are characterized by a high heterogeneity particularly due to topographic variations that determine important variations of the soils conditions. Our objective was to characterize the fluxes of nutrients in solutions in a gallery forest (atmospheric deposition, throughfall, litter leachate and soil solution). The experiment was established in a plot of 100 x 100 m in the Gallery Forest of the Corrego Pitoco, in the Reserva Ecologica do IBGE, DF (15°56'41"S and 47°56'07' W). Three sampling lines were established, parallel to the stream and 45 m apart to each other. The lines represent the wet community (near the stream), intermediate community and dry community (adjacent to a typical Cerrado area). The mean fluxes of NO₃⁻, TOC, K⁺, Ca₂⁺, Mg₂⁺ and Cl⁻ in throughfall were greater than in the atmospheric deposition, indicating that these elements are being leached from canopy. On the other hand, the fluxes of N_{total}, NH₄⁺, N_{organic}, P_{total}, Na⁺ and SO₄²⁻ were lower in throughfall than in the atmospheric deposition, indicating that these nutrients are being retained in the canopy. The C_{organic}, N_{total}, NO₃⁻, NH₄⁺, N_{organic}, K⁺, Ca₂⁺, Mg₂⁺ and Cl⁻ fluxes in litter leachate were greater than in throughfall while P_{total}, SO₄²⁻ and Na⁺ fluxes were lower, indicating that these nutrients are being retained in the litter. The fluxes in throughfall and litter leachate were in the order: C_{organic} > K⁺ > Ca₂⁺ > Cl⁻ > Mg₂⁺ > N_{total} > SO₄²⁻ > Na⁺ > P_{total}.

37.12-P: A Simulation Model of Carbon Cycling and Methane Emissions in Amazon Wetlands

Christopher Potter, NASA Ames Research Center, cpotter@mail.arc.nasa.gov (Apresentador / Presenting)

John Melack, University of California, Santa Barbara, melack@lifesci.ucsb.edu

Laura Hess, University of California, Santa Barbara, lola@icess.ucsb.edu

Bruce Forsberg, Instituto Nacional de Pesquisas da Amazonia, Manaus, forsberg@horizon.com.br

Evlyn Moraes Novo, Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, evlyn@ltd.inpe.br

Steven Klooster, California State University Monterey Bay, sklooster@mail.arc.nasa.gov

An integrative carbon study is investigating the hypothesis that measured fluxes of methane from wetlands in the Amazon region can be predicted accurately using a combination of process modeling of ecosystem carbon cycles and remote sensing of regional floodplain dynamics. A new simulation model has been build using the NASA-CASA concept for

predicting methane production and emission fluxes in Amazon river and floodplain ecosystems. Numerous innovations are being made to model Amazon wetland ecosystems, including: (1) prediction of wetland net primary production (NPP) as the source for plant litter decomposition and accumulation of sediment organic matter in two major vegetation classes -- flooded forests (várzea or igapo) and floating macrophytes, (2) representation of controls on carbon processing and methane evasion at the diffusive boundary layer, through the lake water column, and in wetland sediments as a function of changes in floodplain water level, (3) inclusion of surface emissions controls on wetland methane fluxes, including variations in daily surface temperature and of hydrostatic pressure linked to water level fluctuations. A model design overview and early simulation results are presented.

37.13-P: The influences of total dissolved inorganic carbon (DIC) concentrations and pH on potential outgassing from rivers in Rondônia.

Maria de Fátima Fernandes Lamy Rasera, CENA / USP, mrasera@cena.usp.br (Apresentador / Presenting)

Alex Vladimir Krusche, CENA / USP, alex@cena.usp.br

Nei Kavaguichi Leite, ESALQ / USP, nkleite@esalq.usp.br

Recent studies point to the importance of CO₂ outgassing from rivers of the Amazon, suggesting that a significant part of the carbon fixed by forests return to the atmosphere through this pathway. Gas exchange between the atmosphere and supersaturated waters is a function of gaseous gradients across the air-water interface. Water pCO₂ is strongly determined by the concentrations of dissolved inorganic carbon (DIC) and pH, which, in turn, are a function of physical, chemical and biological processes. This study focus on the influence of DIC concentrations and the pH on potential CO₂ outgassing to atmosphere, using as study area the basin of Ji-Paraná river, Rondônia. Several rivers of the basin were sampled nine times between May/99 and April/02. DIC concentrations were analyzed with a non-dispersive infra-red detector, in a Shimadzu TOC500A analyzer. Temperature, pH and DIC concentrations were used to calculate pCO₂, based on equilibrium equations. A theoretical diffusive flux model was used to estimate CO₂ evasion. The results show that rivers draining areas with more fertile soils present larger concentrations of DIC and of potential CO₂ evasion, although with significant seasonality. During high waters, even with lower DIC concentrations, the parallel decrease in pH is of a magnitude enough to promote higher potential evasions.

Key-words: Carbon dioxide, dissolved inorganic carbon, pH, Amazonian rivers.

37.14-P: Impact of a phytoplanktonic bloom on the trace concentrations of amazonian floodplain lakes (Lago de Curuai, Para, Brazil)

Barroux Gwénael, Université Paul Sabatier, TOULOUSE Franca, barroux@lmtg.ups-tlse.fr

Viers Jérôme, Université Paul Sabatier TOULOUSE Franca, viers@lmtg.ups-tlse.fr

Seyler T Patrick, IRD, Franca, pseyle@lmtg.ups-tlse.fr (Apresentador / Presenting)

Maria de Socorro Rodrigues Ibanez, Universidade de Brasília, mrodrigues@unb.br

The Amazon river is one of the most important source of fresh water to the Ocean (~15% of the world fresh water discharge) and contribute significantly to the chemical fluxes to the global ocean. The most part of the Amazon basin is characterised by an extremely low declivity (1 cm/km), and an extended floodplain, which is controlling the liquid and solid transfers to the Ocean through the storage of large volume of waters during the floods and strong sedimentation processes. These wetland areas constituted by a complex networks of thousands of lakes, named várzeas, extend over more than 300 000 km² [1 ; 3] and represent one of the most productive ecosystems of the world due to the regular enrichment in nutrients by the river waters. These roles set the "várzeas" as key areas to understand the whole transfer process through the Amazon basin. In order to understand which biochemical processes control the concentration and fate of chemical elements inside this ecosystem, an extended scientific survey was conducted in the Curuai floodplain area (56°1'W, 5°59' S ; 1°9'S, 2°3'S, Para State, Brazil). With an extension about 1900 km² at the high water level, the Curuai floodplain lakes system is representative of the Amazon basin.

As the Amazon water is stored in this floodplain, the particular conditions induced by the river regime associated with the high vegetation productivity, generates in turn various transformation and degradation processes of the elements present in the river water [2]. One of these processes is due to the occurrence of phytoplanktonic blooms. Using a multielement analysis approach in a first step, we present the main biochemical features affecting both major and trace elements during a bloom period. Speciation calculations using MINTeq code were then used to model the observed results.

A first approach on our results show depletion in dissolved phase for Mn, Y, REE and Th and excess in dissolved phase for Cr, As, Cs and Pb. These results might be confirmed by further research.

References

[1] Junk W.J.(Ed.) (1997) The Central Amazon Floodplain Springer Verlag, Ecological studies 126.

[2] Seyler P. and Boaventura G. R. (1998) In The biogeochemistry of the Amazon Basin and its Role in a Changing World. McClain M., Victoria R.L. & Richey J.E.(eds.) Oxford Univ. Press.

[3] Sippel S.J., Hamilton S.K., Melack J.M., and Choudhury B.J. (1994) REMOTE SENS ENVIRON 48, 70-76.

37.15-P: How the Amazonian floodplain vegetation can affect the geochemical status of some trace elements in the Amazon River mainstream (Brazil)?

Viers Jérôme, LMTG IRD, viers@lmtg.ups-tlse.fr

Pinelli Marcello, Universidade de Brasília, mpinelli@unb.br

Barroux Gwénael, LMTG Université Paul Sabatier, Toulouse Franca, barroux@lmtg.ups-tlse.fr

Boaventura R Geraldo, Universidade de Brasília, grbunb@unb.br

Seyler T Patrick, LMTG IRD, pseyle@lmtg.ups-tlse.fr (Apresentador / Presenting)

The purpose of the present paper is an attempt to forecast the role of floodplains in the transfer of trace elements by the Amazon River mainstream. The Central Amazon wetland areas constituted by a complex network of lakes, named várzeas,

extend over more than 300,000 km² (Junk, 1985) and represent one of the most productive ecosystems in the world due to the regular enrichment in nutrients by the river waters. The concentration of some trace elements (i.e., Al, Mn, Fe, Co, Cu, Mo, Rb, Sr, Ba, and U) have been measured in the Amazon River water (Manacapuru Station, Amazonas state, Brazil) and in some lake waters and plants (leaves) of a várzea (Ihla de Marchantaria, Manaus, Brazil) at different periods of the hydrological cycle. Four representative plant species (two perennial species: *Pseudobombax munguba* and *Salix humboldtiana*, and two annual herbaceous plants: *Echinochloa polystachya* and *Eichhornia crassipes*) were selected according to the ecological functioning of the site.

Time series obtained for some elements (e.g., Mn, Cu) in the dissolved phase (i.e., <0.20 µm) of the Amazon River water could not be only explained by tributaries (rivers) contribution or instream processes. The contribution of the waters transiting each year through the floodplains should be considered. The results enlighten the fact that chemistry of the waters draining these floodplains is controlled by reactions occurring at the interfaces between the sediments and waters (large variation of redox conditions) and between plants and waters. Trace elements concentrations in the plants (leaves) vary strongly according to the hydrological season. Based on these concentrations data and the biological productivity of these environments a first order calculation was done in order to estimate the amount of elements that can be stored (permanently or temporarily) in the vegetation of these floodplains. These elemental fluxes are not negligible when they are compared with those exported by the dissolved phase of the Amazon River water.

37.16-P: Potabilidade das Águas Subterrâneas do Município de Ji-Paraná. Estudo de Caso: Bairro Nova Brasília

Ariveltom Cosme Silva, UNIR, ariveltom@aol.com (Apresentador / Presenting)

O presente estudo objetivou analisar as águas do aquífero livre do bairro Nova Brasília em Ji-Paraná- RO, no tocante à sua potabilidade. É sabido que os aquíferos livres são mais vulneráveis às ações antrópicas, principalmente quando há deficiência do poder público no que se refere a saneamento básico. A cidade de Ji-Paraná não possui redes de esgotos e a grande quantidade de poços individuais escavados supre aproximadamente 60% da população. A pequena distância entre poços e fossas, aliado a um lençol freático de pouca profundidade, que varia de 4,80 m a 22,50 m, facilita os processos de contaminação do aquífero pelas fossas e águas servidas. O presente trabalho detectou, tanto no período das chuvas quanto na estiagem, índices extremamente elevados de coliformes e nitrato na maioria dos poços. Todas as amostras analisadas continham bactérias e mais de 88% delas apresentaram concentrações de NO₃ superiores ao valor máximo permissível (VPM), que é de 10 mg/L, estabelecido pela legislação vigente, o que torna essas águas impróprias para o consumo humano. Para o plano de amostragem, utilizou-se o método estatístico de "amostragem sistemática" (LANDIM, 1998), com a locação de vinte e dois poços escavados tipo "amazonas" e sete poços tubulares. A metodologia de coleta de amostras utilizada é a descrita no Guia de Coleta de Amostras de Água da CETESB (1988). Para a determinação das concentrações iônicas, utilizou-se a técnica da cromatografia líquida, com supressão de íons em equipamento DIONEX DX 500, com detecção feita por condutividade elétrica em coluna analítica modelos IonPac AS14HC (4mm) para ânions e CS12A (4mm) para cátions. Após a obtenção dos resultados analíticos, procedeu-se o tratamento estatístico dos dados para a classificação das águas estudadas, bem como para evidenciar a competição dos íons.

37.17-P: Desenvolvimento de metodologia analítica para a determinação simultânea de ácidos carboxílicos de baixo peso molecular e ânions inorgânicos em amostras dos rios da bacia Amazônica empregando Cromatografia de íons

Cristiane Azevedo Tumang, CENA-USP, catumang@cena.usp.br (Apresentador / Presenting)

Alex Vladimir Kruscher, CENA-USP, alex@cena.usp.br

Reynaldo Luiz Victória, CENA-USP, reyna@cena.usp.br

Alexandra Ayres Montebelo, CENA-USP, nandaymo@bol.com.br

Jeffrey E. Richey, University Washington, jrichey@u.washington.edu

Diversos estudos têm sido realizados sobre o ciclo do carbono no rio Amazonas e demonstram que as taxas metabólicas do mesmo são, provavelmente, mantidas por um pequeno estoque de matéria altamente reativa e em concentrações suficientes de ácidos carboxílicos de baixo peso molecular. Portanto, a hipótese de que este grupo de compostos orgânicos seja o mais importante para o metabolismo destas águas permanece em questão. Esses ácidos carboxílicos pertencem ao grupo dos ácidos graxos voláteis, constituindo aproximadamente 2 % do carbono orgânico dissolvido (COD) em águas contendo oxigênio. Em geral, origina-se da degradação microbiológica da matéria orgânica dissolvida e particulada, sendo mais abundantes em ambientes anaeróbicos. As concentrações desses ácidos variam para as águas naturais, se as condições do meio são oxidantes (µg L⁻¹) ou redutoras (mg L⁻¹).

A metodologia analítica foi desenvolvida empregando cromatografia líquida com equipamento DIONEX DX 500, supressão auto-regenerativa (300 mA) e temperatura de 30 °C. O recurso de substituir a alça de amostragem por uma coluna de pré-concentração do tipo IonPac AC15 (50 x 4 mm i.d.) foi utilizado, devido as baixas concentrações dos ácidos carboxílicos nos rios da bacia Amazônica. Através de um amostrador automático, a solução da amostra (1500 µL) foi injetada em um fluxo de fase móvel através de um gerador de eluente (EG40) de hidróxido de potássio (KOH) e pré-concentrada em linha. Em seguida, a mesma foi transportada através de colunas cromatográficas (colunas de guarda AG-15 e coluna analítica AS15, 250 x 4 mm i.d.). O gradiente de concentração do eluente foi fixado no tempo de retenção de 0 a 5 min em 8,0 mM KOH, seguido do aumento da concentração até 60,0 mM KOH no tempo de retenção de 5 a 20 min, os compostos foram eluídos, separados com boa resolução e deslocados para uma cela de detecção de condutividade elétrica acoplada a um detector eletroquímico.

A metodologia empregada mostrou-se adequada para a análise simultânea dos compostos orgânicos (lactato, acetato, propionato, glicolato, formato, butirato, MSA, piruvato, valerato, tartarato, clorato, oxalato, ftalato, maleato e citrato) e ânions inorgânicos (fluoreto, cloreto, nitrito, nitro, brometo, nitrato, sulfato e fosfato) na faixa de concentração de 10 a 500 µg L⁻¹ (r = 0,9987), apresentando um tempo de análise de aproximadamente 30 minutos.

38.1-P: Estudo, Análise e Modelagem da Dinâmica da Descarga em uma Micro-bacia Monitorada na Amazônia Central

Juan Camilo Múnera-Estrada, INPA, jcmunera@inpa.gov.br
Luz Adriana Cuartas, CPTEC INPE, adriana@cptec.inpe.br (Apresentador / Presenting)
Javier Tomasela, CPTEC INPE, javier@cptec.inpe.br
Maarten Waterloo, Free University Amsterdam, watm@geo.vu.nl
Martin George Hodnett, Free University Amsterdam, mhodnett@lineone.net
Antonio Donato Nobre, INPA, anobre@ltid.inpe.br

Na reserva Biológica do Rio Cuieiras, a 100 km de Manaus na Amazônia central, foi instalada uma rede de instrumentos hidrometeorológicos para monitoramento de uma micro-bacia (Bacia do Igarapé Asu 6.37 km²) em área não perturbada de floresta tropical úmida. Pela primeira vez na Amazônia será possível verificar o balanço de água numa bacia não perturbada, medindo as principais componentes do ciclo hidrológico. Para fechar o balanço na bacia, é preciso quantificar a variabilidade da vazão no Igarapé, mas devido às condições de umidade desta região tropical, ao tipo de solo, à alta densidade da vegetação e às características geomorfológicas do transecto onde está localizada a seção de controle (morfologia característica de uma planície aluvial inundável com seção transversal composta), apresentam grandes dificuldades para medir esta variável, principalmente nas enchentes (nível acima de 100 cm), o que dificulta a construção da curva de calibração ou curva chave da seção transversal para níveis acima da seção de canal cheio, gerando incerteza na estimação dos fluxos de saída destes eventos, e por tanto, na calibração e validação dos modelos hidrológicos que estão sendo implementados. Foram usados três métodos para determinar a curva chave: i) Área-velocidade, ii) Área-velocidade incluindo o efeito da densidade da vegetação e, iii) perfis de fluxo. Os resultados obtidos na construção da curva chave aplicando os dois primeiros métodos foram similares e considerados satisfatórios, sendo o segundo mais válido por ter em consideração o fenômeno físico de resistência ao fluxo gerado pela vegetação de floresta na planície inundável, mediante a determinação do parâmetro densidade da vegetação, e considerações de tipo hidráulico como a variação da resistência em profundidade. A curva chave construída prevê valores menores da vazão para níveis superiores ao canal cheio do que predizia a equação exponencial para níveis abaixo de 100 cm, que tinha sido extrapolada, o que estava gerando uma superestimação da vazão nas enchentes. A correção da curva chave permite fazer uma estimação contínua da vazão no Igarapé, com um nível de confiabilidade razoável, não obstante seja desejável medir alguns eventos adicionais para efeitos de uma validação a posteriori. A estimação contínua da vazão é feita aplicando a equação ajustada da curva chave à série contínua de níveis no Igarapé obtida com o sensor de pressão.

38.2-P: Spatial Distribution of the Hydrological Impact of Deforestation in Amazonia

Cassiano D'Almeida, CSRC/UNH, cassiano@eos.sr.unh.edu (Apresentador / Presenting)
Charles J. Vörösmarty, CSRC/UNH, charles.vorosmarty@unh.edu
George Hurtt, CSRC/UNH, george.hurtt@unh.edu
José A. Marengo, CPTEC/INPE, marengo@cptec.inpe.br
S. Lawrence Dingman, Department of Earth Sciences/UNH, ldingman@cisunix.unh.edu
Barry D. Kiem, Department of Geography and Anthropology/LSU, bkiem@srcc.lsu.edu

According to most macroscale modeling studies on the hydrological effects of deforestation, a complete replacement of forests by pastures in Amazonia is expected to result in a weakened water cycle. However, enhanced convective activity induced by disturbed, heterogeneous land-surface areas have been predicted by several mesoscale modeling studies. This contrast is partially supported by observations, which have detected significant trends on both evapotranspiration (decreasing) and runoff (increasing) in various disturbed catchments during the last decades, together with no consistent patterns at the basin scale. It then follows that deforestation induces contrasting effects at different spatial scales, revealing an intrinsic scale dependence on its hydrological impact. Therefore, it implies that despite of the absence of consistent trends at the basin scale, deforestation might still be imposing a strong impact at small and localized areas in the basin. The detection of these areas would help, for example, on the definition of preferable sites for future field expeditions and for improvements on the current gauging station network. And in order to do this, a straightforward modeling experiment is proposed here. The experiment consists on the application of daily (observed) gridded data sets into a water budget closure model - coupled to a simulated river network - which measures the impact of deforestation throughout the basin as the difference between the outputs from a couple of disturbed and undisturbed (control) simulations on each gridcell of the domain. During the disturbed simulation, consistent changes are imposed on each deforested gridcell - classified based on recent remote sensing data.

38.3-P: Caracterização de Margens de Lagos da Planície Amazônica a Partir de Fusão de Imagens Ópticas e de Radar

Andreia Maria S. França, INPE, andreia@ltid.inpe.br (Apresentador / Presenting)
Evlyn M. L. M. Novo, INPE, evlyn@ltid.inpe.br

A planície de inundação dos grandes rios da Amazônia Central comporta um complexo sistema de lagos. O estudo destes sistemas lacustres é de fundamental importância para compreender os processos da dinâmica fluvial do rio Amazonas, pois se comportam como um grande sistema físico aberto, recebendo e transferindo energia simultaneamente. A morfologia destes corpos d'água exerce influências marcantes sobre suas características físicas, químicas e biológicas. Suas grandes dimensões, sua dinâmica sazonal e principalmente a dificuldade de acesso limitam o conhecimento sobre tais áreas, o que faz do Sensoriamento Remoto a única forma viável para sua caracterização e monitoramento. As imagens de radar e de sistemas ópticos permitem identificar formas de lagos, a partir das quais podem-se deduzir seus processos de origem. Porém, as imagens ópticas fornecem informações sobre as características físico-químicas dos alvos, enquanto as imagens

de radar geram informações sobre as características elétricas, a textura e a geometria dos alvos. A fusão destas imagens auxilia na identificação e mapeamento de certas feições geomorfológicas, pois explora os diferentes conteúdos de informação sobre os alvos imageados, facilitando a interpretação visual das feições e melhorando a separabilidade entre classes em classificações numéricas. É nesse contexto que se insere este trabalho que possui como objetivo a caracterização de morfologias lacustres a partir de fusão de imagens ópticas e de radar, como contribuição ao conhecimento da origem dos lagos e seu papel nos ciclos biogeoquímicos dos ecossistemas alagáveis da Amazônia.

38.4-P: Hydraulic Slope of Negro and Solimões Rivers From Satellite Altimetry : Relationship With the Distribution of Erosion/Sedimentation Areas.

Seyler Frédérique, IRD, fseyler@lmtg.ups-tlse.fr (Apresentador / Presenting)

Calmant Stéphane, IRD, stephane.calmant@cnes.fr

Bonnet Marie-Paule, IRD, bonnet@lmtg.ups-tlse.fr

Marco Antonio de Oliveira, CPRM, gehite@ma.cprm.gov.br

We have processed available altimetry data that cross both rivers in order to calculate hydraulic slope at different stage, converting ellipsoid height to geoid height with respect to the static geoid delivered by the GRACE mission at a common. These data evidence various hydraulic step and changes in the curvature of the slope. For the confluence between Negro and Solimões, the altimetric data are compared to water levels computation using 1D St Venant equation constrained by water levels and discharges measured at two gauge stations that bracket the area. Besides, the correlation between these changes in slope curvature and the geographical distribution of erosion/sedimentation areas along-strike and cross-strike the river is investigated, as well as the links between the hydrodynamic behaviour of the rivers and the known neo-tectonic features of the area.

38.5-P: Propagação da Maré no Estuário do Rio Amazonas

Marcos Nicolas Gallo, COPPE/UFRJ, marcosgallo@peno.coppe.ufrj.br (Apresentador / Presenting)

Susana Beatriz Vinzon, DRHIMA/EE/UFRJ e COPPE/UFRJ, susana@peno.coppe.ufrj.br

Adriana Dantas Medeiros, COPPE/UFRJ, adriana@peno.coppe.ufrj.br

Felipe Augusto Oliveira, DRHIMA/EE/UFRJ, felipaug@hotmail.com

O estuário do rio Amazonas estende-se aproximadamente desde a cidade de Óbidos até o talude continental, considerando-se como limites superior e inferior do estuário, respectivamente, aquele local até onde a maré é observada, e a região em que é possível encontrar quantidades apreciáveis de água doce. A maré na plataforma continental amazônica é predominantemente semi-diurna e é amplificada na região costeira, caracterizando o estuário como de macro maré; somando-se a isso as vazões extraordinárias do rio Amazonas, este ambiente apresenta uma forte dinâmica. Efeitos não lineares próprios dos escoamentos em águas rasas resultam na geração de feições e singularidades na maré geradas na propagação. A geração de 'pororocas' em alguns locais da região da foz é um dos resultados mais espetaculares decorrentes da mudança da onda de maré na sua propagação.

A partir de dados maregráficos disponíveis no estuário e linha de costa, e utilizando um modelo numérico barotrópico configurado e calibrado para a região, são mostrados neste trabalho as principais características da propagação da maré no estuário, a geração e dissipação de componentes harmônicas de águas rasas, e em particular o efeito da vazão fluvial e da sua sazonalidade.

38.6-P: Impact of Land Use/Land Cover Change on Hydrological Processes in a Mesoscale Basin in Rondônia (Western,Amazônia)

Manuel Enrique Gamero Guandique, CENA/USP, megamero@cena.usp.br (Apresentador / Presenting)

Reynaldo Luiz Victória, CENA/USP, reyna@cena.usp.br

In this work the hydrological processes were simulated in the Jaru river basin (3,950 km²) within the Rondônia State, Western Amazônia, through the hydrological distributed model SWAT. The land use and land cover change on the basin were analyzed for the years from 1998 to 2000. The results showed that the model simulated reasonably the processes involved in this study. The behavior of the modeling reflected the use characteristics and type of soil of the basin in a distributed way. The annual medium streamflow simulated was underestimated in 7%, considered appropriate at the scale level used and demonstrates the capacity of the model to integrate the effects of the spatial and temporal variability of the drainage area characteristics. The annual sediments production in the basin was estimated in 0.45 t.ha⁻¹, being of the same order of magnitude of that obtained in another works in the same area. On the other hand, the use of the SWAT model and SIG ArcView interface, demonstrated high computational efficiency, making possible systematic analysis of the alterations that can happen in different areas of the basins.

38.7-P: Processes of streamflow generation in a small rainforest catchment in Central Amazonia

Martin George Hodnett, Free University of Amsterdam, mhodnett@lineone.net (Apresentador / Presenting)

Javier Tomasella, CPTEC/INPE, javier@cptec.inpe.br

Luz Adriana Cuartas, CPTEC/INPE, adriana@cptec.inpe.br

Antonio Donato Nobre, INPA, anobre@ltid.inpe.br

Maarten Waterloo, Free University of Amsterdam, watm@geo.vu.nl

Sylvia Mota de Oliveira, INPA, smoli@inpa.gov.br

Camilo Renno, CPTEC/INPE, camilo@cptec.inpe.br

In 2002 and 2003, runoff from the Asu catchment (6.37 km²) was 1455 mm and 832 mm, of which 45% and 31% was stormflow respectively. Earlier studies in the Barro Branco catchment (1.3 km²) in Reserva Ducke (with similar geology and

soils) showed that stormflow was 9% of total runoff in 1981, 1982 and 1983. Other studies in the same catchment suggested that the storm runoff was mainly generated from the valley floor, where the water table is close to the soil surface, leading to saturation excess overland flow (SOF). The Asu data confirm that the valley floor is the source of the storm runoff. The water table in the valley floor is controlled by two factors, (i) in the short-term, local vertical recharge direct to the water table and (ii) in the longer term, the discharge of groundwater from beneath the plateau and slope areas, fed by deep drainage (recharge) from these areas. There is also some evidence that interflow and return flow contribute to storm runoff in very large events.

The main reason for the large difference in storm runoff between the catchments is that in the much larger Asu catchment, the proportion of the catchment occupied by valley floor (32%), with a shallow water table, is much greater than in the Barro Branco. In addition, the rainfall was well above average in 2002. These results show that it may not be appropriate to scale up from process studies in very small catchments, because of scale-related changes in processes.

38.8-P: Landsat TM image restoration for mapping narrow water channels connecting small lake systems in Central Amazon: Mamirauá Sustainable Development Reserve - RDSM *

Dayson Jardim-Lima, National Institute of Amazonian Research - INPA / Project INPA/Max-Planck, dayson@ltd.inpe.br (Apresentador / Presenting)

Maria Teresa Fernandez Piedade, National Institute of Amazonian Research - INPA / Project INPA/Max-Planck, maitepp@internext.com.br

Helder Lima Queiroz, Mamirauá Sustainable Development Institute - IDSM, hqueiroz@ufpa.br

Evllyn Márcia Leão de Moraes Novo, National Institute of Space Research -INPE, evlyn@ltd.inpe.br

Jarauá and Mamirauá Lake Systems of the Focal Area of Mamirauá Sustainable Development Reserve - RDSM are characterized for a myriad of small lakes, either isolated or connected among themselves. The degree of lake connection to main rivers (Solimões and Japurá) along time is a key aspect for the understanding of biogeochemistry processes taking place in the area. The RDSM size (260,000 ha) and complexity, however, prevents an accurate mapping of this connection over time. This paper reports the use of image restoration techniques to improve spatial resolution of Landsat-5TM images in order to map lake connectivity changes between the high and low water. Images (Path/Row 001/62) were acquired at extreme low water (300 cm) and high water (1400 cm) levels. The images were submitted to restoration. Several pixel sizes were tested (from 25 to 5 m), Results showed that 10 to 15 m restoration provided the best channel definition allowing to map channel otherwise not defined in the images.

38.9-P: A base de dados "on-line" do projeto HiBAm-Hidro-geodinâmica da bacia amazônica.

Gérard Cochonneau, IRD, gerard.cochonneau@mpl.ird.fr

Jean Loup Guyot, IRD, jloup@amauta.rcp.net.pe (Apresentador / Presenting)

João Bosco Alfenas, CPRM

Geraldo Boaventura, UnB-IG, grbunb@unb.br

Jacques Calleda, IRD, cld@apis.com.br

Naziano Filizola, ANA, naziano@ana.gov.br

Valdemar Guimarães, ANA, valdemar@ana.gov.br

Pascal Kosuth, Cemagref, pascal.kosuth@teledetection.fr

Alain Laraque, IRD, alain.laraque@mpl.ird.fr

Reginaldo Simões Longuinhos, ANA

Jean-Michel Martinez, IRD, jmichel@unb.br

Laurence Maurice-Bourgoin, IRD, lmaurice@unb.br

Patricia Moreira-Turcq, IRD, pturcq@geoq.uff.br

Frédéric Muller, IRD

Julien Nicod, IRD, nicod@imft.fr

Eurides Oliveira, ANA, eurides@ana.gov.br

Marcos Assis Rios, ANA

Josyane Ronchail, IRD, Josyane.Ronchail@lodyc.jussieu.fr

João Bosco Rondon, ANA

Frédérique Seyler, IRD, fseyler@lmtg.ups-tlse.fr

Patrick Seyler, IRD, pseyler@lmtg.ups-tlse.fr

Gutemberg Menezes Silva, ANA

José Jorge da Silva, ANA

Francis Sondag, IRD, sondag@unb.br

O projeto de pesquisa HyBAm (Hidro-Geodinâmica atual da bacia amazônica) atua no Brasil desde 1994 no âmbito da cooperação científica franco-brasileira (convênio IRD-CNPq) e tem como objetivo principal desenvolver estudos e pesquisas para a compreensão e a modelagem do funcionamento hidrológico, sedimentológico e geoquímico da bacia amazônica. Com o apoio de instituições brasileiras (DNAEE/ANEEL/ANA e UnB), dezenas de campanhas de medições foram realizadas ao longo do rio Amazonas e dos seus principais afluentes.

Para facilitar o acesso a esses dados pelos participantes do projeto como também por uma mais ampla comunidade científica, uma base de dados "on-line" acessível através da Internet foi implementada.

A base disponibiliza parâmetros físico-químicos, resultados das análises químicas em água e MES, concentrações de matérias em suspensão (de superfície e/ou em diversos pontos da seção molhada) e medições ADCP (raw data). Dados hidrológicos gerenciados pela ANA (séries de totais pluviométricos e descargas líquidas) também são disponíveis para os postos principais.

As informações podem ser visualizadas na tela e carregadas, através de navegador Web, em formato compatível Excel. Outros planos de informações (rede fluviométrica, modelo numérico de terreno) também podem ser carregados em formato ArcView. Notas de informações ajudam a interpretação dos dados extraídos e descrevem os protocolos utilizados na coleta e análise dos dados.

A base de dados do projeto HyBAm, prevista para evoluir continuamente, acompanhando os avanços do projeto, torna-se uma fonte de dados acessível para todos os pesquisadores interessados em desenvolver pesquisas nesta área geográfica

ou elaborar mapas temáticos da região.

38.10-P: Los regimenes hidrológicos en la Cuenca Amazónica del Perú

Jorge Yerren, SENAMHI Peru, jyerren@senamhi.gob.pe (Apresentador / Presenting)

Waldo Lavado, SENAMHI Peru, wlavado@senamhi.gob.pe

Pascal Fraizy, IRD Peru, pfraizy@senamhi.gob.pe

Jean Loup Guyot, IRD Peru, jloup@amauta.rcp.net.pe

La cuenca Amazónica del Perú tiene una área de 956 800 km², lo que representa 74 % del territorio nacional. El Río Amazonas a la salida del país, tiene un caudal medio de 45 000 m³/s, el mayor tributario de la cuenca Amazónica. Sin embargo hasta hoy, los regimenes hidrológicos de los ríos de la cuenca amazónica del Perú son poco conocidos principalmente por falta de mediciones del caudal (aforos).

Con los primeros resultados obtenidos por el proyecto HYBAM (convenio SENAMHI - IRD) en Perú desde 2002, basados en aforos con tecnología Doppler (ADCP), se puede hoy describir y analizar el régimen hidrológico del Río Amazonas y de sus principales tributarios andinos : ríos Ucayali, Huallaga y Marañón.

38.11-P: A 1D sediment transport model for the Amazone river

Julien Nicod, INPT, Toulouse, France, nicod@imft.fr

Jean-Pierre Baume, Cemagref, Montpellier, France, jean-pierre.baume@cemagref.fr

Pascal Kosuth, Cemagref, Maison de la Teledetection, Montpellier, France Janeiro, Brasil, pascal.kosuth@teledetection.fr

Benoit Le Guennec, IRD-LMTG, Coppe/UFRJ, Rio de Janeiro, Brasil, benoit@peno.coppe.ufrj.br (Apresentador / Presenting)

A one-dimensional hydrodynamic model is built for the Amazon river from Manaus to Obidos. Floodable areas, major bed and varzeas, are estimated by fitting the observed and computed flood hydrographs.

Campaigns of measurements were performed at different periods of the hydrologic cycle on Amazon, Madeira, Solimoes and Rio Negro rivers: cross sections, bed levels, hydraulic discharges and velocity profiles with ADCP.

To analyse, understand and quantify the suspended load, solid transport capacities are computed and a loading law is used in the sediment transport model under non equilibrium conditions.

In a first attempt, a model of sediment transport between Manacapuru and Obidos is built using some available in situ measurements. These data come from the HyBAM measurement stations net. Samplings of suspended matter are done every ten days. They are taken just under the free surface and so consider only the finer particles of the suspended load. The needed data for the boundaries conditions are here the suspended load in the three upstream contributors (Rio Negro, Solimoes and Madeira). They are estimated by multiplying the concentrations of suspended matter near the free surface by the mean discharge in the cross section. This first model shows that deposit can occur on some reaches, even for the finest particles. That is due to the high or low water flow regimes and depends on flooded areas contribution which can trap sediments.

In the last years, the solid discharges were also estimated measuring concentration profiles by sampling, along three verticals for each cross section in different reaches of the rivers. Grain size distributions were then obtained in laboratory. These data allow to define the balances and fluxes of the suspended matter with more accuracy, and will be used to calibrate a sediment transport model in order to account for the total suspended load, and to precise the contribution of the flooded areas.

38.12-P: Avaliação da confiabilidade de dados hidrográficos para a bacia trinacional da Bolívia, Brasil e Peru do Alto Rio Acre, Amazônia Sul-Occidental.

Mônica De Los Rios Maldonado, Universidade Federal do Acre/Parque Zoológico, mjdLrios@hotmail.com (Apresentador / Presenting)

Irving Foster Brown, WHRC/UFAC, fbrown@uol.com.br

A bacia trinacional da Bolívia, Brasil e Peru do Alto Rio Acre (7.600 km²) é uma das poucas bacias trinacionais na Amazônia. O plano trinacional para gerenciar esta bacia depende, entre outras coisas, da compatibilidade de dados oriundos de três países. Para verificar a confiabilidade da hidrografia desta área foram realizadas comparações entre as hidrografias dos zoneamentos dos estados/departamentos que compartilham a bacia, a hidrografia derivada do Modelo Digital de Elevação (DEM) do Shuttle Radar Topography Mission (SRTM) do ano 2000 (pixel de 90m), usando software IDRISI 32 e imagens LANDSAT TM do ano 1999 (pixel de 30m). A comparação entre os dados dos zoneamentos e do DEM, mostra que eles são contíguos com um deslocamento de 50 a 350m da calha do Rio Acre. Com relação à imagem LANDSAT e os dados do DEM, o deslocamento da drenagem varia entre 30 a 180m. Em áreas de cobertura florestal fragmentada, a rede derivada do DEM mostra ocasionalmente erros significativos, provavelmente devido à diferença de altura da floresta e da pastagem vizinha (entre 20 a 30m). Coordenadas obtidas com GPS dos tributários na sua desembocadura no rio Acre foram comparados com as da rede de drenagem derivada do DEM. Cerca de 40% dos 32 tributários georeferenciados se encontram num raio de um pixel, 68% num raio de quatro pixels. O deslocamento observado entre os dados analisados e a derivação de linhas erradas de drenagem não compromete o uso desses dados para o gerenciamento da bacia.

38.13-P: Operação e Manutenção de uma Bacia Hidrográfica Instrumentada na Amazônia Central

Antonio Huxley Melo Nascimento, Instituto Nacional de Pesquisas da Amazonia, huxley@inpa.gov.br (Apresentador / Presenting)

Glauco Siqueira Gonçalves, Instituto Nacional de Pesquisas da Amazonia, glauco@inpa.gov.br (Apresentador / Presenting)

Luz Adriana Cuartas Pineda, Instituto Nacional de Pesquisas Espaciais, adriana@cptec.inpe.br

Sylvia Mota de Oliveira, Instituto Nacional de Pesquisas da Amazonia, smoli@inpa.gov.br

Antonio Donato Nobre, Instituto Nacional de Pesquisas da Amazonia, anobre@ltid.inpe.br

Javier Tomasella, Instituto Nacional de Pesquisas Espaciais, javier@cptec.inpe.br

A bacia Asu está localizada a cerca de 80 Km noroeste de Manaus (2º 36' 32.67" S , 60º 12' 33.48" W, 130m asl), ocupando uma área de 6.37 km² de floresta de terra firme não perturbada na Amazônia Central. Há aproximadamente dois anos e meio iniciaram-se os trabalhos de instrumentação da bacia, no mesmo local onde se encontra a torre do LBA, para um monitoramento hidrometeorológico da área. Relacionado à parte aérea da floresta, registram-se dados de precipitação e interceptação através de pluviômetros conectados a dataloggers. No que se trata de água no solo, registram-se dados de umidade no solo através de aparelhos TDR e medidas manuais com uma sonda de nêutrons, assim como dados de nível do lençol freático através de divers e medidas manuais com uma trena. No igarapé registram-se a velocidade e altura da água, para o cálculo de descarga, e algumas características físico-químicas como pH, temperatura, condutividade elétrica e concentração de carbono orgânico dissolvido. A operação da bacia envolve a retirada dos dados armazenados nos dataloggers, a realização de medidas manuais e a manutenção e verificação do funcionamento dos equipamentos. As dificuldades encontradas estão normalmente associadas ao ambiente de floresta tropical. A queda de galhos e outros materiais vegetais, por exemplo, costuma danificar as canaletas instaladas para as medidas de interceptação e a solução consiste na manutenção contínua do sistema e troca de filtros. Além disso, após algumas experiências com o grande volume de chuva a ser medido, constatou-se que os coletores apropriados devem conter no mínimo dois litros de água, mesmo que a medida seja realizada a cada evento de chuva. Travamento e descalibração de aparelhos podem ser evitados através da troca freqüente de bateria e sílica.

38.14-P: Macro-geomorphologic analysis of the Araguaia River basin, Brazil

Thiago Morato de Carvalho, Universidade Federal de Goiás, GO, tmorato@infonet.com.br (Apresentador / Presenting)

A geomorphologic/morphometric study of the whole Araguaia River Basin (370,000 km²) was carried out using the SLAR system, radar of lateral view. The morphological features of the terrain were highlighted in order to both analyze and interpret the physical environment of the region using the SRTM products. For editing were used the ENVI software, specialized for environmental analyses with the use of remote sensing. The basic products obtained were the following maps: shaded image, slope, hipsometric, geologic, geomorphologic and hydrology. The results give a framework for a better interpretation of both the geology and the geomorphology of the Araguaia River Basin, by providing perspectives of the terrain and 3D models, as well as to subsidy the hydro-geomorphologic studies at present being developed at the Laboratory of Geology and Physical Geography of the Federal University of Goiás.

38.15-P: Sedimentation in the "varzea" floodplain systems as a potential tool for the study of past natural perturbation events in Amazonia.

Patricia Moreira-Turcq, Intitut de Recherche pour le Développement (IRD-LMTG), Departamento de Geoquímica-Universidade Federal Fulminense, pturcq@geoq.uff.br (Apresentador / Presenting)

Renato Campello Cordeiro, Departamento de Geoquímica-Universidade Federal Fulminense, rccordeiro@geoq.uff.br

Bruno Turcq, Intitut de Recherche pour le Développement (IRD-LMTG), Departamento de Geoquímica-Universidade Federal Fulminense, bturcq@geoq.uff.br

Patrick Seyler, Intitut de Recherche pour le Développement (IRD-LMTG), pseyler@lmtg.ups-tlse.fr

Arnaldo Carneiro, INPA, carneiro@inpa.gov.br

Marcello Bernardes, Departamento de Geoquímica-Universidade Federal Fulminense, bernardes@geoq.uff.br

Lilian C. dos Santos Carlos, Departamento de Geoquímica-Universidade Federal Fulminense

Renata Lima da Costa, Departamento de Geoquímica-Universidade Federal Fulminense

Perturbations of forest ecosystems and hydrological regimes in Amazon basin are relatively known for the last tenth of years by the instrumental records and for the last thousands of years by quaternary studies. An observational time scale from the century to the last millennium is still lacking and this scale corresponds probably to the scale needs for studying the rhythm of the largest events of perturbation (largest fires, extreme floods, extreme dryness).

The "varzeas" floodplains present high sedimentation rates, reaching 1 cm/yr, which made possible the record of perturbation events during the last centuries. The sedimentation in the varzea systems is formed by a superposition of metric sedimentary sequences. These sequences are characterized by fining-up sediments that may include gravel, sands, silts and clays with a variable content of organic matter. The first cause of the sequence deposition is the migration of the channels supplying sediments to the varzeas. As observed in other fluvial systems, the initiation of each sedimentary sequence is probably due to a strong perturbation in the hydrological regime.

Inside the sedimentary sequences the sediment are frequently finely laminated. Different perturbation events can be evidenced: the fires may be recorded by levels of charcoal fragments, the major floods by clayey layers,... Other sediment characteristics, as, for example, organic geochemistry biomarkers can bring information on the rainforest itself.

Due to the high dynamics and hydrological complexity of these systems, such studies need to be based on several cores for each of the studied sites.

38.16-P: Seasonal changes in phytoplankton distribution from Óbidos to Almerim in response to Amazon flood pulse.

Evlyn M. Novo, Instituto Nacional de Pesquisas Espaciais, C.P. 515-CEP 12201-970, Sa~o Jose´ dos Campos, Brasil, evlyn@ltid.inpe.br (Apresentador / Presenting)

Claudio F. Barbosa, Instituto Nacional de Pesquisas Espaciais, claudio@dpi.inpe.br

Ramon M. Freitas, Instituto Nacional de Pesquisas Espaciais, C.P. 515-CEP 12201-970, Sa~o Jose´ dos Campos, Brazil, ramon@ltid.inpe.br

John M. Melack, Institute for Computational Earth System Science, University of California, Santa Barbara, CA 93106, USA, melack@lifesci.ucsb.edu

Yosio E. Shimabukuro, Instituto Nacional de Pesquisas Espaciais, C.P. 515-CEP 12201-970, Sa~o Jose´ dos Campos, Brasil, yosio@ltid.inpe.br

Waterloo Pereira Filho, Departamento de Geografia, Universidade Federal de Santa Maria, Santa Maria, Brazil, waterloo@base.ufsm.br

We report an experiment carried out to assess seasonal changes in phytoplankton distribution in the Amazon floodplain lakes. The moderate resolution imaging spectrometer sensor (MODIS) on the U.S. Terra satellite is designed to provide images at optical wavebands which are suitable for detecting phytoplankton patches. The current satellite operational algorithms are suitable for Case 1 waters, but have limited application for complex Case 2 waters such as the Amazon's. In our study, a mixing model algorithm was applied to MODIS reflectance single date images acquired at three Amazon River stages: rising (April), high (June), falling (September). The study area is located in the floodplain reach extending from Óbidos to Almerim (Pará State). Three endmembers were used to run the mixing model: high suspended inorganic matter (HSIM), low suspended inorganic matter (LSIM), and high Chlorophyll concentration water (Phyto). The selection of those endmembers was based on ground sampling carried almost concurrently to satellite overpasses at Lago Grande de Curuai Lake. Results showed striking changes in lake and river surface occupied by phytoplankton patches among rising, high and falling water stages. During high water phytoplankton patches are confined to lakes closer to terra firme clear water inflow, whereas during the rising and falling water stages, the patches spread all over the floodplain. Average chlorophyll concentrations range from 9.4 mg/l in June (high stage) to 89 mg/l at low stage (September), indicating changes in phytoplankton productivity in response to the Amazon River flood pulse.

38.17-P: Regionalisation of the discharge-sea surface temperature relationships in the Amazon basin

Josyane Ronchail, HYBAM -Research Institute for Development (IRD)- France, josyane.ronchail@lodyc.jussieu.fr (Apresentador / Presenting)

G rard Cochonneau, HYBAM-IRD, gerard.cochonneau@mpl.ird.fr

David Labat, HYBAM - Paul Sabatier University -Toulouse - France, labat@lmtg.ups-tlse.fr

Luc Bourrel, HYBAM-IRD, bourrel@lmtg.ups-tlse.fr

Laurence Maurice-Bourgoin, HYBAM-IRD, lmaurice@unb.br

Naziano Filizola, HYBAM-Agencia Nacional de Aguas (ANA), naziano@ana.gov.br

Jacques Caldele, HYBAM-IRD, cld@apis.com.br

Jean Loup Guyot, HYBAM-IRD, jloup@amauta.rcp.net.pe

Eurides Oliveira, HYBAM-ANA, eurides@ana.gov.br

Discharges in the Amazon basin are analyzed in relation to SSTs in the equatorial Pacific and the Atlantic Oceans using correlation, composites and wavelet techniques. Because of the size of the basin, the main circulation patterns differ from one region to another; thus oceanic forcing also has a specific spatial distribution. A stationary El Ni o-low discharge / La Ni a-high discharge signal is observed in the north eastern basin, in most of the tributaries flowing from the Guyana Shield. It disappears on the western side of the Shield. The same signal prevails in some regions of the southern Amazon. In the Beni River (Bolivian Amazon) at the edge of the Andes and in the right hand affluents of the Madeira and the downstream Tapajos and Xingu valleys, Pacific SST anomalies account for nearly 40% of discharge variability. The inverse signal, with low discharge during La Ni a is observed in south western Amazon, along the Mamor -Madeira basin. Though, this signal is not stationary, and was only observed during the nineties. In the southernmost Amazon basin, discharges are related to tropical and subtropical southern Atlantic SST anomalies. Opposite signals are noticed between the Guapor -Mamor - Madeira basin on one side and the Beni River and the upstream Xingu and Tapajos on another side. It is noteworthy that these relationships are not stationary over the 1974-2001 period. The long term tropical Atlantic variability is related to the low frequency discharge variability in the north eastern Amazon region and in Obidos that drains 80 % of the Amazon basin.

38.18-P: Validation of a soil moisture model for pasture in Rond nia, Brazil.

Luciana Rossato, DMA-CPTEC-INPE, rossato@cptec.inpe.br (Apresentador / Presenting)

Regina C lia dos Santos Alval , DMA-CPTEC-INPE, regina@cptec.inpe.br

Javier Tomasella, DMA-CPTEC-INPE, javier@cptec.inpe.br

Rossato (2002) developed water balance model for estimating soil moisture in Brazil based on the supposition that soil moisture is a function of water storage in the soil, available for the plants, the precipitation and the potential evapotranspiration of the vegetative cover. To estimate the mean monthly water balance for the period 1971 - 1990, the pedological and meteorological information was interpolated by using different spatial and temporal resolutions. The objective of this study is to validate the soil moisture model using the field data obtained during the LBA experiment. The daily data of the soil water storage were collected at Fazenda Nossa Senhora (10 45'S e 62 22'W), Ji-Paran , Rond nia, Brazil, during the period 2000 - 2002. Based on this data, the mean monthly soil water storage for the experimental location was estimated and compared with the model results. The variation curve of the soil water storage estimated by the model and the field observation are quite similar. The correlation coefficients between the model results and the observation for the year 2000, 2001, and 2002 were 0.91, 0.88 and 0.94, respectively. Although the correlation coefficient for the year 2001 was not very high, one can conclude that the model estimates were representative of the observed soil moisture storage for the region and the period of this study.

38.19-P: Hydrological Modeling of Large Scale: Initial Parameterizations in Amazon

Alailson Venceslau Santiago, PPGFAA, LCE-ESALQ/USP, santiago@esalq.usp.br (Apresentador / Presenting)

Daniel de Castro Victoria, LGTI-CENA/USP, dvictori@cena.usp.br

Maria Victoria Ramos Ballester, LGTI-CENA/USP, vicky@cena.usp.br

Antonio Roberto Pereira, LCE-ESALQ/USP, arpereir@esalq.usp.br

Reynaldo Luiz Vict ria, LGTI-CENA/USP, reyna@cena.usp.br

Mariza C. Costa-Cabral, Department of Civil Engineering, University of Washington, cabral@hydro.washington.edu

Jeffrey E. Richey, School of Oceanography, University of Washington, jrichey@u.washington.edu

Anthropogenic alterations of natural ecosystems and their conversion to agricultural areas, especially in the Amazon, are changing land surface and soil characteristics (nutrient storage and cycling rates). Such processes cause alterations in the surface and sub-surface hydrological cycle. In order to quantify such alterations, we are calibrating and evaluating the performance of the Variable Infiltration Capacity model (WOOD et al., 1992), for tropical conditions in the brazilian Amazon. The model is being tested, initially, in the Ji-Paran  (RO) river basin, at a of 1/10 degree (~10 x 10 km) spatial

resolution. For our first run, daily averages of the following meteorological variables were used for the years of 1994 and 1995: rainfall (mm); maximum and minimum temperature (°C) and wind velocity (m/s). Even though the model is more suitable for large scale simulations (2 to 10 degree resolution), and we are still performing initial evaluation tests (with only a small numbers of observations), we observe that VIC results present a good relationship with the literature data. Mean monthly evapotranspiration rates are an example of this, showing good coherency and synchronism with the regional dry and wet seasons, varying proportionally with land use and soil texture. We also noticed that, during the first months of dry season (Ago-Set) this relationship is intensified. The evapotranspirative processes in the forest areas maintains very high rates during this period, primarily due to its large root system, maintaining the equilibrium of the regions' microclimate. The next step is the implementation of a more detailed library for vegetation type and soil classes, especially for Amazon region, hopping to fulfill the lack information and better understand the dynamic processes in the hydrological cycle of such an heterogeneous region as the Amazon.

38.20-P: Monitoramento do Nível do Lençol Freático em Área de Pasto, Floresta Nativa e Área de Manejo Florestal - Sinop, MT

Livia Fernanda Chaves dos Santos, Curso de Geologia/ICET/UFMT, liviafernanda@terra.com.br (Apresentador / Presenting)

Shozo Shiraiwa, Departamento de Física/ICET/UFMT, shozo@cpd.ufmt.br

Este trabalho vem sendo desenvolvido 60km a norte da cidade de Sinop, MT, e analisa o comportamento temporal do nível do lençol freático no período entre outubro de 2003 a janeiro de 2004, em três áreas que apresentam diferentes condições de vegetação e uso do solo, próximas da torre do LBA. A primeira área é de floresta nativa preservada; a segunda é uma área que está começando a ser explorada de maneira racional, sem derrubada da floresta; a terceira é uma área com pastagem. Em cada área pesquisada foram instalados três poços de monitoramento do nível do lençol freático. Estes poços foram realizados através de um trado manual, constituído por uma broca em forma de dupla concha metálica com 7.5 cm de diâmetro que perfura o solo enquanto guarda em seu interior o material investigado. Após a perfuração o poço é revestido com tubo de PVC. A coleta e descrição das amostras foram realizadas a cada variação no tipo de material investigado. O nível do lençol freático foi medido com uma periodicidade mensal. O nível do lençol freático apresentou as seguintes variações de outubro de 2003 para janeiro de 2004: a) na área com pastagem variou de -3,25m para -2,73 m; b) na área de floresta nativa de -2,95 m para -2,97 m e c) na área de manejo florestal de -2,84 m para -2,73 m. Nas áreas com floresta, o nível do lençol freático varia menos que na área de pastagem.

38.21-P: Transporte de Sedimentos de Arraste no Rio Amazonas

Maximiliano Andres Strasser, Laboratório de Hidráulica Computacional, PEC - COPPE / Universidade Federal do Rio de Janeiro, maxi@coc.ufrj.br (Apresentador / Presenting)

Susana Beatriz Vinzon, Laboratório de Dinâmica de Sedimentos Coesivos, PEnO - COPPE / Universidade Federal do Rio de Janeiro, susana@peno.coppe.ufrj.br

Flavio Cesar Borba Mascarenhas, Laboratório de Hidráulica Computacional, PEC - COPPE / Universidade Federal do Rio de Janeiro, flavio@hidro.ufrj.br

Nos escoamentos aluviais com leito composto de areia, freqüentemente são observadas formas de fundo do tipo dunas. Este tipo de estrutura constitui uma das morfologias fluviais de maior relevância, tanto pela resistência que oferecem ao escoamento quanto pelo mecanismo de transporte de sedimentos que representam. A importância do estudo da dinâmica de dunas deve-se a que modificam a hidrodinâmica da corrente, mas também apresentam importantes aplicações práticas associadas pois afetam a formação de ilhas e à navegação, e inclusive, podem até pôr em risco obras civis executadas no leito dos rios (ex. travessia do gasoduto Coari-Manaus).

A descarga de sedimentos do rio Amazonas para o Oceano Atlântico o coloca no terceiro lugar no mundo, no entanto, nenhuma das estimativas publicadas até o momento avalia o transporte de sedimentos do leito. Este trabalho apresenta uma estimação do transporte de sedimentos devido ao movimento das dunas no trecho médio do Amazonas, bem como a descrição dos trabalhos de campo realizados nesse sentido durante as campanhas do Projeto HiBAm (Hidrologia e Geoquímica da Bacia Amazônica).

O levantamento das informações batimetrias longitudinais foram realizadas com ecobatímetro digital e DGPS durante as campanhas de medição de agosto e dezembro de 2001, e mediante ADCP e GPS em março e julho de 2002. As alturas registradas das dunas variaram entre 1 e 14 m, enquanto o comprimento médio foi 160 m. O deslocamento das dunas variou com o regime hidrológico, apresentando velocidades de até 6 m/dia no período de águas altas. O transporte anual de sedimentos por arraste estimado mediante o deslocamento de dunas em Óbidos foi $4,7 \times 10^6$ t/ano.

38.22-P: Water balance for the Ji-Paraná Basin using remote sensing and GIS

Daniel de Castro Victoria, LGTI - CENA/USP, dvictori@cena.usp.br (Apresentador / Presenting)

Maria Victoria Ramos Ballester, LGTI - CENA/USP, vicky@cena.usp.br

Antonio Roberto Pereira, Dep. Ciências Exatas - ESALQ/USP, arpereir@esalq.usp.br

Luiz Antonio Martinelli, Lab. Ecologia Isotópica - CENA/USP, zebu@cena.usp.br

Jeffrey E. Richey, School of Oceanography, University of Washington, jrichey@u.washington.edu

Reynaldo Luiz Victória, LGTI - CENA/USP, reyna@cena.usp.br

The growing change in landuse and cover that has been happening in the state of Rondônia, especially in the Ji-Paraná basin, could result in changes in various ecosystem components, including the water balance. The Thornthwaite-Mather water balance model was inserted into a Geographic Information System in order to estimate the monthly water balance at the whole basin. The input parameters, for the years 1995 and 1996, were: Mean monthly temperature images, composed by daily AVHRR images, pre-processed by an automatic cloud detection algorithm and used to estimate potential evapotranspiration; mean monthly precipitation, interpolated from 31 stations inside and near the study area; soil texture, derived from geostatistical analysis of 756 soil profiles and root depth, estimated from the landcover map. The results show that the model is temporal and spatially coherent, predicting water deficit during the dry periods of the region and

also, areas inside the basin with water deficit or surplus are coincident with the precipitation distribution. However, the model underestimated the annual potential evapotranspiration, estimated at 1050 mm, and real evapotranspiration (864 mm), both values less than the real evapotranspiration obtained by water mass balance for the same period (1276 mm). Future adjustments to the model have yet to be made, such as an increase in the rooting depth and also some enhancements in the monthly temperature composite images, used in the potential evapotranspiration estimate.

38.23-P: Flow regime and flood dynamic of the Araguaia River, Brazil

Sâmia Aquino, Universidade Estadual de Maringá, PR, s.aquino@hotmail.com

Edgardo M. Latrubesse, Universidade Federal de Goiás, GO, latrubes@terra.com.br (Apresentador / Presenting)

The Araguaia is a large tropical river of South America with a drainage area of almost 400,000 km², a mean annual discharge of 6,500 m³/s, and a peak discharge of up to 26,283 m³/s. It is the main fluvial system draining the savanna environments of Central Brazil. Geomorphological studies on the Araguaia are scarce. Here we present some result on the hydrogeomorphological behavior of this large system with focus on flow regime and flood transmission. With an extension of 2,800 m the Araguaia can be divided in three reaches: upper, middle and lower. The middle reach is characterized by a well developed alluvial plain while the upper and lower reaches run on bedrock. The flood dynamic was studied by daily and mean monthly data discharge data, transverse sections, stages, and depth, velocity and width data for a historical series of three decades (1970-1999) of eight gauge stations operated by the Brazilian Geological Survey. Hydrographs, recurrence of flows, time duration of flows, diagrams of discharge variability, hydraulic geometry parameters, drainage area vs. discharge ratios and others parameters were used for modeling the flood dynamic of the system. Three types of floods were identified being named types A, B and C.

Type A characterized by a large storage of water in the alluvial plain of the middle reach. In this type of transmission, discharges are decreasing downstream along the middle reach with lost of water of the 30%, and then increase slowly and persistently along the lower reach. Type B is a normal transmission of floods with a light increase of water discharge while the drainage area increases. Type C is characterized by stable discharges along the middle reach and loss of water along an abandoned channel of the Araguaia River, the Javaes River, now occupied by a anomalous tributary which separates from the Araguaia and meets the main course again downstream.

LC (Mudanças dos Usos da Terra e da Vegetação) / LC (Land Use and Land Cover Change)

[LC_Desmatamento_Desenvolvimento \(LC Deforestation Development\)](#)

39.1-P: A Extensão dos Incêndios Florestais na Amazônia Brasileira em Anos de El Niño e Não El Niño

Ane A.C. Alencar, IPAM, ane@ipam.org.br (Apresentador / Presenting)

Daniel Curtis Nepstad, IPAM, WHRC, dneptad@whrc.org

Maria Del Carmen V. Diaz, IPAM, mcarmen@amazon.com.br

Os incêndios florestais representam um dos principais elementos de degradação das florestas da Amazônia e têm sido cada vez mais frequentes e abrangentes na região devido a fragmentação da paisagem e a intensidade da extração madeireira. Este problema tem se agravado ainda mais em anos de El Niño. Estes incêndios são responsáveis também por grande parte das emissões de gás carbônico regional, atualmente não contabilizadas. Neste contexto, estimativas da área atingida por incêndios florestais em anos de El Niño e Não El Niño e sua contribuição para o fluxo de carbono regional foram produzidas com base no mapeamento de cicatrizes de incêndios florestais em imagens de satélite e entrevistas em três áreas ao longo do arco de desmatamento da Amazônia. Estas estimativas pontuais foram extrapoladas para toda a região utilizando relações de distancia entre a área florestal queimada e as bordas das áreas desmatadas, com as características climáticas e de tipo de fisionomia florestal. Resultados indicam que os incêndios florestais afetam uma área de floresta similar ao desmatamento a cada ano e podem afetar uma área 5-6 vezes maior do que a área desmatada durante anos de seca severa como os de El Niño. Em anos de precipitação normal a maior incidência e abrangência dos incêndios florestais tem sido em áreas de floresta de transição já que estas, devido a sua estrutura mais aberta, são mais suscetíveis as secas sazonais do que os outros tipos florestais. Enquanto que em anos de seca pronunciada (El Niño) as florestas densas são as mais afetadas pelo fogo.

39.2-P: Dinâmica de Ocupação e Perda de Carbono no Leste da Amazônia

Arlete Silva de Almeida, Laboratório Institucional de Sensoriamento Remoto, Museu Paraense Emílio Goeldi, Pará, Brasil, arlete@museu-goeldi.br (Apresentador / Presenting)

Ima Célia Guimarães Vieira, Departamento de Botânica, Museu Paraense Emílio Goeldi, Pará, Brasil, ima@museu-goeldi.br

Thomas A. Stones, The Woods Hole Research Center, P. O. Box 296, Woods Hole, MA 02543 USA, tstone@whrc.org

Eric A. Davidson, The Woods Hole Research Center, P. O. Box 296, Woods Hole, MA 02543 USA, edavidson@whrc.org

As mudanças de uso e cobertura da terra na Amazônia resultam em vários impactos sobre o meio ambiente: diminuição da biodiversidade; ruptura do regime hidrológico e mudanças no balanço de CO₂ e outros gases do efeito estufa. Este trabalho teve como objetivo caracterizar a dinâmica da paisagem e mudanças no balanço de carbono no leste do Pará, no período de 8 anos, utilizando algoritmos e contrastes para as imagens Landsat de 1991 a 2002. Esta área, a leste do Município de Belém, foi colonizada a mais de um século e a maior parte da floresta nativa foi substituída por florestas secundárias. Analisando a dinâmica da paisagem a partir das imagens estudadas, constatou-se um aumento nas áreas de pastagens e solo exposto em quase 50%. Essas alterações implicam em uma perda líquida de aproximadamente 1,4 MgC/ha/ano no Município de São Francisco do Pará, 0,1 MgC/ha/ano nos municípios de Peixe-Boi, Capanema e Nova Timboteua e 1,1 MgC/ha/ano em Castanhal para uma área aproximada de 48.000ha, 138.000ha e 103.000ha, respectivamente. Florestas sucessionais jovens estão envelhecendo, de maneira que a área ocupada por florestas mais

velhas estão aumentando em muitos casos, mas o desmatamento de florestas primárias de terra firme e de igapó estão compensando o ganho líquido de carbono nas florestas secundárias. A perda de carbono da biosfera terrestre é normalmente associada ao desmatamento com o avanço da fronteira agrícola, mas aqui demonstramos uma continuação de perda de Carbono em uma paisagem que foi inicialmente colonizada e desmatada a muitas décadas atrás.

39.3-P: Evaluating Selective Logging Pressure upon the Amazonian Biome Using GIS Cost Surface Models

Paulo Barreto, Imazon, pbarreto@imazon.org.br (Apresentador / Presenting)

Carlos Moreira de Souza Jr., Imazon, carlos@geog.ucsb.edu (Apresentador / Presenting)

Marco Lentini, Imazon, marcolentini@imazon.org.br (Apresentador / Presenting)

Dar Roberts, University of California at Santa Barbara, dar@geog.ucsb.edu (Apresentador / Presenting)

We use a projection of the area accessible to timber exploitation in the Amazonian biome to evaluate logging pressure in the Biome. To predict which forested areas might be harvested by the logging industry, we estimate areas that are economically accessible for logging in the Amazon Biome using GIS cost surface models. The models are based on transportation costs payable by timber companies for harvesting and transporting logs from the forest to the saw mill. Additionally, the model incorporates information on saw mill location, type of species harvested, transportation corridors (roads and navigable rivers), land cover, cost to extract, process and transport logs, and timber price. These data were acquired through 917 interviews conducted between 1998 and 2001.

Our logging economic extent model shows that approximately 78% of the forests within the Biome are accessible to timber harvesting. The accessible forests are divided into zones based on timber value. The first zone is economically feasible for the exploitation of all timber species, making up 6% of the forests in the Biome. In the next zone selective logging is profitable only for mid-value species (14% of the forests). The last two zones include the forests that are profitable for harvesting only high value species such as mahogany, comprising 42% and 16% of the forested Biome, respectively. Only 22% of the Amazonian Biome is inaccessible for logging, meaning that the area is either too far from wood mills, or where natural barriers impede transportation of logs to markets.

We plan to use our GIS model of logging extent to identify logging pressure over protected areas and to prioritize areas for monitoring logging activities with remote sensing. The model also has the potential to be integrated with remote sensing maps that are being produced by LBA researchers to evaluate the installed capacity of saw mill centers that are currently in operation in the Amazon region.

39.4-P: Deforestation Patterns Along the Highway Belem/Tome-Acu, Brazilian Amazonia.

Doris Graziela Navarro, 1. PhD. Program in Environmental Science, School of Public and Environmental Affairs, Indiana University, USA., 2. Anthropological Center for Training and Research on Global E, dgnavarr@indiana.edu

Scott S. Hetrick, 1. Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, USA., shetrick@indiana.edu

Eduardo Sonnewend Brondizio, 1. Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, USA., 2. Center for the Study of Institutions, Population, and En, ebrondiz@indiana.edu (Apresentador / Presenting)

The Brazilian Amazonia has experienced important transformations in the last decades, as consequence of the intense development pressure in the region. Political and economic policies have facilitated colonization over recent years in many areas such as the region surrounding Tomé-Açu county, located 130 km south Belém, the capital of Pará State. Tomé-Açu was founded by Japanese immigrants in the beginning of twentieth century, and its economy is characterized by intensive agriculture, followed by agroforestry development and pasture formation. The construction of highways has favored the colonization process and agricultural projects between Tomé-Açu and Belém, which has caused significant environmental changes in this region. This work intends to analyze the temporal variation of the deforestation pattern and landscape transformation along of the highway PA-140 using Landsat Thematic Mapper images (TM and ETM+) from 1991 to 2002 period. This study aims to quantify the environment impacts of this highway between Belém/Tomé-Açu and subsidizes further research in the region.

39.5-P: Estimating climatic implications of soy and pasture expansion in Mato Grosso

Julia Pongratz, University of Maryland, julia.pongratz@gmx.de

Ruth DeFries, University of Maryland, rdefries@geog.umd.edu (Apresentador / Presenting)

Lahouari Bounoua, NASA GSFC, bounoua@dounia.gsfc.nasa.gov

Douglas Morton, University of Maryland, morton@geog.umd.edu

Liana Anderson, INPE, liana@ltd.inpe.br

Yosio Shimabukuro, INPE, yosio@ltd.inpe.br

Estimating the climatic implications of land cover change in the Brazilian Amazon has become a scientific priority, given the extensive transformation of areas of primary vegetation to pasture and agriculture. We simulate the sensitivity of climate parameters to these changes for a region in northern Mato Grosso using the Simple Biosphere Model SiB2 (GSFC/NASA). SiB2 simulates exchange of energy, moisture and momentum between the atmosphere and biosphere. An improved photosynthesis-conductance sub-model enables us to assess the differences in carbon assimilation and water vapor transfer between vegetation and the atmosphere. We address an important large-scale land cover transformation in the Brazilian Amazon by comparing transitions from C4 vegetation such as pasture to C3 soybean fields. To assess the impacts of recent changes in this region, we compare two parallel SiB2 model simulations for land cover classifications from 2000-2001 and 2002-2003. NDVI derived from MODIS data at 250 m resolution is used to calculate FPAR, LAI, and other biophysical parameters, and combined with soil and climate data as model inputs. The prognostic variables of SiB2 are canopy, soil surface, and deep soil temperatures as well as water storage from canopy interception and soil water balance at varying depths. These results provide the basis for our analysis of the impact of land cover change on local climate and hydrology for the two time periods.

39.6-P: The Rubber Tappers' Rapidly Transitioning Land Use Strategies: Cattle Ranching Expansion in the Chico Mendes Extractive Reserve in Acre, Brazil

Carlos Valerio A. Gomes, Department of Geography/University of Florida, SETEM/Federal University of Acre, valerio@ufl.edu (Apresentador / Presenting)

Stephen G Perz, Department of Sociology, University of Florida, sperz@soc.ufl.edu

Irving Foster Brown, Wood Hole Research Center, SETEM/Federal University of Acre, fbrown@uol.com.br

Despite the fact that Acre has one of the largest percentages of its territory under protected areas in Amazonia, it has had the highest rate of cattle ranching growth in the region over the last decade. The state of Acre is the birthplace of the Extractive Reserve System, which has been promoted as a major strategy for forest conservation while simultaneously providing a sustainable economic return to extractivist peoples based on non-timber forest products (NTFPs). Since the establishment of the Extractive Reserve System in 1992, extractivist communities continue to face low-income generation based solely on NTFPs. The push for economic growth is a major driver forcing cattle ranching practices in Extractive Reserves. This research addresses key socio-economic and biophysical factors influencing cattle ranching expansion in the Chico Mendes Extractive Reserve (CMER) linking household land-use decisions to a broader context. Understanding the underlying drivers that lead to cattle ranching among rubber tappers is a complex process that involves multiple agents operating at different scales. Principles of "hierarchy theory" are used in order to examine various levels of the socioeconomic and biophysical drivers involved in the cattle ranching phenomena in the CMER. These drivers are divided within the three-tiered hierarchical levels of "distant," "intermediate," and "proximate." By using hierarchy theory, one can achieve a broader understanding of not only the biophysical, but also the socio-economic drivers of cattle ranching within a synergistic framework. Such an approach can contribute to the strengthening of alternative land-use strategies in the CMER and other protected areas in Amazonia.

39.7-P: Avaliação da abrangência das Áreas de Proteção Permanente (APP) em relação a Reserva Legal em ambientes de floresta da Amazônia

Felipe Resque Jr, IPAM - INSTITUTO DE PESQUISA AMBIENTAL DA AMAZÔNIA, felipe@ipam.org.br (Apresentador / Presenting)

Ane Alencar, IPAM - INSTITUTO DE PESQUISA AMBIENTAL DA AMAZÔNIA, ane@ipam.org.br (Apresentador / Presenting)

José Heder Benatti, IPAM/UFPA, benatti@amazon.com.br

As matas ciliares exercem importante papel na proteção dos cursos d'água contra o assoreamento e a contaminação com defensivos agrícolas, além de, em muitos casos, se constituírem nos únicos remanescentes florestais das propriedades rurais sendo, portanto, essenciais para a conservação da fauna e possibilidade de servir como corredores biológicos. Estas peculiaridades conferem às matas ciliares um grande aparato legal principalmente no Código Florestal brasileiro que especifica distancia a partir da margem dos cursos d'água que devem ser consideradas como áreas de preservação permanente. Porém, apesar desse aparato e da reconhecida importância ecológica, as matas ciliares continuam sendo eliminadas cedendo lugar para a especulação imobiliária, para a agricultura e a pecuária e, na maioria dos casos, sendo transformadas apenas em áreas degradadas, sem qualquer tipo de proteção. Nesse sentido, este trabalho tem por objetivo calcular quanto de Área de Preservação Permanente (especificamente a Mata Ciliar) existe em relação a área amostrada em diferentes tipos de paisagens da Amazônia. Para isso foram utilizadas áreas amostrais de 50 x 50km em diversas regiões do Estado do Pará e Mato Grosso, nas quais foram gerados buffers (faixas de largura mínima) de 30m, 50m e 100m de distancia a partir da margem dos cursos d'água menores que 10m, de 10 a 50m e de 50 a 200m de largura respectivamente. Os cálculos indicaram que de 5 a 15% das áreas amostrais seriam enquadradas como Área de Proteção Permanente (APP) perante o Código Florestal. Pretende-se analisar o quanto da APP já foi desmatado em diferentes tipos de fronteira agrícola da Amazônia.

39.8-P: Conversão de Floresta Tropical em Pastagem e Sua Influência no Balanço Hídrico da Região de Ji-Paraná, Rondônia.

Kécio Gonçalves Leite, Universidade Federal de Rondônia, keciog@yahoo.com.br (Apresentador / Presenting)

Carlos Mergulhão Jr., Universidade Federal de Rondônia, camerg@unir.br

Fernando Luiz Cardoso, Universidade Federal de Rondônia, cardoso@unir.br

Fabrcio Bertoni Zanchi, Universidade de São Paulo, faberzanchi@hotmail.com

Juliano Alves de Deus, Universidade Federal de Rondônia, julianoalde@yahoo.com.br

Leonardo J. G. Aguiar, Universidade Federal de Rondônia, veraneiro@hotmail.com

Paulo Anderson Renda, Universidade Federal de Rondônia, paulorenda@ibest.com.br

Anderson Teixeira Telles, Universidade Federal de Rondônia, andersong3@ibest.com.br

A influência do desmatamento da Amazônia no balanço hídrico foi estudada a partir de dados meteorológicos coletados durante todo o ano de 2001 em dois sítios experimentais do Projeto LBA na região de Ji-Paraná - RO, sendo um de floresta tropical e outro de pastagem. Observou-se uma redução de 23% na quantidade de precipitação e de 4% na evapotranspiração real na pastagem em relação à floresta. O estudo do balanço hídrico evidencia uma variação maior de água no perfil de solo da pastagem, sugerindo escassez de água mais severa, sendo que na pastagem o solo manteve a capacidade de campo apenas nos três primeiros e nos dois últimos meses do ano, ao passo que na floresta o solo manteve sua capacidade de campo durante 7 meses, sofrendo uma redução apenas no período menos chuvoso. Os resultados preliminares permitem observar que, de maneira cíclica, a mudança de cobertura vegetal de floresta tropical em pastagem reduz a quantidade de água disponível no solo, ocasionando uma menor oferta de água ao processo de

evapotranspiração no período menos chuvoso. Uma menor transferência de vapor à atmosfera por sua vez influencia a quantidade de chuva. Chovendo menos, há menor oferta de água para reabastecer o solo, e, desta forma, o período seco tende a se agravar.

39.9-P: Land Use and Land Cover Change in Amazonia Frontier, Ji-Paraná Basin - Rondônia

Lais Carvalho Hanada, CENA/USP, lchanada@esalq.usp.br (Apresentador / Presenting)

Maria Victória Ramos Ballester, CENA/USP, vicky@cena.usp.br

Reynaldo Luiz Victória, CENA/USP, Reyna@cena.usp.br

Jeffrey E. Richey, School of Oceanography - University of Washington, jrichey@u.washington.edu

Massive land-use change has occurred in the Amazon basin in the last 3 decades, resulting from a complex product of economic and social factors, infrastructure development, soil characteristics and cultural factors that reflect in the deforestation process. The Ji-Paraná basin is located in Rondônia State and comprises an area of 75,400 km², corresponding to 31% of the State area. Intensive migration to this region started in the beginning of 70's, resulting from governmental settlement projects. Today, more than 60% of the state population lives in this basin. The main objective of this study is to better understand the land use and cover changes in Ji-Paraná basin in the last 15 years and analyze some drivers of tropical deforestation. Deforestation maps were derived from the supervised classification (maximum likelihood rule) of Landsat5-TM and Landsat7- ETM+ images, for the years 1986, 1992, 1996 and 2001. To account for the influence of landscape characteristics we performed a cross tabulation between slope, soil fertility, distance to a main road and land use. Our preliminary results show that the basin lost 20% (15,700 km²) of the original forest cover (without the savanna class). Until 2001 the forest class represented 40,800 km² (55%) of the basin area. The larger forest patches are located in flat, low fertility (base saturation lower than 50%) and scarce roads areas, corresponding to 23,750 km², with 7,250 km² located in conservation units. The forest patches on rich soils are located in the central part of Ji-Paraná basin (5,500 km²) and in areas with scarce roads and near conservation units (10,000 km²).

39.10-P: Análise da Intensidade da Exploração Madeireira em Áreas de Floresta Densa e de Transição na Amazônia

Sanae Nogueira Hayashi, Instituto de Pesquisa Ambiental da Amazônia, sanae@ipam.org.br (Apresentador / Presenting)

Ane Costa Alencar, Instituto de Pesquisa Ambiental da Amazônia, ane@ipam.org.br

Oswaldo Carvalho Jr., Instituto de Pesquisa Ambiental da Amazônia, osvaldo@ipam.org.br

Na Amazônia a exploração florestal madeireira está crescendo de forma descontrolada, resultando em uma série de danos à floresta. Cerca de 28 milhões de metros cúbicos de madeira em tora por ano são produzidos por essa atividade, o que equivale a 85% da produção do país. No entanto, a exploração florestal pode diferenciar de uma localidade para outra dependendo de sua tipologia florestal e intensidade de exploração. É nesse sentido que este trabalho buscou analisar a intensidade da exploração florestal em três diferentes regiões exploradas pela indústria madeireira na Amazônia, sendo duas áreas de floresta densa no Estado do Pará (Paragominas e Santarém) e uma área de floresta de transição em Mato Grosso (Bom Jesus do Araguaia). A metodologia do trabalho consiste na análise dos dados de volume, área basal e densidade de árvores abatidas, na qual, para cada área foram analisadas dois sítios de estudo com 1ha. Nesses sítios foram coletados os diâmetros de todos os tocos serrados e as árvores com DAP ≥ 40 cm. O volume da madeira abatida foi estimado através da utilização de diferentes equações volumétricas estabelecidas para as determinadas regiões: $Inv = -7,49337 + 2,086952 * \ln(d)$ para Paragominas e $v = -0,0994 + 9,1941 * 10^{-4} * d^2$ para Santarém e Mato Grosso. A área de Paragominas apresentou o maior abatimento das árvores disponíveis na floresta com DAP ≥ 40 cm, seguidas de Mato Grosso e Santarém com 23%, 19% e 11% respectivamente. Entretanto, o valor absoluto do volume abatido foi maior na área de floresta de transição em Matogrosso com 71m³/ha, pois as árvores abatidas apresentaram o maior diâmetro médio em relação às áreas de florestas densas.

39.11-P: Avaliação do manejo seletivo de madeira e alteração da biomassa através da análise de imagens Ikonos, no município de Cláudia - MT

Wander Hoeger, UFMT, wander_hoeger@yahoo.com.br (Apresentador / Presenting)

George Sanches Suli, UFMT, suli@terra.com.br (Apresentador / Presenting)

Peter Zeilhofer, UFMT, pitalike@terra.com.br (Apresentador / Presenting)

Rodrigo Marques, UFMT, rodqmarques@pop.com.br

Sérgio Gripp, INPE, sergio@cba.inpe.br

Gisele Cristina Baldissera, UFMT, gisele@cpd.ufmt.br

Roberto Juliano Benedito Serra, UFMT, rjuliano@cpd.ufmt.br

O presente trabalho estuda o caso da fazenda Continental, no município de Cláudia, propriedade da Madeireira Maracaí, onde é feito o manejo seletivo e é um dos locais de estudos do grupo de pesquisa do programa LBA (sítio de localização de torre), em MT. A partir dos dados de manejo seletivo de madeira disponíveis, foi feito o relacionamento desses dados locais com os valores de radiância fornecidos pela coleção formada por três imagens Ikonos, em 2000, 2001 e 2002 e imagens Landsat TM+. A variação das imagens com valores de NDVI (Normalized Difference Vegetation Index) foi correlacionada com a variação na biomassa estimada através dos registros de manejo seletivo da Madeireira Maracaí. Estimou-se, então, a partir dos valores da radiação absorvida, o decréscimo e/ou incremento da área foliar devido ao manejo e à regeneração natural.

39.12-P: Monitoramento da expansão de soja em relação ao Zoneamento Agroecológico do município de Santarém

Wanja Janayna Lameira, IPAM - Instituto de Pesquisa Ambiental da Amazonia, janayna@ipam.org.br (Apresentador / Presenting)

Ane Alencar, IPAM - Instituto de Pesquisa Ambiental da Amazonia, ane@ipam.org.br

O município de Santarém tem despontado no cenário Amazônico como uma das principais áreas de expansão agrícola da Amazônia. O objetivo desta análise é qualificar a expansão de grãos (arroz e soja) em relação às unidades agroambientais propostas pelo Zoneamento Agroecológico do município de Santarém, realizado pelo CPRM. Para tal, foram utilizados mapas da área plantada de soja e arroz nos anos de 1999, 2001 e 2002, sobrepostos às zonas agroecológicas. As unidades agroambientais compreendem aquelas destinadas a: (1) Lavoura, classificadas em três tipos com base no solo e com diferentes restrições de uso e mecanização; (2) áreas de Conservação, onde as atividades praticadas devem seguir regras de uso sustentável dos recursos naturais; e (3) Áreas de Preservação Permanente, não disponibilizadas para uso agroflorestal. Os resultados indicam que a maioria da área de expansão de grãos na região de Santarém tem sido concentrado principalmente nas zonas dedicadas a lavoura (58%). Entretanto, as áreas destinadas a preservação permanente (15%), também estão sendo incorporadas neste processo, colocando em risco o futuro do sistema de drenagem da região.

39.13-P: Infrastructure, Regional Development and Livestock in the state of Para, Brazilian Amazon

Benoit Mertens, Center for International Forestry Research (CIFOR), benoit.mertens@cgifor.org (Apresentador / Presenting)

Forest conversions in the Amazon are mostly located in frontier areas along the so-called Arc of deforestation. Within this large zone, various land use change processes are interacting through several modes of land valorisation and organization. The current project aims to examine (i) the spatial and temporal variability regarding incentives and disincentives to convert forests for agricultural uses and (ii) how did contrasted biophysical and socio-economic conditions affect current and future land use and development trajectories, with a particular emphasis on the role of roads.

From case studies in the state of Pará, the project has analyzed how landscape dynamics are related to infrastructure development, ecological conditions, land policies, and to the evolution and the organization of the production, consumption and marketing chains of livestock products. This study has drawn on complementary datasets, socio-economic census, key-informants interviews and satellite remote sensing imagery, linked with geo-referenced information on human and biophysical conditions. These data were integrated in a GIS, and the analyses were supported quantitatively by using spatial econometric modelling approaches and landscape ecology tools.

The land use change analyses in the regions showed quite distinct results with regards to colonization history, deforestation patterns and associated factors. Spatial statistical models have highlighted the fact that explanatory variables, such as the access to markets or the proximity from the roads influence deforestation in different ways depending on the stage of development of the frontier area and the type of producers considered. Such results can further support prospective analyses.

39.14-P: O impacto do número de queimas sobre o potencial regenerativo da vegetação secundária na Amazônia Central

Marcelo Paustein Moreira, Inpa / PDBFF, pinguela@inpa.gov.br (Apresentador / Presenting)

Rita Guimarães Mesquita, Inpa / PDBFF, rita@inpa.gov.br

Ana Luisa Albernaz, Museu Goeldi, anakma@museu-goeldi.br

Eduardo Martins Venticinque, Inpa / PDBFF, edmventi@inpa.gov.br

Na Amazônia Central após o desmatamento, é comum utilizar o fogo para formação e manutenção de pastagens e roças itinerantes. O presente estudo foi conduzido nas áreas do PDBFF, à 80 Km da cidade de Manaus/AM, na BR 174. Para analisar detalhadamente o número de queimas e o tempo desde a última queimada, foram feitas classificações supervisionadas em uma série de 11 imagens. Através de uma análise de rotas foi possível avaliar o impacto das queimadas e idade das capoeiras sobre a biomassa, riqueza de espécies, densidade e dominância de 21 transectos implantados na área de estudo. A análise de rotas mostrou um efeito direto do número de queimas sobre a densidade de indivíduos (0,781) e riqueza de espécies (-0,721). Áreas intensamente queimadas apresentaram grande densidade de indivíduos e menos da metade de espécies das áreas queimadas. No entanto nenhuma destas variáveis teve efeito significativo sobre a biomassa. Ocorreu efeito positivo do tempo desde a última queimada sobre a biomassa (0,572) e negativo na dominância de espécies (-0,781). O efeito densidade foi positivo sobre a riqueza de espécies (0,599) e ocorreu também o efeito negativo da dominância sobre a riqueza (-0,354). De modo geral, nossos resultados apontam para um forte efeito do número de queimas sobre a densidade e riqueza de espécies de áreas em processo de regeneração na Amazônia, indicando que o tratamento prévio a que estas áreas foram submetidas pré-abandono e a intensidade de seu uso pode afetar o potencial futuro de recuperação destas áreas alteradas.

39.15-P: Carbon and nutrient transfers following selective logging in the Amazon: Combining remote sensing and allometry.

Lydia Pauline Olander, Department of Global Ecology, Carnegie Institution of Washington, lolander@globalecology.stanford.edu (Apresentador / Presenting)

Gregory Paul Asner, Department of Global Ecology, Carnegie Institution of Washington, gpa@stanford.edu

Mercedes Maria Cunha Bustamante, Universidade de Brasília, mercedes@unb.br

Until recently it was thought that remotely sensed data were not sufficient to detect and quantify selective logging damage in tropical forests. New spectral mixture analysis of multispectral data has successfully detected selective logging in the Amazon, and an equation has been developed to determine forest gap fraction in logged areas. Logging plots at Cauaxi

and Tapajos in the eastern basin, are captured in Advanced Land Imager or Landsat scenes collected within a year after the logging event. Using remote sensing combined with literature data we estimate how selective logging changes the spatial distribution and quantities of carbon and nutrients.

The total increase in forest gap after logging is around 5% in reduced impact logging blocks and around 20% in conventional logging. Combining this measure of the aerial extent of canopy missing with allometric relationships and data on nutrient concentration for foliage and woody parts, we estimate the total amount of carbon and nutrients transferred from the canopy to the forest floor during a logging event minus those removed as harvest to be approximately 21,000 kgC, 350 kgN, 26 kgP, 160kgK, 350kgCa, and 80kgMg per hectare in the logging areas. This nutrient flush causes significant changes in carbon and nutrients in the top 10cm of soil. Since forest gap corresponds with coarse woody debris, we use the spatial distribution of forest gap after logging to produce an image of estimated spatial distribution of debris. Our results suggest that remote sensing can provide valuable information about the spatial characteristics and quantity of carbon and nutrients altered by selective logging.

39.16-P: Relações hídricas de sistemas agroflorestais seqüenciais no nordeste do Pará: avaliação do potencial hídrico em componentes arbóreos¹

Valdirene Costa de Oliveira, Universidade Federal Rural da Amazônia, valdirene@web.de (Apresentador / Presenting)
Cláudio José Reis de Carvalho, Embrapa Amazônia Oriental, carvalho.bel@terra.com.br
Tatiana Deane de Abreu Sá, Embrapa Amazônia Oriental, tatiana@cpatu.embrapa.br

Sistemas agroflorestais seqüenciais são alternativas para a substituição da agricultura familiar de corte-e-queima em uso na Amazônia oriental. Existem poucos dados sobre as relações hídricas dos componentes destes sistemas. Foram investigados os comportamentos hídricos das espécies arbóreas endêmicas - como a *Lacistema pubescens*, *Davilla rugosa*, *Vismia guianensis*, *Banara guianeses*, *Cecropia palmata* e *Abarema jupunba*. Como espécies de rápido crescimento foram usadas as leguminosas arbóreas *Racospermum mangium* e *Sclerolobium paniculatum*, plantadas no espaçamento de 2x2m em área de 2ha preparada com corte e trituração. Duas outras áreas de igual extensão foram deixadas respectivamente com a vegetação nativa e manejada pelo sistema tradicional de corte e queima. O potencial hídrico foliar foi avaliado com uma bomba de pressão 5 folhas de cada espécie antes do amanhecer (pre-dawn - 04:00-05:00h) e após o meio-dia (12:00-14:00). Os resultados mostram que após o meio dia, todas as espécies endêmicas apresentaram valores de potencial hídrico foliar entre -0,05 e -2,5. Sendo que, com exceção da *L.pubescens*, todas as demais apresentaram uma tendência em relação aos meses secos e úmidos no pre-dawn. Com relação às espécies leguminosas, *S.paniculatum* apresentou potencial hídrico foliar mais elevados que *R.mangium* tanto no pre-dawn quanto no midday durante as observações, indicando com isso que a *S.paniculatum* seja mais tolerante ao stress hídrico imposto pelo ambiente que a *R.mangium*. No geral, até este momento, o preparo do solo não apresentaram uma influencia no comportamento hídrico das espécies endêmicas estudadas.

¹Trabalho executado como parte do Projeto LBA-Milênio

39.17-P: Plantio de árvores de crescimento rápido para recuperação da capacidade produtiva da agricultura familiar na Amazônia Oriental brasileira

Silvio Brienza Jr., Embrapa Amazônia Oriental, brienza@cpatu.embrapa.br
Valdirene Costa de Oliveira, Bolsista Capes-Embrapa Amazônia Oriental, valdirene@web.de (Apresentador / Presenting)
Adélia Ribeiro Ferreira, Bolsista Funtec-Embrapa Amazônia Oriental, deliferreira@yahoo.com.br

A agricultura na Amazônia Oriental brasileira, região colonizada há mais de 120 anos, caracteriza-se pelo processo itinerante de derruba e queima, tem contribuído para o desaparecimento de extensas áreas de floresta e o crescimento de áreas abandonadas (florestas secundárias ou capoeiras). Essa agricultura precisa ser melhorada tecnologicamente para aumentar produtividade e sustentabilidade. O plantio de árvores para enriquecimento de capoeira se associado ao preparo de área sem queima (corte-e-trituração) pode, via acúmulo e mineralização da matéria orgânica, melhor disponibilizar nutrientes para as culturas alimentares. O presente trabalho refere-se ao plantio de *Acacia mangium* Willd. (acácia) e *Sclerolobium paniculatum* Vogel (taxi-branco) num sistema agrícola de milho-mandioca em área preparada via corte-e-trituração de uma floresta secundária de 15-20 anos, localizada na fazenda escola da Universidade Federal Rural da Amazônia, Igarapé-açu (PA). As árvores foram plantadas (junho/2002) no espaçamento 2 m x 2 m, em linhas alternadas, em 2 ha, após a colheita do milho (abril/2002) e quando a mandioca tinha quatro meses de idade. Árvores e mandioca cresceram juntas durante doze meses até a colheita da mandioca (junho/2003). O crescimento em altura das espécies estudadas foi monitorado em quatro parcelas de 144 plantas (100 plantas úteis). Aos seis meses de idade os percentuais de sobrevivência encontrados foram 83% (acácia) e 76% (taxi-branco). Quanto ao crescimento em altura, até aos 18 meses de idade, observou-se melhor performance da acácia (92 cm, 277 cm e 441 cm respectivamente aos 6, 12 e 18 meses de idade) em relação ao taxi-branco (66 cm, 198 cm e 310 cm, respectivamente aos 6, 12 e 18 meses de idade). Os crescimentos em altura observados estão permitindo que as duas espécies plantadas suportem a competição da capoeira que se desenvolveu após a colheita da mandioca.

39.18-P: Effects of land use changes on soil microbial communities in the Cerrado region

Maria Regina Silveira Sartori da Silva, Universidade de Brasília, rsartori@unb.br (Apresentador / Presenting)
Joana Dias Bresolin, Universidade de Brasília, jbresolin@yahoo.com.br
Ricardo Henrique Kruger, Universidade Católica de Brasília, kruger@pos.ucb.br
Mercedes Maria Cunha Bustamante, Universidade de Brasília, mercedes@unb.br
Fabio Bueno Reis Jr., EMBRAPA - CPAC, fabio@cpac.embrapa.br

The composition and activity of soil microbial communities largely determine biogeochemical cycles, the turnover process of organic matter, and the fertility and quality of soils. Plant communities can influence associated soil microbial

communities through the types and amounts of C and nutrients inputs by altering the temperature and water content of the soil. The intensification of agricultural activities in the Cerrado region (savannas of Central Brazil) results in the replacement of native vegetation cover, changes in fire regime and soil physical and chemical properties. As most of soil microorganisms cannot be characterized by conventional cultivation techniques, after soil DNA extraction we used DGGE (Denaturing Gradient Gel Electrophoresis) to investigate soil microbial communities through the comparison of band patterns. Soil samples were taken from 0-5 cm depth in native Cerrado areas (campo sujo and cerrado restricted sense) and in pasture areas. The burned and unburned plots of the two native vegetation types were sampled 2, 10 and 30 days after burning. The samples were collected during the wet and dry season as well as during the transition wet to dry season. Soil DNA was obtained by direct DNA extraction and was amplified by PCR using 16S primers, U968f and L1401r. The comparison of band patterns (amount, position and intensity of bands) indicates significant differences between native and pasture sites and between seasons (wet and dry) and between unburned native areas.

39.19-P: Diagnóstico da capacidade de uso da terra de distintos cenários na bacia hidrográfica do rio Ji-Paraná (RO)

André Marcondes Andrade Toledo, Centro de Energia Nuclear na Agricultura - CENA/USP, atoledo@cena.usp.br (Apresentador / Presenting)

Maria Victoria Ramos Ballester, CENA/USP, vicky@cena.usp.br

Letícia Ayres Montebelo, CENA/USP, letaymo@bol.com.br

Ana Luiza Costa Iemini Bertini, CENA/USP, anabertini@yahoo.com.br

Fabício de Oliveira Lombardi, CENA/USP, flombardi83@yahoo.com.br

Nas últimas três décadas a bacia hidrográfica do rio Ji-Paraná (Rondônia) vem apresentando um cenário com altas taxas de desmatamento e intensificação do uso e manejo da terra, resultante dos projetos de colonização agrícola efetuados pelo Governo Federal. O presente trabalho tem como objetivo identificar as relações entre o uso e cobertura atual do solo e a capacidade de uso da terra de distintos cenários na bacia do rio Ji-Paraná. Tais cenários são referentes a quatro regiões, com áreas que variam de 346,0 a 1700,5 km², nas quais há informações temáticas com nível de detalhe compatível com a metodologia de classificação da capacidade de uso da terra. Os parâmetros físicos e químicos referentes às propriedades dos solos, obtidos de dados pontuais de levantamentos pedológicos, estão sendo interpolados utilizando a geoestatística como ferramenta para análise da distribuição espacial dos mesmos na área de estudo. Todas as informações estão sendo agrupadas e correlacionadas com as classes de uso e cobertura do solo para avaliar a compatibilidade das atividades agropecuárias com as características físicas do terreno. Posteriormente o resultado desse estudo servirá de apoio para a tentativa de validar a aplicação dessa metodologia na mesoescala, abrangendo toda a área da bacia do rio Ji-Paraná, a qual estende-se em 75.400 km². Para o desenvolvimento da presente pesquisa estão sendo empregados Sistemas de Informações Geográficas (SIGs) e o banco de dados do Laboratório de Geoprocessamento do CENA-USP. Os resultados da mesma poderão orientar novas pesquisas e auxiliar em ações dirigidas no sentido de promover a sustentabilidade dos recursos naturais.

39.20-P: Situação da cobertura florestal no Distrito Agropecuário da Zona Franca de Manaus: a importância da escala para espacialização das taxas de desmatamento

Eduardo Martins Venticinqu, PDBFF/INPA, edmventi@inpa.gov.br (Apresentador / Presenting)

Amanda F Mortati, PDBFF/INPA, amortati@inpa.gov.br

Juliana Stropp Carneiro, PDBFF/INPA, justropp@inpa.gov.br

Marcelo P Moreira, PDBFF/INPA, pinguela@inpa.gov.br

Marina Antongiovanni Fonseca, PDBFF/INPA, marina@inpa.gov.br

Taise F Pinheiro, PDBFF/INPA, taise@inpa.gov.br

Jansen A Zuanon, CPBA/INPA, zuaznon@inpa.gov.br

Carlos E Da Costa, PDBFF/INPA, cdacosta@inpa.gov.br

Analisamos a situação da cobertura florestal no Distrito Agropecuário da Zona Franca de Manaus em função de três escalas de bacias hidrográficas, englobando uma área com ~580.000 hectares. Foi realizada uma classificação supervisionada pelo método da máxima verossimilhança sobre três cenas do satélite LANDSAT TM 7. Na classificação foram criadas quatro classes: floresta, capoeiras, desmatamento (pastagens ou solos expostos) e água. Foi detectada alta integridade na cobertura vegetal para a área do distrito com 91,04% de florestas. A segunda classe com maior representatividade foi a das capoeiras com 5,7% de cobertura do distrito. As áreas desmatadas ou urbanizadas somaram um total de 2,7% da área. As maiores porcentagens de desmatamento registram-se na bacia do Rio preto da Eva, que drena uma região com acelerado processo de expansão. De qualquer maneira, esses valores não ultrapassam 6%, um índice bem baixo de eliminação da cobertura vegetal. Quando analisamos o segundo nível hierárquico podemos notar que existem bacias com cobertura florestal de 88 a 99%. Quando analisamos o terceiro nível hierárquico notamos que existem bacias com cobertura florestal de 69 a 100%. De forma geral, houve aumento na variabilidade em função de um refinamento na escala de análise.

[LC_Geral \(LC_General\)](#)

40.1-P: Teores de matéria orgânica, nutrientes e disponibilidade de água, como fatores de limitação ao uso da terra nas bacias dos rios Acre e Iaco, Acre, Brasil

Eufra Ferreira do Amaral, Embrapa Acre, eufra@solos.ufv.br (Apresentador / Presenting)

João Luiz Lani, Universidade Federal de Viçosa, lani@buynet.com.br

Irving Foster Brown, CPWH, fbrown@uol.com.br

O estado do Acre ocupa o extremo sudoeste da Amazônia brasileira e tem uma dinâmica peculiar de ocupação do solo que segue a rede de drenagem, via ribeirinhos e via estradas e ramais via pequenos produtores e pecuaristas. Este trabalho teve como objetivo avaliar os teores de matéria orgânica, cálcio e magnésio e a drenagem do perfil como indicadores de restrições ao uso da terra em duas bacias contíguas. Os teores de matéria orgânica no horizonte A variaram de 0,82 a 2,30 dag/kg, com uma média de 1,55 +/- 0,46. Os teores de cálcio no horizonte A variaram de 0,70 a 45,17 cmolc/kg, com uma média de 14,04 +/- 10,33 cmolc/kg. Os maiores teores foram encontrados nos horizontes superficiais dos Neossolos Flúvicos, nas margens dos rios Acre e Iaco e de seus principais afluentes. No horizonte B e/ou C (no caso dos solos pouco desenvolvidos como os Vertissolos e Neossolos) os teores de cálcio variaram de 0,05 a 29,28 cmolc/kg, com uma média de 7,09 +/- 8,89 cmolc/kg. Os maiores teores foram encontrados nos Cambissolos Háplicos, com influência de carbonatos e sulfatos de cálcio, na bacia do rio Iaco. Na bacia do rio Acre, os Argissolos Vermelhos distróficos, apresentaram os menores teores. Os solos de melhor drenagem estão situados na bacia do rio Acre e os com maiores restrições na bacia do Iaco. Estas características se mostraram importantes como elementos de estratificação de ambientes, e permitiram a visão integrada das bacias.

40.2-P: Socio-spatial processes of forest fragmentation in the Brazilian Amazon: the role of settlement roads

Marcellus Marques Caldas, Michigan State University, caldasma@msu.edu (Apresentador / Presenting)

Robert T. Walker, Michigan State University, rwalker@msu.edu

Eugenio Arima, IMAZON/ Michigan State University, arimaeug@msu.edu

Stephen G Perz, University of Florida, sperz@soc.ufl.edu

Cynthia Simmons, Michigan State University, simmo1cs@cmich.edu

Alexander Paff, Columbia University, ap196@columbia.edu

Steve Aldrich, Michigan State University, aldric30@msu.edu

Jianguo Qi, Michigan State University, qi@msu.edu

Loss of tropical forest remains a subject of great interest due to potential implications for global carbon cycles and biodiversity. This paper considers the social processes that drive deforestation in the Amazon basin by considering frontier governance in mitigating excessive forest loss. Our methodology is a descriptive case study of land cover change in the municipality of Uruara, in the Brazilian State of Pará. Uruara is home to a colonization frontier established by the National Institute of Colonization and Agrarian Reform, or INCRA, in the early 1970s. Although limited to a specific county in the eastern sector of the Amazon basin, much of the discussion is relevant to other areas where colonization is occurring. The study focuses on the primitive transportation corridor we refer to as the settlement road. Such roads were originally constructed -- and continue to be extended -- to provide access to land off the development highways. Our conclusions highlight that the socio-spatial process of landscape change in the micro-frontier of Uruara shows no signs of abating, and that for the future of Amazonia, new highways and infrastructure investments will initiate new processes of land occupation not unlike those described here, in the absence of effective local governance and enforcement of the law.

40.3-P: Conhecimento Atual dos Solos do Estado de Goiás: Elaboração de Sistemas de Informação Geográficos de Solos / Sig-Solos

Pérola Morais Calil, UFG, perolacalil@bol.com.br (Apresentador / Presenting)

Virlei Álvaro de Oliveira, IBGE-DIGEO/GO, virlei@ibge.gov.br

Raros são os projetos de desenvolvimento que de fato se baseiam em um conhecimento real e detalhado a respeito do recurso solo, mesmo sendo este de grande importância para a manutenção da vida na terra. Goiás ainda hoje não possui nenhum trabalho de levantamento de solo ao nível de reconhecimento que contemple todo o seu território. Sabendo da necessidade de inventariar para se planejar de forma racional a manutenção e o uso dos recursos naturais, é que se propôs a presente pesquisa, que é a quantificação e sistematização das informações sobre os trabalhos de levantamentos pedológicos elaborados no Estado de Goiás. Foram levantados 39 trabalhos considerando-se apenas os levantamentos denominados verdadeiros, conforme caracterização de Embrapa (1995). Posteriormente, utilizando-se as coordenadas de localização das áreas estudadas, implementou-se o SIG - Sistemas de Informação Geográficos de solos, no qual poderá ser visualizada a localização e os dados referentes a cada uma das áreas contempladas e não contempladas por levantamentos pedológicos. O presente trabalho apresenta como recomendações além da execução de um levantamento de solos, sistemático voltado para atender às demandas específicas do Estado, a implementação de um SIG que deverá condensar e facilitar a utilização dos dados levantados.

40.4-P: Uso de regressão logística para modelar distribuição espacial de espécies arbóreas na Amazônia Central

Juliana Stropp Carneiro, INPA, justropp@inpa.gov.br (Apresentador / Presenting)

Eduardo Martins Venticinque, PDBFF/INPA, edmventi@inpa.gov.br (Apresentador / Presenting)

A configuração espacial das populações vegetais é afetada por processos bióticos e abióticos do ambiente. Desta forma, a compreensão dos fatores que estruturam essas populações é necessária para a elaboração de modelos de distribuição espacial de espécies. Este trabalho teve como objetivo elaborar modelos preditivos de ocorrência de *Aniba roseodora*, *Cariniana micrantha*, *Caryocar villosum*, *Dinizia excelsa*, *Dipteryx odorata*, *Goupia glabra*, *Manilkara bidentata* e *Manilkara huberi*, *Parkia multijuga*, *Parkia pendula*, *Peltogyne paniculata*, *Pseudopiptadenia psilostachya* em função da topografia. Utilizamos informações sobre presença e ausência de indivíduos em uma área de 9.552 ha. Derivamos a topografia a partir de imagem do radar SRTM (Shuttle Radar Thematic Mission). Estimamos as probabilidades de ocorrência para cada espécie em função da altitude e declividade com regressão logística múltipla. Incorporamos os parâmetros da regressão a um SIG e obtivemos a espacialização das probabilidades. Determinamos a acuracidade dos modelos a partir da comparação entre os valores obtidos na tabela de sucesso de predição e a probabilidade de encontrar indivíduos ao acaso. Para validar os modelos, aplicamos os modelos logísticos em uma área distinta e determinamos sua acuracidade preditiva. Observamos que a topografia estrutura a distribuição de 10 espécies. Os modelos estimaram corretamente a ocorrência de nove espécies na área de elaboração. Constatamos sobreposição entre a distribuição observada e a estimada para essas nove espécies na área de validação. Entretanto, houve variação entre o acréscimo de acerto de ocorrência para essas espécies. Concluímos que modelos preditivos de distribuição de espécies arbóreas podem predir corretamente a

ocorrência de espécies em determinada área, mas que a extrapolação para outras áreas deve considerar outros fatores.

40.5-P: Influência da escala na distribuição espacial da densidade de árvores Amazônia Central

Juliana Stropp Carneiro, INPA, justropp@inpa.gov.br (Apresentador / Presenting)

Eduardo Martins Venticinquê, PDBFF/INPA, edmventi@inpa.gov.br

A distribuição da densidade de árvores depende tanto da estrutura espacial dos fatores ambientais que condicionam sua ocorrência, quanto da história evolutiva de cada uma delas. Este trabalho teve como objetivo investigar a relação entre a altitude e a distribuição espacial da densidade de 11 espécies arbóreas em duas áreas (9.552 e 6.000 ha) na Amazônia Central. Pretendemos entender se os padrões de distribuição são condicionados por efeitos locais, e como estes variam em escala regional. Os dados sobre a ocorrência dos indivíduos (DAP \geq 40cm) foram coletados durante a fase de prospecção das árvores da Mil Madeireira Itacoatiara. Obtivemos o gradiente de altitude com a vetorização da imagem SRTM (Shuttle Radar Thematic Mission). Determinamos a densidade dos indivíduos por cota de altitude. Realizamos análise de covariância entre estas variáveis nas duas áreas. Para *A. roseodora*, *P. pendula* e *P. multijuga* detectamos relação positiva entre a altitude e densidade nas duas áreas, indicando que a altitude condiciona a ocorrência destas espécies em escala local e regional. Observamos para *C. micrantha*, *M. huberi*, *M. bidentata* e *P. psilostachya* interação entre local e altitude, sendo que houve diferença na magnitude da relação entre densidade e altitude. *D. odorata* e *P. paniculata* não tiveram suas densidades relacionadas com a altitude, entretanto ocorreu efeito de local. Para *G. glabra* a densidade e altitude não covariaram entre as áreas, havendo uma inversão da distribuição da densidade em função da altitude. Portanto, a diferença entre o comportamento das densidades nas duas áreas sugere que há variação em uma escala regional na abundância desses indivíduos.

40.6-P: Land Conversion along the Transoceanic Road Iñapari - Iberia: A Socio-Spatial Study of Road Extension and Forest Fragmentation

Andrea Birgit Chavez, University of Florida, Department of Geography, achavez@ufl.edu (Apresentador / Presenting)

This project examines the spatial architecture and fragmented landscapes of the road transect Iñapari-Iberia in the newly emerging frontier region in Madre de Dios, Southeastern Peru. The study area (road axis Iñapari-Iberia) is part of the proposed road extension of the Brazilian BR-317 highway that will link the Peruvian frontier town of Iñapari to the Peruvian Pacific Coast. It seems clear that roads are inevitable and represent a direct impact to land transformation and deforestation, but less clear is where and how these transformations are occurring. Where is primary forest being converted to secondary forest and pasture? To what proximity and extent off the transoceanic road? What factors drive farmers, loggers, and local residents to convert land? No clear history of land uses and their particular historical and economic circumstances along this road is available. No clear understanding of the relationship between policy and economic incentives and land-conversion decision processes exists. Therefore the objective of this presentation is to describe the history of land uses and relate land cover processes with road accessibility, and trace their spatial manifestations on the landscape. As a result a link between the socio-spatial process of road construction and the geometric signature or expression of transoceanic road network on this ecosystem will be constructed. Satellite imagery will be used to measure these variations and changes and household surveys will provide an analysis of why these changes take place. The impact of roads is manifold and only proper location and linkages of causes of landscape conversion will provide clarification for monitoring this emerging frontier region.

40.7-P: Avaliação de Projetos Para Recuperação de Ecossistemas Manguezais, Como Contribuição ao Sequestro do Carbono Atmosférico e À Mitigação do Efeito Estufa Antrópico

Sérgio Mattos Fonseca, APREC Ecossistemas Costeiros, sergiomf@usp.br (Apresentador / Presenting)

Sonia MF Giancesella, USP Universidade de São Paulo, soniag@io.usp.br

Realizamos uma abordagem da economia institucional com uma coleção de regras ordenando o sentido no qual indivíduos e grupos cooperam e competem (Anderson, 1995; North, 1981). Utilizando métodos de integração das áreas do conhecimento envolvidas no estudo das falhas do Mercado, da atuação das Organizações Não - Governamentais e da responsabilidade dos órgãos do SISNAMA (Sistema Nacional do Meio Ambiente), no levantamento da situação atual dos manguezais remanescentes e da implantação de projetos de recuperação de manguezais. O presente estudo pretende avaliar sob a ótica dos requisitos de elegibilidade para inclusão na modalidade Land Use, Land Use Change and Forestry (LULUCF) do Clean Development Mechanism (CDM), a contribuição para o sequestro do carbono atmosférico desses ecossistemas. Relacionando variáveis de crescimento, biomassa e tomando como unidade de análise a do valor total econômico descrito por (Serôa da Motta, 1998), bem como os parâmetros introduzidos por Fonseca (2001), na metodologia Contingent Valuation Method (CVM) para o teste de hipótese da Disposição a Trabalhar Voluntariamente - DATV pela implantação de projetos reflorestamento de ecossistemas manguezais no Brasil, Colômbia, Peru, Equador, México e Cuba.

40.8-P: Floresta-De-Baixio: Diversidade e Riqueza de Espécies

Kianny Martins Formiga, INPA, kianny@inpa.gov.br (Apresentador / Presenting)

Iêda Leão Amaral, INPA, iamaral@inpa.gov.br

Arlem Nascimento Oliveira, UFAM, arlem@inpa.gov.br

As florestas de terra firme da Amazônia caracterizam-se como florestas de platô, vertente, campinarana e baixio. Estudos florísticos realizados na região mostram que elas apresentam alta diversidade. Contudo, nota-se que a maioria dos estudos enfatizam as florestas de platô e de vertentes relegando os demais tipos. Por conseguinte, este estudo tem por objetivo determinar as espécies vegetais da floresta-de-baixio, assim como avaliar os parâmetros de diversidade e riqueza de espécies. O estudo foi desenvolvido na Estação Experimental ZF-2/INPA à noroeste de Manaus-AM, em área de estudos do Projeto LBA. Para tanto, avaliaram-se dois transectos: um de 10 x 300 m e outro de 10 x 700 m, perpendiculares entre si; divididos em 20 parcelas primárias de 10 x 50 m, mensurando-se os espécimes arbóreos, palmeiras e lianas com DAP

maior ou igual a 10 cm. Foram coletadas amostras botânicas, férteis ou não, para identificação das espécies. A diversidade florística foi avaliada pelos índices de Riqueza de Espécie e Equitabilidade (uniformidade). Abordou-se 778 indivíduos, dos quais foram identificados até a presente data, 108 indivíduos distribuídos em 20 famílias, 37 gêneros e 58 espécies. Onze famílias apresentaram maior riqueza de espécies: Sapotaceae-16 espécies (21,1%), Clusiaceae-5 (8,5%), Euphorbiaceae-5 (8,5%), Caesalpinaceae-4 (6,8%), Myristicaceae-4 (6,8%), Myrtaceae-4 (6,8%), Moraceae-3 (5,0%), Rubiaceae-3 (5,0%), Fabaceae, Sterculiaceae e Vochysiaceae cada uma com 2 (3,4%), correspondendo a aproximadamente 80% do total das espécies identificadas. A família Sapotaceae apresentou o maior número de gêneros (4) e espécies (16). CNPq, PPD-G7/LBA.

40.9-P: Efeito de tratamentos silviculturais na regeneração natural de floresta tropical Ombrófila Aberta, na Amazônia Meridional

Elenara Gandini, Universidade Federal de Mato Grosso, gandini.nara@pop.com.br (Apresentador / Presenting)

Carlos Alberto Moraes Passos, Universidade Federal de Mato Grosso, capassos@terra.com.br

Maria José de Souza Noquelli, Universidade Federal de Mato Grosso, snoquelli@ibest.com.br

Erick C.M. Fernandes, Universidade de Cornell, ecf3@cornell.edu

Johannes Leahmann, Universidade de Cornell, cl273@cornell.edu

Susan Riha, Universidade de Cornell, sjr4@cornell.edu

Péricles Aquino Botelho, Universidade Federal de Mato Grosso, periclesbotelho@hotmail.com

Silvana Fuhr, Universidade Federal de Mato Grosso, sil.fu@unversiaibrasil.net

Stefan Jirka, Universidade de Cornell, sj42@cornell.edu

Ted Feldpausch, Universidade de Cornell, trf2@cornell.edu

O objetivo foi analisar o efeito de tratamentos silviculturais na regeneração natural de uma floresta tropical Ombrófila Aberta Submontana, com Palmeiras, localizada no município de Jurueña, MT. Foi estudada uma parcela de 100 ha, sendo que 50 ha foi explorado em 1998 com técnicas de manejo florestal de impacto reduzido (MFIR), dos quais 25 ha com corte de cipó (MFIRCC) e 25 ha sem corte de cipó (MFIRSC), e 50 ha sem intervenção (testemunha). As árvores e palmeiras da regeneração natural foram agrupadas em três estratos: (i) altura < 1,0 m; (ii) 1,0 m < altura < 3,0 m; (iii) altura > 3,0 m e DAP < 10 cm. A coleta de dados foi em janeiro de 2004 e a amostragem para cada tratamento e estrato foi de 6 parcelas, com 4 m² (2 x 2 m), 25 m² (5 x 5 m) e 50 m² (5 x 10 m), respectivamente para os estratos (i), (ii) e (iii). A floresta de MFIRCC apresentou menor densidade e riqueza de cipós enquanto a testemunha maior densidade e riqueza de cipós. No entanto, floresta sob MFIRSC apresentou maior diversidade (riqueza e coeficiente de mistura) de árvores e palmeiras, seguida pela testemunha e da MFIRSC. A mesma tendência entre tratamentos foi observada para a densidade de plantas nos três estratos, tendo o estrato (i) mais de 90% das plantas da regeneração natural, seguido pelos estratos (ii) e (iii). As espécies com maior valor de regeneração natural relativa pouco variaram entre as florestas submetidas aos tratamentos.

40.10-P: The Cuiabá- Santarém Road Linkage and the Effects on Land Cover.

Corey Miyano Hayashi, Anthropological Center for Training and Research on Global Environmental Change, chayashi@indiana.edu (Apresentador / Presenting)

Scott S. Hetrick, Anthropological Center for Training and Research on Global Environmental Change, shetrick@indiana.edu

The 1,700 km Cuiabá Santarém Highway (BR 163) was first cut into the rainforest in 1974. Soybean sectors in Mato Grosso are pushing to complete the pavement of the highway in order to save millions of dollars a year in transportation costs. This poster illustrates the use of a geographic information system to analyze the potential outcomes of paving BR163 (Cuiabá-Santarém). Paving this highway, while economically beneficial for soybean cultivators, may bring detrimental consequences to the regional environment. Published data show that around 5% of the forests within 50 km of the road have been deforested, and that central road networks such as the Cuiabá-Santarém road link and the Trans Amazon Highway has a 16.1% total deforestation rate with a distance of 25 km and a 24% deforestation rate with a distance of 50 km. Deforestation, however, tends to be mediated by other factors such as land tenure, institutional arrangements and the biophysical environment. The poster illustrates how selected variables may effect land-cover change along the BR 163 corridor. It also investigates how these variables may themselves be affected. The poster displays the application of GIS tools such as buffering and cost-surface measures to analyze the potential spread of spatial change along the highway. The poster analyzes how the proximity of administrative boundaries, various conservation areas (federal, state, etc), indigenous areas and factors such as topography may impact the outcome of changes in land cover at different distances from the highway.

40.11-P: Biophysical Predictors of Soy Expansion in Mato Grosso state, Brazil

Ellen Jasinski, University of Maryland, ejasinsk@pop900.gsfc.nasa.gov (Apresentador / Presenting)

Douglas Morton, University of Maryland, morton@geog.umd.edu

Ruth DeFries, University of Maryland, rdefries@geog.umd.edu

Yosio Shimabukuro, INPE, yosio@ltid.inpe.br

Liana Anderson, INPE, liana@ltid.inpe.br

Matthew Hansen, University of Maryland, mhansen@glue.umd.edu

Marcelo Lopes Latorre, INPE, latav@ltid.inpe.br

In only three decades of planting, soy has advanced to become Brazil's principal crop, both in planted area and quantity produced. The state of Mato Grosso (MT) alone has 5.2 million hectares (ha) of soy planted for the 2004 harvest—about 6% of the state's total land area. This is a 13.4% increase over last year for MT and a 35% increase over 2002. Soy production in MT is increasingly mechanized, with the majority of plantations >1000 ha. Today most agriculturalists consider Brazilian cerrado land merely as potential area for cultivation. Only 1.5% of the cerrado is presently protected within federal reserves. Both cerrado and forest lands in MT are being converted to mechanized agriculture at rates that increase annually. To understand the patterns of this expansion, we compared maps of soy cultivation in MT from the past

three years, 2001-2004, using MODIS 250m daily data, with the state's topography, soils, precipitation statistics, road networks, and pre-soy land cover types. Logistic regressions were conducted for each of these data layers against the soy map in order to discern their relative weight in determining the likelihood of land use conversion to mechanized soy cultivation. Final analyses will give insight into the matrix of environmental conditions that encourage soy expansion in MT, providing inputs for holistic land use transition models and guiding the process of protected area designation.

40.12-P: Soil biochemical characteristics under second growth forests of distinct ages and former land use in central Amazonia

Fabiane Lima de Oliveira, INPA, fabiane@inpa.gov.br (Apresentador / Presenting)

Regina C>C Luizão, INPA, rccl@inpa.gov.br

Flavio J. Luizão, INPA, fluizao@inpa.gov.br

In central Amazon, soil preparation for pastures and croplands in upland forest soils involves biomass burning after deforestation, which adds ashes to the soil, changing its nutrient status, organic matter content, and physical properties. These practices affect both crop yields and the subsequent secondary vegetation after land abandonment. This study aims to evaluate the quality of the litter layer produced by second growth of different ages and origins, and to determine its relationship with soil nutrient availability. The study is carried out at the Biological Dynamics of Forest Fragments Project (BDFFP), 80 km north of Manaus, using 20 second growth transects for sampling the litter layer and the upper soil layer (0-10 cm). No direct relationship between soil properties and the litter layer mass or quality were detected in the first sampling. However, the litter layer mass varied significantly with the age of second growth ($p < 0.001$), and with the kind of former land use ($p < 0.001$). Soil pH (3.42-4.79) did not vary significantly with the age of second growth, but it was greater in second growth installed on abandoned pastures. Soil moisture (11.1-30.5 %) and field capacity (22.6-52.5 %) did not show significant differences among ages or among distinct previous land uses. The decrease of the litter layer mass with the age of second growth is likely a result of a more efficient decomposition process in older second growth, which may produce litter of better quality.

40.13-P: Dinâmica de Fragmentos Florestais Naturais Ipuacas considerando-se a Avaliação Multitemporal nos Últimos 48 Anos.

Alan Kardec Elias Martins, UNITINS, akelias@unitins.br (Apresentador / Presenting)

Iracly Coelho de Menezes Martins, UFT, imartins@uft.edu.br

Paula Benevides Moraes, UFT, moraesp@edu.uft.br

O estudo foi conduzido no município de Lagoa da Confusão, Estado do Tocantins, com objetivo de conhecer a dinâmica multitemporal de fragmentos florestais naturais conhecidos regionalmente por ipucas os quais ocorrem nas proximidades da Ilha do Bananal, em região de ecótono entre o Cerrado e a Floresta Amazônica (MARTINS et al., 2001). Tomou-se como base de estudo uma área de 8.232 ha. Foram feitos mapeamentos utilizando uma imagem Landsat-5, obtida no ano de 1998 e fotografias aéreas do ano de 1956. O mapa de uso do solo gerou nove classes, que foram posteriormente confirmadas por levantamentos de campo. Por meio dessa classificação, verificou-se a dominância do varjão (limpo e sujo: 3.003 ha) sobre as demais feições na composição da paisagem. Entre outras feições de ocorrência natural, por ordem decrescente, tem-se o cerrado (1.218 ha), as ipucas (1.107 ha) e as florestas ripárias (622 ha). De acordo com os resultados, verificou-se que variações entre e dentro dos ecossistemas inundáveis refletem-se, principalmente, em mudanças na composição florística das comunidades vegetais, formando verdadeiros mosaicos. As ipucas extraídas do mapeamento efetuado com o uso de fotografias aéreas do ano de 1956 em relação à do mapeamento a partir do uso da imagem Landsat-5 do ano de 1998, demonstrou que 57% desta área passou por um processo de sucessão ecológica. A representatividade das ipucas em termos absolutos (área) em 1998 foi maior e, em número de fragmentos menor. Entretanto, em 1956, obteve-se uma área menor e um maior número de fragmentos.

40.14-P: Diagnóstico Ambiental no Contexto da Paisagem de Fragmentos Florestais Naturais - Ipuacas - no Município de Lagoa da Confusão, Tocantins.

Iracly Coelho de Menezes Martins, Universidade Federal do Tocantins, imartins@uft.edu.br (Apresentador / Presenting)

Conduziu-se o estudo em uma área de aproximadamente 8.000 ha, localizada no município de Lagoa da Confusão - TO. A área se insere numa faixa de ecótono entre o Cerrado e a Floresta Amazônica. Teve como objetivo realizar o diagnóstico ambiental dos fragmentos florestais naturais, denominados regionalmente "ipucas", em nível de paisagem. Consideraram-se os seguintes fatores ambientais: histórico de perturbação, área, perímetro, forma e vizinhança. O histórico de perturbação intensificou-se a partir da implantação do Projeto Rio Formoso para o cultivo de arroz irrigada e expansão da fronteira agrícola. Em relação à classificação fitofisiológica e ao uso antrópico, foram identificadas 11 classes: "ipucas", varjão sujo, varjão limpo, floresta riparia, cerrado "ss", pastagem nativa, pastagem plantada, área agrícola, corpos d'água, afloramento rochoso e rede viária. Foram individualizadas 73 "ipucas", e, a partir das variáveis consideradas, verificou-se que, em relação à área, 56,16% dos fragmentos possuem áreas de até 5 ha. Apenas quatro apresentaram áreas superiores a 100,00 ha. Aproximadamente 50% destas possuem formas alongadas, o que indica alta relação perímetro/área. Apenas três "ipucas" apresentaram índice de circularidade (C) próximos de (1). Foram identificadas as seguintes feições circunvizinhas às "ipucas": Sendo cinco ambientes naturais (varjão sujo, varjão limpo, pastagem natural, corpos d'água e afloramento rochoso) e as demais resultantes de ações antrópicas (área agrícola, pastagem plantada e rede viária). As estratégias de ações e manejo devem contemplar um trabalho integrado entre as instituições de ensino e pesquisa e a comunidade, que visem o conhecimento científico desses ecossistemas e alternativas de uso sustentável.

40.15-P: Efeito de tratamentos silviculturais no estoque de madeira em floresta tropical Ombrófila Aberta, na Amazônia Meridional

Carlos Alberto Moraes Passos, Universidade Federal de Mato Grosso, capassos@terra.com.br (Apresentador / Presenting)

Susan Rija, Universidade de Cornell, sjr4@cornell.edu

Johannes Leahmann, Universidade de Cornell, cl273@cornell.edu

Silvana Fuhr, Universidade Federal de Mato Grosso, sil.fu@unversiabrasil.net

Péricles Aquino Botelho, Universidade Federal de Mato Grosso, periclesbotelho@hotmail.com

Maria José de Souza Noquelli, Universidade Federal de Mato Grosso, snoquelli@ibest.com.br

Elenara Gandini, Universidade Federal de Mato Grosso, gandini.nara@pop.com.br

Erick C.M. Fernandes, Universidade de Cornell, ecf3@cornell.edu

Stefan Jirka, Universidade de Cornell, sj42@cornell.edu

Ted R. Feldpausch, Universidade de Cornell, trf2@cornell.edu

Este trabalho teve como objetivo avaliar o efeito de tratamentos silviculturais no estoque de madeira numa floresta tropical Ombrófila Aberta Submontana, com Palmeiras, localizada no município de Juarena, MT. Foi estudada uma parcela de 100 ha, sendo aplicado manejo florestal de impacto reduzido (MFIR), em 50 ha, em 1998, dos quais 25 ha com corte de cipó (MFIRCC) e 25 ha não (MFIRSC), e 50 ha ficaram sem intervenção (testemunha). As árvores e palmeiras foram agrupadas em três estratos: (i) 10 cm < DAP < 30 cm; (ii) 30 cm < DAP < 45 cm; e (iii) DAP > 45 cm. A coleta de dados foi em janeiro de 2004 e a amostragem para cada tratamento e estrato foi de: 15 parcelas de 25 x 20 m (7.500 m²) para os estratos (i) e (ii) e 30 parcelas de 25 x 20 m (15.000 m²) para o (iii). A área basal (m².ha⁻¹) e o estoque de madeira (m³.ha⁻¹) tenderam a MFIRCC>MFIRSC>Testemunha, sendo o estoque no estrato (iii)>(ii)>(i). O estoque no estrato (iii) foi maior que 60% do total, e os demais pouco diferiram entre si. A área basal tendeu a (iii)>(i)=(ii), tendo o estrato (iii) mais que 50% do total. Borracheira (Moraceae), castanheira-do-Brasil (Lecythidaceae) e cachimbeiro (Lecythidaceae) foram as espécies que mais contribuíram para o estoque de madeira nas florestas MFIRCC, MFIRSC e testemunha, respectivamente.

40.16-P: Regeneração natural de floresta tropical Ombrófila Aberta com Palmeiras, primária, na Amazônia Meridional

Maria José de Souza Noquelli, Universidade Federal de Mato Grosso, snoquelli@ibest.com.br (Apresentador / Presenting)

Carlos Alberto Moraes Passos, Universidade Federal de Mato Grosso, capassos@terra.com.br

Erick Fernandes, Universidade de Cornell, ecf3@cornell.edu

Johannes Leahmann, Universidade de Cornell, cl273@cornell.edu

Susan Riha, Universidade de Cornell, sjr4@cornell.edu

Ted R. Feldpausch, Universidade de Cornell, trf2@cornell.edu

Stefan Jirka, Universidade de Cornell, sj42@cornell.edu

Elenara Gandini, Universidade Federal de Mato Grosso, gandini.nara@pop.com.br

Péricles Aquino Botelho, Universidade Federal de Mato Grosso, periclesbotelho@hotmail.com

Silvana Fuhr, Universidade Federal de Mato Grosso, sil.fu@unversiabrasil.net

O objetivo foi avaliar a regeneração natural numa floresta tropical Ombrófila Aberta de Submontana, com Palmeiras, primária, localizada no município de Juarena, MT. O estudo foi realizado em um talhão de 1.000 ha, do total de 25.000 ha, a ser submetido a exploração florestal. As árvores e palmeiras da regeneração natural foram agrupadas em três estratos: (i) altura < 1,0 m; (ii) 1,0 m < altura < 3,0 m; (iii) altura > 3,0 m e DAP < 10 cm. A amostragem para cada estrato foi feita em outubro de 2003 em 61 parcelas, de 4 m² (2 x 2 m) para o estrato (i), 25 m² (5 x 5 m) para o estrato (ii) e 50 m² para o estrato (iii), distribuídas sistematicamente ao longo de seis transectos de 1 km. O índice de regeneração natural relativa foi determinado pelo total da frequência relativa, densidade relativa e categoria de tamanho relativa. Foram amostradas 123 espécies entre árvores (111) e palmeiras (12), sendo 38 ainda não identificadas, porém cinco de famílias conhecidas. A densidade total média foi de 40.601,6393 ind/ha, sendo 34.795,0820 ind/ha do estrato (i), 3.724,5902 ind/ha do estrato (ii) e 2.081,9672 ind/ha do estrato (iii). A diversidade da vegetação tendeu diminuir com a categoria de tamanho, considerando a riqueza de espécies - (i) 72; (ii) 74; (iii) 82 -, o coeficiente de mistura (QM) - (i) 1:483,27; (ii) 1:50,33; (iii) 1:25,39, e índice de diversidade de Shannon-Weaver (H') - (i) 3,1159; (ii) 3,4274; (iii) 3,6383. Amesclaroceira (Burseraceae), cega-corrente (Moraceae), ingá (Mimosaceae), imbaúba (Cecropiaceae) e roxinho (Caesalpinaceae) foram, respectivamente, as espécies com maior índice de regeneração natural relativo.

40.17-P: Extensive analyses for pasture biophysical and biogeochemical dynamics under the interactions between human and soil types in Rondônia

Izaya Numata, University of California, Santa Barbara, numata@geog.ucsb.edu (Apresentador / Presenting)

Dar A Roberts, University of California, Santa Barbara, dar@geog.ucsb.edu

Oliver A Chadwick, University of California, Santa Barbara, oac@geog.ucsb.edu

Joao Viane Soares, Instituto Nacional de Pesquisas Espaciais, viane@ltid.inpe.br

Francisco Chagas Leonidas, EMBRAPA/CPAFRO-RO, leonidas@cpafro.embrapa.br

Fernando Antonio Sampaio, Universidade Luterano do Brasil/Agronomia-JiParana-RO, pesquisajp@ulbra.br

Joao Luiz Esteves, INCRA-Ji Parana-RO, incralba@ulbra.br

Flavio Fendt, Universidade Luterano do Brasil/Agronomia-JiParana-RO, flaviofendt@bol.com.br

Pastures play a crucial role in sustainable development in the Amazon. Although many studies have characterized pasture condition and degradation in the Amazon, our understanding of Amazonian pastures is still limited to plot and local scales. We have conducted biophysical and biogeochemical analyses of pasture processes at local and regional scales in the state of Rondônia by integrating many pasture sites under different soil types and management practices. Our primary objective is to understand the dynamics of pasture biophysical and biogeochemical properties and their link to management and soil

types.

Sixteen pastures in Rondônia, extending from Porto Velho to Presidente Medici, were selected for biogeochemical characterization. For eleven of the sixteen sites, pasture biophysical analyses were also conducted. These sites vary by soil type (oxisols, ultisols, and alfisols), age (6-10, 11-15, and more than 16 year-old), and management (i.e., property size, animal density and rotation). Pasture biophysical parameters included live and dead above ground biomass (AGB) and LAI. Soil biogeochemical parameters included exchangeable cations, available phosphorus, and base saturation. Field surveys showed that biophysical and biogeochemical parameters decreased as a function of pasture age, but above 11 years-old the differences between the age classes became very small. Pasture biophysical measures changed with grazing intensity as well. For example, pasture AGB was strongly correlated with grazing intensity ($R^2=0.91$), with lower AGB found in small (25 - 60ha) and medium (240 - 600ha) properties with high grazing intensity and higher AGB occurring in large ranches (3500 - 6300 ha) with lower grazing intensity. Soil biogeochemical analyses showed that alfisols had the highest soil fertility even after more than 20 years of land use, followed by ultisols and oxisols. However, available phosphorus reached similar levels among these soil types after 11 years. Despite variation in soil biogeochemistry over the study sites, modified in part by soil type and pasture age, no significant relationship was observed between soil fertility and biophysical properties. Overall results indicate that in Rondônia, pasture management (i.e., intensive and extensive) may affect pasture productivity more strongly than soil types.

40.18-P: Aspectos da avaliação estatística de biodiversidade arbórea para floresta de transição de terra firme amazônica.

George Sanches Suli, UFMT, suli@terra.com.br (Apresentador / Presenting)

Nelson M. Yoshitake, UFAC, suli@terra.com.br

Marcos Silveira, UFMT, suli@terra.com.br

Nicolau Priante Filho, UFMT, nicolaup@terra.com.br

George L. Vourlitis, CSUSM, georgev@csusm.edu

Vanessa Aparecida Santos, UNEMAT, vanessaflorista@yahoo.com.br

Rodrigo Marques, UFMT, rodrigmarques@pop.com.br

A missão RAINFOR (Rede Amazônica de Inventários Florestais)/LBA têm agregado dados de inventários florestais e promovido campanhas de campo padronizadas (PHILLIPS et al. 2002), em diversas áreas da Amazônia. Em junho de 2002, dois transectos de 1 ha foram instalados, na Fazenda Maracá, município de Cláudia e na Reserva Particular do Patrimônio Natural do Cristalino, em Alta Floresta, distante 350 km ao Norte, localizadas no "arco do desmatamento". Clima e solo são fatores determinantes de variações na fitofisionomia da vegetação. Como diferenças na composição florística regional podem ser artifícios de amostragem, o conjunto de dados obtido nas duas áreas foi analisado estatisticamente, através de estimadores de diversidade, como o índice de Shannon, em técnica de re-amostragem aleatória com reposição, "Bootstrap" (EFRON et al. 1993). A aplicação da re-amostragem aleatória foi executada sobre dados de biodiversidade estimados por jackknife de 2ª ordem em floresta de terra firme amazônica de transição nos municípios de Cláudia e Alta Floresta - MT. Assim, a partir da amostragem de 1 ha para cada uma das regiões citadas, estimou-se a riqueza de espécies arbóreas e, com os resultados, foram geradas populações virtuais por bootstrapping. Com essas populações foram calculados índices de biodiversidade, como Shannon, Pielou e Simpson. Esses índices foram comparados de modo a identificar as diferenças quali-quantitativas entre as duas regiões em estudo caracterizando suas diferenças.

40.19-P: Estrutura e Funcionamento de Fragmentos Florestais Naturais (Ipucas) na Planície do Araguaia

Tracy Coelho de Menezes Martins, UFT, imartins@uft.edu.br

Paula Benevides Moraes, UFT, moraesp@uft.edu.br (Apresentador / Presenting)

Alan Kardec Elias Martins, UNITINS, akelias@unitins.br

Os ecótonos são zonas de transição entre comunidades adjacentes que apresentam atributos estruturais e funcionais, cujas funções básicas são servir como habitat, manter biodiversidade, modificar fatores ambientais e acumular/exportar matéria orgânica. Na região ecotonal entre o Cerrado e a Floresta Amazônica na Planície do Araguaia, estão presentes fragmentos florestais naturais chamados ipucas, localizados nos campos limpo e sujo (Cerrado), nas partes mais baixas do terreno sujeitas às inundações periódicas. Há poucas informações sobre a ecologia das ipucas, sendo conhecidos alguns estudos de caracterização ambiental em nível de paisagem, sucessão ecológica, impactos ambientais decorrentes de projetos de orizicultura irrigada, insetos himenópteros e leveduras associadas, desenvolvidos por pesquisadores da UNITINS, UFT, UFV e UFMG. O Centro Canguçu estuda o fenômeno do sequestro do carbono por esse tipo de vegetação. Os resultados apontam que as ipucas tem papel importante no sequestro de carbono e manutenção da biodiversidade produzida na interface com outros tipos de vegetação como o varjão e os murundus. Este grupo propõe um Programa de Estudos que integre conhecimentos necessários para compreender o funcionamento e o papel desses ecossistemas para o equilíbrio ecológico e sustentabilidade dessa ecorregião. São metas: inventariar a biodiversidade de grupos indicadores; identificar a interação entre as comunidades; mapear a ocorrência e mecanismos de sucessão ecológica das ipucas em escala temporal; identificar o comportamento hidrológico das ipucas e adjacências; entender a contribuição desses fragmentos para o balanço atmosférico dos gases do efeito estufa; estudar a ocupação atual da planície e buscar alternativas sustentáveis para melhoria da qualidade de vida dos atores sociais envolvidos.

[LC_Sensoriamento_remoto \(LC_Remote_Sensing\)](#)

41.1-P: Rapid assessment of deforestation in Mato Grosso State using MODIS and ETM+ data

Liana Oighenstein Anderson, INPE, liana@ltid.inpe.br (Apresentador / Presenting)

Yosio Edemir Shimabukuro, INPE, yosio@ltid.inpe.br

Douglas Morton, University of Maryland, morton@geog.umd.edu

Ruth DeFries, University of Maryland, rdefries@geog.umd.edu

Marcelo Lopes Latorre, INPE, latav@ltid.inpe.br

Ellen Jasinski, University of Maryland, ejasinsk@pop900.gsfc.nasa.gov
Matthew Hansen, University of Maryland, mhansen@glue.umd.edu
André Lima, INPE, andre@ltid.inpe.br

This work reports the findings of a rapid assessment of deforestation in the Amazon using multitemporal fraction images derived from MODIS 250 m daily surface reflectance and ETM+ data. ETM+ scenes acquired for the same days as MODIS imagery were used as ground truth for training and validation phases. A linear mixing model was applied to 8 sequential ETM+ scenes (path/row 227/68), collected during the dry season of 2002, and to the corresponding MODIS data. Fraction images for soil, shade, and vegetation were derived from the linear spectral mixing model, and the soil fraction images were used to identify new deforestation during each 16-day period. This methodology builds on the experience from PRODES Digital that applies image segmentation to the fraction images derived from Landsat TM to identify deforestation using a non-supervised classification per region algorithm. Overall, our deforestation detection results from the multitemporal analysis of MODIS and ETM+ images showed good agreement. Detection accuracy was evaluated separately for new deforestation by size classes. Due to the size and pattern of the deforestation, the MODIS data under or overestimated the total deforestation area for small clearings. As the deforested area increases, the MODIS results match the ETM+ results more closely. We present an accurate methodology for detecting deforestation activities in near real time using Terra MODIS daily data. This approach can be used to provide more frequent data for enforcement of forest protection laws.

41.2-P: O Uso de Imagens de Alta Resolução na Construção de Bibliotecas Espectrais de Árvores

Marina Antongiovanni, INPA/PDBFF, marina@inpa.gov.br (Apresentador / Presenting)
Eduardo Martins Venticinque, INPA/PDBFF, edmventi@inpa.gov.br
Marcelo Paustein Moreira, INPA/PDBFF, pinguela@inpa.gov.br
Neranda Gomes Ferreira, INPA/PDBFF, fgomes@inpa.gov.br
Taise Farias Pinheiro, INPA/PDBFF, taise@inpa.gov.br
Juliana Stropp Carneiro, INPA/PDBFF, justropp@inpa.gov.br
Ana Segalim Andrade, INPA/PDBFF, titina@inpa.gov.br
Sammya D' Angelo, INPA, sammya@inpa.gov.br
William F. Laurance, PDBFF, laurancew@tivoli.si.edu

Na superfície terrestre, os diversos alvos refletem a energia solar de maneira diferenciada, de modo que os sensores remotos detectam e registram esta radiação eletromagnética refletida em determinada faixa do espectro eletromagnético, e geram informações que podem ser associadas a um objeto conhecido na superfície terrestre. Assim, o resultado da interação entre a radiação eletromagnética e uma copa de árvore gera um padrão espectral que, possivelmente, nos fornecerá informações sobre a estrutura da copa, tamanho e densidade das folhas. Desta forma, neste estudo pretendemos, com o uso de imagem de alta resolução do satélite Quickbird, montar uma biblioteca espectral das espécies arbóreas de dossel e emergentes nas áreas do Projeto Dinâmica Biológica de Fragmentos Florestais, Manaus, AM. Esperamos que as copas sejam agrupadas não por corresponderem à mesma espécie botânica, mas por possuírem características semelhantes, como arquitetura de copa, tamanho e disposição de folhas, entre outras. No presente momento, estamos em uma fase preliminar do estudo, onde, na imagem, o dossel das áreas de estudo já foi submetido a uma classificação supervisionada. A classificação separou de forma adequada copas com diferentes características espectrais. As classes geradas serão relacionadas com as características das folhas e das copas em chaves de identificação, que nos permitirão compreender o potencial das imagens Quickbird na confecção de bibliotecas espectrais de árvores.

41.3-P: Detection of Mesoscale Seasonal and Inter-annual Variation In Vegetation of the Amazon Basin

Victoria Ramos Ballester, CENA-USP, vicky@cena.usp.br (Apresentador / Presenting)
Miles G Logsdon, University of Washington, mlog@u.washington.edu
Milton Smith, University of Washington, msmith@u.washington.edu
Robin Weeks, University of Washington, rweeks@u.washington.edu
Reynaldo Luiz Victória, CENA-USP, reyna@cena.usp.br
Jeffrey E. Richey, University of Washington, jrichey@u.washington.edu

In the Amazon Basin, seasonal and inter-annual spectral changes measured by satellites result from anthropogenic disturbance and from the interaction between climate variation, and the ground and vegetation cover. Measurements of spectral change provide information on physical processes controlling this interaction at the mesoscale. In this article we analyze a 17-year sequence of daily AVHRR-GAC images to produce a monthly record of surface spectral change encompassing El Niño Southern Oscillation (ENSO) cycles. Monthly cloud free composite images from daily AVHRR data were produced by linear filters that minimize the fine scale spatial variance and allowed for a wide range analysis within a consistent mathematical framework. We report here on the use of a minimized local variance filter (MLV) that produced spatially smooth images in which major land cover boundaries and spatial gradients are clearly represented. Changes in the configuration of these boundaries and the composition of the elements they defined are described in terms of landscape change. The time series produced with the MLV filter reveals a marked seasonal difference in the pattern of the landscape and structural differences over the length of the time series. Strikingly, the response of the region to drier El Niño years appears to be delayed in the MLV series, the maximum response being in the year following El Niño and little or no change seen during El Niño.

41.4-P: Detecção da Dinâmica da Cobertura Vegetal na Região de Cristalina - GO a Partir de Processamento Digital de Imagens Landsat no Período de 1995 e 2003

Maria Gonçalves da Silva Barbalho, Secretaria da Fazenda do Estado de Goiás, mbarbalho@cultura.com.br (Apresentador / Presenting)

Simone Almeida Jácomo, UFG/IESA, jacomo@iesa.ufg.br (Apresentador / Presenting)

Niransi-Mary da Silva Rangel Carraro, UFG/IESA, nirageo@hotmail.com (Apresentador / Presenting)

O Estado de Goiás está inserido no Bioma Cerrado, cuja diversidade de fauna e flora é uma das mais ricas do mundo. Entretanto, a introdução da agricultura moderna na década de 70, onde há o uso intensivo da motomecanização, de agrotóxicos, do desmatamento e do fortalecimento da concentração fundiária, viabilizado por políticas governamentais (POLOCENTRO, PRODECER), tem feito com que esse bioma sofra vários impactos negativos como a substituição da cobertura vegetal natural, alteração dos solos, erosão e posterior assoreamento dos reservatórios naturais. Um exemplo que ilustra o problema da utilização intensiva do trinômio ecológico vegetação, solo e água, justificando a necessidade de um estudo de análise integrada dos aspectos físicos, bióticos e sócio- econômicos é o Município de Cristalina - GO, área da pesquisa. Neste sentido, este trabalho teve como objetivo avaliar e quantificar a mudança de cobertura vegetal, a partir de imagens LANDSAT, no período de 1995 e 2003, utilizando o Índice de Vegetação da Diferença Normalizada, seguido da classificação das imagens para discriminar as categorias de mudança. Os resultados obtidos permitiram identificar áreas críticas, podendo subsidiar o planejamento e gestão dos recursos.

41.5-P: Mapping deforestation and secondary succession forest in the Brazilian Amazon using SPOT-4 VEGETATION data

João Brito Carreiras, Instituto Superior de Agronomia, Department of Forestry, Lisboa, jmbcarreiras@isa.utl.pt (Apresentador / Presenting)

José Cardoso Pereira, Instituto Superior de Agronomia, Department of Forestry, Lisboa, jmc Pereira@isa.utl.pt

Manuel Lameiras Campagnolo, Instituto Superior de Agronomia, Department of Mathematics, Lisboa, mlc@math.isa.utl.pt

Yosio Edemir Shimabukuro, Instituto Nacional de Pesquisas Espaciais, Department of Remote Sensing, yosio@ltdid.inpe.br

The main purpose of this work is to assess the potential of multitemporal images from the SPOT-4 VEGETATION sensor, 1-km spatial resolution, to obtain a land cover map of the Brazilian Amazon, discriminating primary tropical forest, *cerrado* (savanna), deforestation, natural/artificial waterbodies, and secondary succession forest. For our study, we used a temporal series of 12 monthly composite images of 2000, derived from the SPOT-4 VEGETATION sensor. A set of 19 Landsat TM/ETM+ scenes was used to obtain areas of known land cover class. The 10-fold cross validation procedure indicates the k -nearest neighbors (k -nn), with $k=7$, as the best classification algorithm to solve this problem, with an overall accuracy of 0.923. Accuracy assessment of some land cover classes was done by comparison with county statistics of deforestation, primary tropical forest and natural/artificial waterbodies, derived from Landsat TM/ETM+ imagery. The correlation coefficient between county-level proportion of deforestation/secondary succession forest, primary tropical forest, and natural/artificial waterbodies, obtained from coarse resolution (this study) and high resolution (Landsat TM/ETM+ imagery) is high (0.88, 0.95, and 0.97, respectively). The estimated total area of deforestation and secondary succession forest was 834,469 km² and 57,592 km², respectively. Deforestation occurred primarily in areas of primary tropical forest (45.5%), in regions of *cerrado* (32.9%), in transition forest (19.1%), and other vegetation types (2.5%). Deforestation in areas of *cerrado* partially explains the difference between this study and INPE's estimation (587,727 km², up to year 2000).

This study concluded that SPOT-4 VEGETATION data are very adequate for estimating deforestation and secondary succession forest in tropical regions. The land cover map produced may be useful in models of regional carbon flux.

41.6-P: Method for Large-scale Mapping of Forest Gap Fraction and Logging in Amazonia

Amanda Naslund Cooper, Carnegie Institute of Washington, acoop@stanford.edu (Apresentador / Presenting)

Gregory Paul Asner, Carnegie Institute of Washington, gpa@stanford.edu

Kathleen Heidebrecht, Carnegie Institute of Washington, kheide@globalecology.stanford.edu

Amanda Susan Warner, Carnegie Institute of Washington, amanda@globalecology.stanford.edu

José Natalino Macedo Silva, EMBRAPA, natalino@cpatu.embrapa.br

Mercedes Maria Cunha Bustamante, (6) Universidade de Brasília, mercedes@unb.br

Over recent years the use of satellite imagery has been an invaluable tool in monitoring land cover change in Amazonia. Using Landsat ETM+ data, automated mapping of photosynthetic vegetation fraction and canopy gap fractions for the Brazilian states of Acre, Northern Mato Grosso, Rondonia, Para and Amazonas was performed. An initial mosaic of orthorectified data, available from Earthsat, was used as the base ETM+ coverage. Each scene was only available for one year, ranging in acquisition date from 1999 to 2001. The raw ETM+ images were converted to reflectance using an atmospheric correction code. Masks were created and applied for clouds, water and cloud shadows. Masked reflectance data were then processed through a spectral unmixing model, Carnegie's AutoMCU which determines photosynthetic vegetation (PV), non-photosynthetic vegetation (NPV), bare soil, and shade fractions. The raw MCU output was then corrected to remove the effects of the shade fraction. Image rescaling was needed to standardize PV, NPV and soil results between images, as there were discrepancies between images due to atmospheric artifacts and differing dates of image acquisition. Lastly, for 1999 to 2002, state-level mosaics of high resolution imagery have been produced. These maps highlight the diversity of forest structural conditions and land use throughout much of Amazônia and represents an advance in mapping of large ecosystems.

41.7-P: An Assessment of Land Cover Dependencies of VI-Biophysical Relationships for Regional Extrapolations of Ground LBA Ecology Measurements in Brazilian Cerrado

Tomoaki Miura, University of Hawai'i at Mānoa, tomoakim@hawaii.edu

Alfredo R. Huete, University of Arizona, ahuete@ag.arizona.edu

Laerte G. Ferreira, Universidade Federal de Goiás, laerte@iesa.ufg.br (Apresentador / Presenting)

Edson E. Sano, EMBRAPA-Cerrados, sano@cpac.embrapa.br (Apresentador / Presenting)

The savanna in Brazil, locally known as "cerrado," is the most intensely stressed biome with both natural environmental pressures and rapid/aggressive land conversions. Large-scale vegetation characterization of the biome is needed in order to improve our understanding of the human impact on carbon and other biogeochemical cycling and the prospect for sustainable land use in the Brazilian cerrado. One of the most common approaches for measuring or monitoring biophysical conditions is the empirical correlation of spectral vegetation indices (VIs) with such biophysical parameters as leaf area index (LAI), % green cover, and fraction of absorbed photosynthetically active radiation (fAPAR). Few studies, however, have been conducted to investigate the relationships of VIs with biophysical parameters for the Brazilian cerrado. In this study, we assessed VI-biophysical relationships and their land cover dependencies with the goal of deriving proper functional forms for cerrado using a hybrid, multi-layer canopy reflectance (CR) model. A range of cerrado physiognomies as well as converted pastures were measured for tissue optical and structural properties in the beginning of a dry period in 2002. The data were then used to constrain the CR model. The field sites included cerrado grassland, scrub cerrado, wooded cerrado, and cerrado woodland as undisturbed cerrado physiognomies, and pastures of various ages (from one to eight years old). VIs were computed from the model-simulated reflectance and correlated with the biophysical parameters of LAI and fAPAR to assess the relationships. The model-simulated data set showed observable trends where the data for cerrado grassland and scrub cerrado, for wooded cerrado and cerrado woodland, and for pastures formed different relationships. These results imply that the stratification of land cover types are necessary in order to accurately estimate LAI and fAPAR from the empirically-derived relationships, but the land cover classes do not have to follow conventional cerrado physiognomies, requiring only a few classes including grassy and woody cerrado, and pastures.

41.8-P: Seasonal and Inter-Annual MODIS Data Responses over a Dry to Wet Amazon Tropical Forest Gradient

Alfredo R Huete, University of Arizona, ahuete@ag.arizona.edu (Apresentador / Presenting)

Kamel Didan, University of Arizona, kamel@ag.arizona.edu

Yosio Edemir Shimabukuro, INPE, yosio@ltid.inpe.br

Tomoaki Miura, University of Hawaii, tomoakim@hawaii.edu

We investigated the seasonal dynamics of the seasonally dry to perhumid tropical forests through an east - west transect along the Amazon using high temporal frequency observations from the Terra- Moderate Resolution Imaging Spectroradiometer (MODIS). Prior studies with the NOAA-AVHRR instrument have shown the limitations of extracting seasonal signatures over the Amazon forest due to the extent of cloud contamination and the saturated response of the normalized difference vegetation index (NDVI). In this study we used 4 years of 250-m MODIS enhanced vegetation index (EVI) data, filtered with quality assurance (QA) 'metrics' to extract the forest signal from highly cloud-contaminated data over the Amazon. The observed MODIS temporal profiles exhibited distinct seasonal trends in the seasonally dry forests, representing the combined, *integrative* phenology of numerous forest tree species. The MODIS EVI did not saturate and revealed a higher response in the dry season for the seasonally dry forests, a result attributed to a flush of new biologic leaf activity. This was in agreement with net ecosystem exchange results reported from flux tower measurements. On the other hand, forest converted and disturbed areas showed a distinct drying trend with lower EVI values, due to the soil drying process and relatively shallow roots of the vegetation in the converted areas. These results show that fine temporal satellite datasets can track biologic activity in the Amazon region, including biologic responses to shifts in vegetation type and disturbance. This provides an improved understanding of the spatial and temporal variations in the carbon and water cycles throughout Amazonia.

41.9-P: High resolution image processing for tree diversity mapping in Tropical Forests of the Western Amazon, Tiputini Biological Station (TBS) Ecuador.

Edwin Keizer, INPA, keizer@inpa.gov.br (Apresentador / Presenting)

The Western Amazonian region is considered a biodiversity hotspot because of its high biological diversity and the fast growing anthropogenic pressure on the landscape, including forest conversion to agriculture, exploitation of mineral resources (e.g. oil) and more frequent incidences of forest fires. These characteristics of the region demand for instrumental tools supporting decision making for prioritizing biological inventories, conservation and sustainable utilization. The recent availability of high resolution satellite imagery provides us with more data and information over extensive areas on the diversity of biological, biophysical, land-use conditions at the landscape scale. The mapping of tree diversity, applying satellite imagery, at the species or groups of species level, gives us valuable insights in ecological processes and its spatial characteristics (e.g. heterogeneity, spatial distribution). Especially in the tropical forest environment, this is a challenge because of its high levels of tree diversity and its complex forest structures. This study presents an approach of tree diversity mapping, using a combination of the high resolution satellite sensor data of Quickbird (0.6 ~ 2.8 m) and aerial photos of different resolutions (0.03 ~ 0.3m) taken from airborne platforms (Helium balloon and airplane) in the tropical lowland forests. Relationships between image objects identified in the sequence of multi resolution imagery and ground collected taxonomic plus tree crown structure data are being studied. Results of this research should facilitate the identification of areas with high(er) priority for inventories, conservation and sustainable use planning. This research is also part of the HERB (Hydrology, Ecology and Regional Biodiversity) project.

41.10-P: Sensitivity of Automated Monte Carlo Unmixing to Surface Reflectance Uncertainties Caused by Aerosols, Water Vapor, and Terrain Slope-Aspect

David E. Knapp, Carnegie Institution, Dept. of Global Ecology, dknapp@globalecology.stanford.edu (Apresentador / Presenting)

Gregory Paul Asner, Carnegie Institution, Dept. of Global Ecology, gpa@stanford.edu

Amanda Naslund Cooper, Carnegie Institution, Dept. of Global Ecology, acoop@stanford.edu

Mercedes Maria Cunha Bustamante, Universidade de Brasilia, Depto. de Ecologia, mercedes@unb.br

Michael M. Keller, University of New Hampshire, Complex Systems Research Center and USDA Forest Service, International Institute of Tropical Forestry, michael.keller@unh.edu

José Natalino Macedo Silva, EMBRAPA- Amazonia Oriental, natalino@cpatu.embrapa.br

Darrel L. Williams, NASA Goddard Space Flight Center, Laboratory for Terrestrial Physics, Darrel.L.Williams@nasa.gov

The effects of aerosol, water vapor, and Earth-Sun orientation are problematic in calculating atmospherically-corrected reflectance for biophysical parameter estimates from satellite imagery. With advances in satellite-based sensor technology, the ability to estimate aerosol optical thickness (AOT), water vapor, and terrain orientation has steadily improved. However, as techniques to extract biophysical parameters become dependent on more accurate measurements of surface reflectance from space, the need to determine the sensitivity of algorithms to uncertainty and variation in AOT, water vapor, and terrain slope-aspect increases in importance.

The effects of aerosol, water vapor, and terrain slope and aspect were evaluated to determine how uncertainties in these parameters affect results from the Automated Monte Carlo Unmixing algorithm used to estimate forest gap fraction throughout Amazonia. In testing the sensitivity to atmospheric perturbations, a radiative transfer model was used to simulate various levels of aerosol and water vapor in a Landsat ETM+ image. The analysis demonstrated that the uncertainties in the ground-based endmember reflectances were far greater than surface reflectance uncertainties caused by aerosols, water vapor, and terrain slope-aspect.

41.11-P: Aspectos relevantes para o desenvolvimento de uma metodologia para a correção atmosférica, de imagens geradas pelo sensor IKONOS.

Rodrigo Marques, UFMT, rdgmarques@hotmail.com (Apresentador / Presenting)

Peter Zeilhofer, UFMT, pitalike@terra.com.br

George Sanches Suli, UFMT, sulit@terra.com.br

Sérgio Gripp, UFMT

Gisele Cristina Baldissera, UFMT, gisele@cpd.ufmt.br

Roberto Juliano Benedito Serra, UFMT, rjuliano@cpd.ufmt.br

As imagens Ikonos adquiridas pelo programa LBA, têm sido utilizadas em larga faixa de aplicações (HURT, G. et al., 2003). Entretanto, uma das limitações para o seu uso em comparações de índices medidos no solo é a dificuldade de correção atmosférica pela indisponibilidade de dados, como, por exemplo, visibilidade. O presente trabalho descreve os procedimentos utilizados para a correção atmosférica, de precisão moderada, de algumas imagens, utilizando o programa 6S (VERMOTE, et al., 1997) e Envi (Research Systems, Inc.). A validação ou estimativa do intervalo de erro conseguido pelos resultados é feita a partir da comparação dos valores de radiância nos pixels com os valores captados pelos sensores instalados no alto de uma torre de coleta de dados a 42 metros de altura. As imagens escolhidas para o tratamento foram aquelas cujo tema é o sítio de estudo localizado aproximadamente a 50 km de Sinop. O centro da imagem está sob as coordenadas 11°24'45"S e 55°19'29"O. A influência de dados geralmente difíceis de serem conseguidos em campo, como o de visibilidade, que não se encontra disponível na região, foi avaliada através da simulação com dados hipotéticos.

41.12-P: Problemas no uso de imagens de alta resolução para quantificação de indivíduos arbóreos

Taise Farias Pinheiro, INPA/PDBFF, taise@inpa.gov.br (Apresentador / Presenting)

Marina Antongiovanni Fonseca, INPA/PDBFF, marina@inpa.gov.br

Eduardo Martins Venticinque, INPA/PDBFF, edmvinti@inpa.gov.br

Marclo Paustein Moreira, INPA/PDBFF, pinguela@inpa.gov.br

Felipe de Araújo Sobrinho, INPA, felip@inpa.gov.br

Ana Segalim Andrade, INPA/PDBFF, titina@inpa.gov.br

William F. Laurence, INPA/PDBFF, laurancew@tivoli.si.edu

Sammya Agra D'Angelo, INPA, sammya@inpa.gov.br

As imagens geradas pelo satélite QuickBird possuem uma resolução espacial de 0,7m, e têm se mostrado uma importante ferramenta para estudos em áreas florestais. Neste trabalho analisamos o potencial de imagens Quickbird para a individualização de copas de árvores de dossel e emergentes nas áreas do Projeto Dinâmica Biológica de Fragmentos Florestais, em Manaus, AM. Mais especificamente, verificamos se o número de copas individualizadas varia com a experiência do analista. (quantificamos a variação na quantidade de copas individualizadas na imagem QuickBird em função da fase de individualização.) Utilizando o software ArcView GIS 3.2, um analista individualizou as copas, dentro de 25 parcelas de 1ha, em três momentos (etapas) distintos. As individualizações de cada etapa foram feitas de forma a contemplar o número máximo possível de copas visualizadas. Observamos que a cada etapa de individualização foram identificadas, em média, um número 30% maior de copas que a fase anterior. Este resultado pode estar relacionado a alguns fatores. Embora algumas copas, principalmente copas de árvores emergentes, sejam facilmente identificadas na imagem, o analista visualiza também copas pertencentes a outros estratos da floresta. Estas copas são de difícil individualização por se confundirem com copas de árvores adjacentes que estão a mesma altura. A ocorrência de sombras e a diferença do padrão espectral das copas adjacentes são fatores que, quando combinados, podem facilitar a identificação das copas. Os resultados obtidos indicam que a individualização de copas em imagens de alta resolução exige que o analista tenha um treinamento que o permita ter uma maior familiaridade com estas imagens.

41.13-P: Uso de imagens de alta resolução para quantificação de indivíduos arbóreos em Florestas Tropicais

Taise Farias Pinheiro, INPA/PDBFF, taise@inpa.gov.br (Apresentador / Presenting)
Marina Antongiovanni Fonseca, INPA/PDBFF, marina@inpa.gov.br
Eduardo Martins Venticinque, INPA/PDBFF, edmventi@inpa.gov.br
Marcelo Paustein Moreira, INPA/PDBFF, pinguela@inpa.gov.br
Felipe de Araújo Sobrinho, INPA, felip@inpa.gov.br
Ana Segalim Andrade, INPA/PDBFF, titina@inpa.gov.br
William F. Laurance, INPA/PDBFF, laurancew@tivoli.si.edu
Sammya Agra D'Angelo, INPA, sammya@inpa.gov.br

As imagens de satélite de alta resolução abriram novas possibilidades de estudos e manejo de Florestas Tropicais. O satélite QuickBird fornece imagens com uma resolução espacial de 0,7 m, o que permite identificar copas de árvores emergentes. Usando este potencial, pretendemos determinar uma relação entre o número de indivíduos arbóreos existentes em campo e o número de copas identificadas em uma imagem QuickBird. Este estudo foi realizado nas áreas do Projeto Dinâmica Biológica de Fragmentos Florestais, em 25 parcelas de 1ha situadas em fragmentos florestais. Estas parcelas possuem todos os indivíduos com o DAP ≥ 10 cm marcados e identificados, em sua maioria, até o reconhecimento de espécie. Estes indivíduos foram agrupados em classes de DAP (A: $10 \leq 20$ cm, B: $20 \leq 30$ cm, C: $30 \leq 40$ cm, D: $40 \leq 50$ cm e E: ≥ 50 cm) de maneira a nos permitir agrupar nas classes "D" e "E" um maior número de árvores de dossel e emergentes (grupo, supostamente, mais visualizado na imagem). A individualização das copas, na imagem, foi realizada no software Arcview GIS 3.2. Esperávamos encontrar, em regressões lineares simples, relações significativas e positivas entre o número de árvores das classes "D" e "E" e o número de copas individualizadas na imagem. Esta expectativa baseia-se em uma relação que encontramos entre o DAP e a altura das árvores, onde árvores com DAP ≥ 40 cm apresentaram maior probabilidade de serem emergentes e de dossel. No entanto, tais relações não foram observadas para nenhuma das classes de DAP criadas. Estes resultados indicam que, usando este método, as imagens Quickbird não são boas ferramentas para prever o número de indivíduos arbóreos em uma área florestal.

41.14-P: Is P band polarimetric Radar necessary or sufficient to create accurate maps as basis of a monitoring System for the Amazon Forest??

Marcela Jose Quinones, Wageningen University, quinones@science.uva.nl (Apresentador / Presenting)
Dirk Hoekman, Wageningen University, Dirk.Hoekman@wur.nl

A new polarimetric classification approach is used to evaluate the relevance of the P-band polarimetric SAR in the classification of AirSAR multifrequency polarimetric radar for the creation of landscape, land cover, flooding and biomass maps in the Colombian Amazon. Differences in wave penetration can explain the capacities of the different radar bands to map, forest structure, flooding and biomass i.e the information contained in C,L and P bands are necessary to create a landscape map, while the information contain on the P band only can be sufficient to create an accurate flooding map. Field data is used to calculate accuracy values for different maps in two study sites of the Colombian Amazon. Speckle levels and post processing of classified images is also taken into account. P band radar capabilities and restrictions will be discussed.

41.15-P: Comparação da distribuição espacial de pontos quentes AVHRR e MODIS na região tri-nacional Brasil-Bolívia-Peru e municípios do Estado do Acre

Diogo Selhorst, Universidade Federal do Acre/Parque Zoobotânico/Setem, selhorst@bol.com.br (Apresentador / Presenting)
Irving Foster Brown, Woods Hole Research Center; Universidade Federal do Acre/Parque Zoobotânico/Setem, fbrown@uol.com.br
Nara Vidal Pantoja, Universidade Federal do Acre/Parque Zoobotânico/Setem, Npantoja@ufac.br
Leigh Johnson, Fulbright Fellow; OASCA/Universidade Federal do Acre/Parque Zoobotânico/Setem, leighjohnson@fulbrightweb.org
Peter Schlesinger, Woods Hole Research Center, pschles@whrc.org

A distribuição espacial de pontos quentes, usados como indicadores de queimadas, comumente direciona políticas públicas de controle do uso do fogo na Amazônia brasileira. Diferenças absolutas no número de pontos quentes, gerados por diferentes sensores, são esperadas devido às características inerentes a cada sensor. Espera-se que a distribuição espacial seja proporcional na comparação entre as distintas fontes de dados. Usamos dados de junho a setembro de 2003 para verificar a proporcionalidade entre dados do MODIS - Aqua/Terra e AVHRR - NOAA-12 (INPE) para a região da tríplice fronteira entre Peru (Madre de Dios), Brasil (Acre) e Bolívia (Pando), conhecida como a região MAP, e para os 22 municípios do Estado do Acre. Na região MAP a proporção dos pontos apresentou diferenças significativas (Chi-Quadrado $p < 0,01$) entre os dados dos diferentes sensores, porém o Acre contém cerca de 80% dos pontos quentes da região MAP. No Estado do Acre ordenamos os municípios responsáveis pela maioria das queimadas e encontramos diferenças marcantes na lista gerada com as duas fontes de dados para o mesmo período. Segundo dados do AVHRR e MODIS, respectivamente, o município de Sena Madureira foi o 10° e o 3° da lista, Capixaba o 6° e 12° e Feijó 17° e 8°. Uma hipótese sobre as inconsistências é a cobertura do NOAA que tende a diminuir nas localidades mais a oeste, como é caso dos municípios de Feijó e Sena Madureira no Estado do Acre e do Departamento de Madre de Dios no Peru. Os resultados indicam que decisões em políticas públicas podem ser influenciadas de acordo com os dados usados.

41.16-P: Field Assessment of Hot Pixel Data: A Case Study of the Alcobrás Settlement Wildfire to Evaluate the Accuracy of AVHRR, GOES, and MODIS Sensors as Indicators of Biomass Burning Events

Leigh Johnson, Setor de Estudos do Uso da Terra e Mudanças Globais, Parque Zoobotânico, Universidade Federal do Acre, leighjohnson@fulbrightweb.org

Jorge Henrique Garcia, Federação dos Trabalhadores na Agricultura do Estado do Acre, fetacre@uol.com.br

Diogo Selhorst, Setor de Estudos do Uso da Terra e Mudanças Globais, Parque Zoobotânico, Universidade Federal do Acre, dselhorst@pop.com.br (Apresentador / Presenting)

Elsa Mendoza, Instituto de Pesquisa Ambiental da Amazônia & Setor de Estudos do Uso da Terra e Mudanças Globais, Parque Zoobotânico, Universidade Federal do Acre, elsa_mendoza@uol.com.br

Erika Nascimento, ProArco/IBAMA, erika.nascimento@ibama.gov.br

Irving Foster Brown, Woods Hole Research Center & Setor de Estudos do Uso da Terra e Mudanças Globais, Parque Zoobotânico, Universidade Federal do Acre, fbrown@uol.com.br

Manuel Cesario, Observatório da Amazônia Sul-Occidental em Saúde Coletiva e Ambiente, Universidade Federal do Acre, manuel.cesario@uol.com.br

Fire is a revealing indicator of changing land use patterns in Amazonia. As densely settled colonization projects increase across the region, agricultural fires are ever more likely to slip out of control and become wildfires, producing intense, continuous burning events. This study analyses one such event, comparing the utility of AVHRR, GOES, and MODIS hot pixel data for monitoring the fire's development over time and space. Between 16 August and 9 September 2003, a several thousand-hectare wildfire developed in the contiguous Alcobras and Zaquieu Machado colonization projects (~600 families in 15-ha lots, latitude -10.295 to -10.465 and longitude -67.715 to -67.885) in the Municipality of Capixaba, Acre State, Brazil. Community mapping activities have both confirmed and contradicted satellite data; they have also provided a property-level picture of the fire's evolution. AVHRR, GOES, and MODIS hot pixel data sets each yield different pictures of the fire's progression, due to the respective satellite's overpass time and frequency, spatial resolution, and the processing algorithm used. While AVHRR data from INPE show 45 points spanning a period of 13 days, with burning events peaking on August 27, MODIS data provided by the University of Maryland show 111 points spanning a period of 19 days, with a burning peak on August 27 and another crest on September 1. GOES data processed by INPE display 12 points spanning a period of 17 days, with burning events peaking on August 28. GOES data for the same area, processed by the University of Wisconsin, display 103 points spanning a period of 24 days, peaking on August 29. Preliminary results indicate that while AVHRR and MODIS-U Maryland data provide more accurate and nuanced spatial histories of the wildfire, GOES-U Wisconsin data present a superior temporal illustration of the fire's evolution. The study demonstrates the benefits of community-level validation of sensor accuracy and the importance of developing capacity for continued field monitoring.

41.17-P: Monitoramento Ambiental em Áreas de Cerrado a Partir de Dados MOD13Q1 Realçados Através de um Modelo de Mistura Espectral

Adriana Aparecida Silva, UFG, apsilva@iesa.ufg.br (Apresentador / Presenting)

Laerte Guimarães Ferreira, UFG, laerte@iesa.ufg.br

Manuel Eduardo Ferreira, UFG, manuel@iesa.ufg.br

Nilson Clementino Ferreira, CEFET, ncferrera@brturbo.com

O processo de uso e ocupação do bioma Cerrado, ainda que relativamente recente, tem sido bastante intenso. Estima-se que aproximadamente 40% deste bioma já tenham sido convertidos em áreas de agricultura e/ou pastagem. Outros 40% já sofreram algum processo de transformação, enquanto que os 20% restantes tem sido alvo constante de desmatamentos com vistas à ampliação de áreas agricultáveis. Considerando a necessidade de monitoramento sistemático e operacional deste bioma, neste estudo avaliamos o uso do modelo de mistura espectral aplicado às imagens de reflectância do produto MOD13Q1 (tiles h13v10 e h12v10). O incremento no desmatamento da cobertura vegetal para o Estado de Goiás no período de 2001 - 2003 foi obtido tanto a partir de imagens fração solo quanto imagens fração vegetação. Para o período considerado, mudanças na paisagem foram definidas em função de um limiar de mudanças (50%) aplicado ao resultado da subtração das respectivas imagens fração, quanto a partir da tabulação cruzada da imagem fração solo segmentada e classificada. Nossos resultados indicam variações significativas na quantificação de mudanças na superfície em função do método de comparação de imagens, bem como, e principalmente, devido à escolha dos endmembers usados na geração das imagens fração.

41.18-P: Identificação de clareiras através de imagens de satélite de alta resolução

Felipe de Araújo Sobrinho, INPA / PDBFF, felip@inpa.gov.br (Apresentador / Presenting)

Taise Farias Pinheiro, INPA / PDBFF, taise@inpa.gov.br

Marcelo Paustein Moreira, INPA / PDBFF, pinguela@inpa.gov.br

Marina Antongiovanni Fonseca, INPA / PDBFF, marina@inpa.gov.br

Eduardo Martins Venticinque, INPA / PDBFF, edmventi@inpa.gov.br

A imagem do satélite Quickbird nos permite perceber, em uma área de floresta primária, as sombras geradas devido a heterogeneidade nos estratos superiores da floresta. Esta heterogeneidade pode ser originada pela diferença na altura das árvores de dossel e emergentes, ou pela presença de clareiras. Neste trabalho testamos o potencial dessa imagem na detecção de ocorrência de clareiras em uma área de floresta primária na Amazônia Central. O estudo foi realizado a cerca de 80 Km ao norte da cidade de Manaus nos fragmentos florestais de 1 e 10 hectares localizados na Fazenda Esteio, pertencente ao Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF). Para o estudo foi feita uma classificação supervisionada, separando as áreas de sombra das de não sombra, depois essas áreas foram transformadas em polígonos com área conhecida. Esses polígonos foram agrupados em 6 classes de tamanho. No total foram sorteados 80 polígonos distribuídos por todas as classes, em campo cada um desses polígonos foi visitado com a finalidade de se verificar quais deles eram clareira. Para relacionar o tamanho dos polígonos de sombra com a ocorrência de clareiras, foi feito uma regressão logística. Nossos resultados mostraram que a probabilidade de uma área classificada como sombra ser clareira esta relacionada com o tamanho da sombra ($G = 16.1$, $GL = 1$, $p < 0.001$), mostrando uma grande tendência das sombras grandes serem clareiras. Esses resultados dão indicações do alto potencial das imagens de alta resolução do

satélite Quickbird para quantificar características estruturais da floresta tropical.

41.19-P: A Review and an Intercomparison of Remote Sensing Techniques to Map Selective Logging in the Brazilian Amazon

Carlos Moreira de Souza Jr., Instituto do Homem e Meio Ambiente da Amazônia - Imazon, Caixa Postal 5101 Belém, PA CEP 66613-397 Brazil, Department of Geography, Univeristy of Califonia, Santa Barbara Ell, carlos@geog.ucsb.edu (Apresentador / Presenting)

Gregory Paul Asner, Carnegie Institution, Dept. of Global Ecology Stanford University 260 Panama St., Stanford CA 94305, USA, gpa@stanford.edu

Dar A. Roberts, Department of Geography, Univeristy of Califonia, Santa Barbara Ellison Hall, 3611, Santa Barbara, UC Santa Barbara, CA 93106, US, dar@geog.ucsb.edu

Remote sensing applications to map selective logging in tropical forests are still under development. While methods to map selectively logged area and to estimate biophysical properties of these forests exist, a comparison of these methods is still lacking. Visual interpretation of Landsat TM/ETM provided some of the first remote sensing estimates of the area affected by selective logging in the Brazilian Amazon (INPE, 2000; Matricard et al., 2001). Visual interpretation is possible when logging 'scars' are visible on the images. However, the scars only persist for one to two years after logging. Furthermore, visual interpretation is challenging when the logging intensity is low (e.g., < 5 m³ ha⁻¹ for mahogany extraction), is time consuming and can have a human bias.

Digital image processing techniques, such as minimum distance and maximum likelihood classifiers, have also been used to estimate the area affected by selective logging in the Amazon (Stone and Lefebvre 1998) as well as texture and reflectance analyses (Asner, et al. 2002). These techniques failed to map selectively logged areas accurately because of the high spectral ambiguity between intact forest and selectively logged forests.

Another approach tested for mapping selective logging is soil fraction images derived from spectral mixture analysis (SMA). Soil fraction enhances the detection of the log landings and 'roads'. Based on a site-specific harvesting radius, it is possible to estimate the area affected by selective logging from log landings (Souza Jr. and Barreto, 2000; Monteiro et al., 2003). If field data on forest damage are available, this area mapping technique can be used to estimate forest damage. However, this approach does not provide spatial information about the location of the forest damages.

Asner et al. (2004) have proposed the use of gap fraction data derived from SMA as a mean to estimate forest canopy damage associated with selective logging. The gap fraction map has the potential of being integrated with contextual information, such as log landing and road maps, to distinguish forest gaps caused by selective logging from natural forest gaps. Finally, non-photosynthetic vegetation (NPV) fraction images, also obtained through SMA, have been used to map several levels of forest degradation associated with selective logging (Souza Jr. et al; 2003).

To compare these techniques, we are currently applying them to a 150,000 ha of forests located in Paragominas Municipality - PA. - logged from 1999 to 2002. Reference data include forest inventory and field data on forest damage planned to be acquired in May through June 2004. We expect to integrate the best of each these techniques to develop an unambiguous approach for mapping selective logging that distinguishes it from natural forest disturbances.

41.20-P: Sensor MODIS para análise ambiental em Zona Transfronteírica- Brasil/Uruguai: avaliação e perspectivas.

Valdir Adilson Steinke, IBAMA, valdirs@zipmail.com.br (Apresentador / Presenting)

Eristelma Teixeira de Jesus Barbosa, UnB, eris@unb.br

Christian Niel Berlinck, IBAMA - UnB, berlinck@unb.br

Este trabalho está inserido no projeto denominado "Lagoa Mirim" no qual estão envolvidos, o IBAMA, a Universidade de Columbia e o PROBIDES do Uruguay. O objetivo é utilizar informações oriundas de sensores remotos orbitais para aperfeiçoar a implementação de Acordos Ambientais Multilaterais - MEA's. Para isto está sendo desenvolvido um trabalho piloto utilizando aplicativos de sensoriamento remoto na área da Lagoa Mirim no sul do Brasil e Bañados del Este, no nordeste do Uruguay, as quais formam a zona transfronteírica entre Brasil e Uruguay. Esta região foi selecionada por apresentar características peculiares no que diz respeito a biodiversidade local, em função do aspecto bilateral para gerenciamento deste ambiente e, ainda, por ser uma região de intensa pressão antrópica, exercida pelas atividades agrícolas. No âmbito de uma análise regional, propõe-se nesse trabalho avaliar as informações geradas pelo sensor MODIS para a identificação da "zona de influência da Lagoa Mirim" e para a identificação de novas áreas de preservação, fazendo uma comparação com dados de campo georreferenciados. Especificamente foram utilizadas as bandas de reflectância do produto Mod13q1 (250 m), correspondentes ao vermelho (0.620-0.670), infravermelho próximo (0.841-0.876) e azul (0.459-0.476 mm). Os resultados, ainda que preliminares, apontam a delimitação de uma área de influência à Lagoa Mirim, caracterizada pelos mesmos componentes ambientais, os quais são representados na imagem por características radiométricas semelhantes. Essa área abrange as características de biodiversidade e àquelas indicativas de ameaças a este espaço, as quais indicam a necessidade da criação de áreas prioritárias de conservação.

41.21-P: Multi-Scale Evaluation Of The Region Of Eastern Amazonia Using Ikonos, Landsat, SRTM And MODIS Data

Thomas A Stone, The Woods Hole Research Center, tstone@whrc.org (Apresentador / Presenting)

Ima Celia Vieira, Museu Emilio Goeldi, ima@museu-goeldi.br

Arlete Silva de Almeida, Museu Emilio Goeldi, arlete@museu-goeldi.br

Eric A Davidson, The Woods Hole Research Center, edavidson@whrc.org

Satellite data from four sensors and topographic data of a portion of Para were compared to explore the information gained and lost for identifying land covers at various scales in areas east and south east of Belem. Because much of this area has been occupied for up to 200 years, this is an older area of clearing with few remaining large forest patches.

We used 1 and 4m Ikonos, 30m Landsat ETM+ data, 250 and 500m MODIS data and 90m Shuttle Radar Topography

Mission (SRTM) data for this analysis. Also, we developed intermediate resolution scale data by aggregating higher resolution data.

We examined locales where these data cover common areas by evaluating how scale changes (changes in grain size) affect mean pixel values, variance and entropy, a measure of the image texture complexity. Using a 3 X 3 pixel moving window or filter, we have examined all scales and found that with coarser resolutions, mean pixel values decline, and variance increases. However, entropy increases and then declines with the point of inflection for entropy varying from sensor to sensor. In general, entropy is usually lowest at highest resolution, increases rapidly at an intermediate resolutions and then undergoes a slow decline as resolution increases.

Understanding how changes in scale and sensors affect our ability to extrapolate from fine scales to broad scales or basinwide helps us to estimate if information is lost or gained as we change scales.

41.22-P: Arranjo espacial do dossel e alguns problemas relacionados ao uso de imagens de alta resolução no estudo de florestas tropicais

Eduardo Martins Venticinquie, PDBFF/INPA, edmventi@inpa.gov.br (Apresentador / Presenting)

Marina Antongiovanni Fonseca, PDBFF/INPA, marina@inpa.gov.br

Marcelo P. Moreira, PDBFF/INPA, pinguela@inpa.gov.br

Taise P. Farias, PDBFF/INPA, taise@inpa.gov.br

Fernanda G. Ferreira, PDBFF/INPA, fgomes@inpa.gov.br

Juliana Stropp Carneiro, PDBFF/INPA, justropp@inpa.gov.br

Felipe de Araújo Sobrinho, PDBFF/INPA, felip@inpa.gov.br

Ana S. Andrade, PDBFF/INPA, titina@inpa.gov.br

William F. Laurance, SI/PDBFF, laurancew@tivoli.si.edu

Embora exista uma alta diversidade de assinaturas espectrais nas copas das árvores de uma floresta tropical, existe uma área representativa de dossel, como correspondendo a copa de uma árvore em específico, que não conseguimos identificar nas imagens de alta resolução. Na Floresta de Terra Firme da Amazônia Central esse fato é muito evidente. Desta forma, o objetivo deste estudo é avaliar o que acontece nestas áreas onde há dificuldade de individualizar a copa das árvores. Este trabalho está sendo realizado nas áreas do Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF), localizado 80 km ao norte de Manaus, Amazonas. A interpretação destas áreas foi realizada com uso de imagens do satélite QuickBird (definição de 70 cm), e foi comparada com dados obtidos através de videografia de alta resolução (definição de 7 cm). Os resultados ainda se encontram em fase de análise, mas preliminarmente indicam que com a imagem da videografia podemos identificar a grande maioria das copas, mesmo quando estas se encontram juntas e na mesma altura. O mesmo não acontece para as imagens do satélite QuickBird que apresentam confusão na separação das copas quando estas se encontram na mesma posição do estrato vertical. Outro fator de confusão bastante importante é a presença de cipós que unem as copas das árvores e causam problemas na individualização das mesmas. Ainda conhecemos bem pouco sobre a porcentagem de cobertura florestal que é composta por cipós, entretanto podemos supor que uma parte da dificuldade de individualizar a copa das árvores advém desta cobertura.

41.23-P: A Supervised Neural Linear Feature Extractor for Remotely Sensed Data

Genong Yu, Indiana State University, gyu@indstate.edu (Apresentador / Presenting)

Ryan R Jensen, Indiana State University, r-jensen@indstate.edu

Paul W Mausel, Indiana State University, gemause@isugw.indstate.edu

Linear features in remotely sensed data are important for classification and visual interpretation. A supervised neural network linear feature extractor that uses both spatial and spectral characteristics of linear features in a remotely sensed image was developed and implemented in the object-oriented Amazon Information System (AIS) built for a NASA funded LBA ECO project. This study compared the supervised neural network linear feature extractor with conventional extractors, i.e. maximum likelihood classifier (MLC), Canny edge detector, and Hough transform line detector. The study compared the following three aspects: (1) multiple spatial resolution images, including IKONOS, ASTER and Landsat TM data, (2) two different types of linear features, rivers and roads, and (3) different post-processing algorithms, including the Hough transform. A supervised neural network linear feature detector was developed that combines the sensitivity of a neural network to spectral information at different scales with the ability of neural network to utilize local information through model-based line detection. Analysis of results indicate that the neural network approach used is superior to a conventional MLC-based edge detection or spectral classification in all three aspects investigated.

Keywords: linear feature, multiple layer perceptron, multiscale

[PC_Nuvens_\(PC_Clouds\)](#)

42.1-P: Microphysical evidence of the transition between predominant convective/stratiform rainfall associated to the large-scale variability of precipitation in Southwest Amazon

Rachel Ifanger Albrecht, IAG/USP, rachel@master.iag.usp.br (Apresentador / Presenting)

Maria Assução Faus da Silva Dias, IAG/USP CPTEC/INPE, assuncao@cptec.inpe.br

The distinction between convective and stratiform precipitation profiles around various precipitating systems existent in tropical regions is very important to the global atmospheric circulation, which is extremely sensitive to vertical latent heating distribution. In South America, the convective activity responds to the Intraseasonal Oscillation (IOS). This work analyzes data from a disdrometer, a radar profiler and a polarimetric radar, installed in the Ji-Paraná airport, RO, Brazil, for the field experiment WETAMC/LBA & TRMM/LBA, in January and February of 1999. The methodology is based on the partition of the precipitation into convective and stratiform, and the classification of hydrometeors by fuzzy logic systems. The microphysical analysis of the periods with the presence or the absence of the South Atlantic Convergence Zone (ZCAS), associated to the IOS, showed a large difference in type, size and microphysical processes of hydrometeor growth in each wind regime: periods without a ZCAS presented more intense convection, leading strong processes of the precipitation growth in both convective and stratiform types; during periods with a well stabilised ZCAS, there were small precipitating systems, with a less convective feature, similar to those from monsoon regions in their active phase.

42.2-P: Drop Size Distribution Measurements in TRMM-LBA and beyond

Ali Tokay, JCET/UMBC, NASA/GSFC, tokay@radar.gsfc.nasa.gov

Rachel Ifanger Albrecht, IAG/USP, rachel@master.iag.usp.br (Apresentador / Presenting)

This paper presents drop size distribution measurements during NASA's Tropical Rainfall Measuring Mission (TRMM) - Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) and follow-up field campaigns conducted in Kwajalein, Florida Keys, and Wallops Island. Each site represents different climate region. The rainfall in Amazon Basin of Brazil represents tropical continent rainfall, while Wallops Island receives both widespread and convective rainfall. Kwajalein represents the tropical oceanic rainfall, while Florida Keys receives continental rainfall with oceanic background. The differences in characteristics of rainfall have a direct impact on satellite rainfall algorithms including TRMM and upcoming Global Precipitation Measurement (GPM) mission. The error characteristics of drop size distribution measurements and small-scale variability will also be discussed through a regional study.

42.3-P: Modeling of LBA/EMfIn!/SMOCC-2002 Cloud Microphysics

Gerson Paiva Almeida, Universidade Estadual do Ceará, gerson@uece.br (Apresentador / Presenting)

Alexandre Araújo Costa, Yale University/Funceme, alexandre.costa@yale.edu

Antonio Charles Silvério, Universidade Estadual do Ceará/Universidade Federal do Ceará, silverio@fisica.ufc.br

A parcel model with detailed microphysics was used to simulate different cloud microphysics regimes observed during the SMOCC/EMfIn!/LBA field campaign in Amazonia. The model is set to allow up to 300 particles categories, according to the specific needs on representing CCN of different sizes (including giant and/or ultragiant particles) and chemical composition. For representing the cloud/raindrop spectrum a total of 100 bins are allowed along with a comprehensive representation of microphysical process, including nucleation, condensational growth, collision-coalescence and collisional and spontaneous raindrop breakup. The model was capable of simulating the behavior of clouds in a wide range of environments, from very clean to heavily polluted. Results agree with previous works, which suggest that polluted environments suppress precipitation development in the liquid phase, especially when giant CCN are not present. On the other hand, if a significant amount of giant CCN becomes available, the increase of the effective diameter with height is almost insensitive for droplet concentrations greater than 1000 cm⁻³ regardless the aerosol and CCN chemical composition. The parcel model results can be used to develop better parameterizations of the aerosol indirect effect in large-scale models for climate studies.

42.4-P: Classificação de Nuvens em Imagens Multiespectrais GOES-8 na Região Amazônica: Comparação com Radiossondagens

Marcus Jorge Bottino, CPTEC/INPE, bottino@cptec.inpe.br (Apresentador / Presenting)

Juan Carlos Ceballos, CPTEC/INPE, ceballos@cptec.inpe.br

Wagner Flauber Lima, CPTEC/INPE, wagner@cptec.inpe.br

Um método de classificação do tipo "agrupamento dinâmico" foi utilizado para identificar a cobertura em imagens GOES-8 no período setembro de 2002 na região amazônica. O método utiliza imagens multiespectrais, considerando 11 diferentes variáveis associadas a cada pixel e sua distancia euclidiana a um conjunto de centróides num espaço vetorial de 11 dimensões. Cada classe se identifica pelas coordenadas do seu centróide. O método sugere a existência de em torno de 40 combinações básicas de tipos de cobertura. Os resultados da classificação de imagens foram comparados com perfis atmosféricos obtidos a partir de radiossondagens sobre a sítio da Fazenda Nossa Senhora durante o experimento Dry-to-Wet-LBA. Foram analisados os dados nos horários 00 e 12 UTC, comparando os perfis com as classes identificadas nas imagens GOES dentro de uma área de 3x3 pixels. Considerou-se a temperatura de brilho média (canal 4) das classes (centróides) identificadas nesta área. Resultados preliminares compreendendo diversas situações (céu claro, cúmulos,

estratos e conveccao profunda) identificadas nas imagens mostram coerência entre os centróides das respectivas classes e as temperaturas de topo de nuvem deduzidas da análise das radiossondagens. Os resultados sugerem que o método permite discriminar adequadamente as condições atmosféricas com grande detalhamento espacial e temporal, utilizando-se de um procedimento objetivo e não supervisionado de classificação.

42.5-P: Daily Cycles of Type and Amount of Cloud Cover Over Amazon Region Deduced From GOES-8 Imagery

Juan Carlos Ceballos, CPTEC/INPE, ceballos@cptec.inpe.br (Apresentador / Presenting)

Marcus Jorge Bottino, CPTEC/INPE, bottino@cptec.inpe.br

The type and amount of cloud cover over Amazon region (75W to 45W, 19S to 5N) was analyzed in different spatial scales for the period September 2002, that is, during the Dry-to-Wet AMC/LBA Campaign. Multispectral GOES-8 imagery was classified following a clustering method developed at DSA/CPTEC, which is iterative (of the "dynamical centroids"-type), considering each pixel as an 11-dimensional vector (with components defined by brightness temperature in channels 2 to 5, and related variables as texture and difference between channels). VIS channel was not included, in order to avoid sharp discontinuities during one daily cycle. About 7 million pixels were clustered for five days, distributed in eight different times, defining 232 11-dimensional centroids. Factor analysis suggests existence of no more than 4-6 principal modes (factors) and about 40 different groups of scenes. Resulting groups exhibit coherence with nephanalysis (visual inspection). Once defined the clustering method and typical centroids, classification of all images (eight by day) during one month allows to describe daily cover evolution for main types of cloudy (Cu, St, Ci, deep convective type) and clear-sky pixels, as well as transitions between them. Preliminary results (averaged over the region) suggest that clear-sky area varied between a minimum of 30% (at 06 GMT) and a maximum of about 45% (nearly constant between 12 and 24 GMT). Deep convection showed maximal area at 21-24 GMT, being minimal at 15 GMT. Cu cover showed influence of diurnal solar cycle, attaining up to 20% of the region at about 18 GMT.

42.6-P: Changes in the microphysical structure of convective clouds over the Amazon

Alexandre Araújo Costa, Yale University, alexandre.costa@yale.edu (Apresentador / Presenting)

Steven C Sherwood, Yale University, steven.sherwood@yale.edu

Massive burning takes place every year over central Brazil and the Amazon basin, contributing a significant aerosol loading that may affect clouds and climate regionally or even globally. In this work, we show evidences that changes in the aerosol field may be influencing the microstructure of convective clouds from its early stages, during which the development of warm rain is inhibited due to the large number of aerosol particles forming droplets, to the mature cumulonimbus stage, in which the size of the ice particles at the top of such clouds apparently follows the same behavior, with a larger number of smaller particles appearing under polluted conditions. From the SMOCC-EMfIN-LBA data set, it was shown that, in the polluted environment, at the freezing level the droplets grew only to about half of Rosenfeld's threshold of 28 μm . If warm rain initiation is expected only several kilometers above the freezing level, it is probable that ice-phase processes already started. In fact, on late September, the warm rain height is on the order of 8 km, going down to about 6 km during the transition to wetter conditions. The influence of the aerosol concentration apparently propagates to the glaciated tops of cumulonimbi, as the 3.7 μm reflectance decreases significantly from September/October/November to December/January/February over the Amazon.

42.7-P: Ceilometer Observation of Seasonal and Diurnal Variation in Cloud Cover Fraction, Cloud Base Height, and Visual Range in the Eastern Amazon Region

Matthew J. Czikowsky, University at Albany, State University of New York, matt@asrc.cestm.albany.edu (Apresentador / Presenting)

David Roy Fitzjarrald, University at Albany, State University of New York, fitz@asrc.cestm.albany.edu

Ricardo K Sakai, University at Albany, State University of New York, sakai@asrc.cestm.albany.edu

Oswaldo Luiz Leal de Moraes, Universidade Federal de Santa Maria, moraes@mail1.ufsm.br

Otávio C. Acevedo, Universidade Federal de Santa Maria, otavioa@yahoo.com

Rodrigo da Silva, Universidade Federal de Santa Maria, rodrigo@asrc.cestm.albany.edu

At an old growth forest site of LBA-ECO (KM67), located in the Tapajos National Forest off Kilometer 67 of BR-163 south of Santarém, a Vaisala CT-25K ceilometer was installed in May, 2001 and was operational into 2003. The ceilometer provides 15-second measurements of cloud base (three levels up to 7500 m), echo intensity, and a 30-m resolution backscatter profile.

The ceilometer was operational for a sufficient amount of time to examine wet-to-dry season variations in cloud cover fraction, cloud base height, and visual range. Preliminary analysis of the lowest cloud base measurements shows the average lowest cloud base varies from near 1000m during wet season (February through June) afternoons to around 1500m in afternoons during the dry season (September through December).

We relate diurnal variations in the lowest cloud base height to the lifting condensation level (LCL). The LCL at a nearby cleared site (KM77) corresponds very well with the lowest cloud base detected by the KM67 ceilometer, whereas the LCL at the forested KM67 site is lower. Two other cloud layers are also sometimes detected. Wet and dry season properties of deeper clouds will be discussed.

42.8-P: Aspectos climatológicos e de mesoescala dos ecos de radar em Rondônia durante o experimento DRY-TO-WET SEASON CAMPAIGN - LBA, para o período de 18/10 a 04/11/2002

José Carlos Figueiredo, Instituto de Pesquisas Meteorológicas, Universidade Estadual Paulista, Bauru S.P., Brazil, figueiredo@ipmet.unesp.br (Apresentador / Presenting)

Gerhard Held, Instituto de Pesquisas Meteorológicas, Universidade Estadual Paulista, Bauru S.P., Brazil, gerhard@ipmet.unesp.br

Este trabalho apresenta alguns aspectos climatológicos e de mesoescala dos ecos de radar meteorológico, instalado a 40

km da cidade de Ouro Preto/Rondônia/Brasil, em operação durante o experimento DRY-TO-WET SEASON CAMPAIGN - LBA, sendo a análise aqui apresentada para o período de 18/10 a 04/11/2002. A situação sinótica do período mostrou a atuação de 10 frentes frias sobre o Brasil, quando a média para o mês outubro é de 6, sendo que destas 4 atuaram durante o período em análise. Outro fator sinótico em grande escala importante foi a atuação da Alta da Bolívia durante todo o período, com posicionamento a oeste da posição climatológica (norte de Rondônia) entre o Peru e o Acre. Nenhum vórtice ciclônico em altos níveis foi observado no nordeste do Brasil. Nesse período analisou-se um caso contendo três sistemas de mesoescala, com aparência de "gancho" entre 20 e 120 km do radar, com intensidades de ecos variando entre 40 e 50 dBZ, valores esses encontrados em 80% dos casos analisados no período marcado pela predominância de chuvas convectivas (a partir das 15UTC), com maior frequência no quadrante N do radar. De acordo com os dados sinóticos de superfície, a maior concentração de chuvas ocorreu no oeste do Amazonas e Norte de Rondônia. As chuvas classificadas como estratiformes em 90% dos casos, predominavam a partir das 01UTC, variando entre 20 e 30dBZ. As trajetórias dos ecos mais intensos (>45dBz) se apresentaram em sua maioria de NE para SW.

42.9-P: Cumulus Parameterization Impact of the Simulation of the Dry to Wet Transition using Period in 2002 in the SW Amazon

Silvio Nilo Figueroa, CPTEC/INPE, nilo@cptec.inpe.br (Apresentador / Presenting)

Antônio Marcos Mendonça, CPTEC/INPE, mendonca@cptec.inpe.br

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

The transition of the dry to wet season in the Southern Amazon is characterized by the sudden increase of the latent heat source. In large scale models the parameterization of the latent heat source is considered to be a major source of uncertainty. Thus, it is reasonable to consider the impact of different cumulus parameterizations in the transition process in the CPTEC global circulation model. A set of experiments, based on the operational seasonal forecasting cycle, were performed with the traditional Kuo (K) scheme, as the control, and two experiments with the Relaxed Arakawa-Schubert (RAS). It is shown that the diurnal cycle of precipitation in the control produces maximum values in the morning while the RAS delays the maximum precipitation to the afternoon. Thus, the RAS is shown to produce more realistic results. Significant differences are also found in the surface fluxes of heat and moisture as the RAS is shown to be more realistic than the traditional Kuo scheme. Further experiments with the Grell scheme will also be shown and compared to the other two schemes.

42.10-P: Caracterização dos Sistemas Convectivos durante Dry-to-Wet 2002

Maria Eugenia Baruzzi Frediani, Departamento de Ciências Atmosféricas, IAG, USP, frediani@model.iag.usp.br (Apresentador / Presenting)

Carlos Augusto Morales, Departamento de Ciências Atmosféricas, IAG, USP, morales@model.iag.usp.br

Luiz Augusto Toledo Machado, Centro de Previsão do Tempo e Clima - CPTEC, DSA, INPE,, machado@cptec.inpe.br

Este trabalho visa identificar a origem da precipitação e das descargas elétricas, assim como caracterizar os estágios de desenvolvimento espacial e temporal dos sistemas convectivos observados durante a estação de transição (Dry to Wet) de 2002 do projeto RACCI/LBA. Os dados utilizados nesta análise são: Trajetória dos sistemas convectivos rastreados pelo FORTRACC utilizando as imagens do infra-vermelho do satélite GOES; precipitação horária a partir de uma rede de 29 pluviômetros instalados em Rondônia; e a ocorrência de descargas atmosféricas observadas por um rede de detecção relâmpagos do projeto de cooperação TRMM/LBA.

A intensidade da precipitação e o número de descargas elétricas detectadas sobre um sistema convectivo permitem inferir o estágio de desenvolvimento destes sistemas. A localização dos relâmpagos e região de máxima concentração de precipitação indicam as áreas onde as células em estágio de maturação estão localizadas. A combinação destas informações de precipitação e relâmpagos permitem identificar também as regiões de chuva convectiva e estratiforme. Desta forma, é possível se conhecer o comportamento dos sistemas como um todo, ou seja, a sua evolução temporal e a sua distribuição espacial. Além disso, estas informações serão úteis para entender quando os sistemas convectivos se tornam tempestades (com relâmpagos) ou não (sem relâmpagos).

42.11-P: Characterization of Storm Types During a 30-HOUR Period of Radar Observations During the Dry-to-Wet Atmospheric Mesoscale Campaign of the LBA in 2002

Gerhard Held, Instituto de Pesquisas Meteorológicas, Universidade Estadual Paulista, BAURU, S.P., Brazil, Gerhard@ipmet.unesp.br (Apresentador / Presenting)

A very interesting situation occurred in the morning of 07 October 2002, when a storm developed from its "First Echo" (FE; operationally displayed reflectivity ≥ 20 dBZ beyond 25 km range due to the application of a "Doppler Filter 3") up to 20 km height within less than 30 min, about 140 km west-north-west of the radar. Its echo core (and presumably its updraft) was upright, as of the vast majority of storms, which I observed during the period 6-21 October 2002. However, almost simultaneously, about 80 km to the east, another multicellular storm developed, but the two main cores were strongly tilted. This storm only reached 13 km in height, but was longer lasting than the one with the vertical cores. Radial velocities did not show any significant differences. Later during this day, these two complexes and other isolated to scattered, smaller storms, created a huge stratiform cloud cover, which resulted in occasional isolated showers and aided the development of new cells under its umbrella.

In the evening of the same day ($\pm 20:00$ LT), a strong Microburst was observed over the urban area of Ji Paraná. During the early hours of the following morning ($\pm 02:30$ LT) very isolated cells developed at random over the eastern part of Mato Grosso, consolidated after about one hour, forming a Mesoscale Convective System (MCS), which ultimately moved at 50-60 km.h⁻¹ across the whole State of Rondônia. The leading edge was characterized by very strong and tall cells, with a steep gradient of reflectivity, trailing behind a large area of stratiform precipitation.

42.12-P: Characterization of Storm Types During a 30-HOUR Period of Radar Observations During the Dry-to-Wet Atmospheric Mesoscale Campaign of the LBA in 2002

Gerhard Held, Instituto de Pesquisas Meteorológicas, Universidade Estadual Paulista, BAURU, S.P., Brazil, Gerhard@ipmet.unesp.br (Apresentador / Presenting)

The observations described in this paper were made with an S-band Doppler radar, which was located about 40 km south of Ouro Preto do Oeste (Rondônia).

A very interesting situation occurred in the morning of 07 October 2002, when a storm developed from its "First Echo" (FE; operationally displayed reflectivity ≥ 20 dBZ beyond 25 km range due to the application of a "Doppler Filter 3") up to 20 km height within less than 30 min, about 140 km west-north-west of the radar. Its echo core (and presumably its updraft) was upright, as of the vast majority of storms, which I observed during the period 6-21 October 2002. However, almost simultaneously, about 80 km to the east, another multicellular storm developed, but the two main cores were strongly tilted. This storm only reached 13 km in height, but was longer lasting than the one with the vertical cores. Radial velocities did not show any significant differences. Later during this day, these two complexes and other isolated to scattered, smaller storms, created a huge stratiform cloud cover, which resulted in occasional isolated showers and aided the development of new cells under its umbrella.

In the evening of the same day ($\pm 20:00$ LT), a strong Microburst was observed over the urban area of Ji Paraná. During the early hours of the following morning ($\pm 02:30$ LT) very isolated cells developed at random over the eastern part of Mato Grosso, consolidated after about one hour, forming a Mesoscale Convective System (MCS), which ultimately moved at 50-60 km.h⁻¹ across the whole State of Rondônia. The leading edge was characterized by very strong and tall cells, with a steep gradient of reflectivity, trailing behind a large area of stratiform precipitation.

42.13-P: Dry to Wet Season: Cloud cover, precipitation and thermodynamics features

Luiz Augusto Toledo Machado, INPE/CPTEC, machado@cptec.inpe.br (Apresentador / Presenting)

Carlos Augusto Morales, USP/IAG, morales@model.iag.usp.br

Henri Laurent, IRD-France, Henri.Laurent@ird.fr

Carlos Frederico Angelis, INPE/CPTEC, angelis@cptec.inpe.br

This study analyzes the cloud cover, the precipitation and the thermodynamics features observed in the Southwestern Amazonia during the pre-wet season. The dataset gathered for this study was collected during the Radiation, Cloud, and Climate Interactions in the Amazonia during the dry-to-wet transition season/LBA (RACCI/LBA) campaign that occurred in September-November of 2002 in Rondonia State. Radiosonde, rainfall data, GOES satellite images and radar reflectivity CAPPIs from the TECTELCOM ground weather radar were examined to describe the main characteristics observed during the beginning of the wet season. Thermodynamic parameters like, CAPE, moist static energy, CINE, boundary layer humidity divergence were used to describe the cloud cover and precipitation evolution from the dry to wet raining season. Larger CAPE values were found during the pre-wet season than during the beginning of the regular wet season, however, those events were less often than during the end of October - beginning of November. Total cloud cover did not show any clear difference between both periods. However, convective cloud and rain fraction show a remarkable increase from one period to another. CAPPI fields from 2 km up to 18 km show differences in the convection intensity between pre and regular wet season. The cloud cover organization is also analyzed through the description of the life cycle of mesoscale convective system from dry to wet and in the regular raining season. Finally, the diurnal cycle of the thermodynamic variables and cloud characteristics are also described for both periods.

42.14-P: Thermo-Electrodynamical analysis related to thunderstorm activities in Pantanal Sul Matogrossense, Brazil: preliminary studies.

Odim Mendes Jr, DGE/CEA/INPE, odim@dge.inpe.br (Apresentador / Presenting)

Margarete Oliveira Domingues, LAC/CTE/INPE, margarete@lac.inpe.br

Chou Sin Chan, DMD/CPTEC/INPE, chou@cptec.inpe.br

Cesar A. A. Beneti, Simepar, beneti@simepar.br

The understanding of the atmospheric thermodynamics is an important tool to forecast thunderstorm activities related to frontal, mesoscale and local convection events. The atmospheric electrical discharges help to monitor some hidden features of the instantaneous physical development of the thunderstorms. In this work two datasets of intensive campaigns are used to analyze the thermo-electrodynamical aspects in the Pantanal Sul Matogrossense region. More than 100 radiosondes were launched, about four radiosondes per day. Usually, there is a lack of atmospheric profile information in this region. This experiment was performed in two different atmospheric seasons: (1) in September 1999 in a transition season, and (2) in February 2002 - in a Summer season. In both cases, some cold front passages by this region were identified and in the summer mesoscale and local convection also were organized. This work studies these events in a thermodynamical and electro-dynamical aspects using RIDAT stroke data, these radiosondes dataset, GOES-8 images, forecast model datasets, and calculated stability indices and critical isotherm position cloud development. Results on lightning polarity were also discussed related to the events, among other parameters. This detailed knowledge could help the engineering purposes and meteorological monitoring in a several ways, specially nowcasting.

42.15-P: A data mining methodology for tracing convective kernels from cloud-to-ground discharge and other atmospheric datasets.

Jacques Politi, CAP/INPE, jacques.politi@lac.inpe.br (Apresentador / Presenting)

Stephan Stephany, LAC/INPE, stephan@lac.inpe.br

Margarete Oliveira Domingues, LAC/INPE, margarete@lac.inpe.br

Odim Mendes Jr., DGE/INPE, odim@dge.inpe.br

Convective activity is used in many tropical atmospheric studies, and usually requires radar and satellite generated data in order to trace it. However, the availability of such data sets may be very limited according to the sampled time interval and area coverage. An alternative strategy to overcome these issues would be the tracing of convective activity by means of electric discharge data sets. This work presents a data mining based methodology to process and analyze cloud-to-ground discharge and other atmospheric data sets, combining sensor-collected and modelling data. Data mining techniques are used to analyze great amount of data trying to identify frequent correlations, patterns and anomalies in a large domain of commercial or scientific applications. In this context, the current work provides means for monitoring and diagnosis of convective kernels. The data mining cycle requires data pre-processing and filtering. As discharge data is very sparse in both the space and time domains, a spatial analysis method, the kernel estimator, was used to reduce this data aggregating it in clusters. The tuning of the system parameters allows to choose different meteorological scales for the analysis. Tests aimed at the Brazil Pantanal Sul Matogrossense area using Interdisciplinary Pantanal Experiment datasets. Input data included meteorological data such as precipitation rates, pressure, temperature, wind field and also some electric properties. Test results are shown and discussed.

Authors would like to acknowledge the support received by projects CNPq 78707/2003-7, CNPq 477819/2003-6 and FAPESP 98/00105-5 and CNPq MSC grant.

42.16-P: Cloud Top Ascent Speeds during SMOCC

Earle Williams, Massachusetts Institute of Technology, earlew@ll.mit.edu (Apresentador / Presenting)

Luiz Augusto Toledo Machado, CPTEC, machado@cptec.inpe.br

Carlos Augusto Morales, University of Sao Paulo, Sao Paulo, Brazil, morales@model.iag.usp.br

Gerhard Held, IPMET, Bauru, Brazil, gerhard@ipmet.unesp.br

A study was undertaken in SMOCC to examine the strength of vertical air motions in convective clouds during the transition period from dry season to wet season. Over this transition period (September-November, 2002), the cloud condensation level at midday descends from the mid-troposphere (strongly continental conditions) to levels of order 500 m characteristic of the 'green ocean' regime (pronounced maritime conditions) of the wet season. The main goal of this study was to test the idea that updraft width and the efficiency with which CAPE (Convective Available Potential Energy) is transformed to updraft kinetic energy scales with the cloud base height (Williams and Stanfill, 2002). Theodolite measurements of cloud tops were integrated with theodolite and thermodynamic (via surface relative humidity) measurements of cloud base height to determine cloud top ascent speeds. Nearby thermodynamic soundings were acquired on the same days to provide measurements of CAPE, at 12 UT, 15 UT, 18 UT and 21 UT. Results show that the cloud top ascent speeds increase roughly as $D^{1/2}$, where D is the cloud depth, consistent with simple predictions for spherical 'bubbles'. Results also show that larger ascent speeds are observed, on average, when the relative humidity is low than when it is high. CAPE is useful as a control parameter on ascent speed. Comparisons will be presented as they are available.

[PC_Geral\(PC_General\)](#)

43.1-P: Perfis de aquecimento diabático na Região Amazônica

Aline Anderson de Castro, IAG/USP, aline@master.iag.usp.br (Apresentador / Presenting)

Maria Assução Faus da Silva Dias, CPTEC/INPE, assuncao@cptec.inpe.br

Marcos Longo, IAG/USP, marcos@master.iag.usp.br

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

A liberação de calor latente associada à intensa precipitação que ocorre nas regiões tropicais é um importante fator na determinação das características das circulações atmosféricas em diversas escalas espaciais e temporais. Este trabalho tem como objetivo realizar uma comparação da estrutura vertical do aquecimento diabático em diferentes regiões da Floresta Amazônica.

O aquecimento foi calculado como resíduo da equação da termodinâmica. Os dados utilizados são da re-análise do NCEP, para os meses de janeiro e fevereiro de 1994 a 2004. Foram feitas também análises para períodos com diferentes regimes de vento.

O nível de máximo aquecimento diabático está associado à situação que o gerou. Em uma região com pouca convecção, a superfície funciona como fonte de calor sensível e os máximos se localizam nos níveis mais baixos da troposfera, invertendo-se a noite, quando a superfície torna-se mais fria. Já uma fonte localizada em níveis mais altos está associada à liberação de calor latente podendo estar associada à convecção rasa ou profunda, dependendo dos níveis de máximo aquecimento. De uma forma geral, as regiões no Hemisfério Norte apresentam um perfil de atmosfera seca, enquanto as do Hemisfério Sul, em sua maioria, apresentam maior liberação de calor latente em níveis mais altos.

43.2-P: Monitoramento dos fluxos de energia e CO2 em torre meteorológica na Reserva Florestal do Jarú, em Rondonia

Fernando Luiz Cardoso, UNIR/Ji-Paraná, cardoso@unir.br (Apresentador / Presenting)

Durante o período de março de 1999 a novembro de 2002, os fluxos turbulentos de calor sensível, calor latente e CO2 foram medidos quase continuamente em uma torre de 60 m de altura na Reserva Biológica do Jarú (10.08o S, 61.93o W), em Ji-Paraná, Rondônia. A área é caracterizada por estar bem próxima a áreas desmatadas, que podem causar importante influência nas circulações locais e nos fluxos. Em janeiro de 2004 esta torre foi deslocada para uma nova localidade, a aproximadamente 12 km ao sul da posição anterior, e reativada na mesma reserva florestal. Esta nova localidade é menos perturbada por desmatamentos em relação à anterior, porém apresenta relevo mais acidentado. Neste poster apresentamos os conjuntos de dados coletados no novo sítio, além de análises comparativas de variáveis meteorológicas e dos fluxos de energia e CO2 entre as duas localidades, analisando os possíveis impactos das características da superfície

próximas à torre.

Serão apresentadas também as perspectivas de pesquisas a serem realizadas neste sítio, como, por exemplo, estudos de física de solo, de interação entre a vegetação e a radiação, de monitoramento de biomassa, entre outros.

43.3-P: Inclusion of radiosondes data of the Campaign of LBA in the Regional Data Assimilation in CPTEC during October 15 to 29, 2002.

Rosangela Saher Cintra, Centro de Previsão de Tempo e Estudos Climáticos - CPTEC/INPE, rcintra@cptec.inpe.br (Apresentador / Presenting)

Elizabeth Silvestre Espinoza, Centro de Previsão de Tempo e Estudos Climáticos - CPTEC/INPE, elizabet@cptec.inpe.br

The analysis system implemented at CPTEC to regional Eta model to give the initial condition using the Regional Physical-space Statistical Analysis System (RPSAS) developed at Global Modeling and Assimilation Office (GMAO), from GSFC/NASA, to improve the skill of this model. The RPSAS has been designed as an incremental improvement over the current Optimal Interpolation (OI) based in Data Assimilation System (DAS). The inclusion of the data from LBA campaign supplies additional support in the knowledge of the true state of the atmosphere in the observations grid of the data assimilation system. A comparison of Observation Data Stream (ODS) and the RPSAS analysis field and the Eta six hour forecast field (first guess) is made and the results were obtained for the period LBA campaign, October 15-29,2002 in southeast of Amazon. The Eta model was integrated daily for the 00, 06, 12 and 18 GMT using as initial condition from analyses of the RPSAS. The statistical indexes were calculated with the purpose of evaluating the quality of the analysis. The observations minus analysis and the observations minus first guess for variables: geopotential height and humidity to levels 850, 500 and 300 hPa were used to generate mean (bias score) and standard deviation (RMS) for each region resulting the statistical evaluating of the observing system from South America. The first results presents the bias score mean for the geopotential height on 500 hPa has amplitude around 16 mgp to 00Z , it has 28 mgp to 06Z, 8 mgp at 12Z and 14 mgp at 18Z.

43.4-P: Variabilidade Sazonal das Temperaturas do Ar e do Solo no Projeto ESECAFLOR Caxiuanã Pará

Antônio Carlos Lôla da Costa, UFPA, lola@ufpa.br (Apresentador / Presenting)

Alan Pantoja Braga, UFPA, alan_meteoro@yahoo.com.br (Apresentador / Presenting)

João Athaydes Silva Jr, UFPA, athaydes@ufpa.br (Apresentador / Presenting)

Paulo Henrique Lopes Gonçalves, UFPA, phlg@ufpa.br

Rafael Ferreira da Costa, UFCG, rfcostampeg@bol.com.br

Patrick Meir, UEDIN, pmeir@ed.ac.uk

Yadvinder Singh Malhi, UEDIN, ymalhi@ed.ac.uk

A região tropical caracteriza-se por altas temperaturas e precipitações anuais. As altas temperaturas estão associadas à intensa radiação solar anual. A Amazônia é conhecida como região de clima quente e úmido, entretanto, estas condições podem sofrer grandes alterações quando influenciada por fenômenos de grande escala. A temperatura do ar e do solo apresenta um papel fundamental no comportamento da vegetação, embora estas possam diferir consideravelmente, principalmente quando submetidas a condições adversas de tempo. Este trabalho apresenta os resultados preliminares de um estudo das variações médias horárias, diárias e sazonais da temperatura do ar e do solo na área de pesquisa do projeto ESECAFLOR, desenvolvido em Caxiuanã, Estado do Pará, onde foi feita a exclusão da água da chuva em uma área de um hectare de floresta nativa, para estudos da resposta desta floresta a condições de deficiência hídrica prolongada. Foram realizadas medidas da temperatura do ar acima e abaixo da estrutura de exclusão da água, assim como, na superfície do solo na área de exclusão. Em relação à variabilidade média diária das temperaturas do ar, observou-se que os maiores valores ocorreram sempre abaixo da estrutura da exclusão, sendo mais pronunciados na época menos chuvosa, ao passo que na época chuvosa estes valores são praticamente semelhantes. No que diz respeito à temperatura da superfície do solo, esta apresentou um comportamento atípico, sendo mais elevada durante a época mais chuvosa, o que caracteriza o grande impacto da estrutura de exclusão no microclima local.

43.5-P: Variabilidade Sazonal do Balanço de Energia em Ecossistema de Manguezal no Nordeste do Estado do Pará

Antônio Carlos Lôla da Costa, UFPA, lola@ufpa.br (Apresentador / Presenting)

João Athaydes Silva Jr, UFPA, athaydes@ufpa.br

Paulo Henrique Lopes Gonçalves, UFPA, phlg@ufpa.br

Alan Pantoja Braga, UFPA, alan_meteoro@yahoo.com.br

Jose Maria Nogueira da Costa, UFV, jmncoستا@ufv.br

Patrick Meir, UEDIN, pmeir@ed.ac.uk

Yadvinder Singh Malhi, UEDIN, ymalhi@ed.ac.uk

A energia solar chega à superfície na formas de radiação solar direta e radiação solar difusa, cujo produto final é a radiação solar global. Parte da radiação que é absorvida é emitida novamente como radiação térmica, sendo o restante usado para aquecer a superfície e o ar acima dela, ou para fornecer energia para evaporar água do solo e da vegetação. As condições meteorológicas dos manguezais alteram-se sazonalmente em função da declinação solar, o que provoca mudanças no balanço de energia. A quantidade de energia absorvida pelos manguezais varia diretamente com sua área foliar. No período em que as árvores perdem folhas, a atenuação da radiação solar é reduzida. Em dias ventilados a penetração da radiação solar tende a ser maior, pois conforme aumenta a velocidade do vento, há uma agitação das folhas, modificando a disposição das copas das árvores e permitindo a entrada de maior quantidade de radiação solar no interior do manguezal. No presente trabalho estudou-se a variabilidade sazonal do balanço de energia em um ecossistema de manguezal no Nordeste do Estado do Pará, onde se observou que durante a época chuvosa da região acontece uma redução de cerca de 35% no saldo de radiação solar. Durante a época menos chuvosa da região existe predominância dos fluxos de calor sensível, ao passo que durante a época chuvosa, apesar de predominar os fluxos de calor latente, a diferença porcentual entre estes fluxos é praticamente a metade dos observados na outra época.

43.6-P: Nocturnal Variability in CO₂ Concentration in Amazonian Pasture: Episodes of Fast Decline

Margarete Oliveira Domingues, LAC/CTE/INPE, margarete@lac.inpe.br (Apresentador / Presenting)

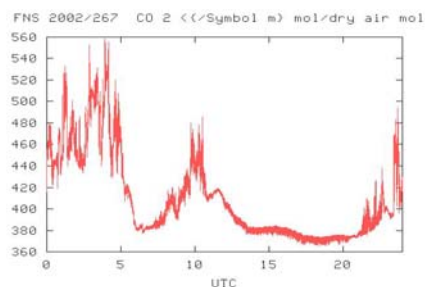
Leonardo Deane de Abreu Sá, CPTEC/INPE- Museu Goeldi, ldsa@museu-goeldi.br

Antonio Ocimar Manzi, CPTEC/INPE - INPA, manzi@inpa.gov.br

Celso Von Randow, INPE, celso.vonrandow@wur.nl

Luis Marcelo de Mattos Zeri, Max-Planck-Institute for Biogeochemistry (Jena, Germany), mzeri@bgc-jena.mpg.de

The studies of nocturnal boundary layer has increased nowadays. The reason for it is that many meteorological phenomena can act isolated or jointly to produce effects that generate great modifications in the surface meteorological variable fields during the night, specially under strong stability conditions. Examples of those phenomena are low level jets, gravity waves and katabatic winds. In order to develop this study, turbulent wind velocity (u, v, w components), temperature, humidity and CO₂ concentration data sets, obtained during dry to wet seasons in a pasture in a deforested area in Amazonian were used. The data were measured in 2002 September (dry-season) to November (wet-season), as a part of the Brazil/European Union LBA Tower Consortium, in southwestern part of Amazonian region and Dry-toWet RACCI/LBA Campaign. Measurements are made at a micrometeorological tower located in the Nossa Senhora Farm (10o 045.7' S, 62o 21.4' W) county of Ouro Preto D'Oeste. The fast response wind speed and temperature measurements, sampled at 10.42 Hz rate, were made using a three-dimensional sonic anemometer (Solent A1012R, Gill Instruments), at a height of 4 m. The variability of the CO₂ concentration was analyzed with special attention during the nocturnal period. Many interesting situations were noticed during stable nights without rainfall. After the CO₂ concentration presented an increasing trend, an abrupt fall in its concentrations values have occurred (see figure). Based on the analyses of the vertical profile and surface meteorological variable, a physical explanation for this phenomenon has been proposed. This kind of phenomena is crucial to a better understanding of the CO₂ budget in the Amazônia.



43.7-P: The Convective Boundary Layer Over Pasture in Amazonia During the LBA Dry-to-Wet Experiment 2002

Gilberto Fisch, Centro Técnico Aeroespacial (CTA), gfisch@iae.cta.br (Apresentador / Presenting)

Luiz Augusto Toledo Machado, INPE/CPTEC, machado@cptec.inpe.br

Maria Assução Faus da Silva Dias, INPE/CPTEC, assuncao@cptec.inpe.br

Roberto F. da Fonseca Lyra, UFAL, rffi@ccen.ufal.br

Anton J. Dolman, UVA, dolman@geo.uva.nl

The coupling between a typical ranchland and the Convective Boundary Layer (CBL) has been investigated using radiosoundings at 8, 11, 14 and 17 Local Time (- 4 hours from GMT), as a part of LBA/DRY-TO-WET 2002 experiment. The field campaign held from Sept 15 up to Oct 30, 2002, extending from the end of the dry season (Sept) to the onset of the wet period (Oct). The profiles of potential temperature and specific humidity have been used to compute the mean properties of the CBL, as well as the height of the CBL. The CBL height varied from a typical value around 2000-2200 m during the end of the dry season (Sept 18-20,2002) to a figure around 1600-1800 m in the beginning of the wet period (20-28,Oct). The potential temperature and humidity profiles did not changed remarkable during this period, oscillating from 307 - 308 K and 12 - 14 g/kg. During the beginning of the wet season, some local showers have occurred and produced a remarkable change in the structure of the CBL. Some events have been analyzed. For instance, on Sept 28,2002, the height of the CBL was around 1400-1500 m at 14 LT with a average potential temperature (q) around 306 K and specific humidity (q) of 13.5 g/kg. After a very strong rainfall (38 mm/3 hours) at afternoon, the CBL has been destroyed (height around 500 m) with q of 300 K and q around 15-16 g/kg. There was also a nocturnal jet case (night from Sept 23-24) with strong wind of 11 m/s at 500 m. This strong windshear created an unexpected shallow mixed layer (height of 400 m) during the night instead of the nocturnal/stable pattern. This data-set will provide opportunity for modeling studies of the growing of the CBL and coupling with aerosols and/or clouds.

43.8-P: Influences of biomass burning on land-atmosphere interactions and dry-to-wet transition over Amazonia

Yan Zhang, Georgia Institute of Technology, yzhang@eas.gatech.edu

Hongbin Yu, Georgia Institute of Technology, hyu@eas.gatech.edu

Rong Fu, Georgia Institute of Technology, fu@eas.gatech.edu (Apresentador / Presenting)

The influences of biomass burning smoke on local rainfall and the structure of the atmospheric boundary layer have been actively studied in recent years. However, whether the large-scale biomass burning in the later dry season over Amazonia could influence the dry-to-wet transition have not been examined. Previous observations have shown that the substantial increase of rainfall from dry to wet season over Amazonia are actually caused by small changes of the atmospheric thermodynamic structure relative to those over other monsoon regions. Consequently, the onset date of wet season can vary greatly as influenced by external or internal anomalous forcings. Thus, it is possible that the transition of the atmospheric thermodynamic structure and circulation from dry to wet season is also sensitive to the impacts of biomass burning smoke. To test this hypothesis, we have forced RegCM3 model with direct radiative forcing of smoke inferred from

MODIS for the transition season (August to November). The comparison with control run helps us to examine the direct and semi-direct influences of smoke on the transition from dry to wet season. Our preliminary results show that the direct and semi-direct forcings of smoke could significantly influence the rainfall and related atmospheric and land surface conditions during the transition. However, these changes are sensitive to the prescribed vertical distribution of the aerosols. The physical and dynamic processes key to determine the aerosols' influence on wet season onset will be discussed in our presentation.

43.9-P: Severe meteorological events in Northern Mato Grosso between June 1999 and September 2003.

Ralf Gielow, CPTEC/INPE, ralf@cptec.inpe.br (Apresentador / Presenting)
João Andrade Carvalho, FEG/UNESP, joao@feg.unesp.br
Ernesto Celestino Alvarado, University of Washington, alvarado@u.washington.edu
David Victor Sandberg, USDA Forest Service, dsandberg@fs.fed.us
José Carlos Santos, LCP/INPE, jcarlos@lcp.inpe.br

As part of ongoing prescribed burnings experiments, an automatic weather station(AWS) was installed in a site at the Fazenda Caiabi (9° 58' S; 56° 21' W), Alta Floresta, MT, in June 1999; this AWS continues operational up to the present. The Terra Firme forest at the site was slashed in May 1999 and burned in August 1999; thereafter, the burned site, with 4 ha, was abandoned and a natural regrowth occurred, with the AWS measuring continuously the incident solar radiation, the air temperature and the rainfall. With some discontinuities, the reflected solar radiation, the net radiation, the wind direction and velocity, and the air moisture content were also measured. Further, since August 2002, CPTECs ETA Regional 40 x 40 km numerical weather prediction variables are being recorded for the site, with the purpose of comparing them with the AWS measurements. This study identifies and analyses the severe rainfall and temperature decreases ("friagens") events that occurred during the period between May 1999 and September 2003 at the site mentioned.

43.10-P: Observações de clima e Fluxos turbulentos de água e CO₂ sobre o Cerrado sensu stricto e cana-de-açúcar

Robinson Isaac Negrón Juárez, IAG/USP, robinson@model.iag.usp.br (Apresentador / Presenting)
Humberto Ribeiro da Rocha, IAG/USP, humberto@model.iag.usp.br (Apresentador / Presenting)

Apresentam-se os resultados do monitoramento sobre um ecossistema natural de cerrado sensu stricto (cerrado) (21°37'9"S,47°37'58"W, em Santa Rita de Passa Quatro) e um agroecossistema de cana-de-açúcar (cana) (21°6'S, 48°4'W) em SP. As variáveis do clima foram amostradas a cada 15 segundos e gravadas em médias de 10 min. Os fluxos turbulentos são obtidos pela técnica de eddy covariance, com coleta de dados na frequência de 10,4125 Hz, e fluxos médios de 30 min. O cerrado e a cana foram monitorado no período de janeiro de 2001 a dezembro de 2002. Complementarmente utilizou-se os dados de monitoramento da cana no período 1996/1997 de Rocha (1998). A irradiância solar incidente (K_i) sobre o cerrado (a cana) foi de 175 W/m² (165 W/m²) na estação seca e 240 W/m² (220 W/m²) na estação úmida. O albedo solar médio no cerrado (na cana) foi de 0,12 (0,21) na estação seca, e 0,13 (0,17) na estação seca e úmida. Estas diferenças no albedo modificam o balanço de energia nos dois sítios. Embora (K_i) tenha sido maior no cerrado e menor na cana, a precipitação foi maior no cerrado, portanto efeitos locais bem como antrópicos podem estar favorecendo uma maior atividade convectiva. A temperatura por sua vez foi aproximadamente maior em 1°C no cerrado, porém esse comportamento não foi uma constante ao longo do período de estudo. Na estação úmida e seca a razão de Bowen no cerrado foi de 0,2±0,4 e 0,8±0,85 e na cana foi de 0,36±0,1 e 1,3±0,9, respectivamente.

43.11-P: Latent and Sensible Heat Flux Height Variation Within and Above the Rebio Jaru Amazonian Rain Forest Canopy

Maria Betânia Leal Oliveira, INPA, mabetania@uol.com.br (Apresentador / Presenting)

In this work we verify how the vertical sensible and latent heat fluxes change with height within and above the Amazonian rain forest canopy, under daytime and nighttime conditions. The data were measured in September, October and November 2002, during the dry-to-wet season RACCI campaign of the Large Scale Biosphere Atmosphere Experiment in Amazonia (LBA), in southwestern part of Amazonia region. Measurements were made at several different heights in a 60 meters micrometeorological tower located in the Biological Reserve of Jaru (10o 04' S, 61o 56' W), Brazil. We used the fast response sonic data of wind velocity and temperature measured and the fast response Krypton/Campbell hygrometer data of air humidity simultaneously at three different heights at least, as of a) 62 m, 22 m and 5m; b) 62 m, 35 m and 22 m; and c) 62 m, 42 m and 38 m. The wind velocity components humidity and temperature data were decomposed into various frequency bands using biorthogonal wavelets and the covariances were computed in each of the bands to assess the scale variability of the heat fluxes at each level.

43.12-P: Detection of real time influence regions on the eddy flux and concentration measurements as a support for aircraft measurements during FIRE

Marcos Longo, IAG/Universidade de São Paulo, marcos@master.iag.usp.br (Apresentador / Presenting)
John Lin, DEAS/Harvard University, jcl@io.harvard.edu
Christoph Gerbig, DEAS/Harvard University, chg@io.harvard.edu
Maria Assução Faus da Silva Dias, CPTEC/INPE, assuncao@cptec.inpe.br
Pedro Leite Silva Dias, IAG/Universidade de São Paulo, pldsdias@master.iag.usp.br
Saulo Ribeiro de Freitas, CPTEC/INPE, srfreitas@cptec.inpe.br
Rodrigo Gevaerd, IAG/Universidade de São Paulo, rodrigo@master.iag.usp.br
Steven C. Wofsy, DEAS/Harvard University, scw@io.harvard.edu
Paulo Artaxo, IF/Universidade de São Paulo, artaxo@if.usp.br

This work describes a methodology which determines the most significant regions to have measures taken with

instrumented aircrafts. This methodology is based on the influence functions theory, and will be used during the FIRE campaign, which will take place in the end of 2004 dry season in Mato Grosso area.

At the first stage, high-resolution numeric weather forecasts will be run with BRAMS model. Before the campaign, the mean squared error (MSE) between the forecasts and the radiosonde measurements of wind velocity will be estimated. From these forecasts, considering the error, the STILT lagrangean model, which allows the time-inverted integration, will be applied. STILT will be run from the 72-hour forecast at fixed points chosen from the concentration and flux measurement sites. This model outputs a trajectory plume as well as influence functions.

Preliminary sensitivity tests have been developed in order to verify how adequate this framework is to the FIRE region. A simulation over Mato Grosso in October 15th to 17th, 2002 will be presented. During this period, widespread convection was observed over the focused area. Results show that the air particles behaviour within the mixing layer and the vertical displacement due to the convective activity are well reproduced. When the MSE is considered, the influence function field becomes suggests a larger area, which is desirable when the flight over significant regions is planned.

43.13-P: Características dos Sistemas Convectivos de Mesoescala Observados Sobre a Amazônia Durante o Experimento RACCI/LBA

Suzana Rodrigues Macedo, Instituto Nacional de Pesquisas Espaciais, suzana@cptec.inpe.br (Apresentador / Presenting)

Luiz Augusto Toledo Machado, Instituto Nacional de Pesquisas Espaciais, machado@cptec.inpe.br

Carlos Augusto Morales, Instituto de Astronomia, Geofísica e Ciências/USP, morales@model.iag.usp.br

Daniel Vila, Instituto Nacional del Agua, dvila@ina.gov.ar

Henri Laurent, Institut de Recherche por le Développement LTRE, Henri.Laurent@ird.fr

Este trabalho analisa a convecção tropical através do acompanhamento de sistemas convectivos de mesoescala observados em imagens do canal infravermelho do satélite GOES-8, a cada meia hora, obtidas durante a campanha RACCI/LBA, realizada em Rondônia no período de Setembro a Novembro de 2002. A metodologia empregada baseia-se no emprego do software FORTRACC (Forecast and Tracking of Active Convective Cells) para detecção e acompanhamento do ciclo de vida dos sistemas convectivos. Este programa detecta e acompanha os sistemas convectivos durante o seu ciclo de vida descrevendo a evolução das características radiativas e morfológicas. Neste trabalho foram utilizados os limiares de 235K para a detecção de sistemas convectivos e 210K para células convectivas imersas no sistema convectivo. A mesma metodologia foi empregada aos dados do radar da TECTELCOM que operou durante o experimento a partir do CAPPI para alturas entre 2 e 18 km. Este estudo descreve as características dos sistemas convectivos do ponto de vista das nuvens (satélites) e da água líquida (radar) no período de transição entre a estação seca e chuvosa. Os resultados descrevem as distribuições de tamanho, horários de nascimento e dissipação, ciclo diurno e realiza um estudo de caso para alguns eventos extremos observados durante a campanha.

43.14-P: Importance of the Low Level East East of the Andes (LLJ) and the moisture transport from the Amazon Basin to the la Plata Basin

José A. Marengo, CPTEC/INPE, marengo@cptec.inpe.br (Apresentador / Presenting)

Pedro Leite Silva Dias, USP/IAG, pldsdias@master.iag.usp.br

Maria Assunção Faus da Silva Dias, CPTEC/INPE, assuncao@cptec.inpe.br

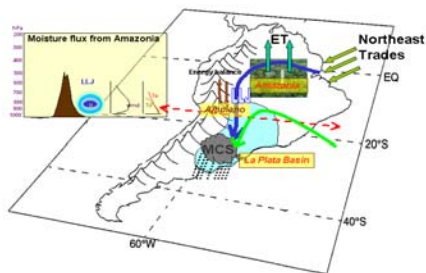
Tercio Ambrizzi, USP/IAG, ambrizzi@model.iag.usp.br

Gilberto F Fisch, IAE/CTA, gfisch@iae.cta.br

Luiz Augusto Toledo Machado, CPTEC/INPE, machado@cptec.inpe.br,br

Iracema F Cavalcanti, CPTEC/INPE, iracema@cptec.inpe.br

The Low Level Jet East of the Andes (LLJ) represents a mesoscale circulation feature located to the East of the Andes, and which maximum speed is on the first 2 km in the vertical. The LLJ brings moisture from the Amazon basin into the La Plata basin, and seems to be stronger in summer, producing rainfall in the southeaster South American region. We present some results of the SALLJEX field Campaign of summer 2003, explaining some of the observed features of the LLJ, as well as upper and low-level circulation for seasonal means and SALLJ composites during the warm and cold seasons. On the circulation characteristics, SALLJ composites during the warm season show the enhanced low-level meridional moisture transport coming from equatorial South America as well as an upper level wave train emanating from the West Pacific propagating towards South America. The intensification of the warm season LLJ obeys to the establishment of an upper-level ridge over southern Brazil and a trough over most of Argentina. The circulation anomalies at upper and lower levels suggest that the intensification of the LLJ would lead to an intensification of the South Atlantic Convergence Zone SACZ later on, and to a penetration of cold fronts with an area of enhanced convection ahead at the exit region of the LLJ.



43.15-P: Sobre a Participação do Avião Laboratório Para Pesquisas Atmosféricas (ALPA) no LBA

Emerson Mariano Silva, UECE, emerson@uece.br (Apresentador / Presenting)

Gerson Paiva Almeida, UECE, gerson@uece.br
João Bosco Verçosa Leal Jr., UECE, jblealjr@uece.br
Carlos Jacinto Oliveira, UECE, cjacinto@uece.br
Francisco Geraldo Melo Pinheiro, UECE, fgmpinheiro@uece.br

O Avião Laboratório para Pesquisas Atmosféricas (ALPA), atualmente sob a coordenação do Grupo de Física da Atmosfera (GFA) da Universidade Estadual do Ceará (UECE), é uma poderosa plataforma experimental de coleta de dados de microfísica de nuvens com a capacidade de realizar medidas e processamento de dados em tempo real. Adicionalmente, essa aeronave possui condições potenciais para efetuar estudos em outras áreas de interesse em pesquisa atmosférica, tais como: Radiometria, Química da Atmosfera, Estudos Ambientais, Aerofotometria, entre outros.

O ALPA é equipado com diversos instrumentos e sensores que auxiliam na tarefa de coleta e processamento de dados. Dentre eles pode-se citar: Sensores de variáveis meteorológicas padrões características (pressão atmosférica, temperatura ambiente e do ponto de orvalho, umidade relativa do ar, etc.), piranômetros, Global Positioning System (GPS), sensores de medida do conteúdo de água líquida Csiro-King e Johnson Williams, contador de Núcleos de Condensação de Nuvens (CCNC), sonda para estimar a concentração e a distribuição de tamanhos de gotículas FSSP-100 e sondas Espectrométricas Ópticas 200-X e 200-Y.

Atualmente, o ALPA juntamente com a equipe de pesquisadores do GFA vem participando de campanhas experimentais em diversas partes do território brasileiro. Dentre essas participações pode-se citar o experimento SMOCC- EMfiN!-LBA (Smoke Aerosols, Clouds, Rainfall and Climate - Experimento de Microfísica de Nuvens - Large-Scale Biosphere-Atmosphere Experiment in Amazônia), realizado no período de 21/09 a 18/10/2002, na região amazônica.

O presente trabalho tem como objetivo descrever a tecnologia e a metodologia utilizadas pelo ALPA e o GFA no experimento supra citado.

43.16-P: Avaliação de perfis de vento interior da Camada Limite Atmosférica

Sylvia Elaine Marques de Farias, CPTEC/INPE, sylvia@cptec.inpe.br (Apresentador / Presenting)
Chou Sin Chan, CPTEC/INPE, chou@cptec.inpe.br

O sucesso das previsões de tempo provenientes de modelos de mesoescala é em parte creditado ao esquema de parametrização da Camada Limite Atmosférica (CLA). Este estudo tem por objetivo avaliar perfis verticais do vento no interior da CLA. As avaliações se constituirão da comparação entre perfis medidos por radiossonda e previstos pelo modelo de mesoescala Eta do CPTEC. Serão avaliados os desvios e os erros médios quadrados para a camada compreendida entre 1000 e 700mb. Os dados são provenientes do projeto LBA.

43.17-P: Time Evolution of the Nocturnal Boundary Layer Over Amazonia

Rosa Maria Nascimento dos Santos, CPTEC/INPE, rosa@cptec.inpe.br (Apresentador / Presenting)
Gilberto Fernando Fisch, IAE/CTA, gfisch@iae.cta.br

The CLN time evolution was studied based on vertical profiles of potential temperature, humidity (q) and wind (direction and speed), gotten from soundings with tethered balloon, over 3 sites (forest, RM and FNS), during the field experiments wetAMC-LBA (wet season) and RBLE3 (dry season). Mean characteristics - depth (h_i), temperature on the top of CLN, thermal discontinuity, and the intensity nocturnal inversion - were determined for these two periods, and a comparative study was carried out. During the dry season the CLN was deeper over the forest - between 180 m (at 6 p.m.) and 420 m (at 5 a.m.), however the temperature on CLN top was 1.4 K higher over the pasture than over the forest. Also, strongest nocturnal inversion regularly happened over the pasture, with intensity peaking at 7 p.m. (50.5 K.km^{-1}), indicating greatest stability over this site. Nevertheless, for the wet period the CLN was shallower over all sites (forest and deforested areas), and it revealed a more pronounced development over the deforested areas, particularly Rolim de Moura ($\sim 215 \text{ m}$ at 7 a.m. and 296 m at 6 a.m.). Temperatures on the top layer tended to be higher at deforested than at forested sites (by 1.3 K at FNS, and 1.5 K at RM).

43.18-P: Low Level Jet Influence on the Nocturnal Boundary-layer Vertical Structure Above Caxiuanã Forest Reserve During Wet Season

Daniele Santos Nogueira, Universidade Federal do Pará - UFPA, holywod@interconnect.com.br (Apresentador / Presenting)

Leonardo Deane de Abreu Sá, Centro de Previsão de Tempo e Estudos Climáticos, Instituto Nacional de Pesquisas Espaciais (CPTEC-INPE)- Museu Paraense Emílio Goeldi (MPEG)., ldsa@museu-goeldi.br

Julia Clarinda Paiva Cohen, Universidade Federal do Pará - UFPA, jcpcohen@ufpa.br

In this work we investigate the occurrence of low level jet (LLJ) events in the nocturnal boundary-layer above the "Ferreira Penna Scientific Station", in Caxiuanã Forest Reserve, which is located in the North-Eastern part of Amazonia. As LLJ we define a region of the wind velocity vertical profile located below 1 km height in which the strength of the wind is greater than 5 m/s and where there is a relative maximum value in such way that the wind velocity value decays at least 2 m/s both above and below the jet region. We use radiossonde data of wind velocity, potential virtual temperature, specific humidity and bulk Richardson number to show that LLJs actually separate the atmospheric boundary-layer in two regions with distinct mixing characteristics: a below LLJ well mixed layer and a above LLJ layer without mixing. These data were collected during April 2002 - Experiment of Milenio/LBA Project. At the height of the LLJ (between 200 and 400 m height) the wind velocity changes of direction and is north-easterly. The results have important implications for correct parameterization of forest-atmospheric exchange processes.

43.19-P: Fontes e Sumidouros de Vapor D'água e Calor Sensível Sobre o Pantanal

André Becker Nunes, INPE, anunes@cptec.inpe.br (Apresentador / Presenting)
Prakki Satyamurty, INPE, saty@cptec.inpe.br

O objetivo deste trabalho é avaliar as fontes e sumidouros de vapor d'água e calor sensível sobre a região do Pantanal, através da análise dos fluxos de superfície. Para isto, foram usados os dados coletados durante o experimento IPE (Experimento Interdisciplinar do Pantanal) da época mais seca (IPE 2) e da época de solo inundado (IPE 3). Na estimativa dos fluxos de calor latente e sensível foi aplicado o método de Penman-Monteith, o que mostrou que durante a época inundada o fluxo de calor latente foi cerca de 5% maior do que na fase seca; já os fluxos de calor sensível foram praticamente iguais. Outra característica apresentada é que os picos dos fluxos observados na fase inundada apresentaram valores de 590 Wm^{-2} de calor latente e 25 Wm^{-2} de calor sensível, além de um atraso de aproximadamente 4 horas comparados com os picos dos fluxos observados na fase seca, que tiveram valores de quase 500 Wm^{-2} de fluxo de calor latente e 24 Wm^{-2} de fluxo de calor sensível. Considerando o sítio experimental representativo de toda a área do Pantanal, fez-se o confronto dos resultados de fluxo de calor latente com os dados de precipitação, cuja média diária foi de 0.7 mm no IPE 2 e 2.2 mm no IPE 3. Este confronto mostrou quando a região do Pantanal atua como fonte ou sumidouro de calor latente e sensível. Uma explicação para a diferença entre a precipitação e os fluxos de calor latente é a atuação de fontes externas de umidade, principalmente a Amazônia. Desta forma também foi analisada heurísticamente a influência do Jato de Baixos Níveis na convergência de umidade no Pantanal.

43.20-P: Um Estudo de Caso Envolvendo Evaporação Regional na Camada Limite Planetária Através do Abracos e Modelo MM5.

José Francisco Oliveira Jr, NCQAR/LAMCE/COPPE/UFRJ, juninho@acd.ufrj.br (Apresentador / Presenting)
Eduardo Barbosa Correa, NCQAR/LAMCE/COPPE/UFRJ, ecorrea@acd.ufrj.br
Daniel Carlos Menezes, LPM/COPPE/UFRJ, dcm@fapeal.br
Rodrigo Santos Costa, LPM/COC/COPPE/UFRJ, rodrigo@coc.ufrj.br
Nilton Oliveira Moraes, NCQAR/LAMMA/COPPE/UFRJ, nilton@acd.ufrj.br

A estimativa da evaporação em escala regional através da interface superfície-atmosfera, particularmente na Camada Limite Atmosférica (CLA) é útil para compreender as interações em grande escala e introduzir novas parametrizações em Modelos de Mesoescala e Global, principalmente a profunda importância dada evaporação regional na Circulação Geral da Atmosfera (CGA) e do Balanço de Energia. Por isso, temos por objetivo comparar os fluxos superficiais de energia através de alguns métodos de estimativas da evapotranspiração que foram aplicados ao conjunto de dados micrometeorológicos do ABRACOS (Anglo-Brazilian Climate Observation Study), em diferentes sítios (floresta-pastagem) no período de 1992, em Ji-Paraná - Rondônia. O período refere-se a estação chuvosa e seca, onde serão comparados aos modelos empíricos (Priestly-Taylor e Penam) e resultado obtidos pela simulação do Modelo MM5.

43.21-P: Estudo da Convecção em Pastagem-Floresta Utilizando Radiossondagem e Modelo MM5.

José Francisco Oliveira Jr, NCQAR/LAMCE/COPPE/UFRJ, juninho@acd.ufrj.br (Apresentador / Presenting)
Rodrigo Santos Costa, LPM/LAMCE/COPPE/UFRJ, rodrigo@coc.ufrj.br
Nilton Oliveira Moraes, NCQAR/LAMMA/COPPE/UFRJ, nilton@acd.ufrj.br
Eduardo Barbosa Correa, NCQAR/LAMMA/COPPE/UFRJ, ecorrea@acd.ufrj.br
Daniel Carlos Menezes, LPM/LAMCE/COPPE/UFRJ, dcm@fapeal.br

A ocorrência de convecção profunda observada na região de (floresta-pastagem) através do CAPE (Convection Available Potential Energy), Temperatura Potencial Equivalente (θ_e) e simulações com modelo MM5 teve por objetivo caracterizar a distribuição da convecção diária na estação seca e chuvosa, durante o experimento ABRACOS (Anglo-Brazilian Climate Observation Study). Com simulações do MM5 foi observada uma grande distinção em relação ao horário de ocorrência da convecção, sendo no início da tarde para estação seca, e entre o início da manhã e as primeiras horas da noite na estação chuvosa. Durante a estação seca os valores do CAPE variaram de fraco a moderadamente instável, obedecendo a escala proposta por (Stutevant, 1994), com exceção às 1500 TL (Tempo Local), quando o CAPE foi bastante forte indicando uma situação altamente instável, e sendo confirmado pelos perfis de θ_e e com valores do CAPE próximos de 3000 J/kg . Já na estação chuvosa foi verificado que o CAPE foi diferente em relação à estação seca, havendo várias situações que oscilaram entre fraco até extremamente instável, particularmente, nos horários de 1800-2100 TL, com CAPE da ordem de 3500 J/kg . Desta forma, foi conseguido correlacionar os ecos de radar e o CAPE, apenas nos horários de forte instabilidade atmosférica. Os valores de CAPE é a condição necessária, porém não suficiente na determinação da convecção. As técnicas de análise deste estudo, no qual incluem a sondagem e modelagem atmosférica é perfeitamente aplicável para o estudo da convecção, principalmente na região Amazônica.

43.22-P: Do amazonian trees loose water at night?

Rafael S Oliveira, University of California - Berkeley, rafael@socrates.berkeley.edu (Apresentador / Presenting)
Todd E Dawson, UC Berkeley, tdawson@socrates.berkeley.edu
Stephen O Burgess, University of Western Australia, sss@cyllene.uwa.edu.au
Scott R. Saleska, Harvard University, saleska@fas.harvard.edu
Steven C. Wofsy, Harvard University, scw@io.harvard.edu
Daniel Curtis Nepstad, Woods Hole Research center, dnepestad@whrc.org

It is regularly assumed that plants do not transpire during the night. Here, we show that this assumption is incorrect and provide evidence that nighttime transpiration can constitute a significant part of daily water loss for trees inhabiting the Tapajos National Forest, Amazonia. To quantify nighttime water fluxes at the tree and ecosystem scales we used heat ratio sapflow on trees and eddy covariance methods during 2 years in the "km 67" site of the Tapajos forest. We found that tree

crowns do loose water at night and that nighttime transpiration can constitutes 5-14% of the total daily forest water use. These findings have implications for investigations of tree physiology (nighttime transpiration contributes to predawn water potential disequilibrium) and are relevant for constructing whole ecosystem water balance. To our knowledge this is the first documented case of nighttime water loss for Amazonian trees and forest stands.

43.23-P: Sistema de Aquisição de Dados ALPA2000

Francisco Geraldo Pinheiro, UECE, fgmpinheiro@uece.br (Apresentador / Presenting)

Carlos Jacinto Oliveira, UECE, cjacinto@uece.br

Rafael Castelo Martins, UECE, castelorafael@yahoo.com.br

Francisco Walber Silva, UECE, fwalber@bol.com.br

O Avião Laboratório para Pesquisas Atmosféricas (ALPA) conta com um conjunto de equipamentos destinados à pesquisa em microfísica de nuvens. Estes equipamentos, uns com saída analógica e outros com saída digital, são conectados ao sistema de aquisição de dados ALPA2000 para armazenamento destas informações e visualização em tempo real. O ALPA2000 pode ser dividido em dois subsistemas: O primeiro para tratamento de sinais analógicos e o segundo para tratamento de sinais digitais. O subsistema para tratamento de sinais analógicos é composto por uma placa de conversão A/D de 12 bits configurável em 16 canais diferenciais ou 32 em modo comum, instalada dentro de um microcomputador. O subsistema para tratamento de dados digitais é composto de duas entradas seriais, padrão RS232. A primeira recebe dados de um GPS e a segunda recebe dados de duas sondas espectrométricas (OAP200X e OAP200Y) através de uma interface paralela/serial. O programa de controle foi desenvolvido em um ambiente gráfico e permite a visualização de todos os parâmetros em tempo real. Algumas informações são mostradas na forma de instrumentos digitais e outras na forma de instrumentos analógicos. Uma janela está disponível com 3 gráficos (sinais analógicos X tempo) onde o parâmetro a ser visualizado pode ser escolhido. O sistema foi testado em laboratório em campo com resultados satisfatórios e atualmente está sendo modificado para a inclusão de mais uma entrada de dados na forma serial.

43.24-P: Radiação Fotossinteticamente Ativa No Sub-bosque De Uma Floresta Primária No Oeste Do Pará, Amazônia

Irene Cibelle Sampaio, Universidade Federal do Pará, cibelle@lbaeco.com.br (Apresentador / Presenting)

Oswaldo Luiz Leal de Moraes, Universidade Federal de Santa Maria, Moraes@mail1.ufsm.br

David Roy Fitzjarrald, Universidade de Albany, fitz@asrc.cestm.albany.edu

Ricardo Sakai, Universidade de Albany, sakai@asrc.cestm.albany.edu

Este é um estudo que pretende caracterizar a sazonalidade do regime de radiação fotossinteticamente ativa através do dossel de uma floresta primária. Uma rede de piranômetros foi instalada no chão da floresta e um sensor PAR para intercomparação, assim como piranômetros e sensores PAR em uma torre de 67m que medem radiação incidente e refletida no dossel. A razão do PAR e radiação total incidente no dossel é de aproximadamente 36,24 % e decresce aproximadamente 8 vezes até chegar ao sub-bosque; sendo absorvida em média 97,5% da radiação PAR. Sabendo que a intensidade que a luz atravessa o dossel é descrita por um análogo à lei de Beer, determinaremos o coeficiente de extinção para vários valores de LAI e apresentaremos a variação diária e sazonal destes parâmetros.

43.25-P: Análise da Variabilidade Temporal do IWV na Pré Estação Chuvosa Utilizando GPS.

Luiz Fernando Sapucci, Programa de Pós Graduação em Ciências Cartográficas da FCT-UNESP, Presidente Prudente, SP, Brasil, sapucci@prudente.unesp.br (Apresentador / Presenting)

Luiz Augusto Toledo Machado, Centro de Previsão de Tempo e Estudos Climáticos CPTEC-INPE, Cachoeira Paulista, SP, Brasil, machado@cptec.inpe.br (Apresentador / Presenting)

João Francisco G. Monico, Departamento de Cartografia da FCT-UNESP, Presidente Prudente, SP, Brasil, galera@prudente.unesp.br

Artemio Plana Fattori, Departamento de Ciências Atmosféricas IAG-USP, São Paulo, SP, Brasil, artemio@dgf.uchile.cl

A variabilidade do conteúdo atmosférico de vapor d'água (IWV - Integrated Water Vapor) no tempo e no espaço constitui resultado de diversos processos atmosféricos na Amazônia. A análise da variabilidade temporal e espacial do IWV permite averiguar o início da estação chuvosa, o impacto dos aerossóis no IWV e estudar diferentes escalas associadas aos processos convectivos. Explorando a alta resolução temporal do IWV obtida a partir do processamento das observáveis GPS (Global Positioning System) e utilizando os dados coletados por três receptores instalados nos sítios da campanha RACCI, o presente trabalho realiza uma análise detalhada da variabilidade temporal do IWV em diferentes escalas temporais e em diferentes regiões de Rondônia. Essa análise permite precisar a data de início da estação chuvosa do ponto de vista da umidade na coluna atmosférica. Com a alta resolução temporal das estimativas do IWV fornecidas pelo GPS, associada aos dados de vento, é possível monitorar o fluxo de vapor d'água atmosférico, a variabilidade do ciclo diário nos períodos: seco e úmido e na fase de transição. Além disso, tais estimativas possibilitarão a realização dos primeiros experimentos que visam verificar o impacto da assimilação dessas informações nos modelos de Previsão Numérica de Tempo (PNT). Esses resultados contribuirão para mostrar a potencialidade da Rede Brasileira de Monitoramento Contínuo dos sinais GPS, denominada RBMC, na determinação do vapor d'água atmosférico para estudos de sua variabilidade temporal sobre o território brasileiro e para a assimilação em modelos de PNT.

43.26-P: Impacto da convecção úmida na baixa estratosfera - um estudo de caso

Thais Machado Scherrer, IAG/USP, thais@model.iag.usp.br (Apresentador / Presenting)

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

O presente trabalho visa o estudo numérico do processo de transporte de energia entre a troposfera e a baixa estratosfera na região tropical do Brasil através das ondas de gravidades geradas em situações de intensa atividade convectiva. Explora-se o impacto da resolução vertical utilizada no modelo (RAMS - Regional Atmospheric Modeling System). A motivação veio da observação de grandes alterações em campos de temperatura e vento em 70-20 hPa em sondagens

realizadas nas vizinhanças de sistemas convectivos úmidos muito intensos - há indícios de que a resolução vertical utilizada no modelo numérico pode representar diferenças muito significativas nos campos de temperatura na baixa estratosfera.

Mostra-se aqui o resultado de simulações homogêneas, inicializadas com uma sondagem realizada em 25 de janeiro de 1999, em ABRACOS, mas sem vento.

Futuramente, pretende-se poder avaliar qual a resolução vertical necessária em modelos numéricos de previsão de tempo e clima na região tropical.

43.27-P: Variação Sazonal de Alguns Elementos Meteorológicos em Ecossistema de Manguezal no Nordeste do Estado do Pará

João Athaydes Silva Jr, UFPA, athaydes@ufpa.br (Apresentador / Presenting)

Antônio Carlos Lôla da Costa, UFPA, lola@ufpa.br

Paulo Henrique Lopes Gonçalves, UFPA, phlg@ufpa.br

Alan Pantoja Braga, UFPA, alan_meteoro@yahoo.com.br

Rafael Ferreira da Costa, UFCG, rfcostampeg@bol.com.br

Patrick Meir, UEDIN, pmeir@ed.ac.uk

Yadvinder Singh Malhi, UEDIN, ymalhi@ed.ac.uk

Jose Maria Nogueira da Costa, UFV, jmcosta@ufv.br

O município de Bragança está localizado à Nordeste do Estado do Pará, distante cerca de 200 km da capital, Belém. O município é cortado por rios, mangues e igarapés. A possível conversão de manguezais exuberante em manguezais degradada pode influenciar decisivamente no clima regional e local. Os manguezais são ecossistemas costeiros muito produtivos, por oferecerem espaço vital para numerosas espécies de peixes, moluscos e caranguejos, apresentando alto rendimento pesqueiro e representando assim, a base de subsistência para grande parte da população local, sendo um dos ecossistemas mais produtivos do planeta. O estudo da sazonalidade do clima destas regiões é importante para uma melhor compreensão destes complexos ecossistemas. Este manguezal apresenta uma floresta com dossel médio de 18m de altura e árvores que alcançam até 25m. As análises apresentadas neste trabalho referem-se a informações obtidas durante o período seco e o chuvoso nos anos de 2002 e 2003. Observou-se que a maior variabilidade térmica ocorreu na época menos chuvosa, com amplitude média diária de 3,0°C. A umidade relativa do ar apresenta-se elevada durante todo ano, com valores acima de 80%. A radiação solar global sofre uma redução média de 35% na época chuvosa, o que esta associada com as características de nebulosidade da região. O vento predominante é de Norte / Nordeste durante todo ano, sendo a sua velocidade média da ordem de 3,5 m/s na época menos chuvosa, ao passo que, na época chuvosa este valor médio é da ordem de 2,0 m/s.

43.28-P: Estudo Observacional da Altura da Camada de Mistura em Bragança e Caxiuanã Durante o Período Chuvoso de 2002.

Adriano Marlisom Sousa, Universidade Federal de Pelotas, marlisom@hotmail.com (Apresentador / Presenting)

Julia Clarinda Cohen, UFPA, jcpcohen@ufpa.br

Edson José Paulino Rocha, UFPA, eprocha@ufpa.br

A região Amazônica está sofrendo uma taxa elevada de desflorestamento, sendo a floresta tropical substituída inicialmente pelo pasto e por colheitas agrícolas. O acoplamento entre tipos diferentes de superfície (floresta ou grama tropical) e a camada limite, vem sendo investigada usando dados observacionais (das radiossondagens) coletados sobre a floresta e região costeira da Amazônia oriental. Esses dados suportam a noção que o desflorestamento pode modificar a dinâmica da camada limite, durante a época chuvosa, (Fisch, 1996). Durante o período de 8 a 22 de abril de 2002, foram lançadas radiossondas no litoral (manguezal) e no interior do continente (floresta) a cada 6 horas. Com esses dados, fez o estudo relativo à dinâmica da formação e evolução da camada limite atmosférica (CLA). A camada de mistura (CM) portou-se em torno de 550m na costa e na região de floresta em média de 750m. Através de estudo de casos, avaliou-se a evolução da camada de mistura numa seqüência de 3 dias. Na floresta a camada de mistura desenvolveu-se de 130m para 870m no horário de maior atividade convectiva, ultrapassando de 120m de altura aquela encontrada no litoral durante o experimento de campo. Durante a estação seca nos dois ambientes distintos eles têm a mesma altura em média (1000m) segundo (Fisch, 2001), mas durante a estação chuvosa as temperaturas e as umidades do ar são similares.

43.29-P: Mecanismos de Controle da Variação Sazonal da Transpiração de Uma Floresta Tropical no Nordeste da Amazônia

José Danilo Costa Souza Filho, UFPA, danilofilho@vicoso.ufv.br (Apresentador / Presenting)

Aristides Ribeiro, UFV, ribeiro@ufv.br

Marcos Heil Costa, UFV, mhcosta@ufv.br

Julia Clarinda Cohen, UFPA, jcpcohen@ufpa.br

No presente trabalho, utilizou-se dados do projeto CARBOPARÁ parte integrante do Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia (LBA) coletados na reserva florestal de Caxiuanã, região nordeste da Amazônia. A evapotranspiração total num intervalo de 39 dias para o período chuvoso foi 108,2 mm, com valor médio de 2,9 mm dia⁻¹, enquanto, durante o período menos chuvoso, a evapotranspiração total num intervalo de 29 dias foi 128,8 mm, com média de 4,3 mm dia⁻¹ para o período. Os valores máximos da condutividade de superfície (Cs), nos dois períodos, ocorreram às 08:00 h, sendo estes valores de 0,060 m s⁻¹ e 0,045 m s⁻¹ para o período chuvoso e menos chuvoso, respectivamente. A condutância aerodinâmica média (Ca) foi 0,164 m s⁻¹ e 0,210 m s⁻¹, para os períodos chuvoso e menos chuvoso, respectivamente. Os valores máximos da Ca observados para os períodos chuvoso e menos chuvoso, foram respectivamente 0,220 e 0,375 m s⁻¹. Verificou-se que Cs guarda uma relação exponencial inversa com o déficit de vapor de água atmosférico, para diferentes intervalos de irradiância solar global. A análise horária do fator de desacoplamento sugere que a evapotranspiração, durante a manhã, tem um maior controle realizado pela disponibilidade de energia,

quando comparado ao período menos chuvoso. Durante a tarde verifica-se que o dossel da floresta progressivamente tende a estar mais acoplado à atmosfera, para ambos os períodos estudados demonstrando maior controle superficial na transpiração.

43.30-P: Variação Sazonal do Albedo Para a Floresta de Caxiuanã-PA

José Danilo Costa Souza Filho, UFPA, danilofilho@viciosa.ufv.br (Apresentador / Presenting)

Aristides Ribeiro, UFV, ribeiro@ufv.br

Marcos Heil Costa, UFV, mhcosta@ufv.br

Julia Clarinad Cohen, UFPA, jpc Cohen@ufpa.br

Neste estudo, foram investigados dois períodos distintos, representando as estações mais e menos chuvosa do ano na reserva florestal de Caxiuanã, região nordeste da Amazônia. Para melhor entender as variações na quantidade de radiação solar refletida pela superfície, entre os períodos estudados, analisou-se o coeficiente de reflexão (albedo). O valor médio diário do albedo durante o período chuvoso foi 8,2% e 11,9% para o período menos chuvoso. Verifica-se um consistente aumento do albedo no período chuvoso para o menos chuvoso, chegando este último a representar, em termos médios, um valor 45% maior. Três fatos podem explicar esta diferença e referem-se a frequência de molhamento do dossel, do estado hídrico da floresta e do índice de área foliar (IAF). No período chuvoso, em 93% dos dias, ocorreram precipitações, enquanto no período menos chuvoso ocorreram chuvas em apenas 52% dos dias. Tal fato evidencia que, no período chuvoso houve maior frequência de molhamento do dossel e maior disponibilidade hídrica para a Floresta. A presença de água depositada sobre o dossel, ou internamente nas folhas (abundante suprimento de água pelo solo nesse período), gera menores índices de reflexão da radiação solar incidente, uma vez que a água apresenta coeficiente de transmissão de ondas curtas relativamente alto. Outro fato que explica a ocorrência de maior albedo no período menos chuvoso é o maior índice de área foliar do dossel. O IAF médio em Caxiuanã, observado durante o período chuvoso, foi 5,4 m² m⁻² e para o período menos chuvoso 6,0 m² m⁻²

43.31-P: Variabilidade Pluviométrica Multi-escala na Amazônia Oriental e Mecanismos Dinâmicos Associados

Everaldo B. de Souza, DM-CG-UFPA, everaldo@ufpa.br (Apresentador / Presenting)

Julia C.P. Cohen, DM-CG-UFPA, jpc Cohen@ufpa.br

Edson José Paulino Rocha, DM_CG-UFPA, eprocha@ufpa.br (Apresentador / Presenting)

Tércio Ambrizzi, IAG-USP, ambrizzi@model.iag.usp.br

Os aspectos diagnósticos da variabilidade temporal presente nos dados de precipitação pluviométrica coletados nos sítios representativos dos ecossistemas de Campo (Soure), Manguezal (Bragança) e Floresta (Caxiuanã), localizados no estado do Pará dentro da Amazônia Oriental, são investigados neste trabalho. As séries de precipitação (disponíveis no banco de dados gerenciado pelo projeto MilênioLBA - subprojeto UFPA) encontram-se originalmente em intervalos de 30/30 e 60/60 minutos durante o período de agosto de 2000 a março de 2004. A Transformada em Ondeletas (TO) de Morlet é utilizada para detectar objetivamente os modos dominantes de variabilidade pluviométrica temporal multi-escala no domínio tempo-frequência. Uma vez identificados os picos espectrais com significância estatística, aplica-se o filtro de Lanczos nas séries de precipitação, com a finalidade de reter primordialmente as variações associadas a cada banda de variabilidade temporal detectada pela TO. Estas bandas referem-se a variabilidade de alta frequência (< 1 dia; entre 1-7 dias) e também a variabilidade submensal (entre 10-30 dias). Alguns eventos de precipitação significativa se processando em cada banda temporal foram então criteriosamente selecionados para a montagem de composições. O procedimento de filtragem temporal também foi aplicado nos dados em ponto de grade da reanálise NCEP/NCAR (disponível diariamente a cada 6 horas). Assim, com base nos mapas das composições montadas com os dados filtrados da reanálise, foram analisadas as características principais da circulação atmosférica, convecção tropical, bem como a dinâmica dos mecanismos atmosféricos associados a cada banda de variabilidade temporal.

43.32-P: Estimativa do balanço de radiação médio à superfície por satélite durante o DRY-TO-WET AMC/LBA

Jaidete Monteiro de Souza, CPTEC/INPE, jaidete@cptec.inpe.br (Apresentador / Presenting)

Juan Carlos Ceballos, CPTEC/INPE, ceballos@cptec.inpe.br

Foi estimado o balanço de radiação médio diário à superfície para a região de Rondônia durante o experimento DRY-TO-WET AMC/LBA, procurando utilizar apenas informação de satélites ambientais (GOES-8 e NOAA-16). A radiação solar à superfície foi estimada mediante o modelo GL1.2, baseado em informações do canal VIS do GOES-8 e rodando operacionalmente no CPTEC-INPE. A componente de radiação de onda longa ascendente (OLA) foi avaliada a partir de informações de temperatura e de emissividade da superfície; a primeira foi estimada utilizando algoritmos "split-window" (GOES e NOAA), e a segunda a partir do índice de vegetação por diferenças normalizadas (NDVI - Normalized Difference Vegetation Index). Para estimativa da radiação de onda longa descendente (OLD) foi desenvolvida uma parametrização baseada na temperatura média na baixa troposfera e na água precipitável; a parametrização foi obtida a partir de radiossondagens em diversas localidades do Brasil. O método permite aproveitar as sondagens remotas por satélite. A comparação com os dados do DRY-TO-WET mostra que o saldo de onda longa (OLD - OLA) obtido por satélite é coerente com a verdade terrestre em média diária, com erro da ordem de 10 Wm⁻². O saldo de onda curta apresenta superestimativa da ordem de 10 Wm⁻², podendo atingir 30 Wm⁻² devido à presença de aerossol de queimadas. O saldo de onda longa é de ordem inferior ao de onda curta (da ordem de 10%), em consequência o saldo médio de radiação à superfície pode ser avaliado a partir da radiação solar incidente com uma correção devida ao saldo de onda longa (cuja ordem de grandeza é avaliada a partir de parametrizações baseadas na sondagem remota da atmosfera).

43.33-P: Análise de Desempenho dos Sistemas de Sondagem Aqua e ICI/NOAA Sobre Rondônia Durante o Experimento Dry-to-wet LBA

Rodrigo Augusto Souza, INPE/DSA, rodrigo@cptec.inpe.br (Apresentador / Presenting)

Juan Carlos Ceballos, INPE/DSA, ceballos@cptec.inpe.br

Christopher Dwight Barnet, NOAA/NESDIS, chris.barnet@noaa.gov

Analisa-se o desempenho do modelo de inversão da NASA-AQUA (diferentes versões) e do "Inversion Coupled with Imager" (ICI) para recuperar perfis de temperatura e umidade durante o experimento de campo "DRY-TO-WET LBA" realizado nos meses de setembro e outubro de 2002, sobre a região amazônica, nos sítios de Guajará-Mirim, Porto Velho e Ouro Preto d'Oeste. Os perfis atmosféricos recuperados pelos diferentes modelos de inversão foram comparados com as radiossondagens do experimento de campo. As análises basearam-se em cálculos de erros médios e erros médios quadráticos. Na comparação com cada radiossonda foram utilizados todos os perfis atmosféricos inferidos sob diferentes condições de nebulosidade e localizados dentro de um raio de até 100km do sítio de lançamento. Similarmente, foram feitas comparações entre os perfis obtidos pelas radiossondagens e os perfis das análises do modelo global do Centro de Previsão de Tempo e Estudos Climáticos (CPTEC). Observou-se que os perfis de temperatura e umidade sobre a região amazônica foram melhor inferidos pelo ICI e pelas análises do modelo de PNT do CPTEC, do que pelo modelo da NASA. Os perfis estimados pelo ICI atingiram níveis de qualidade dentro dos erros esperáveis, de até 1,5K para os perfis de temperatura e de 1,5g/kg para os de umidade. Os perfis recuperados pelo modelo de inversão da NASA-AQUA estão abaixo do nível de qualidade desejado, de 1K para o perfil de temperatura e 1g/kg para o perfil de umidade.

43.34-P: Análise em tempo-escala de um evento associado a um jato em baixos níveis no Pantanal matogrossense

Luis Marcelo de Mattos Zeri, Max-Planck-Institute for Biogeochemistry, mzeri@bgc-jena.mpg.de
Leonardo Deane de Abreu Sá, Museu Paraense Emílio Goeldi, ldsa@museu-goeldi.br (Apresentador / Presenting)
Eliana Soares de Andrade, LIM/CPTEC/INPE, eliana@cptec.inpe.br
Gannabathula Sri Sesha Durga Prasad, CPTEC/INPE, prasad@cptec.inpe.br

A inclusão da contribuição de fenômenos de mesoescala no estudo de fluxos turbulentos pode ser crítica em situações de estabilidade estável, como na Camada Limite Noturna (CLN). Nessas situações, os fluxos são pequenos e a inclusão indevida da contribuição dessas escalas pode mudar a magnitude e até o sinal do fluxo calculado, incorporando no cálculo dos fluxos contribuições de escalas maiores que as turbulentas, como é o caso da mesoescala. Ainda, há evidências recentes de que a CLN fortemente estável na superfície pode ter associada a si fenômenos tais como: a) camada limite forçada por fonte de turbulência elevada; b) intermitência; c) Jatos em Baixos Níveis (JBN); d) variações de meso-escala; e) ondas de gravidade. Posto isto, procurou-se analisar em maior detalhe a evolução de sinais turbulentos para dois dias de 1999. Os sinais foram decompostos em escalas através da Transformada em Onduletas.

O sítio experimental localiza-se na Fazenda São Bento em Passo do Lontra (19° 34' S; 57° 01' W), município de Corumbá, MS, próximo à Base de Estudos do Pantanal, pertencente à Universidade Federal do Mato Grosso do Sul, localizada às margens do rio Miranda. Os dados utilizados foram coletados no Experimento Interdisciplinar do Pantanal (IPE - Interdisciplinary Pantanal Experiment) na campanha de setembro de 1999 (IPE-2), na estação seca.

A análise dos dados mostra uma provável interação entre um JBN micrometeorológico com a turbulência, levando a um valor positivo no fluxo de calor sensível.

43.35-P: Análise do Ambiente Convectivo na Região Sudoeste da Amazônia: Um Estudo de Caso

Eder Paulo Vendrasco, Instituto de Astronomia, Geofísica e Ciências Atmosféricas - USP, eder@master.iag.usp.br (Apresentador / Presenting)
Maria Assunção Faus da Silva Dias, Centro de Previsão de Tempo e Estudos Climáticos - INPE, assuncao@cptec.inpe.br

O estudo consistiu em analisar as características dinâmicas e termodinâmicas do sistema convectivo ocorrido durante o experimento DrytoWet/LBA através do cálculo dos resíduos da equação de balanço para o vapor d'água, vortacidade e termodinâmica. Foi feita uma análise para estabelecer a importância de cada termo das equações mencionadas e assim identificar os termos predominantes. Foram utilizados os dados de radiossondagens, os quais foram interpolados em níveis regulares de pressão e feita análise objetiva de Barnes. Mostrou-se que os termos de expansão diabática e advecção vertical de temperatura foram majoritários no resfriamento e aquecimento da atmosfera, enquanto que o termo de advecção horizontal de vortacidade absoluta e o termo de divergência do vento foram os principais responsáveis pelo resíduo da equação de vortacidade. Por outro lado, o balanço de umidade mostrou uma contribuição mais distribuída entre os termos. Todos os resíduos tiveram seu máximo em módulo por volta de 500 hPa, o que mostrou de acordo com os dados de refletividade do radar.

43.36-P: O Microclima do Manguezal de Bragança-PA

Marco Vieira Ferreira, ufpa, marco.98@bol.com.br (Apresentador / Presenting)
João Batista Miranda Ribeiro, ufpa, jbm@ufpa.br
Leonardo Deane de Abreu Sá, Museu Emílio-Goeldi, ldsa@museu-goeldi.br
Julia Clarinda Paiva Cohen, Ufpa, jcpcohen@ufpa.br
Mirlen Tássia Filgueira Silva, ufpa, mirlenfilgueira@yahoo.com.br

TÍTULO DO TRABALHO

O microclima do manguezal de Bragança-PA

As condições micrometeorológicas dos manguezais alteram-se em relação à latitude e sazonalmente em função da declinação solar, que provoca mudanças no balanço térmico e no balanço de energia pelas variações na radiação solar global incidente. As chuvas regionais exercem uma influência importante na dissolução dos sais marinhos baixando o seu conteúdo acumulado no substrato. Estas características nos levaram a caracterizar parcialmente o microclima do manguezal de Bragança-PA com base nos elementos meteorológicos descritos a seguir.

Para a medição das variáveis micrometeorológicas necessárias para a caracterização do microclima do manguezal, foi erguida uma torre de 25 m de altura, no topo da qual foi instalada uma estação meteorológica automática (EMA). Serão utilizados os dados de precipitação, velocidade e direção do vento, temperatura e umidade do ar, e radiação solar global, gerados no período de 2000 a 2003.

temperatura do ar. A amplitude térmica tem influência direta no ciclo biológico do mangue, que não assimila bem grandes amplitudes, acima de 5,0oC, em base horária e diária. A amplitude sazonal atinge 2,5oC, mostrando que há pouca variação na temperatura do manguezal.

A característica da umidade relativa do ar é de taxas elevadas, especialmente no período noturno, quando são frequentemente observadas formações de nevoeiro, após a meia - noite, perdurando muitas vezes até próximo ao amanhecer quando o nevoeiro torna-se mais denso. Durante o dia a concentração de umidade permanece elevada, isso graças à boa disponibilidade de água nos canais superficiais. Associado a este fator destaca-se as elevadas taxas de precipitação, principalmente concentradas entre janeiro e maio. Neste período ocorrem os maiores valores, atingindo uma máximo de 359 mm, no mês de março de 2001.

43.37-P: Análise de Múltiplas Escalas de Tempo Sobre a Atmosfera no Leste da Amazônia Durante o Experimento Cimela

Maria Isabel Vitorino, IAG/USP, ISABEL@MODEL.IAG.USP.BR (Apresentador / Presenting)

Leonardo Deane de Abreu Sá, MUSEU GOELDI/INPE, ldsa@museu-goeldi.br

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

Este trabalho visa a identificação das diversas escalas temporais de variabilidade atmosférica a leste da Amazônia, durante o experimento CIMELA (Circulações de Mesoescala a Leste da Amazônia), ocorrido no período de 24/10 a 17/11/2003.

Este, teve como meta principal a caracterização das circulações atmosféricas de mesoescala a partir de diferentes condições de superfície. A região de interesse é a da floresta nativa denominada de Caxiuanã, localizada a Nordeste do Pará. Os dados de reanálises do NCEP/NCAR (National Centers for Environmental Prediction/National Center for Atmospheric Research) foram utilizados com o intuito de avaliar os aspectos atmosféricos de grande escala e suas possíveis influências locais no período do experimento. A Transformada em Ondeletas (via Morlet Complexa) foi utilizada para determinar as escalas em que houve maior variabilidade das grandezas meteorológicas supramencionadas. A partir dos resultados obtidos, são propostas as explicações dinâmicas para os mesmos.

43.38-P: Análise estatística de variáveis meteorológicas em diferentes ecossistemas do litoral Atlântico da Amazônia

Wladimir José de Santis Jr., IAG-USP, desantis@model.iag.usp.br (Apresentador / Presenting)

Adilson Wagner Gandu, IAG-USP, adwgandu@model.iag.usp.br

Julia Clarinda Paiva Cohen, UFPA, jpcpcohen@ufpa.br

Iniciando com o Projeto DESMATA, e continuando com o INSTITUTO DO MILÊNIO LBA, foram implantadas estações automáticas de coletas de dados meteorológicos em três diferentes ecossistemas na região leste da Amazônia, próximas ao litoral do Atlântico. Essas estações estão instaladas em um campo natural (Soure), manguezal (Bragança), e floresta (Caxiuanã), com medidas contínuas de variáveis meteorológicas em intervalos de 10 a 60 minutos. Sendo coletados desde agosto de 2000, o conjunto desses dados representa uma importante fonte de informação para o estudo do clima e de sua variabilidade em três ecossistemas representativos da região leste da Amazônia. O tratamento estatístico desses dados poderá trazer importantes subsídios para o entendimento do funcionamento desses ecossistemas, que por sua vez, tem grande influência na variabilidade dos fluxos de carbono nessa região da Amazônia.

Este trabalho apresenta os resultados preliminares da análise estatística de algumas variáveis meteorológicas (temperatura e ventos) coletadas nas estações automáticas acima citadas. Os resultados são apresentados em termos de histogramas, valores médios e desvios padrões.

A análise mostra que a temperatura média nesses três sítios é da mesma ordem (26,5 a 27,5 °C), com maior desvio padrão em Caxiuanã. Observa-se também que os maiores (menores) valores de temperatura são registrados no período seco (chuvoso). Os ventos apresentaram maiores valores médios (3 m/s) nas estações do litoral (Soure e Caxiuanã), comparados com o valor médio observado sobre a floresta de Caxiuanã (1 m/s). Em termos de componentes do vento, a componente zonal (meridional) é mais intensa em Bragança (Soure).

43.39-P: Estudo da Variação Média Horária da Temperatura do Solo em Diferentes Profundidades em Manguezal Natural e Degradado (Período Menos Chuvoso)

Neri Ellen Fernandes Nóbrega, UFPA, garotadotempo@yahoo.com.br (Apresentador / Presenting)

Antônio Carlos Lôla da Costa, UFPA, lola@ufpa.br

Paulo Henrique Lopes Gonçalves, UFPA, phlg@ufpa.br (Apresentador / Presenting)

João Athaydes Silva Jr, UFPA, athaydes@ufpa.br

Alan Pantoja Braga, UFPA, alan_meteoro@yahoo.com.br

Rafael Ferreira da Costa, UFGC, rfcostampeg@bol.com.br

Patrick Meir, UEDIN, pmeir@ed.ac.uk

Yadvinder Singh Malhi, UEDIN, ymalhi@ed.ac.uk

A temperatura do solo apresenta um papel fundamental no comportamento da vegetação. Temperaturas do solo extremamente elevadas têm um efeito prejudicial sobre as raízes. Já as baixas temperaturas impedem a absorção de nutrientes minerais. O objetivo deste trabalho foi apresentar os resultados de um estudo da variação média horária da geotemperatura em diferentes níveis de profundidades em áreas de manguezal natural e degradado na região Nordeste do Estado do Pará. A pesquisa foi desenvolvida no município de Bragança - Pará, no período menos chuvoso da região, onde foram utilizadas estações meteorológicas automáticas localizadas em uma área de manguezal natural e outra de manguezal degradado, respectivamente. As profundidades utilizadas foram de 5cm, 20cm e 50cm. Observou-se que as maiores amplitudes térmicas foram encontradas na área de manguezal degradado, com mínimos de 1,2°C a 50 cm e máximos de 6,1°C a 5cm. Em relação ao manguezal natural, este apresentou temperaturas médias diárias relativamente constantes, com valores em torno de 27,0°C nas menores profundidades, enquanto que a 50 cm este valor foi de 22,6°C. Verificou-se que a variação média horária da temperatura do solo diminuiu com a profundidade. A variação da temperatura

do solo na área de manguezal natural é praticamente desprezível, sendo que as maiores porcentagens das trocas energéticas ocorrem a pequenas profundidades, não superiores a 20 cm. Este fato deve estar associado às características dos solos, além da influência das inundações periódicas proporcionadas pela ação das marés.

[PC_Cobertura_da_terra_\(PC_Land_Cover\)](#)

44.1-P: Estudo do Balanço de Radiação em Áreas de Pastagem e Floresta em Rondônia

Leonardo J. G. Aguiar, Universidade Federal de Rondônia, veraneiro@hotmail.com (Apresentador / Presenting)
Fabício Berton Zanchi, Universidade de São Paulo, fabricao@model.iag.usp.br
Renata Gonçalves Aguiar, Universidade Federal do Mato Grosso, rgaguiar@cpd.ufmt.br
Fernando Luiz Cardoso, Universidade Federal de Rondônia, cardoso@unir.br
Paulo Renda Anderson, Universidade Federal de Rondônia, paulorenda@ibest.com.br
Juliano Alves de Deus, Universidade Federal de Rondônia, julianoalde@yahoo.com.br
Kécio Gonçalves Leite, Universidade Federal de Rondônia, keciog@yahoo.com.br
Anderson Teixeira Telles, Universidade Federal de Rondônia, mecanicatelles@ibest.com.br
Antônio Ocimar Manzi, Instituto Nacional de Pesquisas da Amazônia, manzi@inpa.gov.br
Bart Kruijt, Alterra, bart.kruijt@wur.nl
Celso Von Randow, Alterra, celso.vonrandow@wur.nl
Edgar Martinez Marmolejo, Universidade Federal de Rondônia, edgar@unir.br

Por ser nossa principal fonte de energia disponível para a realização dos fenômenos físicos e biológicos, a radiação solar assume um importante papel na mudança do clima local, e entender este processo em uma região tropical é importante para determinar padrões climáticos em escala global, devido a grande disponibilidade de energia. Os dados de radiação solar e terrestre analisados em forma de médias diárias e mensais no ano de 2002 para a estação seca (junho a agosto), e estação chuvosa (janeiro a março), foram obtidos por sensores de radiação piranômetros e pirgeômetros Kipp & Zonen pertencentes ao Consórcio de Torres Brasil-União Européia (BR/EU LBA), que possui dois sítios experimentais em Rondônia, sendo um em área de pastagem situado na Fazenda Nossa Senhora (FNS), em Ouro Preto D'Oeste e outro em área de floresta tropical na Reserva Biológica do Jarú (REBIO), município de Ji-Paraná. Os resultados obtidos sugeriram que durante a estação seca o albedo na área de floresta foi de 13,1% e na área de pastagem de 21,3%, para a estação chuvosa os valores foram de 11,4% na área de floresta e 18,6% na área de pastagem. O saldo de radiação na floresta foi 11% maior que na pastagem, devido à maior refletividade da pastagem (albedo) à radiação solar incidente, sendo essa diferença mais acentuada na estação seca, o que sugere um melhor aproveitamento da energia disponível por áreas cobertas com florestas tropicais.

44.2-P: Intradiurnal variability of soil temperature, heat flux, and soil thermal diffusivity in different ecosystems in eastern Amazonian

Regina Célia dos Santos Alvalá, DMA-CPTEC-INPE, regina@cptec.inpe.br (Apresentador / Presenting)
Julia Clarinda Paiva Cohen, Departamento de Meteorologia - UFPA, jcpcohen@ufpa.br
Ralf Gielow, DMA-CPTEC-INPE, ralf@cptec.inpe.br
José Ricardo Santos de Souza, Departamento de Meteorologia - UFPA, jricardo@ufpa.br
Leonardo Deane de Abreu Sá, DMA-CPTEC-INPE, ldsa@museu-goeldi.br
Paulo Rogério de Aquino Arlino, DMA-CPTEC-INPE, paulo@cptec.inpe.br
Adilson Wagner Gandu, DCA-IAG-USP, adwgandu@model.iag.usp.br

Heat and moisture exchanges between the ground surface and the atmosphere are frequently dominant driving mechanisms for mesoscale circulations. These surface processes depend on the soil and surface characteristics, thus presenting spatial variation. Over land, significant diurnal changes of temperature and moisture balance near the interface with the atmosphere also occur. So, coupled models of heat and moisture transport in the soils near its surface require information about soil thermal properties, which are used to determine temperature profiles and heat flux in the soil. In particular over the Amazon region, a vast area has been changed into pasture or agricultural land, a change that produces significant alterations in the soil-vegetation-atmosphere interactions and, consequently, in the weather and climate. In the present work, the intradiurnal variability of soil temperature, heat flux and moisture content in eastern Amazonian are analyzed. The thermal diffusivity is iteratively obtained through a numerical solution of the heat conduction equation using soil temperature series. The measurements were collected within the Milênio-LBA program - Subproject UFPA, during the experiment CiMela ("Mesoscale Circulations in Amazonian East"), held during the dry period of 2003 in different ecosystems of the Pará State: (i) forest (Caxiunã Reserve, Melgaço - 01°42'30"S; 51°31'45" W); (ii) pasture (Soure, Marajó Island); (iii) natural mangrove (Tracuateua Island, Bragança); (iv) degraded mangrove (Tracuateua Island, Bragança); and (v) agricultural area (Fazenda Escola da Universidade Federal Rural da Amazônia, Igarapé Açu).

44.3-P: Variabilidade observada da umidade do solo em Floresta Tropical Úmida e Cerrado

Rogério Deitali Bruno, DCA/IAG/USP, rogerio@model.iag.usp.br (Apresentador / Presenting)
Humberto Ribeiro da Rocha, DCA/IAG/USP, humberto@model.iag.usp.br
Helber Custódio de Freitas, DCA/IAG/USP, helbercf@model.iag.usp.br
Robinson Isaac Negrón Juárez, DCA/IAG/USP, robinson@model.iag.usp.br
Scott Dennis Miller, UCI, sdmiller@uci.edu
Michael L. Goulden, UCI, mgoulden@uci.edu
Oswaldo M. R. Cabral, CNPMA/EMBRAPA, ocabral@cnpma.embrapa.br

Padrões da variabilidade espaço-temporal da umidade do solo com médias de 30 min de dados contínuos de Reflectometria no Domínio da Frequência (Campbell CS615), coletados em áreas de floresta tropical úmida e cerrado restrito, são analisados e comparados.

Os dados foram coletados em dois perfis profundos (10 m) localizados na área de Floresta da Floresta Nacional do Tapajós - km 83 (área de clareira e área coberta), em Santarém/PA, e em um perfil de 2,5 m sob Cerrado no Parque Estadual de Vassanunga, Gleba Pé-de-Gigante, em Santa Rita do Passa Quatro/SP. Os dados foram convertidos em conteúdo de umidade volumétrica através de calibração realizada em laboratório por gravimetria automática de amostras de solo não deformadas. As curvas foram derivadas de ajuste não linear com função sigmoide, ao invés de funções polinomiais sugeridas pelo fabricante, aumentando a exatidão da estimativa da umidade do solo. Discute-se a variabilidade sazonal e do ciclo diurno e a variabilidade vertical da umidade do solo, sendo possível observar claramente padrões de secagem e de recarga hídrica ao longo de todo o perfil. Parâmetros característicos de cada tipo de solo (água disponível, capacidade de campo etc) e fenômenos físicos (drenagem, ascensão capilar etc) foram estimados e quantificados. A estimativa da evapotranspiração através da variação da umidade do solo foi comparada com médias de fluxo de calor latente estimadas pelo método de *eddy correlation*, nas torres das áreas experimentais, o que sugeriu uma noção sobre a zona efetiva de extração da água nos biomas estudados.

44.4-P: Dissociação das Propriedades do Solo da Vegetação no Esquema de Superfície SSiB e seu Impacto no Balanço Hidrológico da Amazônia

Luiz Antonio Candido, CPTEC/INPE, lcandido@cptec.inpe.br (Apresentador / Presenting)

Javier Tomasella, CPTEC/INPE, javier@cptec.inpe.br

Manzi Antonio Ocimar, INPA, manzi@inpa.gov.br

Carlos Afonso Nobre, CPTEC/INPE, nobre@cptec.inpe.br

Embora os atuais modelos de circulação geral da atmosfera estejam acoplados a esquemas de superfície mais sofisticados, a inicialização da umidade do solo ainda é especificada através de climatologias geradas por modelos simples de balanço hídrico. A utilização destas climatologias de umidade do solo na inicialização dos modernos esquemas de superfície promove erros de inconsistência física. Alternativas foram adotadas, por exemplo, por Sato et al., (1989) e Manzi e Planton (1994), que aplicaram procedimentos específicos para adaptar estas climatologias a valores apropriados aos seus esquemas de superfície. A consequência da aplicação destas metodologias é que a condição inicial de umidade do solo é alterada pelos parâmetros de superfície atribuídos em função da distribuição dos biomas considerados, de tal forma que experimentos de impacto da mudança de vegetação no clima, ao substituir um bioma por outro, poderão modificar a umidade do solo cuja influência incrementará o efeito da mudança do bioma. O objetivo é avaliar o impacto que a representação mais realista das propriedades do solo pode promover na representação do ciclo hidrológico da Amazônia. Os experimentos realizados com o MCGA foram: 1) propriedades do solo definidas em função do mapa de vegetação; 2) propriedades do solo derivadas de dados pedológicos. A comparação com os mapas de propriedades do solo mostra a inclusão de variações espaciais mais realistas. As variáveis do ciclo hidrológico mostram-se bastante sensíveis a esta nova representação de propriedades dos solos.

44.5-P: Mudanças no clima regional devido as modificações recentes da cobertura vegetação Amazônica

Francis Wagner Silva Correia, INPE, francisw@cptec.inpe.br (Apresentador / Presenting)

Regina Célia dos Santos Alvalá, INPE, regina@cptec.inpe.br

Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br

No decorrer das últimas décadas o território brasileiro, como um todo, tem apresentado diferentes transformações no padrão espacial e de uso e cobertura da terra, as quais vão desde altas taxas de desflorestamento da floresta tropical na região Norte a desertificação no Nordeste. Essas diferentes transformações ocorridas na cobertura da superfície, associadas às práticas de uso da terra, exercem uma grande influência na hidrologia, clima e ciclos biogeoquímicos em diferentes regiões do Brasil. A Bacia Amazônica contém aproximadamente 60% das florestas tropicais restantes no mundo e desempenha papel fundamental na manutenção da biodiversidade, clima e hidrologia regional, e armazenagem de carbono terrestre. A região amazônica brasileira tem apresentado nas últimas décadas as maiores taxas de desflorestamento, com média de 2 milhões de hectares por ano. Diante das constantes modificações que vêm ocorrendo no uso da terra nesta região, algumas questões podem ser levantadas, tais como: Essas mudanças poderiam causar impactos no clima? E, quais seriam estes impactos? Em resposta a estas questões um grande número de estudos tem usado modelos de circulação geral da atmosférica (MCGA) para examinar os possíveis efeitos do desmatamento amazônico de grande escala no clima regional e global. Todos esses experimentos com MCGA mostraram um significativo aumento da temperatura da superfície e diminuição da evapotranspiração sobre a bacia após os desflorestamentos. Diante desses resultados, uma outra questão a ser abordada refere-se a inclusão nos modelos de uma cobertura vegetal mais realista da Amazônia, e consequentemente a avaliação dos efeitos climáticos que ela gera nos modelos. Dessa maneira, resultados de simulações com modelos de circulação geral (MCG/CPTEC) e regional (Eta/CPTEC) da atmosfera, utilizando informações mais realistas da cobertura vegetal da Amazônia brasileira (incluindo desflorestamento recente do projeto PROVEG do CPTEC/INPE) serão apresentadas. No intuito de melhorar a representação dos processos da superfície continental nesses modelos os parâmetros do Simplified Simple Biosphere Model (SSiB), acoplado a eles, foram calibrados com dados micrometeorológicos de pastagem e floresta de Terra Firme obtidos no LBA.

44.6-P: Investigation of South American Land/Atmosphere Interactions Using the Regional Eta/ssib Model

Fernando Henrique De Sales, University of California Los Angeles, fsales@ucla.edu (Apresentador / Presenting)

Yongkang Xue, University of California Los Angeles, yxue@geog.ucla.edu

The NCEP Eta model coupled with a biosphere model, SSiB, was set up over the South American continent to study the role of land/atmosphere interactions in the South American hydrometeorology and regional climate predictability. NCEP Reanalysis and NCEP GCM output were used as initial and lateral boundary conditions for 3-month regional integrations. Sea surface temperature, sea ice concentration and snow cover were updated daily during the simulation.

Results were compared to GCM and Reanalysis data as well as to observation to evaluate the dynamic downscaling of the regional climate model in regional hydrometeorological study. To understand the predictability, a series of sensitivity studies has been designed to explore the role of variety of factors in water cycle simulations. These factors include domain size, horizontal resolution, different lateral boundary conditions and different convective scheme.

Preliminary results indicate the regional model was able to capture most of the features of precipitation distribution over Brazil as well as to improve atmosphere circulation simulations when compared to the GCM results and reanalysis data. Although rainfall magnitudes were not perfectly reproduced, the model properly simulated the maximum precipitation region over the southern part of Brazil and the dry areas elsewhere during the dry season period.

The study shows the importance of a regional model and the proper land surface processes representation in the South American rainfall simulation and the role of more realistic boundary condition description in predicting its regional climate.

44.7-P: Simulação do desmatamento no leste da Amazonia usando um modelo de alta resolução

Adilson Wagner Gandu, IAG-USP, adwgandu@model.iag.usp.br (Apresentador / Presenting)

Julia Clarinda Paiva Cohen, CG-UFPA, jcpcohen@ufpa.br

José Ricardo S. de Souza, CG-UFPA, jricardo@ufpa.br

Para avaliar os possíveis efeitos do desmatamento nas condições climáticas da região leste da Amazonia, foram feitas simulações numéricas com um modelo de alta resolução espacial, que leva em conta as características fisiográficas da região, tais como a topografia, linha da costa e grandes rios dessa região.

Os resultados mostraram importantes aspectos associados aos efeitos de mesoescala que não são tipicamente representados em simulações similares com Modelos de Circulação Geral. Próximo às zonas costeiras e ao longo dos grandes rios, o desmatamento resulta em uma diminuição da nebulosidade e da precipitação. Porém, aumento de nebulosidade e de precipitação foi previsto sobre áreas elevadas, especialmente nas encostas de montanhas dos vales dos rios. Os fluxos de calor sensível e de calor latente em superfície apresentam tanto anomalias positivas quanto negativas.

As magnitudes dessas anomalias foram maiores durante a estação menos chuvosa. A velocidade do vento próxima à superfície foi a variável meteorológica que teve a mudança mais significativa devido ao desmatamento. A redução no coeficiente de rugosidade resultante da substituição da floresta por pastagem produziu um aumento da velocidade do vento próxima à costa Atlântica. As maiores velocidades do vento diminuem a convergência de umidade e, conseqüentemente, reduzem os totais de precipitação nessa região.

Os resultados obtidos dessas simulações de alta resolução mostram que, em geral, a orografia, linha da costa, e distribuição dos grandes rios tem um importante papel na determinação das anomalias de precipitação, ventos e trocas de energia associadas com o desmatamento no leste da Amazonia.

44.8-P: High Resolution Numerical Simulation of the Deforestation Impact in the Cuiba/Santarem Region

Adilson W. Gandu, IAG/USP, adwgandu@model.iag.usp.br (Apresentador / Presenting)

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

Demerval S. Moreira, IAG/USP, demerval@master.iag.usp.br

Several numerical studies have been performed in the last decade on the possible impact of deforestation in the Amazon. However, due to the constraints related to computational power, most studies have considered uniform deforestation over the whole Amazon, a rather unrealistic situation. On the other hand, some numerical studies with higher resolution models have indicated that the mesoscale circulations associated with the pasture/forest contrasts may lead to an increase in the precipitation, an effect opposite to the prevailing decrease of precipitation in the large scale deforestation. The main objective of this work is to evaluate the regional impact of deforestation using idealized scenarios of deforestation along the Cuiba/Santarem highway. The RAMS model is used at a resolution of the order of 15 km in order to study the combined effect of topography, land use, inundated areas and coastal shape in the regional climate. Two experimental settings are discussed. The first is based on short term integrations, with initial condition at rest in order to identify the role of local topographical and land use forcing. The second set is a year long simulation, forced by the coarse resolution reanalysis with the current pasture area substituted by forest and the same type of simulation with the current pasture-forest distribution. Future experiments will be performed with possible future scenarios of deforestation.

44.9-P: Variações micrometeorológicas foram observadas entre área de manguezal natural e área desmatada, durante o experimento do CiMeLa

João Batista Miranda Ribeiro, PC, jbmri@ufpa.br (Apresentador / Presenting)

Paulo Jorge Souza, PC, pjosouza@aol.com (Apresentador / Presenting)

Mirlen Tássia Filgueira Silva, PC, mirlenfilgueira@yahoo.com.br (Apresentador / Presenting)

Marco Antônio Ferreira, PC, marco98@bol.com.br (Apresentador / Presenting)

O manguezal de Bragança-PA compreende uma área de, aproximadamente, 120 km², porém o desmatamento do manguezal vem aumentando consideravelmente, facilitado pela estrada que liga Bragança à praia de Ajuruteua, atravessando inteiramente os manguezais. Como as condições climáticas da região equatorial diferenciam-se de outras latitudes, caracterizadas principalmente por índices pluviométricos elevados, relacionados com altas taxas de evapotranspiração e temperatura do ar, é importante estudarmos a resposta dos ecossistemas de manguezais às condições climáticas e qual o papel desempenhado pelos manguezais quanto ao equilíbrio climático. Especificamente, a região costeira do Pará é muito carente no que concerne à uma base de dados micrometeorológicos que caracterizem a existência dos manguezais e sua interação com a atmosfera. Dentro desse ecossistema, muitas áreas foram desmatadas, ocorrendo clareiras com cerca de 4 km². As alterações no comportamento micrometeorológico está sendo analisado em função deste desmatamento. Tomando como base os estudos de RIBEIRO (2000), o qual percebeu cerca de 2oC de aumento na temperatura do ar e transportes de calor no solo de cerca de 60 W.m² na área de clareira. Os dados foram coletados de estações meteorológicas automáticas e abrangem o período de 27 de outubro a 15 de novembro de 2003.

44.10-P: Fluxos de massa e energia em área de reflorestamento em função do crescimento da vegetação

Kelli Cristina Aparecida Munhoz, UNEMAT - Universidade do Estado de Mato Grosso, kwmm@terra.com.br (Apresentador / Presenting)

Nicolau Priante Filho, UFMT - Universidade Federal de Mato Grosso, nicolaup@terra.com.br

Sérgio Roberto de Paulo, UFMT - Universidade Federal de Mato Grosso, sergio@cpd.ufmt.br
José de Souza Nogueira, UFMTUFMT - Universidade Federal de Mato Grosso, nogueira@cpd.ufmt.br
Luciana Sanches Souza, UFMTUFMT - Universidade Federal de Mato Grosso, lsanches@cpd.ufmt.br
George Louis Vourlitis, California State University San Marco, georgev@csusm.edu

A mudança em grande escala da cobertura do solo pode causar alterações no clima de uma região, causadas pelas alterações nos fluxos de massa e energia. Devido às altas taxas de desmatamento da Amazônia nas últimas décadas, que podem estar alterando o clima regional ou mesmo mundial, o reflorestamento é considerado uma das alternativas para minimizar os impactos negativos do desmatamento desordenado. Na Amazônia, entretanto, há falta de informações sobre os fluxos de massa e de energia em áreas de reflorestamento, e de que forma tais fluxos se comportam em função do crescimento da vegetação. O objetivo desta pesquisa foi a determinar a variação temporal dos fluxos de calor sensível, latente e CO₂ em função do crescimento da vegetação em uma área de reflorestamento (com 14 espécies nativas e 1 exótica), através do método de covariância de vórtices turbulentos. O experimento foi realizado na Fazenda São Nicolau, localizada no município de Cotriguaçu, nas proximidades do marco 9º 51,73' S: 58º 13,81' W, utilizando os dados coletados em uma área de pastagem que está sendo reflorestada. A pesquisa foi realizada ao longo de dois anos consecutivos (março de 2002 a setembro de 2003). Os resultados indicaram que não houve diferença significativa entre 2002 e 2003 para os fluxos de calor sensível, latente e de CO₂. Esse comportamento pode ser atribuído ao fato da pastagem na região ser vigorosa, e que o crescimento mudas no período não ter sido suficiente para interferir nos fluxos.

44.11-P: Impactos Climáticos Associados à Cenários Futuros de Desmatamento da Floresta Amazônica

Gilvan Sampaio, INPE/CPTEC, sampaio@cpotec.inpe.br
Carlos Afonso Nobre, INPE/CPTEC, nobre@cpotec.inpe.br (Apresentador / Presenting)
Luiz Antônio Cândido, INPE/CPTEC, lcandido@cpotec.inpe.br

A Comunidade Científica nas últimas décadas têm estudado as interconexões entre os ecossistemas terrestres e a atmosfera. Há grande interesse de como as mudanças nos ecossistemas terrestres podem afetar a atmosfera. Uma das manifestações mais óbvias das interações da atmosfera com o ecossistema é a relação entre o padrão global da cobertura de vegetação e o clima. O clima é o fator que mais influencia na determinação da distribuição de vegetação e suas características num contexto global (Prentice, 1990). A localização de desertos, florestas tropicais, entre outras, é ditada pelas características do clima. Todavia, os tipos bioclimáticos além de serem utilizados para classificação do clima, também podem servir para definir relações entre a vegetação e o clima. Por outro lado, mudanças na estrutura da vegetação também podem ter significativa influência no clima, estabelecendo assim uma relação de interação mútua.

Muitos autores discutiram os possíveis efeitos do desflorestamento tropical nos processos do clima global. Estudos de modelagem utilizando MCGA têm considerado a sensibilidade do sistema climático para uma completa conversão da floresta Amazônica para pastagem (Dickinson and Henderson-Sellers, 1988; Shukla et al. 1990; Nobre et al., 1991, Henderson-Sellers et al., 1993). Estudos de sensibilidade utilizando modelos climáticos têm claramente estabelecido a importância das florestas tropicais em influenciar o clima da Terra. O presente trabalho avalia os impactos da conversão da floresta Amazônica para savana, utilizando-se dois cenários distintos, sendo: 1) cenário de desmatamento projetado para o ano de 2033 (Woods Hole Research Center). Neste caso, as regiões desmatadas foram consideradas como savana, e 2) toda a floresta amazônica foi convertida para savana. Os resultados indicam que há um aumento significativo da temperatura superficial e uma redução da evapotranspiração. É também feita uma análise do padrão de precipitação obtido utilizando-se os dois cenários.

44.12-P: Impacto da Utilização de Diferentes Esquemas de Superfície na Previsão Regional do Modelo Eta

José Roberto Rozante, CPTEC/INPE, rozante@cpotec.inpe.br (Apresentador / Presenting)
Luiz Antonio Candido, CPTEC/INPE, lcandido@cpotec.inpe.br
Simone Shizue Tomita, CPTEC/INPE, tomita@cpotec.inpe.br

Como parte de um esforço do CPTEC em unificar o uso do avançado esquema de superfície SsiB nos modelos regional e global, o modelo Eta acoplado ao SsiB é avaliado em comparação a sua versão operacional acoplada ao esquema OSU. O Eta-SsiB foi utilizado em vários estudos, tais como previsões de tempo e sazonais mostrando bom desempenho. O objetivo deste trabalho é avaliar o modelo Eta-SsiB em comparação ao Eta-OSU e discutir o impacto nas previsões associado com o uso de diferentes esquemas de superfície. As duas versões foram aninhadas ao modelo global de previsão de tempo de alta resolução (T126L28) e que usa o esquema de superfície SsiB. A partir destes estudos é possível avaliar a importância da consistência dos estados iniciais da superfície e da física do modelo de superfície para previsão regional. Os resultados das integrações dos modelos Eta-SsiB e Eta-OSU, realizadas para dezembro, janeiro e fevereiro de 2003, são analisados e comparados com observações de precipitação e temperatura do ar próximo a superfície. O "skill" dos modelos referente aos campos atmosféricos é avaliado com os dados de reanálise.

44.13-P: Measuring Vegetation Aerodynamic Roughness Over the Amazon Basin

Sassan S. Saatchi, JPL/CALTECH, saatchi@congo.jpl.nasa.gov (Apresentador / Presenting)
Regina Célia dos Santos Alvalá, CPTEC/INPE, regina@cpotec.inpe.br
Scott A. Denning, Colorado State Univ., denning@atmos.colostate.edu

The aerodynamic roughness length (Z₀) is an important parameter to determine the vertical gradients of mean wind speed and the conditions for momentum transfer over a vegetated or bare rough surface. Over vegetated surfaces, the aerodynamic roughness length has a simple one-to-one relationship with the rms height of the vegetation at the top of the canopy. Once this roughness length is determined for a surface, it does not change with wind speed, stability or stress. During the LBA experiment the Regional Atmospheric Modeling System (RAMS) with flexible horizontal and vertical resolution will be used in conjunction with other models to simulate the atmospheric circulation and trace gas concentration and transport at various scales. This model is suitable to determine the effect of surface roughness parameter at trace gas transport both at local level for LBA study areas and on at the regional level for the entire Amazon basin. In this paper, we present the estimation of this parameter from data fusion of several remote sensing and ground data. SRTM (Shuttle Radar Topography Mission) data at 3 arc-sec resolution, texture maps derived from JERS-1 L-band

radar system, vegetation cover types are the main spatial data sets used in data fusion. A semi-empirical algorithm relating these surface parameters to the rms height of the vegetation and the aerodynamic roughness was developed. This algorithm was applied to the entire SRTM data to estimate the roughness length over the basin at 1 km resolution.

44.14-P: Impacts of Land-Cover Change on the Hydrometeorology of the Amazon

Renato Ramos da Silva, Duke University, renato@duke.edu (Apresentador / Presenting)

Roni Avissar, Duke University, avissar@duke.edu

Hydroclimate change resulting from the replacement of natural forest by degraded vegetation in the Amazon has yet to be fully understood and quantified. In this study the Regional Atmospheric Modeling System (RAMS) is used to understand and quantify the impacts of deforestation on the hydrometeorology of the Amazon basin during the wet season. Three scenarios of land covers are considered: (1) current vegetation; (2) original forest, before massive deforestation was initiated in the Amazon basin; and (3) degraded land-cover as a result of deforestation expansion as estimated by Nepstad et al. Special attention is paid to convection, cloud formation and rainfall distribution. Results indicate a significant impact of land-cover change on the amount and spatial distribution of precipitation during the wet season in Rondonia.

44.15-P: Clima e Fluxos de Superfície-Atmosfera Sobre Cerrados Seco e Alagável

Rafael Nora Tannus, USP, tannus@model.iag.usp.br (Apresentador / Presenting)

Humberto Ribeiro da Rocha, USP, humberto@model.iag.usp.br

Helber Custódio de Freitas, USP, helbercf@model.iag.usp.br

Robinson Isaac Negrón Juárez, USP, robinson@model.iag.usp.br

Rogério Bruno, USP, rogerio@model.iag.usp.br

Leuda da Silva Oliveira, USP, leuda@model.iag.usp.br

Oswaldo M. R. Cabral, EMBRAPA, ocabral@cpma.embrapa.br

Rita Maria Ribeiro, Instituto Ecológica, rrmribeiro@ruralnet.com.br

Dariusz Kurzatkowski, Instituto Ecológica, kurzatkowski@hotmail.com

Stefano Merlin, Instituto Ecológica, merlinecológica@uol.com.br

Erich Collicchio, UNITINS, ecollicchio@uol.com.br

O bioma Cerrado apresenta diversas fisionomias, dos campos às formações florestais. Cada fisionomia possui um nível de funcionamento ecológico e consequentemente uma forma diferente de interagir com a atmosfera, sob variantes condições climáticas. A compreensão dos mecanismos de funcionamento de cada fisionomia é fundamental para entendimento do bioma, e para sua previsibilidade, sob indicadores como sustentabilidade, vulnerabilidade e adaptabilidade, diante de questões como mudanças climáticas e mudanças de uso da terra.

Este trabalho compara observações climáticas e micrometeorológicas de fluxos turbulentos de superfície sobre duas áreas, o Cerrado Sensu Stricto (seco), localizado em Santa Rita do Passa Quatro, SP, e um Cerrado (ecótono) (alagável), na Ilha do Bananal.

É esperado que a vegetação dos Cerrados esteja mais vulnerável e com variantes estados fenológicos durante períodos de estresse fisiológico, o que torna estes períodos uma época chave para estudos de funcionalidade. É esperado que o nível de estresse se acentue durante o período mais seco e o período de alagamento, respectivamente.

Através de dados obtidos com torres micrometeorológicas equipadas com sistemas de eddy-covariance, compararemos variáveis como os fluxos de superfície, umidade do solo, eficiência do uso da água e produtividade, bem como, descrever o ambiente no qual ambos os ecossistemas se encontram, através da análise do balanço hídrico, saldo de radiação e temperatura. Através da utilização de um modelo classe SVAT (SiB2) calibrado para as áreas experimentais, foram feitos testes de sensibilidade voltados ao estudo das transformações fisionômicas e critérios de vulnerabilidade.

[PC_Modelagem \(PC_Modeling\)](#)

45.1-P: Two-dimensional Pattern of Forecast Model Drift in the Amazon Basin

José Antonio Aravequia, CPTEC / INPE, araveq@cptec.inpe.br (Apresentador / Presenting)

Pedro Leite Silva Dias, IAG / USP, pldsdias@master.iag.usp.br

The precipitation forecast drift (bias) at several time intervals of the CPTEC and the NCEP global models were computed for the period of 1997-1999. The CPTEC model shows less precipitation than the observations in the Amazon Basin during the summer, indicating that the model is not able to sustain enough convective forcing. As a result of the precipitation negative bias it is shown that the upper air flow develops a cyclonic drift. The NCEP model tends to overestimate the precipitation in the northern portion of the basin and underestimate in the central and southern portions. This pattern is shown to be related to the precipitation bias in the Andes. The causes of the precipitation bias are partially related to the convective parameterization and numerical constraints associated with the numerical treatment of steep orography. Both models indicate that there is a significant intraseasonal (20-60 day) signal in the precipitation bias of the 120hr forecast in the Amazon region which is shown to be related to the Madden Julian oscillation. Thus, there are periods of higher predictability of the precipitation and periods of lower predictability with period of the order of 20-60 days.

45.2-P: The CPTEC global model bias in the Amazon region: results of long term simulations and predictive skill in seasonal forecasting.

Helio Camargo, CPTEC/INPE, helio@cptec.inpe.br (Apresentador / Presenting)

Pedro Leite Silva Dias, CPTEC/INPE - IAG/USP, pldsdias@master.iag.usp.br

José A. Marengo, CPTEC/INPE, marengo@cptec.inpe.br

Anete Fernandes, CPTEC/INPE, anete@cptec.inpe.br

Lincoln Muniz, CPTEC/INPE, lincoln@cptec.inpe.br

Nuri Calbete, CPTEC/INPE, nuri@cptec.inpe.br
Christopher Castro, CPTEC/INPE, castro@cptec.inpe.br
Ana Paula Maletba, CPTEC/INPE, malerba@cptec.inpe.br
Ana Cláudia Araújo Preste, CPTEC/INPE, anaprest@cptec.inpe.br

Operational Seasonal forecasts have been issued by the Center for Weather Forecasting and Climate Studies (CPTEC) based on an Atmospheric General Circulation Model (AGCM - spectral resolution T62 and 28 vertical levels) since 1995. These runs are performed in two different modes: the first mode assumes that the Sea Surface Temperature anomalies (SSTA) is persisted during the 8 month integration; the second mode is based on the SSTA produced by the NCEP Equatorial Pacific coupled model and/or CPTEC's Tropical Atlantic Canonical Correlation model and persisted SST anomalies elsewhere. The evaluation of the CPTEC AGCM reference skill is based on a 50 year simulation forced by the observed SSTA (1952-2001) with 9 members of the ensemble (which differ by the choice of different initial conditions).. Simple statistical analysis for the Amazon was performed. Results show that even though acceptable and statistically significant linear correlation values were found for northern Amazon for March-April-May (MAM) concerning on the long term simulation, interannual variability shows positive and negative bias, comparing to Xie-Arkin observed precipitation. Considering the last few operational forecasts, results show a positive biased signal for northern Amazon. In the southern portion of the region although the last forecasts captured the observed negative anomalies, no statistically significant correlation values were found for the rainy season (December-January-February - DJF). An analysis of the last 7 years performance of the operational forecasting is also presented.

45.3-P: Proposta de uma Metodologia de Inicialização da Umidade do Solo para a Previsão de Tempo Regional

Luiz Antonio Candido, CPTEC/INPE, lcandido@cptec.inpe.br (Apresentador / Presenting)
Gilvan Sampaio de Oliveira, CPTEC/INPE, sampaio@cptec.inpe.br
Carlos Afonso Nobre, CPTEC/INPE, nobre@cptec.inpe.br

A sazonalidade do armazenamento da água no solo pode induzir um "efeito memória" de longo período na variabilidade atmosférica. Isto implica que a inicialização errônea da umidade do solo no modelo meteorológico, pode causar inconsistências nos fluxos de calor à superfície. A qualidade da previsão pode ser afetada, justificando a necessidade de informações de umidade do solo mais "realistas" para inicializar tais modelos. Propõe-se uma metodologia, baseada na versão acoplada do modelo Eta-SSiB e na versão "offline" do mesmo esquema de superfície (SSiB) adotado na versão acoplada, no intuito de gerar um campo de umidade do solo mais consistente. As forçantes atmosféricas utilizadas no módulo "offline" são uma combinação de variáveis atmosféricas simuladas pelo módulo acoplado e a precipitação observada, que permite uma melhor estimativa do balanço de água no solo, em termos de heterogeneidade e confiabilidade. A aplicação desta nova condição de água no solo foi testada na previsão de tempo do modelo operacional Eta do CPTEC, nos meses de dezembro de 2002 a fevereiro de 2003. Os resultados obtidos para um evento de ZCAS mostrou que a nova condição de umidade do solo contribuiu para reduzir o excesso de precipitação, sistematicamente presente nas previsões. O impacto na precipitação foi, possivelmente, ocasionado pela alteração da estabilidade atmosférica, associada a variação da condição hídrica da superfície, e não pelo mecanismo de reciclagem da umidade atmosférica. Estes resultados promissores sugerem que a representação mais adequada da condição hídrica do solo pode ser uma ferramenta importante na intensificação da aplicação da previsão de tempo na agricultura e no monitoramento hidrológico de bacias.

45.4-P: Circulações de Mesoescala no Leste da Amazônia - CiMeLa

Julia Cohen, UFPA, jpc Cohen@ufpa.br (Apresentador / Presenting)
Regina Célia dos Santos Alvalá, INPE, regina@cptec.inpe.br
Adilson Gandu, USP, adwgandu@model.iag.usp.br
Leonardo Deane de Abreu Sá, INPE/MPEG, ldsa@museu-goeldi.br
Galdino Mota, UFPA, galdinov@ufpa.br
Maria Isabel Vitorino, USP, isabel@model.iag.usp.br
Paulo Arlino, INPE, paulo@cptec.inpe.br
João Batista Miranda Ribeiro, UFPA, jbmrr@ufpa.br
Isa Maria Silva, UFPA, imos@ufpa.br
Edson José Paulino Rocha, UFPA, eprocha@ufpa.br
Jose Paulo Costa, UFPA, jpaulo@ufpa.br
Jose Danilo Souza Filho, UFPA, danilofilho@ufv.br
Jose Ricardo Souza, UFPA, jricardo@ufpa.br
Paulo Jorge Oliveira, UFPA, pj@ufpa.edu.br

No escopo do projeto Milênio-LBA - Subprojeto UFPA realizou-se, no período menos chuvoso (27/10 a 15/11/2003), uma campanha no leste da Amazônia para avaliação do impacto dos diferentes ecossistemas nas circulações locais e de mesoescala. Nessa campanha, denominada "Circulações de Mesoescala no Leste da Amazônia" (CiMeLa), coletaram-se dados meteorológicos em diferentes ecossistemas do Estado do Pará: Bragança (manguezal natural e degradado), Soure (campos do Marajó), Igarapé Açu (agricultura) e Caxiuanã (floresta primária).

Os dados coletados estão sendo utilizados para avaliar a influência das circulações locais e de mesoescala geradas devido à heterogeneidade das superfícies, as quais são caracterizadas por diferentes tipos de vegetação e por contrastes terra/água, buscando entender o papel dessas circulações sobre os fluxos de energia, de água e de carbono no manguezal natural e de floresta.

Além da coleta de dados por estações meteorológicas automáticas, das medidas de fluxos de calor e de umidade e de perfis verticais do vento em diferentes níveis, foram feitas radiossondagens e gravadas imagens de satélite de alta resolução. As radiossondagens foram lançadas simultaneamente em Bragança e em Caxiuanã a cada 6 horas, com intervalo alterado para 3 horas nos últimos cinco dias da campanha. Medidas de fluxo de calor, de temperatura e de umidade no solo foram coletadas em todos os ecossistemas considerados. O conjunto de dados está sendo utilizado para o estudo dos aspectos observados, assim como estão sendo feitas simulações numéricas com modelo de alta resolução para entendimento da influência de brisas lacustre e marinha no leste da Amazônia.

45.5-P: On the performance of the Meso Eta regional weather forecast model in Rondonia

Jorge Luís Gomes, CPTEC/INPE, gomes@cptec.inpe.br

Josiane F. Bustamante, CPTEC/INPE, josiane@cptec.inpe.br

Margarete O. Domingues, LAC/INPE, margarete@lac.inpe.br (Apresentador / Presenting)

During dry-to-wet season in RACCI-LBA campaign in september-october, 2002 the regional weather forecast model Meso Eta was used to predict synoptic and meso-scale events in Rondonia. This model has a higher order spatial resolution, 15 km, than the Eta/CPTEC operational model, 40 km. To verify the performance of Meso Eta, we study two meso-scale convectivity systems and squall lines that cross Rondonia state in 8th of October and compare the results we obtained with it to Eta/CPTEC and National Centers for Environmental Prediction (NCEP) analysis, satellite images and other data sets from this campaign.

45.6-P: Data Assimilation using RPSAS during the experiment of LBA, October, 15 to 29 2002

Elizabeth Silvestre Espinoza, Centro de Previsão de Tempo e Estudos Climáticos - CPTEC/INPE, elizabet@cptec.inpe.br (Apresentador / Presenting)

Rosângela Saher Cintra, Centro de Previsão de Tempo e Estudos Climáticos - CPTEC/INPE, rcintra@cptec.inpe.br

The analysis system implemented at CPTEC to regional Eta model to obtain the initial condition using the Regional Physical-space Statistical Analysis System (RPSAS) developed at Global Modeling and Assimilation Office (GMAO), from GSFC/NASA. The inclusion of the data from LBA campaign have an impact to weather forecast. The Eta model was integrated daily for the 00, 06, 12 and 18 GMT using as initial condition from analyses of the RPSAS, with radiosondes data from LBA experiment during October, 15 to 29, 2002. This paper presents the results of comparison between the analysis fields from RPSAS and SSI/NCEP analysis for geopotential height, humidity and wind to levels 850, 500 and 250 hPa to South America. The evaluation of the impact of weather forecast is realized using the prediction of the precipitation for 24, 48 and 72 hours, and compared with prediction using operational regional Eta model at CPTEC.

45.7-P: Data Assimilation Impact on the Moisture Transport from the Amazon to the Plata Basin

Dirceu Luis Herdies, CPTEC/INPE, dirceu@cptec.inpe.br (Apresentador / Presenting)

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

The assimilation system at CPTEC is performed using the Physical-space Statistical Analysis System (PSAS), both in the Atmospheric Global Circulation Model and the Regional Model. This scheme solves analysis equations globally, thus eliminating the local approximation and data selection of the optimal interpolation (OI) schemes. PSAS is comparable to the global variational spectral analysis system, but unlike spectral analysis schemes, it works directly in physical space. It minimizes an objective function with the control variable defined in observation space. During the SALLJEX (South American Low-level Jet Experiment) experiment, six radiosonde data were added to the normal dataset which comprises the GTS, ATOVS, TPW and QuikScat data. These radiosondes were operating in an area which was not covered by the operational measurements, the area of the Low Level Jet occurrence. Thus, a better description of the moisture flux from the Amazon to the south is expected to be accomplished. The objective is to show the impact of assimilating these additional data in the analysis system during the SALLJEX, and to show the impact on the magnitude of the moisture flow, using the CPTEC Global model. The results show that there is an intensification of the LLJ and a small shifting of its center towards west and an increase of the humidity in the area of the LLJ.

45.8-P: Sensibilidade do clima no Sudeste do Brasil devido às mudanças do uso da terra

Robinson Isaac Negrón Juárez, USP, robinson@model.iag.usp.br (Apresentador / Presenting)

Humberto Ribeiro da Rocha, USP, humberto@model.iag.usp.br

É discutido um experimento numérico realizado com o modelo atmosférico RAMS, simulando o clima sobre o Sudeste do Brasil durante um ano, testando-se dois cenários distintos: o primeiro refere-se às condições de superfície com a vegetação nativa da região (circa 1850), aqui referenciado como experimento VN, e o segundo representando a vegetação atual, aqui referenciado com experimento VA. No domínio da simulação utiliza-se uma grade centrada em 23°S, 47°W com resolução horizontal de 80 km em latitude e longitude, cobrindo uma área de 2000 km × 2000 km, totalizando 25 x 25 pontos de grade que abrange parte da Região Centro Oeste (sul de Goiás, centro leste de Mato Grosso do Sul), a Região Sudeste (Minas Gerais, Espírito Santo, Rio de Janeiro e São Paulo) e parte da Região Sul (Paraná, Santa Catarina e Rio Grande do Sul).

Os resultados do mostraram que as variações da precipitação entre os dois casos alternaram-se espacialmente, com setores onde até ±50 mm de mudanças ocorreram na estação seca, e de ±200 mm na estação úmida. Isto sugeriu que a vegetação atual poderia potencialmente alterar o regime de precipitação, favorecendo o aumento em algumas áreas e a diminuição em outras, com aumento de temperatura à superfície. Estes resultados são os primeiros reportados neste foco de investigação, indicando uma chave relevante para o entendimento das mudanças no clima regional devido às mudanças no uso da terra.

45.9-P: September/October 2002 Mesoscale Reanalysis of the RACII campaign in Rondonia/Brazil

Demerval Soares Moreira, MASTER/IAG/USP, demerval@master.iag.usp.br (Apresentador / Presenting)

Pedro Leite Silva Dias, IAG/USP, pldsdias@master.iag.usp.br

The data assimilation module of the Regional Atmospheric Modeling System (RAMS) was operationally used during the September-October 2002 RACCI campaign in Rondonia, located in the southern portion of the Amazon Basin in the

transition from the forest to pasture. The analysis was performed with a coarse grid with 80 km resolution and a fine grid of 20 km over the area of interest. Nudging towards the NCEP analysis was applied at the borders of the coarse grid and very weak nudging was maintained during the assimilation cycle. The scheme was stable and provided realistic estimates of the low level flow during the campaign. A comparison with observed surface and upper air data indicates that the downscaling significantly reduces the analysis bias. A separate comparison is provided by the bias between the model precipitation and the satellite derived data (TRMM) and the comparison with the surface fluxes provided by the micrometeorological towers. The diurnal variation of the low level flow as well as of the precipitation were also reasonably reproduced by the mesoscale reanalysis.

45.10-P: Dry to Wet Transition Simulation with Dynamic Vegetation

Demerval Soares Moreira, Department of Atmospheric Sciences, Institute of Astronomy and Geophysics, University of São Paulo, demerval@master.iag.usp.br (Apresentador / Presenting)

Pedro Leite Silva Dias, Department of Atmospheric Sciences, Institute of Astronomy and Geophysics, University of São Paulo, pldsdias@master.iag.usp.br

Adriana Beltran, Department of Atmospheric Sciences, Colorado State University, abeltran@dragon.atmos.colostate.edu

Roger Pielke, Department of Atmospheric Sciences, Colorado State University, pielke@atmos.colostate.edu

A downscaling with the Regional Atmospheric Modeling System (RAMS) coupled with the General Energy and Mass Transport Model (GEMTM) will be performed for the RaCCI period (September and October, 2002). This period represents the transition between the dry to the rainy season in Rondonia, located in the South-western Amazon Basin. The vegetation parameters (leaf area index, albedo, CO₂ flux, etc.) change significantly from September to October, and affect directly the latent and sensible flux. Therefore, in a long period simulation, these changes must be considered. The GEMTM model was developed to forecast the dynamic interactions between land surfaces and the atmosphere. Thus in the coupling GEMTM provides to RAMS these new parameters. The results will be compared with data from METAR, SYNOP and RaCCI campaign, as well as with the downscaling results from RAMS without GEMTM.

45.11-P: Avaliação do Esquema de Convecção RAS Utilizando o Modelo CGM/CPTEC Durante o Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia (LBA)

Maria Aurora Mota, Universidade Federal do Pará/CPTEC-INPE, aurora@ufpa.br (Apresentador / Presenting)

Antônio Marcos Mendonça, Centro de Previsão de Tempo e Estudos Climáticos-INPE, mendonca@cptec.inpe.br

De forma geral, os modelos numéricos apresentam dificuldade em prever a precipitação para regiões tropicais, em partes, devido aos esquemas de convecção empregados. Entretanto, é possível que alguns ajustes nos esquemas de convecção possam contribuir para melhorar o desempenho dos modelos. Desta forma, procurou-se neste trabalho, avaliar e propor alguns ajustes no esquema "Relaxed Arakawa Schubert" (RAS) implementado no modelo global do CPTEC. Para avaliação foram utilizados os dados de precipitação do período de 22/02 a 26/03 de 1999, da campanha do LBA em Rondônia.

Obteve-se que o esquema RAS original produz uma grande quantidade de precipitação em todos os horários dos dias 22 ao 24, porém no dia 25 o modelo não conseguiu prever uma precipitação intensa ocorrida entre 21 e 24 UTC. No intuito de melhorar a performance do modelo utilizando o esquema RAS, foram realizados dois ajustes no esquema. No primeiro, modificou-se a forma como o topo e a base da nuvem são calculadas, e no segundo foi incluída uma modificação no perfil vertical de eficiência da nuvem. No primeiro caso, houve uma diminuição na quantidade de precipitação prevista para a região, sendo que os horários de ocorrência de precipitação foram melhor simulados, incluindo o episódio de chuva intensa do dia 25. Na segunda modificação, o esquema apresenta pouca eficiência para produção de precipitação e por isso os horários de ocorrência de precipitações não são bem detectados. Os resultados encontrados sugerem que a inclusão da nova forma de calcular o topo e a base da nuvem pode contribuir para melhorar a previsão do modelo global utilizando o esquema RAS, que por sua vez pode ajudar na melhoria da previsão do ciclo hidrológico na Amazônia.

45.12-P: Utilização do Conceito de Entropia Generalizada Para Caracterizar Diferenças Entre as Flutuações de Temperatura e de Velocidade do Vento Acima e Abaixo da Copa da Floresta Amazônica em Rondônia

Maurício José Alves Bolzan, UNIVAP, bolzan@univap.br

Fernando Manuel Ramos, LAC-INPE, fernando@lac.inpe.br (Apresentador / Presenting)

Leonardo Deane de Abreu Sá, CPTEC-INPE/MPEG, ldsa@museu-goeldi.br

Reinaldo Roberto Rosa, LAC-INPE, reinaldo@lac.inpe.br

São estudadas características específicas da estrutura dos campos de flutuações turbulentas de temperatura e velocidade do vento acima e abaixo da copa da Floresta Amazônica, em Rondônia. São utilizados dados de resposta rápida (taxa de amostragem de 60 Hz) medidos com anemômetro e termômetro sônico (Campbell 3d) durante o Experimento LBA/WETCAM (Large Scale Biosphere Atmosphere Experiment in Amazonia - Atmospheric Mesoscale Campaign), realizado de Janeiro a Março de 1999 na Reserva Florestal do Jaru, em Rondonia. Com fundamento em modelo estatístico baseado na termoestatística não extensiva de Tsallis aplicado à distribuição de incrementos de temperatura (T) e de velocidade do vento (V), foi possível determinar um parâmetro entropico, q , para cada uma dessas variáveis (q_T e q_V). Este contém informação essencial sobre a estrutura das flutuações turbulentas e tem relação estreita com a intermitência de pequena escala. Neste estudo foi investigada a relação q_T/q_V para medidas efetuadas acima e abaixo da copa florestal. Em geral, acima da copa florestal $q_T > q_V$, e abaixo da mesma, $q_T = q_V$, aproximadamente. São discutidas interpretações físicas para os resultados.

45.13-P: Reducing the uncertainty of surface albedo in climate models for better predictions of the future Amazonia climate

Silvia Monteiro Santos, Universidade Federal de Viçosa, smonteiro@vicoso.ufv.br (Apresentador / Presenting)
Marcos Heil Costa, Universidade Federal de Viçosa, mhcosta@ufv.br

Surface albedo has been shown to significantly affect tropical atmospheric circulation and climate. However, previous studies that considered the effect of changes in surface albedo on the regional climate, including former tropical deforestation studies, usually used a land surface parameterization that represented albedo with an error of the same magnitude of the albedo signal that would drive the climate change. Two decades ago, climate models estimated annual-mean albedo with ± 0.05 absolute accuracy, while ten years ago the uncertainties improved to 0.02. Today, although an error <0.01 for the annual-mean albedo estimate is usual, it can reach 0.03 on a monthly basis. As uncertainties in the representation of land surface albedo can translate to uncertainties in the simulated climate, it is important to estimate the albedo with high accuracy (<0.01), even at the seasonal scale. Our strategy is to reduce this uncertainty through the incorporation of new processes that affect the land surface albedo at a seasonal scale, and through a better calibration of the models against field data collected at different field sites and against remote sensing products. Initial results indicate that some processes that currently are not (well) represented in land surface models, like leaf wetness and the correct partition of the incoming solar radiation in direct and diffuse fields, introduce biases in the surface albedo that account for most of uncertainties at the seasonal scale. The incorporation of these processes in an off-line version of the land-surface model IBIS successfully reduced the seasonal error at tropical rainforest sites. Future tests will be performed with IBIS coupled to a climate model.

45.14-P: A General Mean Wind Velocity Profile Relationship for an Amazonian Rain Forest Environment

Leonardo Deane de Abreu Sá, CPTEC-INPE/MPEG, ldsa@museu-goeldi.br (Apresentador / Presenting)
Vanusa Bezerra Pachêco, INPA, leodeane@uol.com.br

We studied mean wind velocity profiles measured on a 60m height tower built in the forest reserve JarÉ (10005'S, 61035'W), belonging to IBAMA institution, located in the Brazilian north-western state of Rondonia. The data were collected during LBA (Large Scale Biosphere-Atmosphere Experiment in Amazonia) wet season campaign. The nine cup anemometers whose measurements were used in this work were vertically placed in a way to provide good calculation of the mean velocity wind profile inflexion point value. This allow us to obtain well fitted third degree polynomial functions for the vertical wind profiles. Thus, it was possible to determine with reasonable prevision the following physical parameters: inflexion-point height, z_i ; inflexion point height wind velocity, u_i ; mean wind shear at the canopy top $z=h$, $sh = (d\langle u \rangle / dz)$; characteristic length scale, $L_h = \langle u_h \rangle / sh$, where z is the above surface height. This is useful to obtain above and below canopy nondimensional wind velocity, u/u_i , as a function of a nondimensional inside canopy depth $(z - z_i)/L_h$. The results for more than 300 data points seem to confirm the suggestions that the wind shear in the canopy top and the inflexion point in the wind velocity vertical profile synthesize the basic informations concerning the dynamics of turbulent interactions between the flow above and below the Amazonian forest canopy in Rondonia.

45.15-P: Low Level Jet Effects Upon the Surface Atmospheric Boundary-layer Wind Field Above Caxiua Forest Reserve During Dry Season

Leonardo Deane de Abreu Sá, CPTEC-INPE/MPEG, ldsa@museu-goeldi.br (Apresentador / Presenting)
Daniele Santos Nogueira, DM-UFPA, holywod@interconnect.com.br
Julia Clarinda Paiva Cohen, DM-UFPA, jcpcohen@ufpa.br

In this work we investigate the occurrence of low-level jet (LLJ) events during the dry season in the nocturnal boundary-layer above the Caxiua Forest Reserve. As LLJ we define a region of the wind velocity vertical profile located below 1 km height in which the strength of the wind is greater than 5 m/s and where there is a relative maximum value in such way that the wind velocity values decay at least 2 m/s just above and below the jet region. We use data collected during the CIMELA (Eastern Amazonia Mesoscale Circulations) Experiment, which took place in several eastern Amazonia sites during October–November 2003: i) radiosonde data to obtain vertical profiles of wind velocity to detect LLJs and to determine some mixing characteristics induced by them; ii) four "Vektor" cup anemometer (30 s sampling rate) located in a 54 m height meteorological tower installed in forest environment to obtain wind velocity profiles, both above and below the forest canopy. LLJs occurred in three different nocturnal profiles. Its mean height was approximately 550 m and its mean velocity value was often greater than 10 m/s. Some very strong wind events, lasting no more than 3 min, were been observed near 22 LT (local time), probably associated with LLJ mixing. Our interpretation is that "top-down" mixing induced by LLJ reaches the surface during these strong wind events. They have obvious consequences for forest-atmosphere exchange processes.

45.16-P: Estudo diagnóstico da interação Oceano - Atmosfera no litoral de Ajuruteua - Bragança (PA), Norte do Brasil: Correlação entre os parâmetros meteorológicos e oceânicos.

Alexandre Melo Casseb do Carmo, Universidade Federal do Pará, acasseb@ufpa.br
Tiago Pereira Brito, Universidade Federal do Pará, brito@ibest.com.br (Apresentador / Presenting)

As regiões costeiras da América do Sul, particularmente para o lado do Oceano Atlântico, sofrem forte influência de fenômenos atmosféricos e oceânicos em diversas escalas de espaço e de tempo. Parte dos fenômenos atmosféricos pode ser acompanhada por tempestades caracterizadas por fortes rajadas de vento e grande quantidade de precipitação. Isto implica em diversas alterações na superfície oceânica, tais como, a turbidez da água, a geração de ondas e correntes, a variabilidade dos gradientes de salinidade e de temperatura da superfície do mar (TSM). Nos trópicos da América do Sul,

os fenômenos mais importantes relacionados à propagação de tempestades, entre o oceano Atlântico e o continente, são a Zona de Convergência Intertropical (ZCIT) e as Linhas de Instabilidade (LI). Ambos os fenômenos estão fortemente relacionados à convergência de umidade e grande quantidade de precipitação. Compreender a interação entre os fenômenos atmosféricos e oceânicos é de fundamental importância para institutos de pesquisa e/ou órgãos públicos, interessados em monitorar as adversidades naturais que possam representar perigo às atividades humanas nas regiões costeiras. Este trabalho enfoca a interação oceano-atmosfera, através da relação entre o regime pluviométrico, associado aos distúrbios atmosféricos, o campo de vento, os padrões de TSM e os parâmetros atmosféricos coletados através de radiossondagens e da estação meteorológica instalada no litoral de Ajuruteua - Bragança (PA), na zona costeira norte brasileira. Assim, este trabalho visa colaborar junto ao projeto Milênio-LBA com resultados de cunho diagnóstico, auxiliando nos trabalhos de modelagem e previsão das condições meteoceanográficas.

[PC_Precipitação_\(PC_Precipitation\)](#)

46.1-P: Estimativa da difusividade térmica do solo em áreas de floresta e de pastagem em Rondônia.

Paulo Renda Anderson, Universidade Federal de Rondonia, paulorenda@ibest.com.br (Apresentador / Presenting)

Ralf Gielow, DMA/CPTEC/INPE, ralf@cptec.inpe.br

Regina Célia dos Santos Alvalá, DMA/CPTEC/INPE, regina@cptec.inpe.br

Fabrizio Bertoni Zanchi, Universidade Federal de São Paulo, fabricio@model.iag.usp.br

Fernando Luiz Cardoso, Universidade Federal de Rondônia, cardoso@unir.br

Leonardo J. G. Aguiar, Universidade Federal de Rondônia, veraneiro@hotmail.com

Juliano Alves de Deus, Universidade Federal de Rondônia, julianoalde@yahoo.com.br

Anderson Telles, Universidade Federal de Rondônia, mecanicatelles@ibest.com.br

Kécio Gonçalves Leite, Universidade Federal de Rondônia, keciog@yahoo.com.br

Antonio Ocimar Manzi, INPA, manzi@inpa.gov.br

A temperatura do solo influencia a maioria dos processos entre o solo e as plantas; além disto, é importante para as previsões numéricas de tempo e de clima. Sua determinação, a partir da equação da condução do calor, depende da difusividade térmica e da capacidade calorífica volumétrica do solo, as quais dependem tanto do conteúdo de umidade, que varia com a profundidade e o tempo, quanto da composição química e da textura do solo, as quais, em geral, variam com a profundidade. Neste trabalho, a difusividade térmica foi obtida iterativamente, para dias sem chuva, através de solução numérica da equação citada, utilizando medidas de séries contínuas de temperatura e de umidade no solo, nas profundidades de 10, 20 e 40 cm, coletadas respectivamente por termopares e por reflectômetros por domínio de frequência (FDRs), instalados em sítios arenosos de floresta de Terra Firme (Reserva Biológica do Rio Jaru, Ji-Paraná, RO) e de pastagem (Fazenda Nossa Senhora, Ouro Preto do Oeste, RO). Obteve-se, assim, a difusividade térmica como função da umidade do solo para cada um dos sítios, expressando-se as correlações respectivas por regressões lineares.

46.2-P: Diurnal cycle of rainfall over tropical South America using 3-yr TRMM-PR data

Carlos Frederico Angelis, INPE-CPTEC-DSA, angelis@cptec.inpe.br (Apresentador / Presenting)

Glenn R. McGregor, University of Birmingham, G.R.McGregor@bham.ac.uk

Chris Kidd, University of Birmingham, C.Kidd@bham.ac.uk

Three years of Tropical Rainfall Measuring Mission Precipitation Radar (TRMM-PR) data, acquired during the period 01/01/1998 - 31/12/2000 over the tropical South America, were analysed in order to evaluate and model the diurnal cycle of rainfall near the surface.

Amplitude and phase of the first harmonic revealed five main centres of high rainfall and the timing of maximum precipitation occurrence. The phase map showed the preferred path of rainfall and suggested that precipitation tends to propagate in bands which originate in the east and west extremes of the Amazon region. The easterly rain bands occur in the same area where squall lines were previously detected and mapped by others. Because there is little reference to the westerly bands in scientific literature, the results presented in this assignment are considered new findings. Those bands originate along the eastern slopes of the Andes Cordillera during the first hours of the day and propagate Northwest-Southeast oriented towards the Central Amazon for up to 18 hours.

The results should be considered preliminary rather than definitive due to the low TRMM-PR sampling rate. More studies using ground radar or a longer TRMM-PR time series must be carried out in order to confirm the existence of the westerly propagating systems and shed more light on the results presented by this work.

46.3-P: Variação Diurna da Precipitação no Leste da Amazônia

Fabio Calixto Cabral, IAG-USP, falixto@model.iag.usp.br (Apresentador / Presenting)

Adilson Wagner Gandu, IAG-USP, adwgandu@model.iag.usp.br

Julia Clarinda Paiva Cohen, UFPA, jpc Cohen@ufpa.br

Estudos climatológicos mostram uma acentuada variação espacial e temporal da precipitação junto à costa atlântica e ao longo da Bacia Amazônica. Na escala anual, a precipitação dessa região é regida pelo deslocamento norte-sul da Zona de Convergência Intertropical. Na escala intra-sazonal, alguns estudos mostram a influência da "Oscilação de Maden-Julian" e da incidência de "ondas de leste". Já na escala diurna, outros trabalhos mostram que, durante os horários da manhã, o máximo de precipitação contorna a costa sobre o oceano, enquanto que nos horários da tarde esse máximo intensifica-se, deslocando-se para o interior do continente. Essa variação espacial e temporal da precipitação é associada principalmente à circulação de brisas terrestre e marítima.

Dentro do Projeto Instituto do Milênio LBA, estações automáticas vem coletando dados contínuos de variáveis meteorológicas em três ecossistemas da região leste da Amazônia (campo-Soure, manguezal-Bragança, e floresta-Caxiuanã), desde agosto de 2000. A análise preliminar dos dados de precipitação mostra que, nas estações do litoral (Soure e Bragança), a chuva ocorre preferencialmente durante a madrugada e início da manhã, enquanto que na estação mais interior ao continente (Caxiuanã), ocorre à tarde e início da noite. Além disso, a precipitação nas estações do litoral

ocorre logo após a mínima velocidade diurna do vento, enquanto que na estação de Caxiuanã ocorre após a máxima velocidade do vento. Esses resultados indicam que diferentes mecanismos de interação entre a precipitação e as circulações locais podem estar ocorrendo nessa regiões.

46.4-P: Ciclo diurno da precipitação na Amazônia e o transporte de umidade para a região Sul/Sudeste da América do Sul em simulações sazonais com o modelo regional Eta e o global CPTEC/COLA

Iracema Albuquerque Cavalcanti, CPTEC/INPE, iracema@cptec.inpe.br (Apresentador / Presenting)
Adma Raia, CPTEC/INPE, adma@cptec.inpe.br

No uso de modelos para representar a precipitação de forma correta, é importante que eles sejam capazes de simular o ciclo diurno. Neste estudo é analisado o ciclo diurno da precipitação sobre a Amazônia, em uma simulação climática com o modelo regional Eta e o MCGA CPTEC/COLA. Considerou-se o período de verão quando há grande convecção na Amazônia e também formação de Sistemas Convectivos de Mesoescala sobre o norte da Argentina e Paraguai. Os resultados do modelo Eta provém de 5 integrações sazonais na resolução de 40 km e 38 níveis, e os resultados do MCGA provém das integrações utilizadas como condição de contorno lateral do modelo regional, com resolução de T62L28 (resolução horizontal próxima de 200 km). O período considerado é de 1996 a 2000. As análises dos resultados com o Eta mostram uma variabilidade na precipitação, com máximos acumulados entre 12 e 18 GMT e 18 a 00 GMT, e mínimos entre 00 e 06 GMT e 06 a 12 GMT, sobre a região tropical da América do Sul, consistente com as observações, e máximos valores entre 06 e 12 GMT na região norte da Argentina, consistente com a ocorrência de SCM na região. Nos resultados do MCGA não é evidente o ciclo diurno sobre a Amazônia, centro-sul e sudeste do Brasil, porém ocorre uma variabilidade diurna sobre a costa norte da América do Sul e sobre o sul do Brasil e norte da Argentina. Os resultados são discutidos para os dois modelos e são apresentadas as condições meteorológicas simuladas sobre a América do Sul, também discutindo a interação entre as duas regiões, pelo transporte meridional de umidade realizado pelo jato em baixos níveis.

46.5-P: Variação da Precipitação Pluviométrica no Sítio Experimental do LBA na Floresta Nacional de Caxiuanã, Pará, Brasil (2002-2003)

Rafael Ferreira da Costa, UFCG, rfcostampeg@bol.com.br (Apresentador / Presenting)
Antônio Carlos Lôla da Costa, UFPA, lola@ufpa.br
Patrick Meir, UEDIn, pmeir@ed.ac.uk
Alan Pantoja Braga, UFPA, alan_meteoro@yahoo.com.br
Yadvinder Singh Malhi, UEDIn, ymalhi@ed.ac.uk
Paulo Henrique Lopes Gonçalves, UFPA, phlg@ufpa.br
João Athaydes Silva Jr, UFPA, athaydes@ufpa.br
Paulo Jorge Oliveira, UFPA, pj@ufpa.edu.br

A chuva é certamente a variável meteorológica que mais facilmente caracteriza um determinado local. O conhecimento das variações pluviométricas auxilia no planejamento e realização das atividades humanas. No caso de experimentos científicos, realizados em campos experimentais, a escolha das épocas de atividades (principalmente campanhas intensivas), pode ser determinante para o sucesso de todo o trabalho. Neste sentido, apresentamos neste estudo, uma análise do regime pluviométrico na Floresta Nacional de Caxiuanã para os anos de 2002 e 2003. Neste local, que tem como base a Estação Científica Ferreira Penna (ECFPn), administrada pelo Museu Paraense Emílio Goeldi (MPEG), está instalado um sítio experimental do Projeto LBA/ESECAFLOR. Além deste, diversos outros experimentos se desenvolvem na área. Os dados aqui apresentados foram coletados em uma estação meteorológica automática, instalada no topo de uma torre metálica com 52 metros de altura (01o42'30"S; 51o 31'45"W; 62m). A região de Caxiuanã tem uma distribuição regular das chuvas durante todo o ano. Porém, há uma sazonalidade definida. O período chuvoso está compreendido de Janeiro a Junho (cerca de 75% do total), enquanto o menos chuvoso vai de Julho a Dezembro (25%). Nos anos de 2002 e 2003 foram registradas precipitações totais de 2193mm e 2050mm respectivamente. Sendo para estes anos, os meses de Março com 350mm (16,5%) e Agosto com 57mm (2,7%) os dois extremos do perfil. O mês de Março teve ocorrência de precipitação em 28 dias em 2002 e 26 dias em 2003, enquanto em Agosto foram 15 e 16 dias respectivamente. Considerando os eventos de precipitação de qualquer intensidade, foram registrados em Março de 2002, 78 eventos (42%) maiores que 1 mm h⁻¹ e 10 eventos (13%) maiores que 10 mm h⁻¹. Para Março de 2003 foram 79 (48%) e 03 (4%) eventos respectivamente. Os eventos representaram cerca de 13% em 2002 e 4% em 2003 foram. No mês de Março as chuvas se distribuem por todo o dia, porém as ocorrências mais intensas ocorrem no final da tarde e início da noite. Em 2002 30,4mm às 19 horas e em 2003 12,4mm às 16horas.

46.6-P: Variabilidade Sazonal da Precipitação Pluviométrica em Ecossistema de Manguezal no Nordeste do Pará

Paulo Henrique Lopes Gonçalves, UFPA, phlg@ufpa.br (Apresentador / Presenting)
Antônio Carlos Lôla da Costa, UFPA, lola@ufpa.br (Apresentador / Presenting)
João Athaydes Silva Jr, UFPA, athaydes@ufpa.br
Alan Pantoja Braga, UFPA, alan_meteoro@yahoo.com.br
Rafael Ferreira da Costa, UFCG, rfcostampeg@bol.com.br
Patrick Meir, UEDIN, pmeir@ed.ac.uk
Yadvinder Singh Malhi, UEDIN, ymalhi@ed.ac.uk

O Município de Bragança, localizado no Nordeste do Estado do Pará a 01°03'S de latitude e a 46°46'W de longitude, possui uma área de 3.258 km² tem em suas proximidades áreas de Manguezal. Os manguezais são ecossistemas que cobrem mais de 100.000 km² de continente mundial, apresentando-se em maior desenvolvimento nas regiões Tropicais com maior concentração junto à linha do Equador. O manguezal apresenta um dossel com altura média de 18m e árvores que

alcançam até 25m. Pode-se afirmar que devido ao grande porte das árvores nas florestas das zonas equatoriais, tem relação com regime de precipitação, pois apesar da alta pluviosidade, as precipitações apresentam uma certa regularidade em sua distribuição, Tal distribuição deve-se, principalmente, ao deslocamento da ZCIT (Zona de Convergência Intertropical) sobre a região, associada às altas temperaturas durante todo ano. Isso tudo contribui com a grande diversidade de espécies, densidade e alturas elevadas. As chuvas exercem uma influência importante no equilíbrio dos ecossistemas de manguezais, por atuarem na dissolução de sais marinhos baixando seu conteúdo acumulado no substrato. As informações, para este trabalho foram obtidas de uma estação meteorológica automática no topo de uma torre de alumínio de 25m de altura localizada no interior de uma área de manguezal. O período analisado corresponde às precipitações totais mensais no período de agosto 2000 a outubro de 2003. Observou-se, a ocorrência de dois períodos distintos, um mais chuvoso de janeiro a maio e outro menos chuvoso nos demais meses.

46.7-P: Estimativa de precipitação e conteúdo integrado de vapor d'água utilizando o sensor HSB durante o experimento RACCI/LBA

Wagner Flaubert Lima, INPE/DSA, wagner@cptec.inpe.br (Apresentador / Presenting)

Luiz Augusto Toledo Machado, INPE/DSA, machado@cptec.inpe.br

Carlos Augusto Morales, USP/IAG, morales@model.iag.usp.br

Este trabalho apresenta técnicas para as estimativas do conteúdo integrado de vapor d'água na atmosfera e da precipitação utilizando os dados do sensor de umidade brasileiro, o Humidity Sounder for Brazil (HSB), durante o experimento DRY-TO-WET/LBA, realizada em Rondônia no período de set/out de 2002. Os valores obtidos através desta técnica permitem estudar em alta resolução espacial a variabilidade do vapor d'água e da precipitação na pré-estação chuvosa na região de Rondônia. A estimativa do conteúdo integrado de vapor d'água, em condições de céu claro, foi obtido através da combinação das simulações para os canais de 183 ± 1 , ± 3 , ± 7 e 150 GHz com o modelo de transferência radiativa RTTOV-7 em função do conteúdo integrado de vapor d'água (IWV). O IWV foi calculado através dos perfis de umidade obtidos na campanha do RACCI, em especial as radiossondagens do sítio de Guajará-Mirim, que foram lançadas no horário da passagem do satélite AQUA. Para simular as radiancias do sensor HSB em situação de céu encoberto, foram utilizados os perfis de água líquida obtidos pelo radar meteorológico instalado no sítio experimental de Ouro Preto. Os resultados mostram, para as situações de céu claro, valores de correlações superiores a 0,95 entre as medidas e simulações da temperatura de brilho do HSB, utilizando os perfis de temperatura e umidade obtidos na campanha. Exemplos de recuperações de conteúdo integrado de vapor d'água e precipitações mostram-se coerentes com os calculados pelas radiossondagens e medidos pelo radar meteorológico, respectivamente.

46.8-P: Variabilidade da precipitação no leste da Amazônia (Amapá, Pará, Maranhão) associada aos ENOS

Andreza Carla da Silva Martins, 1, krlinha@terra.com (Apresentador / Presenting)

Ulisses Confalonieri, 2, pmags@ensp.fiocruz.br

Edson José Paulino Rocha, 3, eprocha@ufpa.br

O clima típico dos estados do Pará e Amapá é equatorial quente e úmido com poucas variações de temperatura. Nesta região, ocorrem altos valores pluviométricos, os principais mecanismos que contribuem para seu elevado regime pluviométrico resultam da combinação ou da atuação predominante da Zona de Convergência Intertropical (ZCIT), das brisas marítimas, da penetração de sistemas frontais oriundos do Sul do continente, e da fonte de vapor representada pela Floresta Amazônica e pela atuação da Cordilheira dos Andes. Outros fatores são, ainda, os aglomerados de cumulus e cumulonimbus associados ou não à ZCIT, linhas de instabilidade (LI) e a ocorrência das Ondas de Leste (OL) que atuam principalmente na estação menos chuvosa. O Maranhão, por sua localização geográfica, entre a Amazônia e o Nordeste e, por sua grande extensão na direção sul-norte, apresenta vários padrões climáticos, todos tropicais, mas com diferentes quantidades de precipitações pluviométricas e coberturas vegetais variadas: florestas amazônicas na região Noroeste; cerrados nas regiões Centro e Sul; Zonas semi-áridas, no Nordeste do Estado. Alguns fenômenos interferem no comportamento atmosférico, causando consideráveis variabilidades interanuais como o El Niño. Uma das formas de quantificar o fenômeno El Niño é através do Índice de Oscilação Sul (IOS). Valores negativos e positivos da IOS são indicadores da ocorrência do El Niño e La Niña respectivamente. Este índice foi utilizado no trabalho para compor a análise da variabilidade espacial e temporal da precipitação. Contudo foi possível encontrar valores de anomalias muito diferentes em estações próximas uma das outras.

46.9-P: Padrões da precipitação diária sobre a Amazônia: 1979-93

Guillermo O. Obregón, CPTEC/INPE, obregon@cptec.inpe.br (Apresentador / Presenting)

Carlos Afonso Nobre, CPTEC/INPE, nobre@cptec.inpe.br

Estudam-se os padrões de distribuição de probabilidades incondicional e análises de séries temporais da precipitação diária sobre a bacia Amazônica, para o período de 1979-93, com o intuito de relacioná-las com os fatores dinâmicos que a originam. Um resultado importante do presente trabalho mostra que a alta probabilidade de dias chuvosos ($> 70\%$), observados durante todo o período de estudo sobre quase toda a Amazônia, com máximos no extremo oeste, está constituída em maior proporção pela ocorrência de precipitações moderadas (5 -25 mm). As distribuições de probabilidade também indicam que as precipitações não são só resultado dos sistemas que atuam sobre estas regiões, mas de algum fator local, tal como a orografia no extremo oeste da bacia. Em quanto à distribuição sazonal, a intensidade de probabilidade apresenta variação espacial ao longo do ano, com valores máximos similares, indicando uma relação direta entre dias úmidos e a quantidade de precipitação registrada, independente da estação do ano. Nos meses de verão a distribuição espacial é mais homogênea que nas outras estações e as máximas intensidades de probabilidade localizam-se na região sul da bacia, sobre a posição climatológica do máximo de precipitação de verão. A análise de ondaleta da região sul da bacia, onde se registra a precipitação e intensidade de probabilidade máxima, mostra que as precipitações nesta região apresentam modulação sazonal intensa, com eventos de alta frequência (5-10 dias) muito intensos nos verões, associados principalmente com distúrbios transientes. Eventos significativos com períodos de 32 a 64 dias durante as duas fases do ENOS também são observadas.

46.10-P: Un Análisis Estadístico Breve de la Lluvia Estacional en el Norte de Perú

Jorge Chira, SENAMHI, jchira@senamhi.gob.pe

El objetivo de este estudio es entender la variabilidad de la estación lluviosa en el norte de Perú. Se utilizó el Análisis de Componente Principal (ACP) para encontrar índices regionales de lluvia. Estos resultados se compararon con índices ENSO (El Niño-Oscilación del Sur), con varios meses de anticipación, para encontrar alguna relación que ayude a entender los mecanismos físicos que controlan la estación lluviosa en la región.

El norte de Perú es el primer lugar en ser afectado por el fenómeno El Niño, y es la región dónde se tiene el impacto más fuerte. Este fenómeno causa lluvias torrenciales y fuertes inundaciones, causando pérdidas a la industria agrícola y pesquera entre otros, así como algunas veces pérdidas de vidas humanas. Por consiguiente es muy importante saber cómo será la próxima estación lluviosa, para la prevención y mitigación de desastres naturales así como para la planificación agrícola y pesquera.

Se realizó un análisis estadístico (Análisis de Componente Principal y Análisis de Correlación - CA), para la estación lluviosa en el norte de Perú, con varios índices relacionados al fenómeno ENSO (Anomalías Estandarizadas de Temperatura Superficial de Agua de Mar Niño12 y Niño3 e Índice de la Oscilación Del Sur).

Con ACP se encontró dos índices regionales: R1 (Costa) y R2 (Región montañosa), para las siete estaciones de monitoreo en el periodo de 1973-1998. Se utilizaron datos de reanálisis del NCEP (National Center for Environmental Prediction) y Análisis de Correlación, para calcular áreas correlacionadas con éstos índices, utilizando varios parámetros atmosféricos y oceanográficos, incluyendo la Temperatura Superficial de Agua de Mar-SST, Vientos (850 hPa) y Presión del Nivel del mar (SLP). Finalmente el CA fue usado para calcular la relación entre el índice regional e índices ENSO de NCEP. También se compararon las variaciones interanuales de R1 y R2, con los índices de la región Niño3 e IOS.

Los resultados muestran que el índice R1 para la región de la Costa es más predecible que el índice R2 para la región montañosa.

La predictabilidad de la precipitación para el norte de Perú, está altamente influenciada por la ocurrencia de los eventos ENSO.

Índice dos Resumos por Tema Científico do LBA

(Index of Abstracts by LBA Science Theme)

- **O primeiro autor é listado em parentêses depois de cada título.** (The primary author is listed in parentheses after each title.)

AC (Química da Atmosfera) / AC (Atmospheric Chemistry)

1.3	Smoke Aerosols, Clouds, Rain and Climate (Meinrat Andreae)
8.1	Unraveling the Complexities of the Carbon Cycle in the Amazon (Antonio Nobre)
15.2	Cloud Condensation Nuclei concentrations in the Amazon Basin (Göran Frank)
15.3	Role of aerosol chemical composition on the formation of cloud condensation nuclei during biomass burning periods (Sven Metzger)
15.4	Airborne Measurements of Trace Gases and Aerosol Particles Emission Ratios From Biomass Burning in Amazonia (Pascal Guyon)
15.9	Global Simulation of the Indirect Aerosol Effect With the ECHAM5 GCM (Philip Stier)
15.10	Biomass burning and implications for the pattern of nitrogen deposition in the Amazon Basin (Luciene Lara)
18.6	The relationship between biomass burning aerosols, cloud condensation nuclei and cloud structure in Amazonia (Paulo Artaxo)
18.7	Trace Gases Concentrations during Dry and Wet Seasons in the Amazon Basin (Luciana Gatti)
18.8	Impact of Amazonian deforestation on the oxidizing capacity of the atmosphere (Laurens Ganzeveld)
24.1-P	CCN Closure Study for Amazonian Dry Season Biomass Burning Aerosol (Anders Vestin)
24.2-P	Long-Term Monitoring of Atmospheric Aerosols in the Amazon Basin: Balbina and Santarem - aerosol source identification and apportionment (Maria Lucia Antunes)
24.3-P	Long-Term Monitoring of Atmospheric Aerosols in the Amazon Basin: Alta Floresta and Rondônia - aerosol source identification and apportionment (Maria Lucia Antunes)
24.4-P	Historical record of trace elements in aerosols from Western Amazon Basin during 20th century (1919-1999) from Illimani ice core, Bolivian Andes (Alexandre Correia)
24.5-P	Deposition fluxes of trace elements in Western Amazon Basin during 20th century inferred from Illimani ice core, Bolivian Andes (Alexandre Correia)
24.6-P	O Monitoramento Atmosférico em Rio Branco - AC, uma Contribuição do LBA (Alejandro Antonio Duarte)
24.7-P	The Coupled Aerosol and Tracer Transport model to the Brazilian developments on the Regional Atmospheric Modeling System: model description and validation (Saulo Freitas)
24.8-P	Numerical Simulation of the Influence of the CCN Variability on the Cloud Microphysical Properties in Amazonia Basin During LBA/SMOCC 2002 (João Bosco Leal Jr.)

24.9-P	Análise Conjunta de Perfis Verticais de Concentração de Partículas de Aerossol de Queimadas e de Variáveis Meteorológicas na Amazônia (Franscielly Marquardt)
24.10-P	Carbonaceous aerosol in La Gran Sabana, Canaima National Park, Venezuela (Milexi Pacheco)
24.11-P	Soluble Organic Nitrogen in Airborne Particles and Rains of La Gran Sabana, Canaima National Park, Venezuela. (Milexi Pacheco)
24.12-P	Aerosol Optical Properties over Amazon Basin (Melina Mara Paixão)
24.13-P	Modelling the dynamic behavior of Cloud Condensation Nuclei: case study comparing clean (LBA/CLAIRE 2001) and polluted (LBA/SMOCC 2002) conditions in Amazonia (Theotonio Pauliquevis)
24.14-P	Large-scale measurements of particle size distribution and cloud condensation nuclei during the LBA/SMOCC-2002 experiment in Rondônia (Luciana Rizzo)
24.15-P	Estudo numérico do efeito das partículas de aerossol de queimada sobre as taxas de aquecimento/resfriamento da atmosfera (Ricardo Siqueira)
25.1-P	The impact of the direct radiative effect of the aerosol particles on the calculation of the photolysis rates: a case study for an Amazon site during the biomass burning season (Leila Maria Albuquerque)
25.2-P	Long term measurements of aerosol radiative forcing in Amazonia (Paulo Artaxo)
25.3-P	Desempenho de Modelos Radiativos na Avaliação de Irradiâncias em Presença de Aerossol de Queimadas (Artemio Fattori)
25.4-P	Estudo da evolução temporal da estrutura vertical da atmosfera - efeito do aerossol de queimadas em Alta Floresta (Edson Francischinelli)
25.5-P	Resultados de um Estudo Estatístico das Propriedades Ópticas das Partículas de Aerossol de Queimadas via AERONET (Marcelo Garcia)
25.6-P	Impact of aerosols on the Amazon shortwave surface and atmospheric radiation balance (Hongqing Liu)
25.7-P	Numerical modelling of the biomass-burning aerosol direct radiative effects on the thermodynamic structure of the atmosphere and convective precipitation (Karla Longo)
25.8-P	Spectral Absorption properties of Aerosols in Amazonia during the Wet and Dry Seasons (Jose Martins)
25.9-P	Effect of Smoke Aerosols over the CO ₂ flux in the Amazonia (Paulo Henrique Oliveira)
25.10-P	Seasonal aspects of atmospheric aerosol optical properties over South America from AERONET measurements (Carlos Alberto Pires Jr)
25.11-P	Case studies of high aerosol optical thickness events and transport of biomass burning aerosol over South America from AERONET measurements (Carlos Alberto Pires Jr)
25.12-P	Changes in total, direct and diffuse solar and PAR radiation at the surface due to Amazonian biomass burning: a modeled study (Aline Procopio)
25.13-P	MODIS Cloud Products and Observed Cloud Attenuation of Solar Flux: An Investigation of a Method for Scaling Local Observations to the Regional Level (Joel Schafer)
25.14-P	Effect of smoke on the vertical profile of photosynthetically active irradiance inside the canopy observed at Rebio Jaru (Marcia Yamasoe)
26.1-P	Factors controlling acetic and formic acid concentrations in different tropical forests' rainwater (Vanessa Almeida)
26.2-P	Modeling of the Manaus Driven Ozone Plume (Leila Martins)
26.3-P	Monitoring the Transport of Biomass Burning Emissions in South America (Saulo Freitas)
26.4-P	Seasonality of Isoprene Emissions in the Amazon Basin (Luciana Gatti)
26.5-P	Soil moisture impact on convection and biomass burning pollutants in Roraima, Brazil, during the CLAIRE/1998 Experiment (Rodrigo Gevaerd)
26.6-P	Precipitation chemistry in Amazonia - inorganic components (Mariana Gouvea)

26.7-P	Variability of VOC emission capacity and composition during leaf phenology of the tropical tree species <i>Hymenaea courbaril</i> and its relation to the carbon budget
26.8-P	Regional gradients in Carbon Dioxide and Carbon Monoxide Concentrations across the Amazon Basin
26.9-P	Measurement of organic ions in the Amazonian precipitation (Luciene Lara)
26.10-P	Introducing MOZART chemical mechanism into CATT-BRAMS: preliminary results (Karla Longo)
B (Biogeoquímica) / B (Biogeochemistry)	
10.10	Tropical forests and the global nitrous oxide budget (Jerry Melillo)
12.6	Moisture availability constrains soil trace gas fluxes in an eastern Amazonian regrowth forest (Steel Vasconcelos)
16.2	Pasture Degradation, Secondary Forest Regrowth, and Mature Forest Productivity: Do Nutrients Matter? (Eric Davidson)
16.3	Harnessing Biogeochemistry and Traditional Knowledge For Regenerating Deforested and Degraded Lands in the Amazon (Erick Fernandes)
17.1	How can LBA Achievements be Useful to Agriculture in Amazônia? (Tatiana Sa)
20.1	A hydrological framework for biogeochemical studies (Helmut Elsenbeer)
20.5	The chemistry of two streams draining kaolinitic soils (Daniel Markewitz)
20.6	Significant seasonal and event-driven changes of carbon and nutrient fluxes to first-order streams of an Amazon forest (Mark Johnson)
20.8	Hydrologic nitrogen losses from tropical forest soils -- patterns and implications. (Lars Hedin)
23.1	Changing enzymatic activities and mycorrhizal infections in a chronosequence of secondary and mature forests of eastern Amazonia (Claudio José Reis de Carvalho)
23.6	Responses to fertilization of secondary forest growth following pasture abandonment in central Amazônia, Brazil (Ted Feldpausch)
27.1-P	Relação entre Parâmetros Bioquímicos Foliares e a Reflectância Espectral de Espécies Lenhosas em dois sítios de Cerrado no Parque Nacional de Brasília, DF (Ana Paula Carvalho)
27.2-P	Uso da krigagem ordinária e da cokrigagem para estimar a matéria orgânica em solos de quatro microbacias sob vegetação de floresta no município de Juruena, MT. (Léo Chig)
27.3-P	Aplicação da estatística multivariada para identificar diferenças nos atributos de solo em microbacias sob floresta tropical em Juruena-MT (Eduardo Couto)
27.4-P	Pre-harvest Tree and Vine Biomass in a Rainforest in NW Mato Grosso, Brazil (Ted Feldpausch)
27.5-P	Aplicação da geoestatística para identificar a ocorrência de Latossolos e Argissolos em quatro microbacias sob vegetação de floresta no município de Juruena, MT. (João Novaes Filho)
27.6-P	Isotopic Composition of Soils and Plants in a Gallery Forest of Cerrado Biome: Effect of Topographic Gradient (Lucilia Parron)
27.7-P	Dinâmica do carbono em quatro microbacias sob floresta tropical, no município de Juruena, MT (Evandro Selva)
27.8-P	Coarse Woody Debris Remineralization Rates in an Undisturbed Forest and Selective-Logged Areas at the FLONA Tapajos, Santarem (Hudson Silva)
27.9-P	Carbon, Nutrient, Light Interception and Soil Water Dynamics of Secondary Forests and Agroforestry Systems on Degraded Pastures (Steve Welch)

28.1-P	Influência da puerária (Pueraria phaseoloides), sobre a transformação microbiana de nitrogênio do solo em sistemas agroflorestais do Projeto RECA em Nova Califórnia-RO (Patricia Dresch)
28.2-P	Retorno de Nitrogênio e Fósforo Através de Serrapilheira no Período Úmido em Floresta de Transição Tropical Úmida-Cerrado (Eliane Almeida)
28.3-P	Mapping soil micronutrients in a 63 ha low productivity pasture in Rondonia, Nova Vida Ranch (Carlos Cerri)
28.4-P	Effects of different land use systems in carbon, nitrogen and phosphorus cycles: comparison between slash-and-burn and chop-and-mulch systems. (Roberta Coelho)
28.5-P	Response of the Soil Microbial Community to Fertilization Practices in Agricultural and Native Cerrado Systems in Brazil (Marirosa Molina)
28.6-P	Effect of ash deposition on soil nitrogen availability in burned savannas of the Gran Sabana, Venezuela. (Carlos Méndez)
28.7-P	Major Ions Fluxes in Rainfall and Throughfall at Tapajos National Forest . Belterra, Para State (Raimundo Oliveira Jr.)
28.8-P	Enzima Fosfatase Ácida: Importância e Dinâmica no Ciclo Biogeoquímico do Fósforo em Vegetações Secundárias do Nordeste do Estado do Pará. (Patrícia Oliveira)
28.9-P	Atividade da fosfatase ácida, uréase e micorrizas em uma área de vegetação secundária de Paragominas, Estado do Pará, dois anos após adubação com nitrogênio e fósforo. (Claudio José Reis de Carvalho)
28.10-P	Lixiviação do Nitrato em Quatro Microbacias Sob Cobertura Florestal no Município de Juruena/MT (Luiz Carlos Rodrigues)
28.11-P	Litter Quality of Agroforestry Systems in Central Amazonian (Guilherme Silva)
29.1-P	Herbicide Effect on N Availability and N ₂ O Fluxes During Pasture Reformation in Rondonia, Brazil. (Janaina Carmo)
29.2-P	Profiles of trace gas concentrations from towers at undisturbed forest in the Brazilian Amazon Region (Janaina Carmo)
29.3-P	NO and N ₂ O Emissions Related to the Nitrogen Fertilization in a Cornfield Under No-tillage and Tillage Systems (Arminda Carvalho)
29.4-P	Mapeamento temporal de áreas alagadas na planície de inundação da Amazônia: "input" para estimativas de emissão de metano (Maycira Costa)
29.5-P	Trace Gas Emissions From the Soil Related to Land-Use Changes in the Cerrado Region (Alessandra Kozovits)
29.6-P	NO fluxes from savannas of Central Brazil (Cerrado) subjected to nitrogen and phosphorus fertilization (Alessandra Kozovits)
29.7-P	Monitoring soil radon-222 flux at selectively logged and primary forest sites in the Tapajós National Forest and in an agricultural field at km77 Santarém-Cuiabá highway (2003). (Risonaldo Lima)
29.8-P	Gas Transport, Production and Consumption Rates in the Tapajos National Forest, Para, Brazil, Determined Using RADON-222 Flux Divergence (Christopher Martens)
29.9-P	The influence of sediment composition on isotopic variation of CH ₄ in the eastern Amazonian streams (José Moura)
29.10-P	Effects of water-addition on N oxides and CO ₂ fluxes from soils in pastures of Central Brazil (Alexandre Pinto)
29.11-P	Soil-Atmosphere Flux of Nitrous Oxide and Methane Measured on Sandy Loam and Clay Soils in Undisturbed Forest at the FLONA Tapajos, Brazil (Eraclito Sousa Neto)
29.12-P	NO _x and CO Emissions from Cerrado Plant Litter (Keith Kisselle)

CD (Armazenamento e Trocas de Carbono) / CD (Carbon Dynamics)

1.2	Deforestation and Biomass Burning as Drivers of Regional Climate Change in Amazônia (Maria Assução Silva Dias)
3.1	Compositional Changes in Undisturbed Neotropical Forests and Their Implications for Carbon Dynamics (William Laurance)
3.2	Concerted Changes in Amazon Forest Dynamics (Oliver Phillips)
3.3	Spatial Variation of Forest Structure and Aboveground Biomass in Jaru Reserve, Rondonia, Brazil (Sassan Saatchi)
3.4	Scaling Up Above Ground Live Biomass from Plot Data to Landscape in Amazon Basin (Sassan Saatchi)
3.5	Carbon stocks and sequestration in above-ground wood biomass of Central Amazonian white-water floodplain forests (Jochen Schoengart)
3.6	Old paradigms grow up: tree species composition and forest productivity across Amazonia (Tim Baker)
3.7	Separating Genetic versus Environmental Effects on Amazon Forest Growth and Nutrient Uptake Characteristics (Jonathan Lloyd)
3.8	Modelling Spatial Patterns of Gross Primary Productivity in the Tapajós Region (Luiz Aragão)
3.9	Canopy structure and nutrient productivity across the western Amazon (Sandra Gallego)
3.10	Spatial patterns and temporal dynamics of photosynthesis and transpiration in Amazon basin (Xiangming Xiao)
5.1	Photosynthesis and water use efficiency in twenty tropical tree species of differing successional status in a Brazilian reforestation (Carlos Alberto Martinez)
5.2	Effects of air temperature and transitory CO ₂ availability on carbon assimilation in tropical woody species <i>Swietenia macrophylla</i> King, and <i>Copaifera langsdorffi</i> Desf. (Carlos Prado)
5.3	Ecophysiology of Tree Species of the Tropical Rain Forest Under Enriched CO ₂ Atmosphere: A Successional Approach Using Different Functional Groups Among the Leguminosae
5.4	Effects of the High Concentration of Atmospheric CO ₂ on Growth and Development of Sugar Cane (<i>Saccharum Officinarum</i>) (Marilia Gaspar)
5.5	The photosynthetic response to elevated CO ₂ in high altitude potato species (<i>Solanum curtilobum</i>) (Carlos Alberto Martinez)
5.6	Seasonal changes of ecophysiological responses of <i>Hymenaea courbaril</i> L. (Madeleine Lita Barriga Puente de la Vega)
5.7	Modeling photosynthesis of the tropical tree <i>Hymenaea courbaril</i> L. using artificial neural networks (Madeleine Lita Barriga Puente de la Vega)
5.8	<i>Hymenaea Courbaril</i> l. (leguminosae): A Model Tree to Understand Pathways for Carbon Sequestration Into Cellulose in the Rain Forest (Marcos Buckeridge)
5.9	Mixed Cover of C ₃ and CAM Species in a Tropical Coastal Vegetation: a Unique Situation for Efficient Carbon Sequestration (Eduardo Mattos)
6.2	ENSO-Orchestrated Carbon Supply and Sequestration in Amazonian River Basins by Erosion-Sedimentation Processes (Rolf Aalto)
6.5	Isotopic Constraints on Organic and Inorganic Carbon Cycling in the Amazon River System (Emilio Mayorga Rubi)
6.6	Pilot Experiments on Air-Water Exchange of Carbon Dioxide in the Amazon Basin (Simone Alin)
6.7	Detection of carbon dioxide efflux from the rivers in the atmosphere. (Joseph Berry)
6.8	Evidence of nocturnal horizontal transport of CO ₂ at an Amazon pasture/agricultural site (Otavio Acevedo)
6.9	Intraseasonal Variability of the Surface Fluxes in Santarém (Pedro Silva Dias)
6.10	Explicit Calculation of Surface Carbon Flux on the Flona Tapajos using SiB-RAMS (Ian Baker)

7.3	Combining Landsat ETM+ and Terrain Data for Scaling Up Leaf Area Index (LAI) in Eastern Amazon: an Intercomparison With MODIS Product (Luiz Aragão)
8.2	Spatial Patterns in Forest Carbon Dynamics, Biomass and Biomass Change Across the Amazon Basin. (Yadvinder Malhi)
8.3	Tapajos Primary Forest Study in Context: Comparison of Tapajos Data for Carbon Budgets, Climatic Forcing and Forest Demography Across Amazonia. (Steven Wofsy)
10.1	The Biological Control of Carbon Pathways Inside the Plant as a Response to Changing Environment: a Learning Experience (Marcos Buckeridge)
10.2	Stable isotopes: integrators and tracers of processes from the leaf and microbe to the atmosphere and basin. (Joseph Berry)
10.4	Seasonal and interannual variability of Amazon carbon and water vapour exchange in response to the environment (Bart Kruijt)
10.5	Controls on tropical forest CO ₂ and energy exchange (Michael Goulden)
10.6	From dry to flooded, from Cerrado to Forest : scaling the CO ₂ and H ₂ O atmospheric fluxes across tropical ecosystems (Humberto Rocha)
10.7	Carbon, biogeochemistry, and hydrology: from terrestrial to aquatic systems (Johannes Lehmann)
10.8	Coupling of Carbon, Biogeochemical, and Hydrological Cycles: A Fluvial Perspective (Jeffrey Richey)
11.4	Seasonal variations in C and H ₂ O cycling of a tropical transitional forest (George Vourlitis)
11.9	Teleconnection between tree growth in the Amazonian floodplains and the El Niño-Southern Oscillation effect (Jochen Schoengart)
11.10	Tree ring studies related to carbon uptake in Amazon lowland forests: Tree Growth and Climate (Marco Sack)
12.1	Large carbon emissions from Amazon forests through drought-induced tree mortality and suppression of wood production (Daniel Nepstad)
12.2	Changes in carbon cycling by Brazilian rain forest: effects of soil moisture reduction on soil, leaves and canopy (Patrick Meir)
12.3	Dry-season irrigation alters carbon dynamics in tropical forest regrowth (Daniel Zarin)
12.5	Soil CO ₂ production and transport in the drought experiment in Caxiua National Forest, Para, Brazil. (Eleneide Doff Sotta)
12.7	Stable isotope analyses provide evidence of drought stress impacting plant function at the Seca Floresta (James Ehleringer)
12.8	Correlation but no causation between leaf nitrogen and maximum assimilation: the role of drought and reproduction in gas exchange in an understory tropical plant <i>Miconia ciliata</i> (Melastomataceae) (Débora Aragão)
12.9	Coupling soil hydraulics to stomatal conductance; a mechanism for modelling the impacts of drought on forest gas exchange. (Rosie Fisher)
19.8	Recent Progress in Measuring and Modeling Patterns of Biomass and Soil Carbon Pools Across the Amazon Basin (Christopher Potter)
19.9	Recent Progress in Understanding Terrestrial Carbon Cycles in the Amazon Basin (Susan Trumbore)
19.10	Towards a Model of Carbon Mobilization, Advection, and Reaction in the Amazon River (Jeffrey Richey)
20.7	The role of sorption in retention of dissolved organic carbon in soils of the lowland Amazon basin (Sonya Remington)
21.2	Micrometeorology, CO ₂ and H ₂ O Exchange of a Tropical Rainforest Before and After Selective Logging (Scott Miller)
21.3	Selective Logging Effects on Carbon Budgets at Three Sites in the Brazilian Amazon (Michael Keller)
21.4	Biomass and Necromass in Three Undisturbed Forests in the Brazilian Amazon (Michael Palace)

21.5	Canopy structure and radiation environment metrics indicate forest developmental stage, disturbance, and certain ecosystem functions (Geoffrey Parker)
21.6	Natural disturbance regimes and tropical forest carbon balance: integrating canopy structure, flux measurements, and modeling across the landscape (Scott Saleska)
21.7	What's driving regional changes in old-growth tropical forests? (Jeffrey Chambers)
21.8	Quantifying the effect of sporadic forest disturbances on measured biomass change in forest plots (Yadvinder Malhi)
21.9	Variation in ages and growth rates of trees in Amazonian tropical forests: consequences for carbon and forest management (Simone Vieira)
21.10	Seasonal dynamics of soil, litter, and ecosystem respiratory carbon dioxide fluxes as indicated by stable isotope analyses (Jean Pierre Ometto)
23.8	Legacy of Fire Slows Carbon Sequestration in Amazonian Forest Regrowth (Daniel Zarin)
33.1-P	Biomass and net primary productivity in savannas, Gran Sabana, Canaima National Park, Venezuela (Bibiana Bilbao)
33.2-P	The Effects of Logging and Understory Fires on Biomass in Dense and Transitional Forests (Oswaldo Carvalho Jr)
33.3-P	Distribuição Espacial de Parâmetros Biofísicos da Vegetação na Floresta Nacional do Tapajós - PA (Fernando Espírito-Santo)
33.4-P	If we understand how trees are constructed we could explain why tree growth rate is higher in the west Amazon (Sandra Gallego)
33.5-P	Relating secondary forest characteristics to time series of Landsat-derived reflectances (Stephen Hagen)
33.6-P	Stocks and Fluxes of Coarse Woody Debris in Southwestern Amazon forests (Eurídice Honorio)
33.7-P	Relationships between Forest Composition and Soil and Hydrological Characteristics in a Tropical Forest in NW Mato Grosso (Stefan Jirka)
33.8-P	Variation of Aboveground Biomass in the Forest of Bananal Island, Tocantins State (Dariusz Kurzatkowski)
33.9-P	Diversidade Florística e Biomassa em Cronosequência de Florestas Secundárias no Leste do Pará, Amazônia Oriental (Eliane Leal)
33.10-P	Taxa incremento diamétrico de árvores e estoque de carbono de uma floresta primária na FLONA Tapajós, Santarém-Pará. (Raimundo Lima Júnior)
33.11-P	Spatial patterns in forest carbon dynamics, biomass and biomass change across the Amazon basin. (Yadvinder Malhi)
33.12-P	Application of Remote Sensing Tools to Identify Forest Composition and Seasonal Dynamics in NW Mato Grosso (Andrew McDonald)
33.13-P	Séries de Estereo-Fotografias para Quantificar a Biomassa da Vegetação do Cerrado (Unknown)
33.14-P	Efeito de tratamentos silviculturais na estrutura de floresta tropical Ombrófila Aberta, na Amazônia Meridional (Carlos Alberto Moraes Passos)
33.15-P	Estimativas de volume de madeira na Amazônia Central: efeitos de irregularidades do fuste e ocos (Euler Nogueira)
33.16-P	Effects of wood density and the height-x-diameter relationship on biomass differences between three widespread Amazonian forest types (Bruce Nelson)
33.17-P	Isotopic composition of plant and soil nitrogen on a precipitation gradient in the Brazilian Amazon Forest (Gabriela Nardoto)
33.18-P	Necromass Density Estimates from Two Brazilian Amazonia Forests (Michael Palace)
33.19-P	A Portable Lidar System for Rapid Determination of Forest Canopy Structure (Geoffrey Parker)

33.20-P	Monitoramento da Taxa de Incremento Diametral em Biomassa de Carbono em Floresta Primária na Floresta Nacional do Tapajós (Kleber Portilho)
33.21-P	Effect of contrasting irradiances on the carbon balance and biomass partition in Brazilian savanna (Cerrado) woody seedlings (Carlos Prado)
33.22-P	Interactions Between Soil Fertility and Forest Dynamics in the Bolivian Amazon Forest. (Carlos Alberto Nobre Quesada)
33.23-P	Estimativa do estoque de carbono em distintos materiais e coberturas vegetais no noroeste da Amazônia Legal (Segundo Durval Rezende)
33.24-P	Padrões Estruturais e Alométricos em Florestas Alagáveis na Região da Ilha do Bananal, Estado do Tocantins (Rita Ribeiro)
33.25-P	Distribution of coarse and fine root biomass in native ecosystems and planted pasture in the Cerrado of Central Brazil (Patricia Rodin)
33.26-P	Carbon dynamics and Landscape-scale vegetation patterns in an old-growth Amazonian rainforest (Gregory Santoni)
33.27-P	Análise Florística e Estrutural de uma Floresta Ombrófila Aberta Primária no Hotel de Selva Cristalino, Alta Floresta-MT (Vanessa Aparecida Santos)
33.28-P	Relação da Precipitação Pluviométrica com a Taxa de Crescimento de Espécies Arbóreas com Diâmetro Entre 60 e 70 cm da Amazônia, em Área de Parcela Permanente da Flona Tapajós, Santarém. (Kadson Silva)
33.29-P	Efeito da exploração seletiva de madeira no crescimento e respiração do tronco em floresta de terra-firme na região de Manaus. (Liliane Teixeira)
33.30-P	Análise da Biomassa utilizando método "direto" para pastagem em Rondônia. (Fabricio Zanchi)
34.1-P	Internal carbon cycling in native Cerrado and a pasture in Central Brazil (Roberto Aduan)
34.2-P	Photosynthetic rates and nitrogen use efficiencies in plants of different functional groups in the open savannas of Gran Sabana, Canaima National Park, Venezuela (Bibiana Bilbao)
34.3-P	Plant Community Phenological Responses to Simulated Drought Stress: Preliminary Results from a Partial Throughfall Exclusion Experiment (Paulo Brando)
34.4-P	Drought-tolerance of an eastern Amazon forest, recovery of canopy water status: results from a throughfall exclusion experiment. (Gina Cardinot)
34.5-P	Efeitos do estresse hídrico sobre a condutividade hidráulica foliar do xilema em <i>Coussarea racemosa</i> e <i>Eschweilera pedicellata</i> em uma área de floresta tropical úmida amazônica. (Williams Castro)
34.6-P	Dry events, forest fires occurrences, Human displacement in Amazon and changes in carbon cycle during the upper Holocene (Renato Cordeiro)
34.7-P	Evaluation of Observing and Modeling requirements for the Balanço Atmosférico Regional de Carbono na Amazônia (BARCA) Project (Allan Denning)
34.8-P	The effect of warming on tropical forest gas exchange. (Christopher Doughty)
34.9-P	Variação Sazonal da Área Foliar em Três Extratos da Floresta Amazônica na Região de Sinop (João Areis Ferreira Barbosa Júnior)
34.10-P	Medição de Área Foliar Através da Reflectância Espectral em Espécies Diversificadas na Floresta Nacional do Tapajós, Santarém-Pará - Brasil (Daniel Figueiredo)
34.11-P	Recuperação e Valor de Resgate para o Seqüestro do Carbono Atmosférico em Ecossistemas Manguezais (Sérgio de Mattos Fonseca)
34.12-P	Atmospheric CO ₂ Budget over Amazon Basin: The Role of the Convective Systems (Valdir Herrmann)
34.13-P	Ecosystem Demography Model (ED) (Paul Moorcroft)
34.14-P	Ecosystems responses to seasonal variation and different land use in Amazon Basin using the isotope approach (Francoise Ishida)

34.15-P	Modeling Studies of Carbon Cycling at the Tapajos National Forest using the NASA-CASA Ecosystem Model (Steven Klooster)
34.16-P	Annual carbon cost of stem CO ₂ flux in an old growth tropical forest (Evelene Lopes)
34.17-P	The influences of mesoscale circulations and River CO ₂ effluxes on regional carbon balance in the Tapajos Region, Para, Brazil. (Lixin Lu)
34.18-P	Understanding the effects of drought upon carbon allocation and cycling in tropical forest. (Daniel Metcalfe)
34.19-P	First results from a new high precision trace gas analysis system for air analysis within Brazil (John Miller)
34.20-P	Ecophysiological distinction of plant functional groups in Central Amazonian primary forest (Tomas Domingues)
34.21-P	Comparação de Dois Métodos Para Determinação da Radiação Fotossinteticamente Ativa Interceptada Pelo Dossel (Pedro Priante)
34.22-P	Fraction of Photosynthetically Active Radiation Absorbed by Amazon Tropical Forest: A Comparison Among Estimates Based on in situ Measurements, Modeling and Remote Sensing. (Mônica Senna)
34.23-P	Evaluation of Multi Sensor Satellite Data for Macrophyte Population Assessment at the Amazon Floodplain (Thiago Silva)
34.24-P	Efeito da Exclusão Artificial de Chuvas no Fenômeno de Autopoda de Galhos em <i>Perebea mollis</i> (Poepp. & Endl.) Huber Subsp. <i>mollis</i> (MORACEAE). (Wanderley Silva)
34.25-P	Estimating scalar sources, sinks and fluxes in tropical forests using inverse models (Mario Siqueira)
34.26-P	Resposta do índice de área foliar à radiação fotossinteticamente ativa refletida pelo dossel de ecótono floresta tropical úmida cerrado (Jonas Spolador)
34.27-P	Drought Effects on Plant Mortality, Forest Structure, and Dead Biomass Pools in an Eastern-Central Amazonian Rainforest: Results of a Partial Throughfall Exclusion Experiment (Ingrid Tohver)
34.28-P	Modeling optimum temperature of leaves of canopy tree species in the Central Amazon (Edgard Tribuzy)
34.29-P	Can satellite images track the seasonal dynamics of leaf emergence, leaf aging and litterfall in seasonal tropical evergreen forests? (Xiangming Xiao)
34.30-P	Daily courses isotopic analysis of plant tissues and water vapor at Seca Floresta experiment, Santarem, PA. (Haroldo Jackson da Silva)
35.1-P	Fluxos de massa e de energia em área de reflorestamento, obtidos pelo método de covariância de vórtices turbulentos, a partir de diferentes tempos de amostragem (Renata Aguiar)
35.2-P	Fluxos de CO ₂ num Ecossistema de Manguezal em Bragança-PA (Vanda Andrade)
35.3-P	Energy closure test in central Amazon: sensitivity to the angle of attack corrections (Alessandro Araújo)
35.4-P	Carbon dioxide concentrations within a tropical forest canopy in Central Amazon: spatial and temporal variability in a topographic gradient. (Alessandro Araújo)
35.5-P	Comparação entre os fluxos de calor sensível e de calor latente em áreas de pastagem e de floresta de transição, no noroeste de Mato Grosso (Jose Carlos Arruda)
35.6-P	Automatic calibration of energy-water and carbon exchange processes in the SiB2 model for tropical forest before and after selective logging. (Rafael Rosolem)
35.7-P	Comparação entre os fluxos de calor sensível e de calor latente em áreas de floresta tropical úmida e de floresta de transição, no sudoeste da Amazônia (Vinicius Buscioli Capistrano)
35.8-P	Seasonality in water and energy fluxes in the Tapajos (Lucy Hutyra)

35.9-P	Effects of Intra-Biome Variations in the Tropical Rainforest Biophysical Parameters on the Fluxes Between the Surface and the Atmosphere (Hewlley Imbuzeiro)
35.10-P	Mangrove forests: what mechanism(s) underly seasonal changes in productivity and evapotranspiration? Evidence from plant physiology and eddy covariance studies. (Patrick Meir)
35.11-P	Rates of Energy Storage and Stem Heat Fluxes in a Terra Firme Forest in Central Amazonia (Alessandro Michiles)
35.12-P	Comparação Entre Trocas Gasosas Medidas Pontualmente e Pelo Método de Vortices Turbulentos na Região de Sinop (Eduardo Miranda)
35.13-P	Is the similarity theory adequate to describe turbulent surface fluxes at the LBA-ECO agricultural site in Santarém? (Osvaldo Moraes)
35.14-P	Comparação dos Fluxos de Dióxido de Carbono e Energia em uma Área de Transição Entre a Floresta Amazonica e o Cerrado Matogrossense no Norte de Mato Grosso (João Novaes Filho)
35.15-P	Comportamento dos Fluxos Noturnos de CO ₂ Atmosférico em um Ecossistema de Manguezal da Amazônia (Paulo Jorge Oliveira)
35.16-P	Solução de problemas técnicos em sistemas para medidas de "eddy covariance". (Jean Reinildes Pinheiro)
35.17-P	Monitoring Carbon, Heat, and Water Vapor turbulent fluxes over an Agricultural Field in Santarém. (Ricardo Sakai)
35.18-P	Horizontal Advection of CO ₂ in the Old Growth Forest: LBA preliminary results (Julio Silva)
35.19-P	Avaliacao e comparacao de fluxos de CO ₂ e H ₂ O em duas torres em Manaus (Julio Silva)
35.20-P	Measuring subcanopy CO ₂ advection in the FLONA Tapajós. (Julio Silva)
35.21-P	Perfis Noturnos de Temperatura, Umidade e CO ₂ utilizando Balão Cativo, em dois sítios do LBA-ECO em Santarém, PA. (Rodrigo Silva)
35.22-P	Fluxos de Calor Latente, Calor Sensível e Saldo de Radiação em um Ecossistema de Manguezal do Estado do Pará (Rommel Silva)
35.23-P	Fluxos de CO ₂ Entre a Vegetação e a Atmosfera em Áreas de Pastagem e Floresta em Rondônia (Anderson Teixeira Telles)
35.24-P	Varição do efluxo de CO ₂ no solo em uma floresta de transição no noroeste de Mato Grosso (Carla Maria Valentini)
35.25-P	Low frequency transports in the atmospheric surface layer over Amazon forest (Celso Von Randow)
36.1-P	Soil respiration in native Cerrado and a pasture in Central Brazil: Seasonal variation and deep soil contribution on total flux (Roberto Aduan)
36.2-P	População Microbiana, Carbono e Nitrogênio Microbiano Como Indicador de Biomassa Microbiana de um Solo de Terra Firme sob a Floresta Nacional de Caxiuanã Experimento LBA, na Estação Científica Ferreira Pena, Melgaço-Pará. (Eric Bruno Batista)
36.3-P	Soil organic matter dynamics and physico-chemical properties of intensively-managed Eucalyptus plantations compared to native forests in the Brazilian Amazon (Troy Beldini)
36.4-P	An Approach to Deal with Sources of Data Uncertainty in Dissolved Organic Carbon Dynamic
36.5-P	Flutuação Temporal e Espacial da Liteira Sobre o Solo e da Umidade da Camada Superficial do Solo (Adriana Conceicao)
36.6-P	Soil-Atmosphere Carbon Dioxide Fluxes Measured with Automated Chambers at the Tapajos National Forest (Ruth Varner)
36.7-P	Decomposição de folhas de espécies em uma Floresta de Transição Amazônia Cerrado e uma Floresta Amazônia em período de transição seco-úmido (Higo Dalmagro)
36.8-P	Influência da Quantidade de Biomassa de Liteira Comparada ao Efluxo de CO ₂ do Solo Para uma Floresta em Ji-Paraná, RO. (Juliano Deus)

36.9-P	Leaf Area Index (LAI) and Litter Production Before and After Selective Logging in a Tropical Forest, Eastern Amazônia, Santarém-PA. (Adelaine Michela Figueira)
36.10-P	Efeito da Exclusão de Água do Experimento ESECAFLOR Sobre a Abundância dos Diptera Presentes na Liteira de uma Floresta de Terra Firme (Ivaneide Furtado)
36.11-P	Biomassa de raízes em sistemas agroflorestais implantados em áreas de pastagens degradadas na Amazônia central (Jorge Gallardo Ordinola)
36.12-P	Influência da temperatura e umidade do solo e do ar na produção e acúmulo de serrapilheira em floresta de transição tropical úmida - cerrado (Márcia Gallon)
36.13-P	Fluxos de carbono orgânico dissolvido em microbacias pareadas(floresta x pastagem)no estado de Rondônia. (Sérgio Gouveia Neto)
36.14-P	Relação entre efluxo de CO ₂ do solo e o relevo (Brenda Guimarães)
36.15-P	Internal and external fluxes of dissolved organic carbon in forested headwater Amazonian catchments: Near-surface and aboveground controls on DOC exports. (Mark Johnson)
36.16-P	Terra Preta de Índio of the Amazon: opportunity to study black carbon dynamics in soil (Johannes Lehmann)
36.17-P	Carbono e Nitrogênio Orgânico no Solo e Carbono e Nitrogênio da Biomassa Microbiana em Solos com Gradiente de Umidade, Caxiuanã - PA. (Elessandra Laura Lopes)
36.18-P	Soil Carbon Stocks and Dynamics in Acre: Contrasts with the Remaining Brazilian Amazon (Antonio Melo)
36.19-P	Transporte de carbono e nutrientes da liteira para o igarapé em uma pequena bacia hidrológica de Terra-Firme na amazônia central (Maria Monteiro)
36.20-P	Relações entre a produção de liteira e os componentes do balanço hídrico na Estação Científica Ferreira Penna,Melgaço-PA. (Rosecelia Moreira da Silva)
36.21-P	Influence of soil texture on the dynamics of dissolved organic carbon in soil solution of a primary forest in the Amazon ZF2, Manaus (Vania Neu)
36.22-P	Concentrações carbono e nitrogênio em folhas de árvores em duas florestas de terra firme na Amazônia brasileira, sobre solos de fertilidade contrastante. (Romilda Paiva)
36.23-P	Fluxo de CO ₂ e CH ₄ em pastagens abandonadas, sistemas agroflorestais e floresta primária na Amazônia Ocidental (Juliete Queiroz)
36.24-P	Soil Aluminium Influence Over Tree Species Distribution in the Bolivian Amazon Forest (Carlos Alberto Nobre Quesada)
36.25-P	Decomposição de folhas de espécies em uma Floresta Tropical de Transição em Sinop/MT em períodos de transição úmido- seco e seco-úmido (Fernando Raiter)
36.26-P	Aumento da Produção de Liteira em um Período de El Niño em Floresta de Terra Firme na Amazônia Central (Fabiana Rocha Pinto)
36.27-P	Capacidade de Água Disponível no Solo e Suas Relações com a Fauna do Solo e as Funções Reprodutivas Vegetal: Experimento LBA Esecafloor-Caxiuanã/PA (Ma. Ruivo)
36.28-P	Assessing the impact of land-use change on soil organic carbon dynamics in Central Panama using physical soil fractionation and stable carbon isotopes (Luitgard Schwendenmann)
36.29-P	The influence of water in the relationship between CO ₂ efflux and soil chemical properties in a terra firme forest (Juliana Souza)
36.30-P	Carbono e nutrientes na interface solo-liteira em plantios florestais e florestas nativas de terra firme na Amazônia peruana (Sandra Tapia-Coral)
36.31-P	Variação sazonal da biomassa microbiana-C e da umidade do solo sob diferentes coberturas vegetais na Amazônia central (Lucerina Trujillo Cabrera)

36.32-P	Carbon distribution in particle size fractions of soil organic matter under primary forest and agroforestry systems on two soil types in western Amazonia (Katell Uguen)
36.33-P	Medição do Efluxo de CO2 do Solo com Câmaras Automáticas Sobre Floresta em Rondônia. (Fabricio Zanchi)
HD (Dimensões Humanas) / HD (Human Dimensions)	
2.1	Human Dimensions in LBA (Bertha Becker)
2.2	A dimensão humana nos programas de pesquisa em Mudanças Gloabais: o caso LBA. (Tatiana Schor)
2.3	Patterns of land cover change and land use intensification (Diogenes Alves)
2.4	Population Dynamics in the Amazonian Frontier: Scarcity of Labor and Fertility (Emilio Moran)
2.5	Reconstructing landscape histories and land use trajectories in Eastern Amazônia: Social, demographic, and economic dimensions of deforestation in comparative, multi-level perspective (Eduardo Brondizio)
2.6	Determinantes da Expansão da Pecuária Bovina na Região do Alto Rio Acre (Fabiano Toni)
2.7	Why such a tremendous expansion of cattle ranching in the Amazon ? Discussion from a new research methodology (Jonas Veiga)
2.8	Landscape Fragmentation and Conservation in Rondônia: The Role of Settlers, Loggers, and Forest Peoples (Mateus Batistella)
2.9	Agents of Deforestation (Eustáquio Reis)
2.10	Transportation Logistics and Endogenous Development in the Amazon (Bertha Becker)
9.1	Earth System Processes and Human Health: Linkages in the Amazon (Ulisses Confalonieri)
9.3	Policy Relevance of LBA "Human Dimensions" Science: A Review of Accomplishments and Opportunities (Daniel Nepstad)
13.2	Determinantes e Tendências da Ocupação da Amazônia (Eustáquio Reis)
13.7	Heterogeneity in Road-building Processes and Road Network Architecture: A Comparison of Two Amazonian Arenas and Implications for Projecting Future Land Cover (Stephen Perz)
22.1	Amazon scenarios: modeling the interactions of ecosystems, climate, and land use (Daniel Nepstad)
22.7	A Demographic Dynamics System for the Brazilian Amazon's Municipalities. (Ricardo Garcia)
30.1-P	An Interactive CD-Rom for Teaching Remote Sensing Applied to Amazon Issues and Exemplified by LBA Case Studies. (Nelson Dias)
30.2-P	The Data and Information System of the Large Scale Biosphere-Atmosphere Experiment in Amazonia - LBA (Luiz Horta)
30.3-P	SIG sem computador: ferramenta para comunidades rurais monitorarem os serviços ambientais no Programa Proambiente (Nara Pantoja)
30.4-P	Estudos temáticos de Pesquisas do LBA: Uma contribuição para a produção de material Didático-Pedagógico para o Ensino Fundamental. (Aline Santos)
30.5-P	Avaliação de livros e material didático usado para o ensino de ciências nas escolas de ensino fundamental da região oeste do Pará, Brasil. (Thatiana Silva)
30.6-P	O Ensino dos Ciclos da Água e do Carbono no Ensino Médio em Santarém-PA (Elineu Santos)
30.7-P	The ORNL DAAC: A Source for Biogeochemical and Ecological Data ¹ (Larry Voorhees)

30.8-P	GIS Smart Client: Sharing Intelligence Worldwide (Genong Yu)
31.1-P	O Papel da Floresta Amazônica nas Negociações Internacionais sobre Mudança de Clima Global (Luis Antônio Aimola)
31.2-P	Market incentives for environmental law compliance in Mato Grosso: opportunities and limitations to environmental certification of soy and meat in the Amazon. (Oriana Almeida)
31.3-P	Population redistribution in the Ecuadorian Amazon in the 1990s (Alisson Barbieri)
31.4-P	Fogo Inimigo? As transformações do discurso ambiental na agricultura familiar (Luciana Costa)
31.5-P	A escala e o método como bases para análises: tipologias e setorizações (Reinaldo Correa Costa)
31.6-P	A Natureza como Recurso e a (re)criação de Territorialidades (Reinaldo Correa Costa)
31.7-P	Searching for a place on the Amazonian frontier: the trajectories of invisible rural workers in Acre, Brazil and Pando, Bolivia. (Benedita Esteves)
31.8-P	Institutional Dimensions and Land-Cover Change: Regional and Local Variability in the Lower Amazon (Celia Futemma)
31.9-P	Building Collaborative Networks in LUCC Case Studies in Acre, Brazil (Carlos Gomes)
31.10-P	Social Change and Land Cover Change in Santarem, Para State, Brazil. (Alvaro D'Antona)
31.11-P	Revisiting the livestock and deforestation interplay in the Amazon: The cases of Uruara and southern Para (Pablo Pacheco)
31.12-P	Examination of migration to agricultural frontiers using temporal and spatial cohorts (William Pan)
31.13-P	Socio-spatial Processes of Road-building and Land Cover Change: The Case of Sinop, MT (Stephen Perz)
31.14-P	Basin-Scale Econometric Modeling III: local interactions in deforestation decisions
31.15-P	The causes of deforestation in the Brazilian Amazon : Crossing results from economic models and farmers behaviour analysis (Marie Gabrielle Piketty)
31.16-P	Two stage simulation model of Brazilian Amazon deforestation (Eustáquio Reis)
31.17-P	Study and prediction of malaria distribution at Novo Repartimento municipality-southeast Pará state (Cintia Vasconcelos)
31.18-P	A expansão da pecuária na Amazônia Oriental: O papel dos colonos (Jonas Veiga)
31.19-P	Recuperando áreas de pastagens degradadas por sistemas agroflorestais: serviços ambientais x economia (Elisa Wandelli)
31.20-P	Economic Aspects of Fire Use and Prevention: a household model for the Brazilian Amazon (Larissa Chermont)
32.1-P	Cost functions for harvest, transport, and milling in the timber industry of the Brazilian Amazon (Simone Bausch)
32.2-P	Timber Concessions and Public Forests in the Brazilian Amazon: the ITTO Project in the Tapajós National Forest. (Margaret Francis)
32.3-P	The potential of small farm forestry in the economic development of the Transamazon highway. (Eirivelthon Lima)
32.4-P	O Manejo Florestal e o Uso de Recursos Florestais por Famílias Assentadas: Os Impactos do Projeto Florestas Familiares (Mary Menton)
32.5-P	Industrial development on logging frontiers in the Brazilian Amazon (Frank Merry)
32.6-P	Collective action without collective ownership: community associations and formal logging contracts. (Frank Merry)
32.7-P	Emerging smallholder forest management contracts in the Brazilian Amazon: impacts on welfare and labor supplies.

LC (Mudanças dos Usos da Terra e da Vegetação) / LC (Land Use and Land Cover Change)

7.2	Análise Sazonal dos Produtos MOD13A2 (NDVI/EVI) e MOD15A2 (LAI/fAPAR) Para o Bioma Cerrado (Manuel Ferreira)
7.4	Phenological shifts and variations in vegetation along Amazon eco-climatic transect using MODIS VI time series (Piyachat Ratana)
7.5	Spatiotemporal Shifts in Biologic Activity Across Amazonia Forest-Cerrado Transitions and Land Conversions: an Analysis with MODIS Biophysical Products (Alfredo Huete)
7.6	Mapping Expansion of Soybean Cultivation with MODIS data (Ruth DeFries)
7.7	Combining Land Cover Data with MODIS Active Fire Detections to Establish Fire Type and Estimate Burned Area (Douglas Morton)
7.8	Análise espacial dos padrões de desmatamento na região Amazônica através de dados PRODES e MODIS (Nilson Ferreira)
7.9	Avaliação dos índices de vegetação MODIS para a detecção de mudanças na cobertura vegetal do Cerrado. (Eristelma Barbosa Silva)
7.10	Sistema para Visualização e Análise da Qualidade das imagens MOD13 (Fabio Lobo)
9.2	Regional- and Planetary-scale "Goods and Services" Provided by the Amazon Basin: Examining Trade-Offs Between Human Needs and Environmental Function (Jonathan Foley)
12.4	Drought tolerance of Amazon trees reflects a low vulnerability to cavitation: results from a large scale rainfall exclusion experiment. (Gina Cardinot)
13.1	Understanding the Function of Roads in Land Cover Change (Marcellus Caldas)
13.3	Amazon Soybean Transport Costs (Maria del Carmen Vera-Diaz)
13.4	Land Use and Transportation Costs in the Brazilian Amazon (Diana Weinhold)
13.5	As mudanças sócio-ambientais na Amazônia Sul-Occidental: Avaliação pelas populações ao longo da Estrada Interoceânica no Estado do Acre, Brasil e no Departamento de Madre de Dios, Peru. (Elsa Mendoza)
13.6	Roads: A Proximate or Underlying Cause of Deforestation? (Marie Scouvert)
13.8	Logging roads in the Amazon basin and forest fragmentation: modeling challenges (Eugenio Arima)
13.9	Basin-Scale Econometric Modeling I: road endogeneity and road impacts (Alexander Pfaff)
13.10	Basin-Scale Econometric Modeling II: spatial disaggregation and spatial impacts (Alexander Pfaff)
14.1	Números de Desflorestamento Devem Incorporar Fundamentos de Medidas (Alberto Setzer)
14.2	Public policy implications of accuracy assessment for fire and deforestation monitoring: Don't forget the error bars (Irving Brown)
14.3	Incorporating the use of MODIS data into INPE deforestation mapping (Yosio Shimabukuro)
14.4	Representatividade e limitações dos dados da detecção orbital de queimadas do INPE (Alberto Setzer)
14.5	Characterizing Vegetation Fire Regimes in Brazil Through Adjusted Satellite Fire Detection Data (Wilfrid Schroeder)
14.6	Validation and comparison of Terra/MODIS active fire detections from INPE and NASA/UMd algorithms (Jeffrey Morissette)
14.7	Dinâmica das queimadas no Estado do Mato Grosso (Alexandre Coutinho)

14.8	Passive ground-based analyses for interpreting satellite fire data - Applications to AVHRR and MODIS active fire detections in Amazonia (Manoel Cardoso)
14.9	Remote Sensing Database for the LBA Project (Dalton Valeriano)
17.2	Remote Sensing of Selective Logging: Challenges, Successes, and the Future (Gregory Asner)
17.3	An Integrated Analysis of Ecology and Land Use and Land Cover Dynamics in Eastern Amazônia (Ima Vieira)
18.1	Hydroelectric Dams in Amazônia as Contributors to Global Warming: The Controversy Heats Up (Philip Fearnside)
19.7	Advances in Understanding Land Cover/Land Use Changes for Biogeochemical and Hydrological Modeling (Diogenes Alves)
21.1	Amazon-wide Forest Gap Fraction and Selective Logging from Satellite Analyses (Gregory Asner)
22.2	Integrated Ecological Economics Modeling of Ecosystem Services from Brazil's Amazon Rainforest (Rosimeiry Portela)
22.3	A spatially explicit simulation model of deforestation for the Amazon Basin (Britaldo Soares Filho)
22.4	Analysis of the influence of spatial variables on the location of deforestation in the Brazilian Amazon (Britaldo Soares Filho)
22.5	Reconciling competing land uses along the BR-163 highway: steps towards science-based, participatory land use zoning (Ane Alencar)
22.6	Amazon Soybean Expansion: Yield and Rent Models (Maria del Carmen Vera-Diaz)
22.8	Estimating Amazonian forest fire probability based on edaphic and climatic factors and proximity to land-use and infrastructure. (Paul Lefebvre)
22.9	Effects of Land Use Change on Vertebrate Populations in a Dynamic Frontier in Amazonia (Claudia Azevedo-Ramos)
22.10	Biomass of Amazonian Forest and Greenhouse Gas Emissions: New Data and Controversies (Philip Fearnside)
23.2	Caracterização de Estádios Sucessionais na Amazônia: Resultado do Mapeamento no Sítio Experimental da Floresta Nacional do Tapajós (Fernando Espírito-Santo)
23.3	O desmatamento na região de Roraima e sua relação com áreas de regeneração da floresta: Um indicador do uso da terra (Alexandre Homem de Mello)
23.4	Integrating field data and remote sensing to study secondary forests in Amazonian rural settlements (Mateus Batistella)
23.5	A Survey of Remote Sensing Methods for Mapping Second Growth Forests in Amazônia (Dar Roberts)
23.7	Carbon budget estimation in Central Amazonia: successional forest modelling from remote sensing data (Till Neeff)
39.1-P	A Extensão dos Incêndios Florestais na Amazônia Brasileira em Anos de El Niño e Não El Niño (Ane Alencar)
39.2-P	Dinâmica de Ocupação e Perda de Carbono no Leste da Amazônia (Arlete Almeida)
39.3-P	Evaluating Selective Logging Pressure upon the Amazonian Biome Using GIS Cost Surface Models (Paulo Barreto)
39.4-P	Deforestation Patterns Along the Highway Belem/Tome-Acu, Brazilian Amazonia. (Doris Navarro)
39.5-P	Estimating climatic implications of soy and pasture expansion in Mato Grosso
39.6-P	The Rubber Tappers' Rapidly Transitioning Land Use Strategies: Cattle Ranching Expansion in the Chico Mendes Extractive Reserve in Acre, Brazil (Carlos Gomes)

39.7-P	Avaliação da abrangência das Áreas de Proteção Permanente (APP) em relação a Reserva Legal em ambientes de floresta da Amazônia (Felipe Gonçalves Junior)
39.8-P	Conversão de Floresta Tropical em Pastagem e Sua Influência no Balanço Hídrico da Região de Ji-Paraná, Rondônia. (Kécio Gonçalves Leite)
39.9-P	Land Use and Land Cover Change in Amazonia Frontier, Ji-Paraná Basin - Rondônia (Lais Hanada)
39.10-P	Análise da Intensidade da Exploração Madeireira em Áreas de Floresta Densa e de Transição na Amazônia (Sanae Hayashi)
39.11-P	Avaliação do manejo seletivo de madeira e alteração da biomassa através da análise de imagens Ikonos, no município de Cláudia - MT (Wander Hoeger)
39.12-P	Monitoramento da expansão de soja em relação ao Zoneamento Agroecológico do município de Santarém (Wanja Janayna Lameira)
39.13-P	Infrastructure, Regional Development and Livestock in the state of Para, Brazilian Amazon (Benoit Mertens)
39.14-P	O impacto do número de queimas sobre o potencial regenerativo da vegetação secundária na Amazônia Central (Marcelo Moreira)
39.15-P	Carbon and nutrient transfers following selective logging in the Amazon: Combining remote sensing and allometry. (Lydia Olander)
39.16-P	Relações hídricas de sistemas agroflorestais seqüenciais no nordeste do Pará: avaliação do potencial hídrico em componentes arbóreos ¹ (Valdirene Oliveira)
39.17-P	Plantio de árvores de crescimento rápido para recuperação da capacidade produtiva da agricultura familiar na Amazônia Oriental brasileira (Brienza Junior Silvio)
39.18-P	Effects of land use changes on soil microbial communities in the Cerrado region (Maria Silva)
39.19-P	Diagnóstico da capacidade de uso da terra de distintos cenários na bacia hidrográfica do rio Ji-Paraná (RO) (André Toledo)
39.20-P	Situação da cobertura florestal no Distrito Agropecuário da Zona Franca de Manaus: a importância da escala para espacialização das taxas de desmatamento (Eduardo Venticinque)
40.1-P	Teores de matéria orgânica, nutrientes e disponibilidade de água, como fatores de limitação ao uso da terra nas bacias dos rios Acre e Iaco, Acre, Brasil (Eufran Amaral)
40.2-P	Socio-spatial processes of forest fragmentation in the Brazilian Amazon: the role of settlement roads (Marcellus Caldas)
40.3-P	Conhecimento Atual dos Solos do Estado de Goiás: Elaboração de Sistemas de Informação Geográficos de Solos / Sig-Solos (Pérola Calil)
40.4-P	Uso de regressão logística para modelar distribuição espacial de espécies arbóreas na Amazônia Central (Juliana Carneiro)
40.5-P	Influência da escala na distribuição espacial da densidade de árvores Amazônia Central (Juliana Carneiro)
40.6-P	Land Conversion along the Transoceanic Road Iñapari - Iberia: A Socio-Spatial Study of Road Extension and Forest Fragmentation (Andrea Chavez)
40.7-P	Avaliação de Projetos Para Recuperação de Ecossistemas Manguezais, Como Contribuição ao Seqüestro do Carbono Atmosférico e À Mitigação do Efeito Estufa Antrópico (Sérgio de Mattos Fonseca)
40.8-P	Floresta-De-Baixio: Diversidade e Riqueza de Espécies (Kianny Formiga)
40.9-P	Efeito de tratamentos silviculturais na regeneração natural de floresta tropical Ombrófila Aberta, na Amazônia Meridional (Elenara Gandini)
40.10-P	The Cuiabá- Santarém Road Linkage and the Effects on Land Cover. (Corey Hayashi)
40.11-P	Biophysical Predictors of Soy Expansion in Mato Grosso state, Brazil (Ellen Jasinski)

40.12-P	Soil biochemical characteristics under second growth forests of distinct ages and former land use in central Amazonia (Fabiane Lima de Oliveira)
40.13-P	Dinâmica de Fragmentos Florestais Naturais Ipucas considerando-se a Avaliação Multitemporal nos Últimos 48 Anos. (Alan Kardec Martins)
40.14-P	Diagnóstico Ambiental no Contexto da Paisagem de Fragmentos Florestais Naturais - Ipucas - no Município de Lagoa da Confusão, Tocantins. (Iracly Martins)
40.15-P	Efeito de tratamentos silviculturais no estoque de madeira em floresta tropical Ombrófila Aberta, na Amazônia Meridional (Carlos Alberto Moraes Passos)
40.16-P	Regeneração natural de floresta tropical Ombrófila Aberta com Palmeiras, primária, na Amazônia Meridional (Maria Noquelli)
40.17-P	Extensive analyses for pasture biophysical and biogeochemical dynamics under the interactions between human and soil types in Rondônia (Izaya Numata)
40.18-P	Aspectos da avaliação estatística de biodiversidade arbórea para floresta de transição de terra firme amazônica. (George Suli)
40.19-P	Estrutura e Funcionamento de Fragmentos Florestais Naturais (Ipucas) na Planície do Araguaia (Iracly Martins)
41.1-P	Rapid assessment of deforestation in Mato Grosso State using MODIS and ETM+ data (Liana Anderson)
41.2-P	O Uso de Imagens de Alta Resolução na Construção de Bibliotecas Espectrais de Árvores (Marina Antongiovanni)
41.3-P	Detection of Mesoscale Seasonal and Inter-annual Variation In Vegetation of the Amazon Basin (Maria Ballester)
41.4-P	Detecção da Dinâmica da Cobertura Vegetal na Região de Cristalina - GO a Partir de Processamento Digital de Imagens Landsat no Período de 1995 e 2003 (Maria Barbalho)
41.5-P	Mapping deforestation and secondary succession forest in the Brazilian Amazon using SPOT-4 VEGETATION data (Joao Carreiras)
41.6-P	Method for Large-scale Mapping of Forest Gap Fraction and Logging in Amazonia (Amanda Cooper)
41.7-P	An Assessment of Land Cover Dependencies of VI-Biophysical Relationships for Regional Extrapolations of Ground LBA Ecology Measurements in Brazilian Cerrado (Tomoaki Miura)
41.8-P	Seasonal and Inter-Annual MODIS Data Responses over a Dry to Wet Amazon Tropical Forest Gradient (Alfredo Huete)
41.9-P	High resolution image processing for tree diversity mapping in Tropical Forests of the Western Amazon, Tiputini Biological Station (TBS) Ecuador. (Edwin Keizer)
41.10-P	Sensitivity of Automated Monte Carlo Unmixing to Surface Reflectance Uncertainties Caused by Aerosols, Water Vapor, and Terrain Slope-Aspect (David Knapp)
41.11-P	Aspectos relevantes para o desenvolvimento de uma metodologia para a correção atmosférica, de imagens geradas pelo sensor IKONOS. (Rodrigo Marques)
41.12-P	Problemas no uso de imagens de alta resolução para quantificação de indivíduos arbóreos (Taise Pinheiro)
41.13-P	Uso de imagens de alta resolução para quantificação de indivíduos arbóreos em Florestas Tropicais (Taise Pinheiro)
41.14-P	Is P band polarimetric Radar necessary or sufficient to create accurate maps as basis of a monitoring System for the Amazon Forest?? (Marcela Quinones Fernandez)
41.15-P	Comparação da distribuição espacial de pontos quentes AVHRR e MODIS na região tri-nacional Brasil-Bolívia-Peru e municípios do Estado do Acre (Diogo Selhorst)

41.16-P	Field Assessment of Hot Pixel Data: A Case Study of the Alcobrás Settlement Wildfire to Evaluate the Accuracy of AVHRR, GOES, and MODIS Sensors as Indicators of Biomass Burning Events (Leigh Johnson)
41.17-P	Monitoramento Ambiental em Áreas de Cerrado a Partir de Dados MOD13Q1 Realçados Através de um Modelo de Mistura Espectral (Adriana Silva)
41.18-P	Identificação de clareiras através de imagens de satélite de alta resolução (Felipe Sobrinho)
41.19-P	A Review and an Intercomparison of Remote Sensing Techniques to Map Selective Logging in the Brazilian Amazon (Carlos Souza Jr.)
41.20-P	Sensor MODIS para análise ambiental em Zona Transfronteírica-Brasil/Uruguai: avaliação e perspectivas. (Valdir Steinke)
41.21-P	Multi-Scale Evaluation Of The Region Of Eastern Amazonia Using Ikonos, Landsat, SRTM And MODIS Data (Thomas Stone)
41.22-P	Arranjo espacial do dossel e alguns problemas relacionados ao uso de imagens de alta resolução no estudo de florestas tropicais (Eduardo Venticinque)
41.23-P	A Supervised Neural Linear Feature Extractor for Remotely Sensed Data (Genong Yu)
PC (Física do Clima) / PC (Physical Climate)	
1.1	Overview of Climate-Vegetation Interactions in Amazonia: From the Last Glacial Maximum to the Climates of the Future (Carlos Nobre)
4.1	The evapotranspiration of the Amazon basin
4.2	Water and energy variation associated with the wet season onset over the Amazon (Wenhong Li)
4.3	Activities of the GEWEX Hydrometeorology Panel (GHP) (John Roads)
4.4	Radiation Budgets in Support of LBA Hydrological Modeling (Rachel Pinker)
4.6	Impact of Precipitation Assimilation on Climate Simulations over Brazil (Ana Nunes)
4.7	Insights on modeling the hydrometeorology of the Amazon (Renato Silva)
4.8	Síntese de Quatro Anos de Medidas de Trocas de Energia e de gás Carbônico Acima de Floresta e Pastagem em Rondônia (Antonio Manzi)
4.9	The Isotopic Records of Andean Ice Cores, a Response of Precipitation Variability Over the Amazon Basin (Edson Ramirez)
4.10	Integration Novelties: new thinking for Earth System modelling and climate adaptation and mitigation. (Sarah Cornell)
11.1	How are Land Properties in a Climate Model Coupled through the Boundary Layer to Affect the Amazon Hydrological Cycle? (Robert Dickinson)
11.2	Oceanic Influence on Brazilian Rainfall (W. Timothy Liu)
11.3	The influence of land surface on the wet season onset over the Amazonia (Wenhong Li)
11.5	The atmospheric boundary layer characteristics over forest and pasture in the Amazon region (Gilberto Fisch)
11.7	Is the Amazon Heat Source Relevant for Higher Latitude Climate Anomalies? (Pedro Silva Dias)
11.8	Can Amazon Rainfall influence the Winter Weather over Europe and North America? (Rong Fu)
15.1	CCN Variability During LBA-SMOCC-EMfiN! 2002 and Its Role on Precipitation Initiation Over the Amazon Basin (Alexandre Costa)

15.5	Comments on "Smoking Rain Clouds over the Amazon" by M.O. Andreae, D. Rosenfeld, P. Artaxo, A.A. Costa, G.P. Frank, K.M. Longo and M.A.F. Silva-Dias (Earle Williams)
15.6	Characteristics of the Precipitating Systems during the 2002 Dry-to-Wet Field Campaign in the Amazon Region. (Carlos Morales)
15.7	Airborne and Ground Based Measurement of the Vertical Structure of Cloud Properties (Jose Martins)
15.8	O contexto "Green Ocean" visto através da distribuição de gotículas de nuvem e sua representatividade por uma função gama generalizada. (Jorge Martins)
18.2	Mesoclimate of the LBA-ECO Santarém Study Area (David Fitzjarrald)
18.3	Observations and Simulations of the Water and Energy balances in the Amazon Basin (Jose Marengo)
18.4	Hydroclimatological Teleconnections due to land-cover change in Amazonia (Roni Avissar)
18.5	Comparisons of the Amazon and Congo River Basins: Hydrology, Fire, Thermodynamics and Lightning (Earle Williams)
18.9	Testing interactions between radiation, carbon and water cycles using the LBA data (Yongkang Xue)
19.1	A Decade of Progress in Modeling the Hydroclimatology of the Amazon System (Marcos Costa)
19.2	Recent Progress in Modeling Biome-Climat Interactions in Amazonia (Carlos Nobre)
19.4	Recent Progress in Mesoscale Atmospheric Modeling (Maria Assução Silva Dias)
42.1-P	Microphysical evidence of the transition between predominant convective/stratiform rainfall associated to the large-scale variability of precipitation in Southwest Amazon (Rachel Albrecht)
42.2-P	Drop Size Distribution Measurements in TRMM-LBA and beyond (Ali Tokay)
42.3-P	Modeling of LBA/EMFIN!/SMOCC-2002 Cloud Microphysics (Gerson Almeida)
42.4-P	Classificação de Nuvens em Imagens Multiespectrais GOES-8 na Região Amazônica: Comparação com Radiossondagens (Marcus Bottino)
42.5-P	Daily Cycles of Type and Amount of Cloud Cover Over Amazon Region Deduced From GOES-8 Imagery (Juan Ceballos)
42.6-P	Changes in the microphysical structure of convective clouds over the Amazon (Alexandre Costa)
42.7-P	Ceilometer Observation of Seasonal and Diurnal Variation in Cloud Cover Fraction, Cloud Base Height, and Visual Range in the Eastern Amazon Region (Matthew Czikowsky)
42.8-P	Aspectos climatológicos e de mesoescala dos ecos de radar em Rondônia durante o experimento DRY-TO-WET SEASON CAMPAIGN - LBA, para o período de 18/10 a 04/11/2002 (José Figueiredo)
42.9-P	Cumulus Parameterization Impact of the Simulation of the Dry to Wet Transition using Period in 2002 in the SW Amazon (Silvio Figueroa)
42.10-P	Caracterização dos Sistemas Convectivos durante Dry-to-Wet 2002 (Maria Eugenia Frediani)
42.11-P	Characterization of Storm Types During a 30-HOUR Period of Radar Observations During the Dry-to-Wet Atmospheric Mesoscale Campaign of the LBA in 2002 (Gerhard Held)
42.12-P	Characterization of Storm Types During a 30-HOUR Period of Radar Observations During the Dry-to-Wet Atmospheric Mesoscale Campaign of the LBA in 2002 (Gerhard Held)
42.13-P	Dry to Wet Season: Cloud cover, precipitation and thermodynamics features (Luiz Machado)

42.14-P	Thermo-Electrodynamical analysis related to thunderstorm activities in Pantanal Sul Matogrossense, Brazil: preliminary studies. (Odim Mendes Jr.)
42.15-P	A data mining methodology for tracing convective kernels from cloud-to-ground discharge and other atmospheric datasets. (Jacques Politi)
42.16-P	Cloud Top Ascent Speeds during SMOCC (Earle Williams)
43.1-P	Perfis de aquecimento diabático na Região Amazônica (Aline Anderson de Castro)
43.2-P	Monitoramento dos fluxos de energia e CO2 em torre meteorológica na Reserva Florestal do Jarú, em Rondonia (Fernando Cardoso)
43.3-P	Inclusion of radiosondes data of the Campaign of LBA in the Regional Data Assimilation in CPTEC during October 15 to 29, 2002. (Rosangela Cintra)
43.4-P	Variabilidade Sazonal das Temperaturas do Ar e do Solo no Projeto ESECAFLOR Caxiuanã Pará (Antonio Costa)
43.5-P	Variabilidade Sazonal do Balanço de Energia em Ecossistema de Manguezal no Nordeste do Estado do Pará (Antonio Costa)
43.6-P	Nocturnal Variability in CO2 Concentration in Amazonian Pasture: Episodes of Fast Decline (Margarete Domingues)
43.7-P	The Convective Boundary Layer Over Pasture in Amazonia During the LBA Dry-to-Wet Experiment 2002 (Gilberto Fisch)
43.8-P	Influences of biomass burning on land-atmosphere interactions and dry-to-wet transition over Amazonia
43.9-P	Severe meteorological events in Northern Mato Grosso between June 1999 and September 2003. (Ralf Gielow)
43.10-P	Observações de clima e Fluxos turbulentos de água e CO2 sobre o Cerrado sensu stricto e cana-de-açúcar (Robinson Juárez)
43.11-P	Latent and Sensible Heat Flux Height Variation Within and Above the Rebio Jarú Amazonian Rain Forest Canopy (Maria Betânia Leal de Oliveira)
43.12-P	Detection of real time influence regions on the eddy flux and concentration measurements as a support for aircraft measurements during FIRE (Marcos Longo)
43.13-P	Características dos Sistemas Convectivos de Mesoescala Observados Sobre a Amazônia Durante o Experimento RACCI/LBA (Suzana Macedo)
43.14-P	Importance of the Low Level East East of the Andes (LLJ) and the moisture transport from the Amazon Basin to the la Plata Basin (Jose Marengo)
43.15-P	Sobre a Participação do Avião Laboratório Para Pesquisas Atmosféricas (ALPA) no LBA (Emerson Mariano)
43.16-P	Avaliação de perfis de vento interior da Camada Limite Atmosférica (Sylvia Elaine Marques Farias)
43.17-P	Time Evolution of the Nocturnal Boundary Layer Over Amazonia (Rosa Maria Nascimento dos Santos)
43.18-P	Low Level Jet Influence on the Nocturnal Boundary-layer Vertical Structure Above Caxiuanã Forest Reserve During Wet Season (Daniele Nogueira)
43.19-P	Fontes e Sumidouros de Vapor D'água e Calor Sensível Sobre o Pantanal (André Nunes)
43.20-P	Um Estudo de Caso Envolvendo Evaporação Regional na Camada Limite Planetária Através do Abracos e Modelo MM5. (José Oliveira Júnior)
43.21-P	Estudo da Convecção em Pastagem-Floresta Utilizando Radiossondagem e Modelo MM5. (José Oliveira Júnior)
43.22-P	Do amazonian trees loose water at night? (Rafael Oliveira)
43.23-P	Sistema de Aquisição de Dados ALPA2000 (Francisco Pinheiro)
43.24-P	Radiação Fotossinteticamente Ativa No Sub-bosque De Uma Floresta Primária No Oeste Do Pará, Amazônia (Irene Cibelle Sampaio)

43.25-P	Análise da Variabilidade Temporal do IWV na Pré Estação Chuvosa Utilizando GPS. (Luiz Sapucci)
43.26-P	Impacto da convecção úmida na baixa estratosfera - um estudo de caso (Thaís Scherrer)
43.27-P	Variação Sazonal de Alguns Elementos Meteorológicos em Ecossistema de Manguezal no Nordeste do Estado do Pará (João de Athaydes Silva Junior)
43.28-P	Estudo Observacional da Altura da Camada de Mistura em Bragança e Caxiuanã Durante o Período Chuvoso de 2002. (Adriano Sousa)
43.29-P	Mecanismos de Controle da Variação Sazonal da Transpiração de Uma Floresta Tropical no Nordeste da Amazônia (José Souza Filho)
43.30-P	Variação Sazonal do Albedo Para a Floresta de Caxiuanã-PA (José Souza Filho)
43.31-P	Variabilidade Pluviométrica Multi-escala na Amazônia Oriental e Mecanismos Dinâmicos Associados (Everaldo Souza)
43.32-P	Estimativa do balanço de radiação médio à superfície por satélite durante o DRY-TO-WET AMC/LBA (Jaidete Souza)
43.33-P	Análise de Desempenho dos Sistemas de Sondagem Aqua e ICI/NOAA Sobre Rondônia Durante o Experimento Dry-to-wet LBA (Rodrigo Souza)
43.34-P	Análise em tempo-escala de um evento associado a um jato em baixos níveis no Pantanal matogrossense (Luis Marcelo Zeri)
43.35-P	Análise do Ambiente Convectivo na Região Sudoeste da Amazônia: Um Estudo de Caso (Eder Vendrasco)
43.36-P	O Microclima do Manguezal de Bragança-PA (Marco Vieira)
43.37-P	Análise de Múltiplas Escalas de Tempo Sobre a Atmosfera no Leste da Amazônia Durante o Experimento Cimela (Maria Vitorino)
43.38-P	Análise estatística de variáveis meteorológicas em diferentes ecossistemas do litoral Atlântico da Amazônia (Wladimir de Santis Junior)
43.39-P	Estudo da Variação Média Horária da Temperatura do Solo em Diferentes Profundidades em Manguezal Natural e Degradado (Período Menos Chuvoso)
44.1-P	Estudo do Balanço de Radiação em Áreas de Pastagem e Floresta em Rondônia (Leonardo Aguiar)
44.2-P	Intradiurnal variability of soil temperature, heat flux, and soil thermal diffusivity in different ecosystems in eastern Amazonian (Regina Alvala)
44.3-P	Variabilidade observada da umidade do solo em Floresta Tropical Úmida e Cerrado (Rogerio Bruno)
44.4-P	Dissociação das Propriedades do Solo da Vegetação no Esquema de Superfície SSiB e seu Impacto no Balanço Hidrológico da Amazônia (Luiz Candido)
44.5-P	Mudanças no clima regional devido as modificações recentes da cobertura vegetação Amazônica (Francis Correia)
44.6-P	Investigation of South American Land/Atmosphere Interactions Using the Regional Eta/ssib Model (Fernando De Sales)
44.7-P	Simulação do desmatamento no leste da Amazonia usando um modelo de alta resolução (Adilson Gandu)
44.8-P	High Resolution Numerical Simulation of the Deforestation Impact in the Cuiba/Santarem Region (Adilson Gandu)
44.9-P	Variações micrometeorológicas foram observadas entre área de manguezal natural e área desmatada, durante o experimento do CiMeLa (João Batista Miranda)
44.10-P	Fluxos de massa e energia em área de reflorestamento em função do crescimento da vegetação (Kelli Munhoz)
44.11-P	Impactos Climáticos Associados à Cenários Futuros de Desmatamento da Floresta Amazônica (Gilvan Sampaio)
44.12-P	Impacto da Utilização de Diferentes Esquemas de Superfície na Previsão Regional do Modelo Eta (José Roberto Rozante)

44.13-P	Measuring Vegetation Aerodynamic Roughness Over the Amazon Basin (Sassan Saatchi)
44.14-P	Impacts of Land-Cover Change on the Hydrometeorology of the Amazon (Renato Silva)
44.15-P	Clima e Fluxos de Superfície-Atmosfera Sobre Cerrados Seco e Alagável (Rafael Tannus)
45.1-P	Two-dimensional Pattern of Forecast Model Drift in the Amazon Basin (José Antonio Aravéquia)
45.2-P	The CPTEC global model bias in the Amazon region: results of long term simulations and predictive skill in seasonal forecasting. (Helio Camargo)
45.3-P	Proposta de uma Metodologia de Inicialização da Umidade do Solo para a Previsão de Tempo Regional (Luiz Candido)
45.4-P	Circulações de Mesoescala no Leste da Amazônia - CiMeLa (Julia Clarinda Paiva Cohen)
45.5-P	On the performance of the Meso Eta regional weather forecast model in Rondonia (Jorge Gomes)
45.6-P	Data Assimilation using RPSAS during the experiment of LBA, October, 15 to 29 2002 (Elizabeth Espinoza)
45.7-P	Data Assimilation Impact on the Moisture Transport from the Amazon to the Plata Basin (Dirceu Herdies)
45.8-P	Sensibilidade do clima no Sudeste do Brasil devido às mudanças do uso da terra (Robinson Juárez)
45.9-P	September/October 2002 Mesoscale Reanalysis of the RACII campaign in Rondonia/Brazil (Demerval Moreira)
45.10-P	Dry to Wet Transition Simulation with Dynamic Vegetation (Demerval Moreira)
45.11-P	Avaliação do Esquema de Convecção RAS Utilizando o Modelo CGM/CPTEC Durante o Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia (LBA) (Maria Aurora Mota)
45.12-P	Utilização do Conceito de Entropia Generalizada Para Caracterizar Diferenças Entre as Flutuações de Temperatura e de Velocidade do Vento Acima e Abaixo da Copa da Floresta Amazônica em Rondônia (Maurício Bolzan)
45.13-P	Reducing the uncertainty of surface albedo in climate models for better predictions of the future Amazonia climate (Silvia Santos)
45.14-P	A General Mean Wind Velocity Profile Relationship for an Amazonian Rain Forest Environment (Leonardo Sá)
45.15-P	Low Level Jet Effects Upon the Surface Atmospheric Boundary-layer Wind Field Above Caxiuana Forest Reserve During Dry Season (Leonardo Sá)
45.16-P	Estudo diagnóstico da interação Oceano - Atmosfera no litoral de Ajuruteua - Bragança (PA), Norte do Brasil: Correlação entre os parâmetros meteorológicos e oceânicos.
46.1-P	Estimativa da difusividade térmica do solo em áreas de floresta e de pastagem em Rondônia. (Paulo Anderson)
46.2-P	Diurnal cycle of rainfall over tropical South America using 3-yr TRMM-PR data (Carlos Angelis)
46.3-P	Variação Diurna da Precipitação no Leste da Amazônia (Fabio Cabral)
46.4-P	Ciclo diurno da precipitação na Amazônia e o transporte de umidade para a região Sul/Sudeste da América do Sul em simulações sazonais com o modelo regional Eta e o global CPTEC/COLA (Iracema Cavalcanti)
46.5-P	Variação da Precipitação Pluviométrica no Sítio Experimental do LBA na Floresta Nacional de Caxiuana, Pará, Brasil (2002-2003) (Rafael Costa)
46.6-P	Variabilidade Sazonal da Precipitação Pluviométrica em Ecossistema de Manguezal no Nordeste do Pará (Paulo Gonçalves)
46.7-P	Estimativa de precipitação e conteúdo integrado de vapor d'água utilizando o sensor HSB durante o experimento RACCI/LBA (Wagner Lima)

46.8-P	Variabilidade da precipitação no leste da Amazônia (Amapá, Pará, Maranhão) associada aos ENOS (Andreza Martins)
46.9-P	Padrões da precipitação diária sobre a Amazônia: 1979-93 (Guillermo Obregón)
46.10-P	Un Análisis Estadístico Breve de la Lluvia Estacional en el Norte de Perú (Jorge Chira)
SH (Hidrologia e Química das Águas) / SH (Surface Hydrology and Water Chemistry)	
4.5	Estimativas das Perdas por Interceptação Mediante Novo Método de Medição Desenvolvido e Aplicado em Floresta Não Perturbada na Amazônia Central (Luz Adriana Cuartas)
6.1	Examining the results from the Asu catchment in a wider Amazonian context (Martin Hodnett)
6.3	Suspended sediment Yield in the Amazon basin. An assessment using the Brazilian national data set (Naziano Filizola)
6.4	Role of Floodplains in Suspended Sediment Transfer and Storage Along the Amazon River (Laurence Maurice-Bourgoin)
7.1	Use of MODIS and MERIS data for the water quality monitoring of Amazonian rivers and floodplain lakes (Jean-Michel Martinez)
10.3	The water balance of a forested tropical basin near Manaus: Impacts of the interannual variability of climate on the hydrological cycle. (Javier Tomasella)
10.9	Multi-scale analyses of inundation and wetland vegetation dynamics: Applications to measurements and modeling of carbon fluxes (John Melack)
11.6	Hydraulic redistribution in amazonian trees (Rafael Oliveira)
16.1	Understanding the Surface Hydrology of Amazônia: A Biogeochemical View (Reynaldo Victoria)
19.3	Advances in Modeling Land Surface Hydrology in Amazonia (Michael Coe)
19.5	Recent progress in modeling surface hydrology across the Amazon Basin using a Variable Infiltration Capacity approach (Daniel Victoria)
19.6	Recent progress in estimating suspended sediment yield variability in the Amazon River (Guyot Jean Loup)
20.2	Hydrological Processes in Small Forest and Pasture Catchments of the Eastern Amazonia (Marysol Schuler)
20.3	Physical and Anthropogenic Controls of the Biogeochemistry of the Ji-Paraná River Basin (Western Amazônia) (Maria Ballester)
20.4	Stream water chemistry in three meso-scale hydrologic basins in Eastern Amazonia (Ricardo Figueiredo)
20.9	Key Connections in Amazon Stream Corridors: Using ¹⁵ N to Trace N Transformations and Transport (Linda Deegan)
20.10	Controls of land-water nitrogen movement through small lowland Amazonian forest and pasture drainage basins in Rondônia (Christopher Neill)
37.1-P	Balanço de Nitrogênio em Microbacias Pareadas (Floresta vs. Pastagem) no Estado de Rondônia, Brasil (Adriana Bonilla)
37.2-P	The role of suspended sediments in the metabolism and nutrient concentrations in river waters of Rondonia. (Michelle Cogo)
37.3-P	Estudo das Variáveis Físico-química, Química e Bacteriológica de Igarapés das Bacias Hidrográficas de São Raimundo, Educandos e Tarumã. (Hillandia Cunha)
37.4-P	Determinação dos Parâmetros Físico-Químico e Bacteriológico de Poços Rasos cacimbas da Região Leste da Cidade de Manaus. (Hillandia Cunha)
37.5-P	Stream size influences the biogeochemistry of nitrogen in pasture stream channels. (Christie Haupt)

37.6-P	Towards a Large-Scale Aquatic Carbon Model for the Amazon Basin (Erica Howard)
37.7-P	Controls on stream DOC flux and composition in the Amazon region, Tapajos national forest (Marc Kramer)
37.8-P	Riparian control of carbon dynamics in streams of Rondônia (Alex Krusche)
37.9-P	The Biogeochemistry of Ji-Paraná River, Rondonia (Nei Leite)
37.10-P	Relação Entre Carbono Orgânico Dissolvido e Condutividade Elétrica na Bacia Asu, Amazônia Central, Brasil (Sylvia Oliveira)
37.11-P	Availability of Nutrients in Solutions in a Gallery Forest of Cerrado Biome (Lucilia Parron)
37.12-P	A Simulation Model of Carbon Cycling and Methane Emissions in Amazon Wetlands (Christopher Potter)
37.13-P	The influences of total dissolved inorganic carbon (DIC) concentrations and pH on potential outgassing from rivers in Rondônia. (Maria de Fátima Rasera)
37.14-P	Impact of a phytoplanktonic bloom on the trace concentrations of amazonian floodplain lakes (Lago de Curuaí, Para, Brazil)
37.15-P	How the Amazonian floodplain vegetation can affect the geochemical status of some trace elements in the Amazon River mainstream (Brazil)? (Unknown)
37.16-P	Potabilidade das Águas Subterrâneas do Município de Ji-Parana. Estudo de Caso: Bairro Nova Brasília (Arivelton Silva)
37.17-P	Desenvolvimento de metodologia analítica para a determinação simultânea de ácidos carboxílicos de baixo peso molecular e ânions inorgânicos em amostras dos rios da bacia Amazônica empregando Cromatografia de íons (Cristiane Tumang)
38.1-P	Estudo, Análise e Modelagem da Dinâmica da Descarga em uma Micro-bacia Monitorada na Amazônia Central
38.2-P	Spatial Distribution of the Hydrological Impact of Deforestation in Amazonia (Cassiano D'Almeida)
38.3-P	Caracterização de Margens de Lagos da Planície Amazônica a Partir de Fusão de Imagens Ópticas e de Radar (Andreia Maria França)
38.4-P	Hydraulic Slope of Negro and Solimões Rivers From Satellite Altimetry : Relationship With the Distribution of Erosion/Sedimentation Areas. (Seyler Frederique)
38.5-P	Propagação da Maré no Estuário do Rio Amazonas (Marcos Gallo)
38.6-P	Impact of Land Use/Land Cover Change on Hydrological Processes in a Mesoscale Basin in Rondônia (Western,Amazônia) (Manuel Gamero Guandique)
38.7-P	Processes of streamflow generation in a small rainforest catchment in Central Amazonia (Martin Hodnett)
38.8-P	Landsat TM image restoration for mapping narrow water channels connecting small lake systems in Central Amazon: Mamirauá Sustainable Development Reserve - RDSM * (Dayson Jardim-Lima)
38.9-P	A base de dados "on-line" do projeto HiBAM-Hidro-geodinâmica da bacia amazônica. (Gerard Cochonneau)
38.10-P	Los regimenes hidrológicos en la Cuenca Amazónica del Perú (Yerren Jorge)
38.11-P	A 1D sediment transport model for the Amazone river (Unknown)
38.12-P	Avaliação da confiabilidade de dados hidrográficos para a bacia trinacional da Bolívia, Brasil e Peru do Alto Rio Acre, Amazônia Sul-Occidental. (Monica Maldonado)
38.13-P	Operação e Manutenção de uma Bacia Hidrográfica Instrumentada na Amazônia Central (Antonio Melo)
38.14-P	Macro-geomorphologic analysis of the Araguaia River basin, Brazil (Thiago Morato de Carvalho)

38.15-P	Sedimentation in the "varzea" floodplain systems as a potential tool for the study of past natural perturbation events in Amazonia. (Patricia Moreira-Turcq)
38.16-P	Seasonal changes in phytoplankton distribution from Óbidos to Almerim in response to Amazon flood pulse. (Evlyn Novo)
38.17-P	Regionalisation of the discharge-sea surface temperature relationships in the Amazon basin (Josyane Ronchail)
38.18-P	Validation of a soil moisture model for pasture in Rondônia, Brazil. (Luciana Rossato)
38.19-P	Hydrological Modeling of Large Scale: Initial Parameterizations in Amazon (Alailson Santiago)
38.20-P	Monitoramento do Nível do Lençol Freático em Área de Pasto, Floresta Nativa e Área de Manejo Florestal - Sinop, MT (Livia Fernanda Santos)
38.21-P	Transporte de Sedimentos de Arraste no Rio Amazonas (Maximiliano Andres Strasser)
38.22-P	Water balance for the Ji-Paraná Basin using remote sensing and GIS (Daniel Victoria)
38.23-P	Flow regime and flood dynamic of the Araguaia River, Brazil