

SAFARI-2000

Background

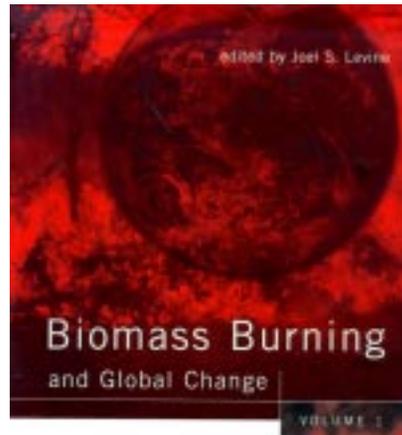
**R.J. Swap (UVA); H.J. Annegarn (WITS);
M. Scholes (WITS) and R.J. Scholes (CSIR)**

**Foundation for Research Development
July 23, 1998**

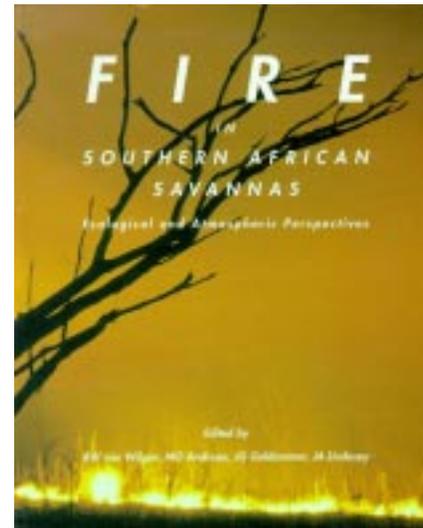
Experimental Heritage for SAFARI 2000

- ◆ SAFARI 92 / TRACE-A — Chapman Conference
- ◆ SAFARI 94
- ◆ IGBP/IGAC BATGE and DEBITS (1994 - present)
- ◆ IGBP Miombo, Kalahari Transect, Sustainable Rangelands (1995 - present)
- ◆ BHATTEX(1996)
- ◆ ZIBBEE (1997)
- ◆ ARREX (1997 - present)

Selected Publications



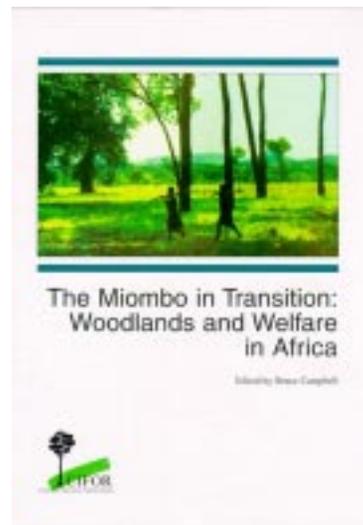
Remote Sensing, Modeling and Inventory Development, and Biomass Burning in Africa



TRACE A and SAFARI
Special Issue



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Published by American Geophysical Union



GLOBAL
CHANGE
IGBP REPORT 41
International Geosphere-Biosphere Programme (IGBP)



The Miombo Network:
Framework for a Terrestrial Transect Study of
Land-Use and Land-Cover Change in the
Miombo Ecosystems of Central Africa

The International Geosphere-Biosphere Programme - A Study of Global Change (IGBP) of the
International Council of Scientific Academies (ICSU)
Stockholm, Sweden

GLOBAL
CHANGE
IGBP REPORT 42
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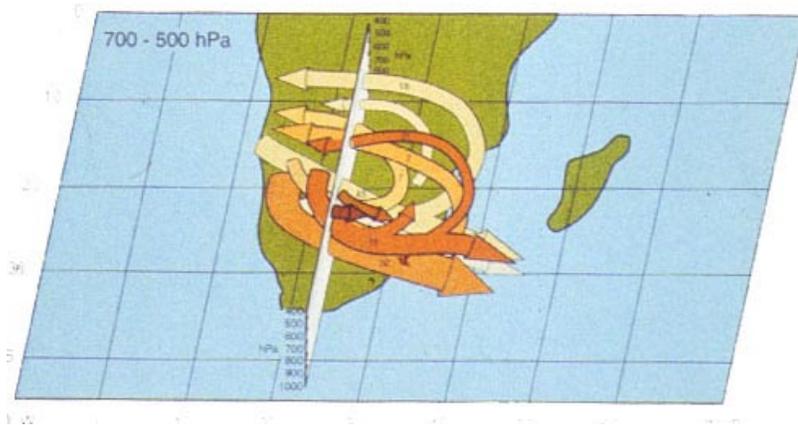
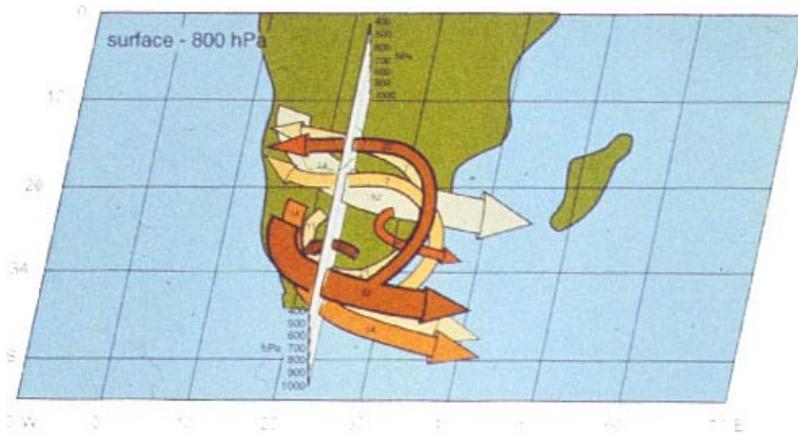
The Kalahari Transect:
Research on Global Change and Sustainable
Development in Southern Africa

The International Geosphere-Biosphere Programme - A Study of Global Change (IGBP) of the
International Council of Scientific Academies (ICSU)
Stockholm, Sweden

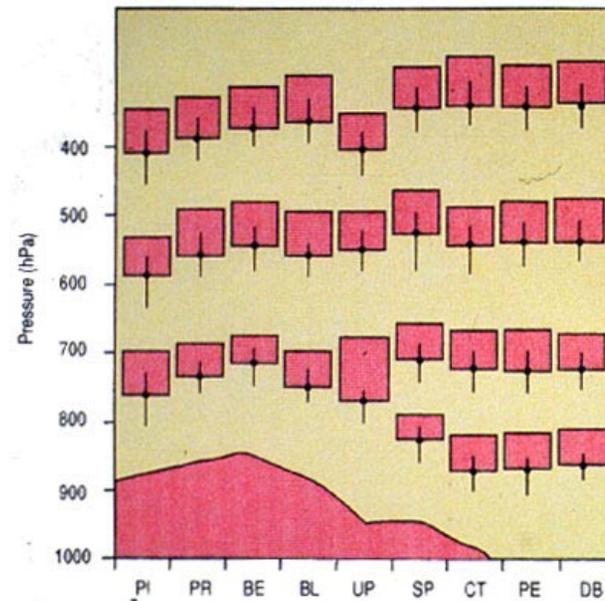
Major Findings

- ◆ Regional Gyre - Ties the whole region together - respects no boundaries!
- ◆ Discrete Atmospheric Transport Patterns
- ◆ Inflow /outflow ties to S. America and Australia
- ◆ Unexpectedly high concentrations of CO, NO_x, CH₄BR

Discrete Atmospheric Transport Patterns



Recirculative Gyre



Capping Stable Layers

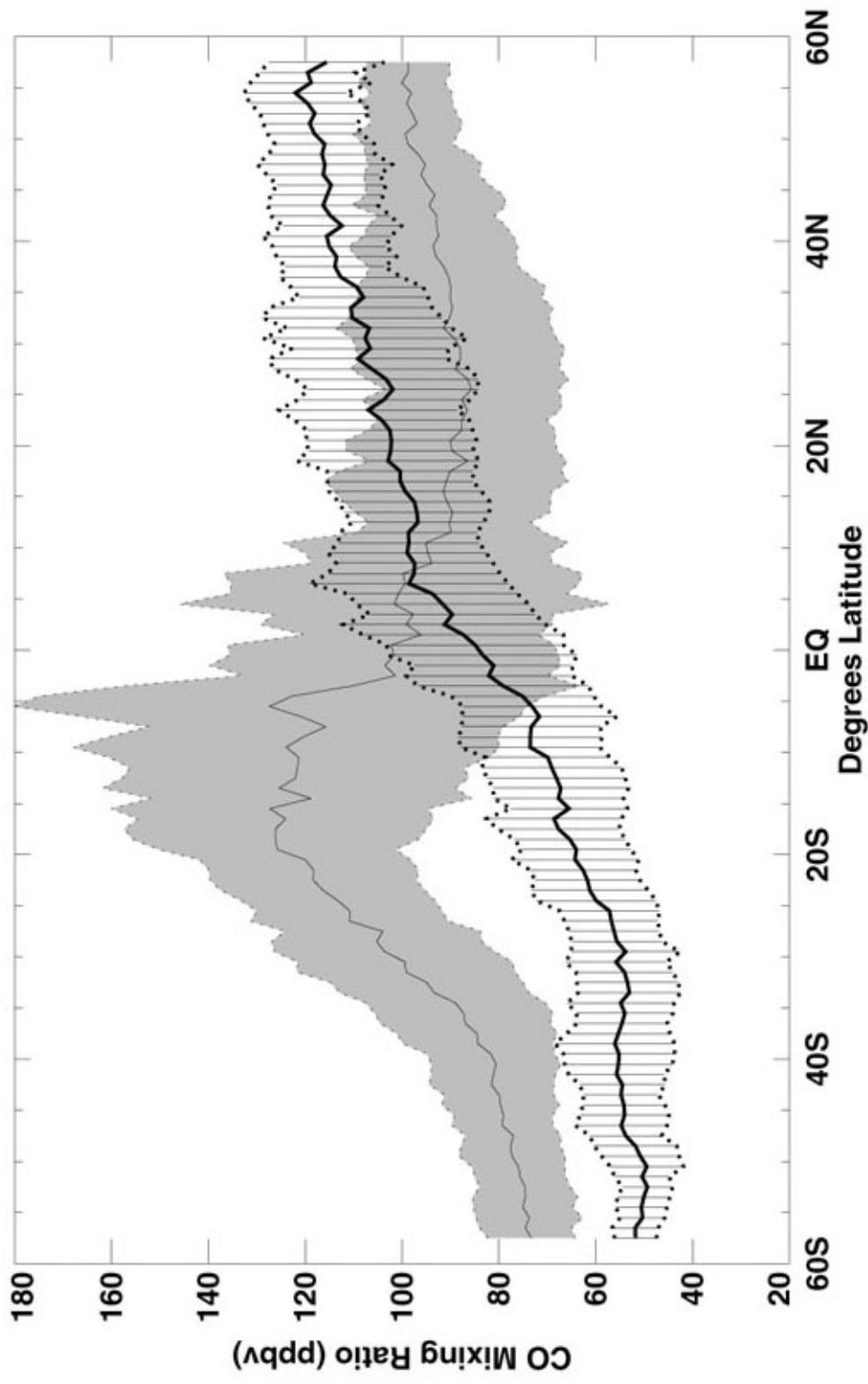
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Measurement of Air Pollution from Satellites Tropospheric CO Zonal Averages

April 1994
October 1994



Major Findings (Con't)

- ◆ 3 Major Sources of Aerosols and Trace Gases:
 - ◆ Biomass Burning; Industrial; Biogenic
- ◆ First steps towards a dynamic emissions model — satellite fires
- ◆ Strongly seasonal patterns - Rainfall, Vegetation, Fires
 - ◆ large interannual variability
 - ◆ timing of observations is critical

Major Remaining Questions

- ◆ Large range in emissions estimates - need improved fuel load (models), burned area (satellite), consumption and emission factor estimates
- ◆ Aerosols / cloud interactions - Role of land use and surface emission processes in these dynamic interactions
- ◆ Quantification of elevation/deposition of aerosol and trace gases
- ◆ Role of emissions on biogeochemical cycling

What is being done to address these questions

- ◆ Regional Science Initiative — **SAFARI 2000**
- ◆ Comprised of the following Science Elements:
 - ◆ Land Processes (Vegetation Models; Land Cover and Land Use Changes; Fire Validation)
 - ◆ Aerosols (In Situ observations; Ground-based, Airborne, Satellite Observations)
 - ◆ Trace Gas Chemistry (Ozone, CO)
 - ◆ Clouds and Radiation
 - ◆ Hydrology ?, Human Dimensions?

SAFARI 2000

The central goal of SAFARI 2000 is to understand the key linkages between the physical, chemical and biological processes, including human impacts, essential to the functioning of the southern African biogeophysical system

To this end, SAFARI 2000 will:

- ◆ Exploit the synergy between remote sensing, modeling, airborne sampling and ground-based studies
- ◆ Use the semi-closed continental atmospheric circulation as an integrating mechanism between the living and physical systems
- ◆ Combine the expertise and knowledge base of regional and international scientists

SAFARI 2000 Science Questions & Issues

- ◆ What are the sources of aerosols and trace gases into the atmosphere over Southern Africa?
 - ◆ How are these sources spatially and temporally distributed, and what are the chemical properties of these sources?
 - ◆ What ecosystem processes are responsible for aerosol and trace gas emissions, and how do climate and other environmental conditions affect these?
 - ◆ What human activities within Southern African are responsible for aerosol and trace gas emissions?
 - ◆ How do Southern African human activities alter the ecosystem processes that are responsible for aerosol and trace gas emissions?
- ◆ How are aerosols and trace gases chemically transformed and transported within the Southern African atmosphere?
 - ◆ How are atmospheric constituents transported into and out of the region?
 - ◆ What are the relationships between climatic variability and the transport and transformations of atmospheric constituents?

SAFARI 2000 Science Questions & Issues - cont'd

- ◆ What are the temporal and spatial patterns of aerosol and trace gas deposition in Southern Africa?
 - ◆ What are the mechanisms of deposition and how do climatic variability and change affect deposition?
 - ◆ How does atmospheric deposition alter the productivity and biogeochemistry of Southern African ecosystems?
- ◆ How do changes in atmospheric aerosols and trace gas concentrations affect the regional climate of Southern Africa?

SAFARI 2000 Science Questions & Issues - cont'd

- ◆ How do atmospheric and terrestrial systems interact and how do these linkages respond to environmental and anthropogenic changes?
 - ◆ How do climate and atmospheric composition determine the structure and function of the ecosystems of Southern Africa?
 - ◆ What is the natural disturbance regime of Southern African ecosystems?
 - ◆ How do land use and land cover patterns affect ecosystem processes and dynamics?
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 - ◆ How do land surface processes affect atmospheric chemistry and radiative forcing within the Southern African atmosphere?
 - ◆ How do changes in atmospheric composition and climate alter ecosystem biogeochemistry and hydrology?
 - ◆ How do these changes in ecosystems in turn alter trace gas and aerosol emissions as well as the regional climate?

SAFARI 2000 - Rules of Play - *tentative*

- ◆ Participation open to all BUT - it's BYOB - Aim to use SAFARI 2000 Science Plan as leverage with national, regional and international funding sources
- ◆ Emphasis on international Collaboration - IGBP provides a framework - No hit and run science
- ◆ Open access to and sharing of data - (ICSU/IGBP data policy - START-DIS model) - No privileged data access period beyond essential data preparation
- ◆ Field coordination through a part-time SAFARI secretariat (TBF) - MOU's needed and need to be respected

SAFARI 2000 - Rules of Play - continued

- ◆ Joint publications encouraged
- ◆ Where possible provide capacity building /technology transfer N/S and S/N - START will facilitate as needed - build on existing networks
- ◆ Sensitivity to host country needs, existing relationships and protocols - Nobody gets burned

Organizational Structure of SAFARI 2000

- ◆ Informal Ad Hoc Committee - (Feb 98 to present)
 - ◆ R.J. Swap (UVA); H.J. Annegarn (WITS); M. Scholes (WITS)

- ◆ Official Points of Contact - (As of 17 July 98)
 - ◆ R.J. Scholes (CSIR/RSA); S. Ringrose (Botswana); L. Marufu (Zimbabwe); G.B. Chipeta (Zambia); W. Versfeld (ENP/Namibia); J. Cumbane (Mozambique); C. Gatebe (Kenya); P. Yanda (Tanzania); D. Kayambazinthu (Malawi); D. Terblanche (SAWB/RSA); A. Joubert (WITS/RSA); T. Suttles (NASA/USA); A. Friend (UK)

- ◆ Science Team - (TBD as funding becomes available)
 - ◆ Provision to ensure representation of those without funding

- ◆ Steering Committee/Executive Committee to be comprised of agreed upon subset of science team

Meeting Timeline for SAFARI 2000

- ◆ February 6, 1998 - University of Virginia - Discussion of UVA/NASA/RSA southern African research mooting of the idea of a broader regional science initiative - SAFARI 2000
- ◆ June 8-10, 1998 - Gaborone - Preliminary discussion of SAFARI 2000 at Kalahari Transect regional meeting
- ◆ June 29-30, 1998 - University of Maryland - Coordination of NASA EOS Validation Activities potentially related to SAFARI 2000
- ◆ July 8, 1998 - FRD, Pretoria - Discussion of upcoming SAFARI 2000 Workshop at Blydepoort, Mpumalanga, South Africa
- ◆ July 11 - 17, 1998 - Blydepoort, Mpumalanga - Workshop on Southern African Land / Atmosphere / Biosphere Interactions: SAFARI 2000 Regional Science Initiative
- ◆ July 23, 1998 - FRD, Pretoria - Discussion of SAFARI 2000 Workshop Results - Representatives from SAWB, WRC, DEAT, FRD, CSIR, WITS, NASA, UVA(USA), the US Embassy and the Commonwealth Scientific Council (UK)

Meeting Timeline for SAFARI 2000 - Cont.

- ◆ Early August - Washington DC - Potential for presentation of the SAFARI 2000 Regional Science Initiative at the Bi-National Commission
- ◆ August 22, 1998 - Seattle, USA - Presentation of the newly formulated science plan of SAFARI 2000 to the International Geosphere-Biosphere Program - International Global Atmospheric Chemistry Experiment - Biomass Burning Experiment Committee (IGBP-IGAC-BIBEX)
- ◆ September 1-11, 1998 - Nairobi, Kenya - Presentation of the newly formulated science plan of SAFARI 2000 at the IGBP SAC V Planning meeting
- ◆ To Be Scheduled - Presentation of the results of the SAFARI 2000 Workshop to both NASA Program Managers and the US National Science Foundation

Funded Activities Related to SAFARI 2000 - US

- ◆ NASA Land Cover Land Use Change (LCLUC)
 - ◆ Miombo Woodlands LCLUC Project - ~ 600 K USD
 - ◆ Kalahari Transect Carbon Balance - ~ 500 K USD

- ◆ NASA Earth Observing System (EOS)
 - ◆ Southern African Validation Experiment (SAVE) - ~ 600 K USD
 - ◆ Aerosol Robotic Network (AERONET) - ~500 K USD/yr
 - ◆ Univ. of Montana/US Forest Service - ~ 500 K USD

- ◆ SAFARI Planning Workshop Funding
 - ◆ 30 K USD (NSF); 5 K USD (IGBP/START); 5 K USD (UVA); 8 K USD (FRD - for South African and Southern African participants)

Funded Activities Related to SAFARI 2000 - RSA

- ◆ Aerosols, Recirculation and Rainfall Experiment (WRC) ~ R300 K (FY 98); application in for ~ R350 K for FY99
- ◆ Transboundary Air Transport and Pollution Study (ESKOM - TESP/THRIP) - ~ R400 K (FY98)
- ◆ IGBP/IGAC/DEBITS - Univ. of Potchefstroom
- ◆ IGBP/IGAC/BATGE - WITS

Proposals Currently Pending - US and RSA

- ◆ SAFARI 2000 Coordination Proposal submitted to NASA Terrestrial Ecology - ~ 200 K USD
- ◆ SAFARI 2000 - to be submitted to South African Department of Arts,, Culture, Science and Technology - > R1,000 K