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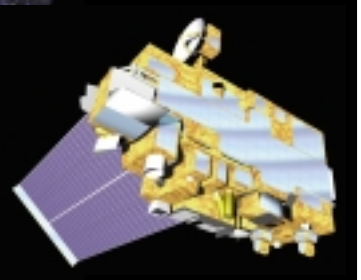
Southern African Regional Science Initiative—SAFARI 2000

Brush fire in miombo woodlands.



NASA EOS Terra Satellite.

Smoke from coal fires for domestic cooking and heating blankets a small township in southern Africa.

NASA ER-2 High-Altitude Research Aircraft.

Industrial emissions from a power plant in South Africa.

Typical instrument tower used for data collection.

Landsat-5 Thematic Mapper composite image of southern Africa. Vegetation appears in green, bare soil is reddish-purple, and urban features are purple and white. Water bodies (shown in black) contrast sharply with the colorful land features. (Image courtesy of the Earth Satellite Corporation, Rockville, MD, www.earthsat.com)

Emissions

Transport and Transformation

Atmospheric Circulation Pattern

Feedback

Deposition and Impacts

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Southern African Regional Science Initiative—SAFARI 2000

The Southern African Regional Science Initiative—SAFARI 2000—is an international science initiative aimed at developing a better understanding of the southern African land-atmosphere-human system.

The goal of SAFARI 2000 is to identify and understand the relationships between the physical, chemical, biological and anthropogenic processes that underlie the land and atmospheric systems of southern Africa. The atmosphere of southern Africa is particularly vulnerable to polluting emissions as it is dominated by a persistent high pressure system causing a large-scale, counterclockwise closed-circulation pattern. Particular emphasis will be placed upon natural and anthropogenic emissions, their characterization and quantification, transport and transformations in the atmosphere, influence on regional climate and meteorology, eventual deposition, and the effects of this deposition on ecosystems. To accomplish this, participants will:

- use a combination of satellite and airborne remote sensing, computational modeling, airborne sampling and ground-based studies;
- through modeling, link the biological, physical and chemical components of the regional ecosystems and integrate them within the semi-closed atmospheric gyre persistent over the region; and
- combine the expertise and knowledge base of regional and international scientists.

SAFARI 2000 is an organizational umbrella designed to maximize the overall effectiveness of a group of various environmental studies occurring from 1999 to 2001. The studies range from those still in their development stage to those which are already in place, including long-term monitoring efforts.

SAFARI 2000 builds on the success of SAFARI-92, which showed that a) it is feasible to characterize, quantify and validate estimates of regional emissions, and b) critical gaps remain in our understanding of the fate and impacts of the emissions on the functioning of the regional land-atmosphere systems.

SAFARI 2000 encompasses the following science elements: terrestrial ecology and land processes; land cover and land use change; atmospheric aerosols and trace gases; clouds and radiation; hydrology; and modeling. These elements will be studied using ground and airborne measurements complemented by remote sensing observations from a new generation of Earth observation satellites, including sensors on NASA's Terra, Aqua, Earth Observing-1 (EO-1), Vegetation Canopy Lidar (VCL), Landsat 7 and Tropical Rainfall Measuring Mission (TRMM) platforms, as well as the European ENVISAT and POLDER II satellites. Data from existing sensors, e.g., the Advanced Very High Resolution Radiometer (AVHRR) onboard the National Oceanic and Atmospheric Administration's (NOAA) polar orbiters, and exisiting satellites, e.g., the European METEOSAT satellite, will also be used to improve regional models. In turn, ground- and aircraft-based measurements from SAFARI 2000 will help validate the remotely sensed satellite observations.

The SAFARI initiative includes continuous efforts as well as intense, episodic field campaigns as described in the table below.

Each successive campaign is expected to increase both international participation and the scope of scientific questions addressed. Ground-based efforts will be coordinated to maximize sampling effectiveness and efficiency, as well as facilitate collaboration and data synthesis. Meteorological and remote sensing measurements will be collected throughout the initiative. The international science networks supporting efforts in the region will help broaden African scientific involvement.

Results from SAFARI 2000 are expected to contribute to the development of improved policies and practices affecting the environment. They should also help local officials gain insight into global change on a regional scale and understand potential impacts from international global change environmental treaties. Regional scientists will benefit through heightened recognition, enhanced capacity, and the transfer of technology. The relevance of the scientific results will be discussed through a series of workshops. One such workshop, the Policy Dialogue Workshop on Ecological Impacts of Trans-boundary Air Pollution in Southern Africa, organized by the Air Pollution Impacts Network for Africa (APINA), has already been held.

SAFARI 2000 has an open data sharing policy. Information will be disseminated regionally and internationally via the Internet as well as through the distribution of CD-ROMs and magnetic tapes.

Additional information can be found on the Internet at: *http://safari.gecp.virginia.edu* and *http://eos.nasa.gov*

Period	Season	Primary Goal
Aug-Sep 1999	Dry	Identify and quantify major dry-season sources of emissions including those from biomass burning, land use, and industry. Implement new ground-based and airborne measurement techniques to characterize incoming solar radiation, near-surface atmospheric processes, and spectral radiation characteristics of vegetation.
Feb-Mar 2000	Wet	Identify and quantify major wet season sources of emissions such as methane from wetlands and non-methane hydrocarbons from plants. Examine the local ecosystem structure at peak biomass by collecting data to calibrate and initialize ecosystem models at local and regional scales, and determine spectral radiation characteristics of vegetation.
Aug-Sep 2000	Dry	Track the movement, transformations, and fallout of dry-season emissions from biomass burning.

Photo Credits: Fire photo courtesy of P. Frost; smoke and industrial emissions pictures courtesy of G. Held; instrument tower photo courtesy of M. King.