

SAFARI 2000 Surface Atmospheric Radiative Transfer (SMART), Dry Season 2000

Abstract

Surface-sensing Measurements for Atmospheric Radiative Transfer (SMART) and Chemical, Optical, and Microphysical Measurements of In-situ Troposphere (COMMIT) consist of a suite of instruments that measure (both in-situ and by remote sensing) parameters that characterize, as completely as possible, constituents of the atmosphere at a given location. SMART and COMMIT are mobile systems that can be deployed to locations that exhibit interesting atmospheric phenomena. This allows investigators to participate in coordinated measurement campaigns, such as SAFARI 2000.

The SMART instruments were deployed to the Skukuza Airport from August 15 to September 17, 2000 to take part in the SAFARI 2000 Dry Season Aircraft Campaign. The SMART-COMMIT mission is designed to pursue the following goals: Earth Observing System (EOS) validation; innovative investigations; and long-term atmospheric monitoring.

Background Information

Investigators:

Si-Chee Tsay (tsay@climate.gsfc.nasa.gov)
Jack Q. Ji (ji@climate.gsfc.nasa.gov)

Project: SAFARI 2000

Data Set Title: SAFARI 2000 Surface Atmospheric Radiative Transfer (SMART), Dry Season 2000

Site: Skukuza Airport, South Africa
Westernmost Longitude: 31.593
Easternmost Longitude: 31.593
Northernmost Latitude: -24.969
Southernmost Latitude: -24.969

Data Set Citation:

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Web Site: <http://smart-commit.gsfc.nasa.gov/index.html>

Data File Information

The data files are stored as ASCII text files, one file per site, in comma-separated-value (csv) format, with column headers. The data files are:

smart_met_parameters_2000.csv
smart_direct_diffuse_2000.csv
smart_incoming_rad_2000.csv

Each file contains the following parameters. The first record in each file contains the column names defined below, followed by subsequent records of data values.

File "smart_met_parameters_2000.csv" Description

Column Name	Definition	Units
Date	Date of data collection	mm/dd/yy
Time	Time of data collection	HHMM UTC
Pressure	Atmospheric Pressure	H Pa
Temperature	Air Temperature	K
Humidity	Relative humidity	%
Wind Speed	Measured wind speed	m/s

File "smart_direct_diffuse_2000.csv" Description

Column Name	Definition	Units
Date	Date of data collection	mm/dd/yy
Time	Time of data collection	HHMM UTC
Direct Solar Irradiance	The solar radiation that passes directly through the atmosphere from the sun.	W/m ²
Diffuse Sky Solar Irradiance	The solar irradiance that reaches the ground after scattering by atmospheric constituents such as air molecules, dust, or clouds.	W/m ²

File "smart_incoming_rad_2000.csv" Description

Column Name	Definition	Units
Date	Date of data collection	mm/dd/yy
Time	Time of data collection	HHMM UTC
Downward Longwave Irradiance	The amount of thermal irradiance emitted from the sky on an upward-facing horizontal surface.	W/m ²
Downward Total Solar Irradiance	The total amount of solar irradiance on an upward-facing horizontal surface (the sum of the vertical component of the direct solar irradiance and the diffuse sky irradiance).	W/m ²

Data Collection at the Skukuza Airport by SMART/COMMIT Team

During SAFARI 2000 Dry Season Aircraft Campaign a suite of measurements were made by the SMART/COMMIT team. The results reported in this data set are for the following SMART instruments deployed and measurements recorded at the Skukuza Airport site within the Kruger National Park:

- several broadband radiometers, for global, diffuse, direct downward solar irradiance and global infrared downward irradiance;
- meteorological sensors, for surface air temperature, pressure, relative humidity, and wind; and
- a Solar Spectral Flux Radiometer (NASA Ames), for spectral solar downward irradiance.

The SMART mobile unit.



Site Description

SMART instrumentation were deployed in an open field located at the end of the runway at the Skukuza Airport, 13 km northeast of the Skukuza tower site location.

Instrumentation

The SMART instruments used in the SAFARI 2000 dry season field campaign are described in the table below. All instruments were calibrated prior to being deployed to South Africa.

SMART Instrumentation

Variable	Instrument	Model	Manufacturer
Direct Solar Irradiance	pyrheliometer	NIP 31823	The Eppley Laboratory, Inc.
Diffuse Sky Solar Irradiance	pyranometer	CM21 980563	Kipp and Zonen
Downward Longwave Irradiance	pyrgeometer	PIR 32193	The Eppley Laboratory, Inc.
Downward Total Solar Irradiance	pyranometer	CM21 980564	Kipp and Zonen
Pressure sensor	barometer	Vaisala PTB101B	Vaisala, Inc.
Air Temperature	temperature and relative humidity sensor	Vaisala HMP 45AC	Vaisala, Inc.
Relative Humidity	temperature and relative humidity sensor	Vaisala HMP 45AC	Vaisala, Inc.
Date and Time	data logger	CR23, CR7	Campbell Scientific, Inc.

SMART instrumentation deployed at the Skukuza airport field site during SAFARI 2000.



Measurement Error for Parameters

The measurement error for the parameters is estimated to be about 1% for the daily average downward measurements, and better than 5% for direct-diffuse measurements.

Known Problems with the Data

The direct solar irradiance may be underestimated by a few percent, depending upon sky conditions, because the thermal-dome-effect is not included (Ji and Tsay, 2000; 2003).

Additional Sources of Information

Related Data Sets

Other data collected by this team at Skukuza include microwave data, the Solar Spectral Flux Radiometer (SSFR) data, and shadow band radiometer data. See the SMART/COMMIT Web Site at [<http://smart-commit.gsfc.nasa.gov/index.html>] for more information.

References

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Point of Contact:

Dr. Si-Chee Tsay
Climate and Radiation Branch
Laboratory for Atmospheres
NASA/Goddard Space Flight Center
Greenbelt, MD 20771
Phone: +01-301-614-6188
Fax: +01-301-614-6307
E-mail: tsay@climate.gsfc.nasa.gov

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