SAFARI 2000 TOMS Aerosol Index Data, Southern Africa, Dry Season 2000

Abstract

Daily Aerosol Index (AI) data from Earth Probe (EP) Total Ozone Mapping Spectrometer (TOMS) for the period of August 12-September 30, 2000 were processed and provided by the Atmospheric Chemistry and Dynamics Branch at NASA/GSFC for the SAFARI 2000 Dry Season Aircraft Campaign.

The TOMS AI is formed directly from measured TOMS radiances in two channels. It is a measure of how much the wavelength dependence of backscattered UV radiation from an atmosphere containing aerosols (Mie scattering, Rayleigh scattering, and absorption) differs from that of a pure molecular atmosphere (pure Rayleigh scattering). Quantitatively, the AI is defined at http://toms.gsfc.nasa.gov/aerosols/AI_definition/ai_ep_definition.pdf. Positive values represent absorbing aerosols (dust and smoke); negative values represent non-absorbing aerosols. The identification is not perfect because of geophysical reasons (e.g., when aerosols are at low altitude).

The data from TOMS records have been used increasingly to understand the behavior of aerosols within the atmosphere. The TOMS is the first instrument to allow observation of aerosols as the particles cross the land/sea boundary. Using these data it is possible to observe a wide range of phenomena such as desert dust storms, forest fires, and biomass burning.

EP TOMS is currently the only NASA spacecraft on orbit specializing in ozone retrieval. EP TOMS was launched in 1996 into an orbit 500 km rather than the 950 km that was originally planned. The lower orbit of EP TOMS decreased the size of the "footprint" of each measurement, which increased the resolution and also increased the ability to make measurements over cloudless scenes. This orbit was chosen to improve the ability of the TOMS instrument to make measurements of UV-absorbing aerosols in the troposphere and enhanced the capability of converting the TOMS aerosol measurements into geophysical quantities such as optical depth. The EP satellite was boosted to 740 km in 1997 when the ADEOS satellite failed. Tropospheric aerosols play a major role in the Earth's climate and the capability to measure them from a TOMS instrument had recently been developed using data from Nimbus-7 and Meteor-3 TOMS.

The TOMS Home Page [http://toms.gsfc.nasa.gov/index_v8.html].

Background Information

Investigators:

Richard D. McPeters, Principal Investigator for Earth Probe TOMS (mcpeters@wrabbit.gsfc.nasa.gov)

Anne M. Thompson (thompson@gator1.gsfc.nasa.gov)

David Larko (larko@jwocky.gsfc.nasa.gov)

Project: SAFARI 2000

Data Set Title: SAFARI 2000 TOMS Aerosol Index Data, Southern Africa, Dry Season 2000

Site: Southern Africa

Westernmost Longitude: -39.375 W
Easternmost Longitude: 75.375 E
Northernmost Latitude: 0.5 N
**Southernmost Latitude:** -39.5 S

Data Set Citation:

McPeters, R. D., A. M. Thompson, and D. Larko. 2005. SAFARI 2000 TOMS Aerosol Index Data, Southern Africa, Dry Season 2000. Data set. Available on-line [http://daac.ornl.gov/] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Data Users Guide: TOMS Users Guide (PDF)

TOMS Aerosol Index Data

The TOMS Aerosol Index data are a daily gridded Level-3 product (ASCII .dat format) that covers the area of 40 deg. S to the Equator and 40 deg. W to 80 deg. E. There is a separate file for each day of data collection. There is also a JPEG image of each data file.
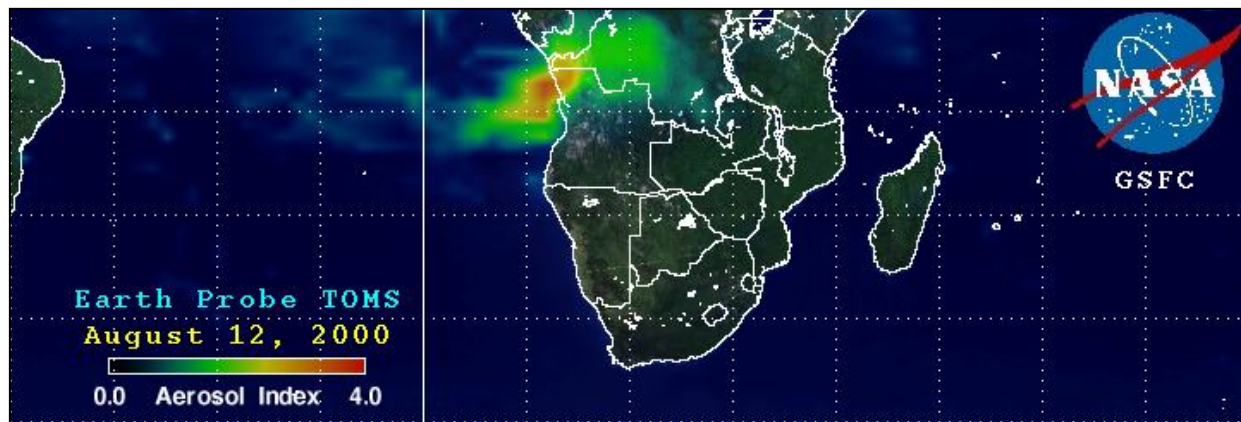
A sample TOMS Aerosol Index image over southern Africa.

TOMS Aerosol Index File Information

Daily Aerosol Index gridded ASCII data files from EP TOMS contain format information in the header of each file. The daily AI is formed directly from measured TOMS radiances in two channels. AI is not a perfect identification; sometimes aerosols are too low to the ground to be detected by TOMS. Additional TOMS Aerosol Index data are available at http://toms.gsfc.nasa.gov/index_v8.html.

Each value is 3 characters long (e.g., 111222333444555). The Aerosol Index has been multiplied by 10.

Positive values represent absorbing aerosols (dust and smoke).

Negative values represent non-absorbing aerosols. The explicit negative sign is included in the character count.

999 = missing or bad data.

Blank spaces are considered characters.

For example:

(blank)(blank)1=0.1 AI

(blank)11=1.1 AI

111=11.1 AI

For instance, the first data row in the Sample Data File below would resolve to:

-8 -9 -9 -7-12-10-11 ...

-0.8,-0.9,-0.9,-0.7,-1.2,-1.0,-1.1 ...

Sample TOMS Aerosol Index Data File

```
    August 12, 2000 Near Realtime Version 7 EP TOMS AEROSOL INDEX X
10
 Longitudes:    96 bins centered on  39.375 W to  79.375 E  (1.25 degree
steps)
 Latitudes :   40 bins centered on  39.5    S to   0.5    S  (1.00 degree
steps)
  -8 -9 -9 -7-12-10-11 -8 -4 -9 -9 -9 -9 -3 -7 -2  0  0 -4 -6 -4 -6 -7 -7 -8
  -9-10 -7 -4 -6 -6 -6 -8 -4 -3 -5 -5 -8 -7 -7 -9 -7 -9 -9-11-10-11 -9-10 -7
  -7 -5 -7 -5 -4 -6 -3 -8  0 -6 -8 -9 -5 -8 -9 -6 -9 -7-11-11 -8 -3 -4  3 -1
  -1 -1  0 -3 -3 -4-10-13 -8-11-11 -9 -8-10 -7 -7 -6 -6 -4 -2  0   lat =  -39.5
  -7-11-11 -8-11 -7 -9 -6 -8 -7 -6-10 -7 -1 -7  0  0 -2 -7 -5 -7 -5 -6 -9 -7
  -6 -3 -4-11 -8 -5 -1 -2 -2  0  1 -1 -5 -9 -6 -6 -5 -6 -9 -9 -7 -9 -9 -8 -8
 -10 -8 -7 -5  0 -8 -4 -4 -5 -4 -6 -5 -5 -7-12 -9 -8-11-11 -8 -1 -3 -1  0 -3
  -3 -5 -1  0 -3-13-10 -8-10-10-11 -7-11 -8 -8 -7 -8 -8 -7 -2 -4   lat =  -38.5
  -8-12 -6-10 -8 -8-11 -9-10-10-10 -3 -6 -7 -7 -2 -4 -5 -6 -5 -5 -6 -6 -5 -3
  -6 -9-11-14 -7 -7 -4 -1  0  1 -5 -7 -5 -5 -6 -6 -5 -7-13-12-10 -8-10-11 -8
  -7 -7 -6 -7 -6 -5 -5 -7 -8 -9 -8 -8 -5 -9-10 -8-10-10 -5 -8 -5  1 -5 -4 -5
  -4 -4  0  0 -2-14 -9 -9-10 -9 -7 -8-11 -6 -9 -8 -7 -6 -3 -3 -1   lat =  -37.5
  -7 -6-10-11-12-11-11-11-11 -7 -6 -6 -6 -3 -3 -4 -4 -5 -5 -5 -7 -5 -3 -2 -6
 -10 -9-10 -8 -6 -4 -2 -2 -1  1 -6 -5 -9-11-11-13-10-12 -9 -7 -8-12-12-11-10
 -11-10-10-10-10 -5 -7 -7 -8 -9 -7 -7 -8-10 -7 -7 -7 -5-10 -8  0 -1 -8 -4 -1
 -11 -6 -1 -1 -5 -7-11 -8 -9 -7 -6 -8 -7 -7 -7 -8 -4 -1 -4  0 -3   lat =  -36.5
```

Acknowledgments

References

Herman, J. R., P. K. Bhartia, O. Torres, C. Hsu, C. Seftor and E. Celarier. 1997. Global distribution of uv-absorbing aerosols from Nimbus 7/TOMS data. J. Geophys. Res., 102: 16,911-16,922.

Torres, O., P. K. Bhartia, J. R. Herman, Z. Ahmad, and J. Gleason. 1998. Derivation of aerosol properties from satellite measurements of backscattered ultraviolet radiation: Theoretical basis. J. Geophys. Res., 103: 17099-17110.

Revison Date: Wednesday, July 20, 2005