MODIS Aerosol Product (MOD 04)

Product Description

The MODIS Aerosol Product (MOD 04) monitors the ambient aerosol optical thickness over the oceans globally and over a portion of the continents. Further, the aerosol size distribution is derived over the oceans, and the aerosol type is derived over the continents. Daily Level 2 (MOD 04) data are produced at the spatial resolution of a 10×10 1-km (at nadir)-pixel array.

Research and Applications

Aerosols are one of the greatest sources of uncertainty in climate modeling. Aerosols modify cloud microphysics by acting as cloud condensation nuclei (CCN), and, as a result, impact cloud radiative properties and climate. Aerosols scatter back to space and absorb solar radiation. The MODIS aerosol product will be used to study aerosol climatology, sources and sinks of specific aerosol types (e.g., sulfates and biomass-burning aerosol), interaction of aerosols with clouds, and atmospheric corrections of remotely sensed surface reflectance over the land.

Data Set Evolution

Prior to MODIS, satellite measurements were limited to reflectance measurements in one (GOES, METEOSAT) or two (AVHRR) channels. There was no real attempt to retrieve aerosol content over land on a global scale. Algorithms had been developed for use only over dark vegetation. The blue channel on MODIS, not present on AVHRR, offers the possibility to extend the derivation of optical thickness over land to additional surfaces. The algorithms will use MODIS bands 1 through 7 and 20 and require prior cloud screening using MODIS data. Over the land, the dynamic aerosol models will be derived from ground-based sky measurements and used in the net retrieval process.

Over the ocean, three parameters that describe the aerosol loading and size distribution will be retrieved. Pre-assumptions on the general structure of the size distribution are required in the inversion of MODIS data, and the volume-size distribution will be described with two log-normal modes: a single mode <0.5 μm) and a single coarse mode to describe dust and/or salt particles (radius >1.0 μm). The aerosol parameters we therefore expect to retrieve are: the ratio between the two modes, the spectral optical thickness, and the mean particle size.

The quality control of these products will be based on comparison with ground stations and climatology.

The related MODIS Cloud Product ATBD, *Algorithm for Remote Sensing of Tropospheric Aerosol from MODIS: Optical thickness over land and ocean and aerosol size distribution over the ocean*, can be found in PDF format at http://eospso.gsfc.nasa.gov/atbd/modistables.html.

Suggested Reading

Chu, D.A. *et al.*, 1998.

Dubovik, O. *et al.*, 2000.

Holben, B.N. *et al.*, 1992.

Holben, B.N. *et al.*, 1998.

Kaufman, Y.J., and C. Sendra, 1988.

Kaufman, Y.J., and L.A. Remer, 1994.

Kaufman, Y.J. *et al.*, 1997a,b.

King, M.D. *et al.*, 1992.

King, M.D. *et al.*, 1999.

Rao, C.R.N. *et al.*, 1989.

Remer, L.A. *et al.*, 1996.

Tanré, D. *et al.*, 1997.

MODIS Aerosol Product Summary

Coverage: Global over oceans, nearly global over land

Spatial/Temporal Characteristics: 10 km for Level 2

Key Science Applications: Aerosol climatology, biomass-burning aerosols, atmospheric corrections, cloud radiative properties, climate modeling

Key Geophysical Parameters: Atmospheric aerosol optical depth (global) and aerosol size distribution (oceans)

Processing Level: 2

Product Type: Standard, at-launch

Maximum File Size: 11 MB

File Frequency: 144/day

Primary Data Format: HDF-EOS

Browse Available:
http://modis-atmos.gsfc.nasa.gov/MOD04_L2/sample.html

Additional Product Information:
http://modis-atmos.gsfc.nasa.gov/MOD04_L2/index.html

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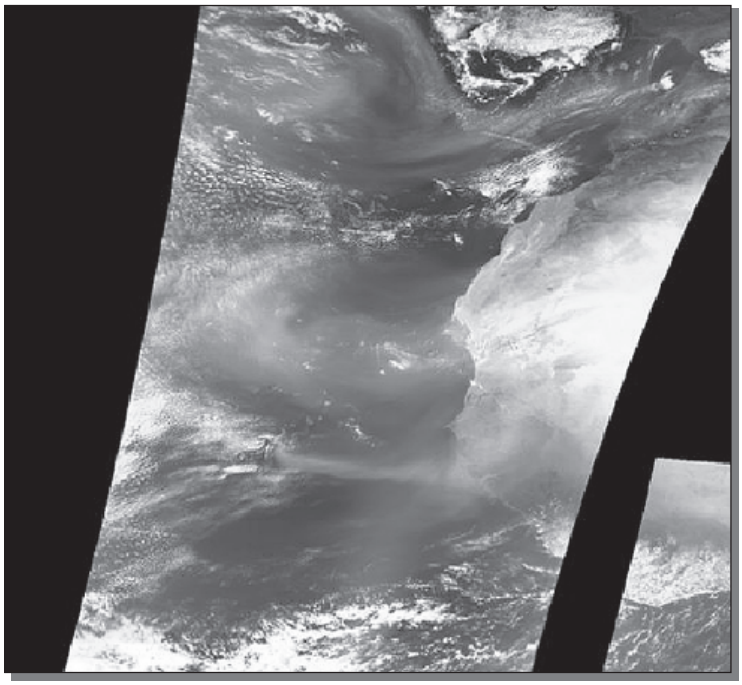
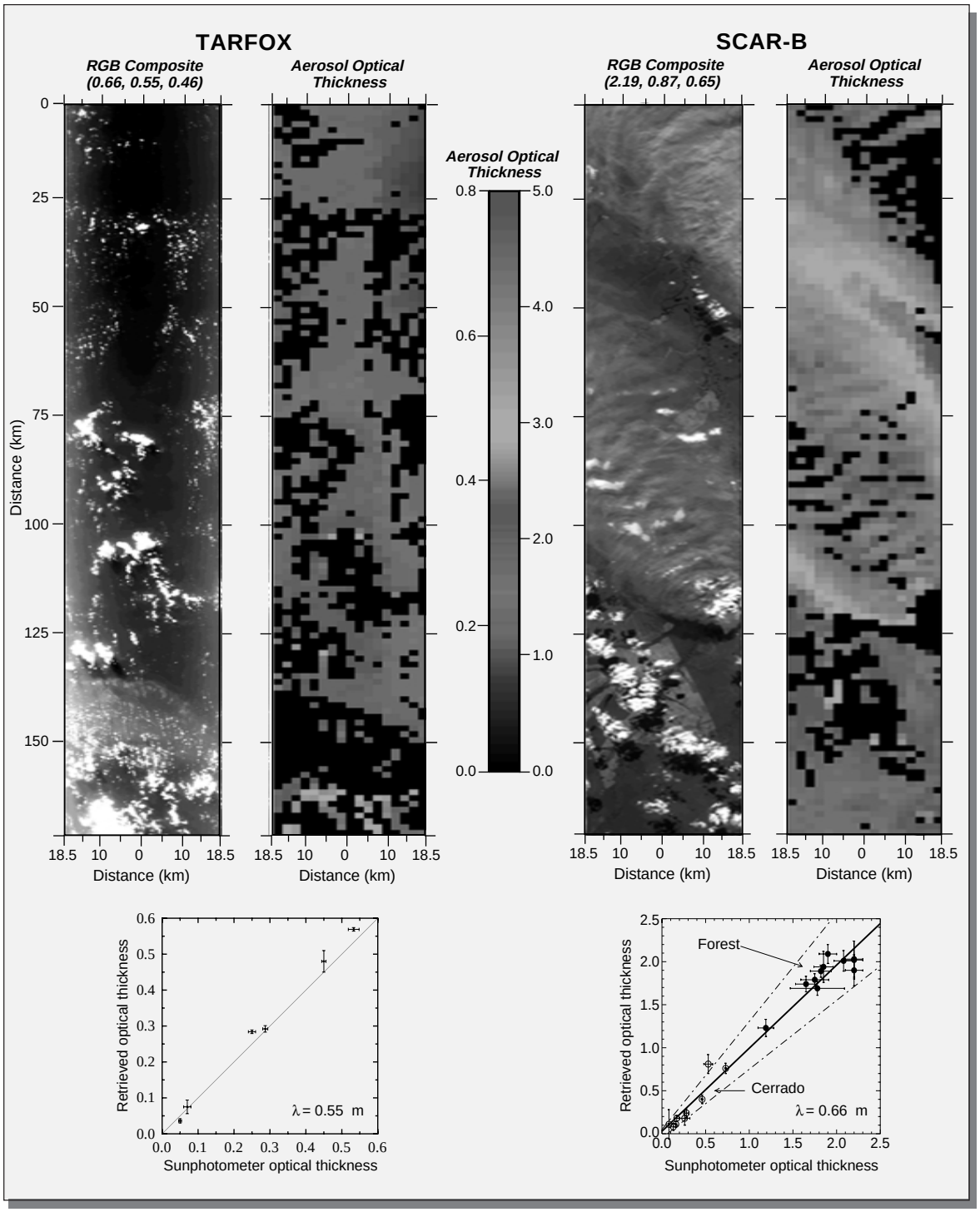


Terra MODIS Image of a Massive Sandstorm blowing off the northwest African desert. This sandstorm blanketed hundreds of thousands of square miles of the eastern Atlantic Ocean on February 29, 2000.



MODIS Airborne Simulator (MAS) Images and Corresponding Aerosol Thickness Retrievals for a 150 × 37-km section of flight during TARFOX (ocean scene) and SCAR-B (land scene). The bottom two panels are the validation of the retrieved aerosol optical thickness in comparison to sunphotometer observations at 0.55 µm (TARFOX; University of Washington C-131A measurements) and 0.66 µm (SCAR-B; ground-based AERONET measurements). (From King, M.D. *et al.*, 1999.)