MODIS Surface Reflectance BRDF/Albedo Parameter (MOD 43)

Product Description

The Bidirectional Reflectance Distribution Function (BRDF)/Albedo parameter provides: 1) coefficients for mathematical functions that describe the BRDF of each pixel in the seven MODIS "Land" bands (1-7); and 2) albedo measures derived simultaneously from the BRDF for bands 1-7 as well as three broad bands (0.4-0.7, 0.7-3.0, and 0.4-3.0 micrometers).

Because deriving BRDF and albedo requires merging multiple looks at each pixel, the BRDF/Albedo parameter is provided every 16 days. Its spatial resolution is 1 km, gridded to Level 3. A 32-day summary albedo product at 0.25° spatial resolution is also provided. Both Terra and Aqua data are merged as available.

Research and Applications

The BRDF functions provided by the BRDF/Albedo parameter: 1) allow normalization of MODIS data to standard viewing and illumination angles, thus removing geometric effects from multidate images; 2) quantify the directional information in the remotely-sensed signal, which is related to ground-cover type; and 3) provide a surface-radiation-scattering model for boundary-layer parameterization in regional and global climate modeling. The BRDF can also be used in extraction of surface reflectances at Level 2. Two albedo measures are provided: "black-sky" albedo (directional-hemispherical reflectance) and "white-sky" albedo (bihemispherical reflectance). These are intrinsic surface properties, independent of atmospheric state. They describe the upward scattering of the solar beam and of uniform diffuse irradiance, respectively, and may be used as input to global and regional climate models.

Data Set Evolution

The BRDF/Albedo algorithm combines gridded, multidate, multiband surface-reflectance data from EOS MODIS and MISR (on Terra) instruments to produce BRDF functions and derived albedo measures. For each grid cell, all cloud-free observations in a 16-day period are assembled and fit to the Ross-Thick/Li-Sparse semiempirical model that describes the BRDF as a linear function of two basic BRDF

shapes. In addition, a single empirical model (modified Walthall) is currently also fitted. The algorithm outputs include: 1) Ross-Thick/Li-Sparse BRDF parameters that best fit the observations, 2) modified Walthall parameters, 3) black-sky and white-sky albedos in three broad bands, and 4) nadir BRDF-adjusted reflectances (NBARs).

Suggested Reading

Barnsley, M.J., and J.-P. Muller, 1991.

d'Entremont, R.E. *et al.*, 1999.

Hu, B. *et al.*, 1997.

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Justice, C. *et al.*, 1998.

Li, X. *et al.*, 1995.

Liang, S. *et al.*, 1999

Lucht, W., 1998.

Lucht, W., and P. Lewis, 2000.

Lucht, W. *et al.*, 2000.

Wanner, W. *et al.*, 1995.

Wanner, W. *et al.*, 1997.

MODIS Surface Reflectance BRDF/Albedo Parameter Summary

Coverage: Global land surface

Spatial/Temporal Characteristics: 1 km, 16 km, 0.5°/16-day; 0.25°/32-day

Key Science Applications: Biogeochemical-cycle modeling, net primary productivity estimation, global climate models

Key Geophysical Parameters: Bidirectional reflectance, spectral albedo

Processing Level: 3

Product Type: Standard, at-launch

Maximum File Size: 329 MB (16-day), 946 MB (32-day)

File Frequency: 289/16-day (16-day), 1/month (32-day)

Primary Data Format: HDF-EOS

Additional Product Information: http://modis-land.gsfc.nasa.gov/products/products.asp?ProdFamID=2
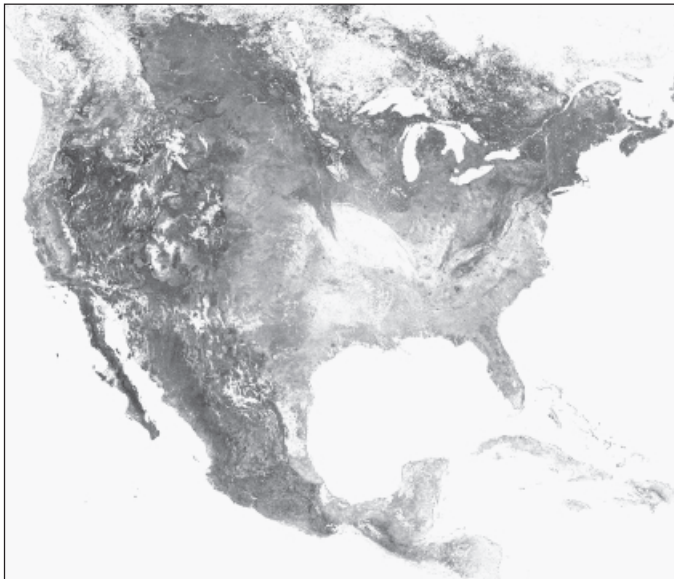
DAAC: EROS Data Center

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Bihemispherical Albedo (White-Sky Albedo) for North America for the period April 22 - May 7, 2000, calculated from the MODIS BRDF/Albedo product algorithm using data from the Terra MODIS near-infrared channel (Band 2). In this image, cloud cover has obscured some regions in the central U.S. as well as other smaller areas shown in white. Light tones in the southeastern U.S. indicate strong reflectance from leaf cover, while much of the more northern regions remains leafless.