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SAFARI 2000 MODIS L3 ALBEDO AND LAND COVER DATA, SOUTHERN AFRICA, DRY SEASON 2000

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Summary:

The Filled Land Surface Albedo Product for Southern Africa, which is generated from MOD43B3 Product, Collection 4 (the official Terra/MODIS-derived Land Surface Albedo - <http://www-modis.bu.edu/brdf/userguide/albedo.html>), is a subset of the global data set of spatially complete albedo maps computed for both white-sky and black-sky at 10 wavelengths (0.47 μ m, 0.55 μ m, 0.67 μ m, 0.86 μ m, 1.24 μ m, 1.64 μ m, 2.1 μ m, and broadband 0.3-0.7 μ m, 0.3-5.0 μ m, and 0.7-5.0 μ m). An exception is that no 2.1 μ m data for black-sky is being archived at this time. The data spatial extent is from approximately 5 degrees N to -30 degrees S latitude and 5 minutes E to 60 degrees E longitude and covers 7 sixteen day periods starting on July 11 through October 15, 2000.

Map Products, containing spatially complete land surface albedo data, are generated at 1-minute resolution on an equal-angle grid. The maps are stored in separate HDF-EOS files for each wavelength, each 16-day period and each albedo type (white- and black-sky). Data belonging to black sky and white sky albedo have been zipped separately. This format allows the user to have flexibility to download and store only the data absolutely needed.

The One-Minute Land Ecosystem Classification Product is a global (static map) data set of the International Geosphere-Biosphere Programme (IGBP) classification scheme stored on an equal-angle rectangular grid at 1-minute resolution. The data set is generated from the official MODIS land ecosystem classification data set, MOD12Q1 for year 2000, day 289 data (October 15, 2000). This data set is used in generating the spatially complete albedo maps, but is also a stand-alone product designed for use by the user community. The Land Ecosystem Classification Map File product file is stored in Hierarchical Data Format (HDF-EOS).

An ecosystem-dependent temporal interpolation technique (Moody et al., 2005) has been used to fill missing or seasonally snow-covered data in the official MOD43B3, Collection 4, albedo product. The method imposes pixel-level and local regional ecosystem-dependent phenological behavior onto retrieved pixel temporal data in such a way as to maintain pixel-level spatial and spectral detail and integrity.

More information can be found at: <http://modis-atmos.gsfc.nasa.gov/ALBEDO/index.html>.

Data Citation:

Cite this data set as follows:

Moody, E. G., M. D. King, S. Platnick, C. B. Schaaf, and F. Gao. 2006. SAFARI 2000 MODIS L3 Albedo and Land Cover 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. doi:10.3334/ORNLDAAC/840.

References:

Eric G. Moody, Michael D. King, Steven Platnick, Crystal B. Schaaf, and Feng Gao. 2005. Spatially Complete Global Spectral Surface Albedos: Value-Added Datasets Derived From Terra MODIS Land Products. IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 43, NO. 1, PP. 144-158.

Data Format:

File Organization

There are 3 data granules for this data set: black sky albedo, white sky albedo and ecosystem map. The albedo data sets are zip files which contain seven folders for seven 16-day periods. The folders are named by year and Julian date. For example, folder 2000.193 indicates the year 2000 and day 193 which is July 11th. Within each folder, there are zipped albedo product files. The black sky albedo data set folders contain 9 zip files indicating 9 wavelengths (0.47 μ m, 0.55 μ m, 0.67 μ m, 0.86 μ m, 1.24 μ m, 1.64 μ m, and broadband 0.3-0.7 μ m, 0.3-5.0 μ m, and 0.7-5.0 μ m). The white sky albedo data folders have 10 zip files indicating 10 wavelengths (0.47 μ m, 0.55 μ m, 0.67 μ m, 0.86 μ m, 1.24 μ m, 1.64 μ m, 2.1 μ m, and broadband 0.3-0.7 μ m, 0.3-5.0 μ m, and 0.7-5.0 μ m). The ecosystem map data granule is also a zip file which contains one ecosystem map file.

File Format Basics

The filled Land Surface Albedo Product files and the ecosystem map file are stored in Hierarchical Data Format (HDF-EOS). HDF-EOS is a multi-object file format for sharing scientific data in multi-platform distributed environments. HDF-EOS files should only be accessed through the HDF-EOS library subroutine and function calls, which can be downloaded from the HDF-EOS web site [<http://www.hdfEOS.org/index.php>]. All of the parameters are stored as Scientific Data Sets (SDS's) within the HDF file.

Gridding and Extent

All of the Filled Land Surface Albedo Products and the One-Minute Land Ecosystem Classification Product are stored on an equal angle lat-lon grid. The grid has a resolution of 1 minute (2 km at the equator and < 1 km at the pole). In this Southern Africa subset, the upper left corner position of the first grid cell (1,1) is located at 5 degrees 1 minute N latitude and 4 degrees 59 minutes E longitude. The lower right corner position of the last grid cell (X, X) is located at -30 degrees 1 minute S latitude and 60 degrees 1 minute E longitude. The convention used here is degrees north latitude are stored as positive numbers; while degrees west longitudes are stored as negative numbers. This allows lat/lon pairs to increase from top to bottom and left to right on the grid.

Filled Land Surface Albedo Map Product File Details SDS List

1. Latitude (NumLatPoints)
Description: Geodetic Latitude
Valid Range: 90 (90N) to -90 (90S) degrees
2. Longitude (NumLonPoints)
Description: Geodetic Longitude
Valid Range: -180 (180W) to 180 (180E) degrees
3. Albedo_Map_xxxx (NumLatPoints, NumLongPoints) xxxx = wavelength
Description: Filled Albedo Map
Dimensions:
Valid Range: 0 to 1

One-Minute Land Ecosystem Classification Map Product File SDS List

1. Latitude (NumLatPoints)
Description: Geodetic Latitude
Valid Range: 90 (90N) to -90 (90S) degrees
Type: Float
2. Longitude (NumLonPoints)
Description: Geodetic Longitude
Valid Range: -180 (180W) to 180 (180E) degrees
Type: Float
3. IGBP_Land_Cover_Type (NumLatPoints, NumLongPoints)
Description: IGBP Ecosystem Classification Map
Type: Byte
Valid Range: '0' to '254'
Fill Value: '255'
Units: Class Number
 - water = '0'
 - evergreen needleleaf forest = '1'
 - evergreen broadleaf forest = '2'
 - deciduous needleleaf forest = '3'
 - deciduous broadleaf forest = '4'
 - mixed forests = '5'
 - closed shrubland = '6'
 - open shrublands = '7'
 - woody savannas = '8'
 - savannas = '9'
 - grasslands = '10'
 - permanent wetlands = '11'
 - croplands = '12'
 - urban and built-up = '13'
 - cropland/natural vegetation mosaic = '14'
 - snow and ice = '15'
 - barren or sparsely vegetated = '16'
 - unclassified = '254'
4. IGBP_Land_Cover_Type_Assessment (NumLatPoints, NumLongPoints)
long_name = "IGBP Land Cover Classification Type Assessment"
units = "flags"
valid_range = '0', '254'
FillValue = '255'
5. IGBP_Land_Cover_Type_Secondary (NumLatPoints, NumLongPoints)
long_name = "Land_Cover_Type_1_Secondary"
units = "flags"
valid_range = '0', '254'
FillValue = '255'
6. IGBP_Land_Cover_Type_Secondary_Percent (NumLatPoints, NumLongPoints)
long_name = "IGBP Land Cover Classification Type Secondary Class"
units = "percent in intergers"
valid_range = '0', '254'
FillValue = '255'
7. Land_Cover_Type_QC (NumLatPoints, NumLongPoints)
long_name = "IGBP Land Cover Classification Type Secondary Class Percentage."
units = "concatenated"
valid_range = '254', '0'
FillValue = '255'
First two bits = "Mandatory QA"

processed, good quality = '0'
processed, see other quality = '1'
not processed due to cloud effects = '2'
not processed due to other effects = '3'

Next two bits = "Quarters since last updated"

0 quarter = '0'
1 quarter = '1'
2 quarter = '2'
3 quarter = '3'

Final four bits = "Land water mask"

Shallow ocean = '0'
Land (Nothing else but land) = '1'
Ocean coastlines and lake shorelines = '2'
Shallow inland water = '3'
Ephemeral water = '4'
Deep inland water = '5'
Moderate or continental ocean = '6'
Deep ocean = '7'

Data Application and Derivation:

Filled Land Surface Albedo Map Product

The availability of global land surface characteristics and albedo data over a wide range of spectral bands and at high spatial resolution has dramatically improved with the launch of the MODIS instrument aboard NASA's Earth Observing System (EOS) spacecraft. However, lack of spatial and temporal coverage due to cloud and snow effects can preclude utilization of official products in production and research studies. The Filled Land Surface Albedo Product has been developed by employing phenological temporal curve fitting to statistically fill missing data in the official product (MOD43B3) in order to provide spatially complete global maps.

Spectral land surface albedo is an important parameter for describing the radiative properties of the Earth while the ecosystem classification and NDVI products are important parameters in describing the productivity and characteristics of the land surfaces. These products reflect the consequences of natural and human interactions, such as anthropogenic, meteorological, and phenological effects on local and global climatological trends. Consequently, these products are integral parts in a variety of research areas, such as general circulation models (GCMs), energy balance studies, modeling of land use and land use change, as well as biophysical, oceanographic, and meteorological studies.

Collection 4 MOD43B3 data for the selected time period has been processed to provide the community with spatially complete albedo products.

Generating these value-added products requires multiple steps (Moody et al., 2005), including: 1) remapping the native MOD43B3 data stored in sinusoidal (SIN) projection onto 1-min climate modeling (equal-angle) grids (CMG); 2) applying the appropriate quality assurance (QA) information to remove retrievals over water and lesser quality and ephemeral snow data; 3) filling missing data with the ecosystem-dependent temporal interpolation technique (using the MODIS MOD12Q1 International Geosphere-Biosphere Programme (IGBP) ecosystem classification dataset); and 4) storing both the original and filled data as well as the original and fill-technique QA into new hierarchical data format (HDF) files.

One-Minute Land Ecosystem Classification Map Product

In a similar manner, the MOD12Q1 static ecosystem classification product is reprojected onto a 1-min spatial resolution equal-angle CMG grid, but only for the IGBP classification scheme and associated QA arrays. This remapped dataset is instrumental in generating statistics by ecosystem class and for implementing the temporal interpolation technique.

Data Access:

This data set is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) [<http://www.daac.ornl.gov>] or the EOS Data Gateway [<https://wist.echo.nasa.gov/~wist/api/imswelcome/>].

Data Archive Center:

Contact for Data Center Access Information

E-mail: uso@daac.ornl.gov

Telephone: +1 (865) 241-3952

FAX: +1 (865) 574-4665



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