

Preprocessed Input Data

Description

MODIS

The Moderate Resolution Imaging Spectroradiometer (MODIS) Surface Reflectance products provide an estimate of the surface spectral reflectance as it would be measured at ground level in the absence of atmospheric scattering or absorption. Low-level data are corrected for atmospheric gases and aerosols, yielding a level-2 basis for several higher-order gridded level-2 (L2G) and level-3 products. MODIS has two instruments and they are overlapping in time (from 2000 on for MODIS (Terra) and mid-2002 for MODIS (Aqua)).

MOD09CMG provides Bands 1–7 in a daily product gridded on a simple 0.05 degree Geographic projection, thus the spatial resolution is 5600 m. Data for each pixel is selected on the basis of low solar zenith angle, minimum Band 3 (blue) reflectance, and absence of cloud from level-3 intermediate files. Science Data Sets provided for this product include reflectance values for Bands 1–7, brightness temperatures for Bands 20, 21, 31, and 32, solar and view zenith angles, relative azimuth angle, ozone, granule time, and quality assessment.

Process

The product has been downloaded directly from <ftp://e4ftl01u.ecs.nasa.gov/>. This data do not have processing. The following legend have been used for the images (see below)

NDVI

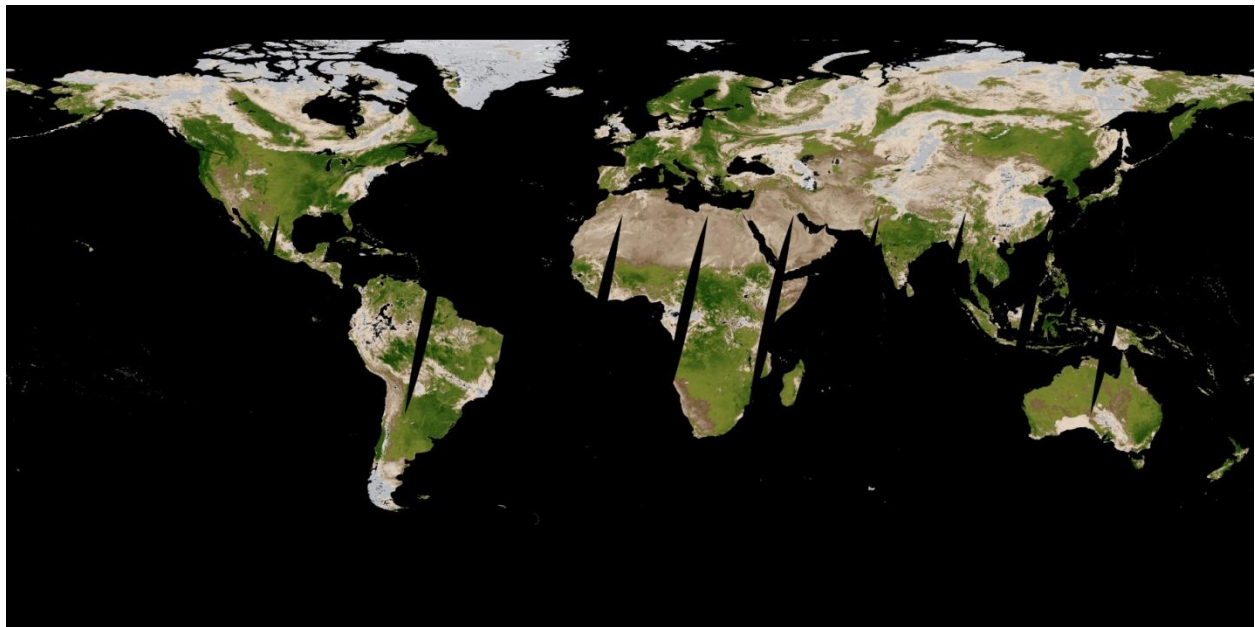
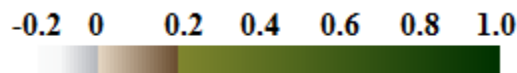


Figure 1 Input Data (MODIS)

The following table shows the days of the year without data for both Terra and Aqua.

Terra	
Year	Missing days
2000	0-54, 117-118, 219-230, 342-366
2001	167-182, 238, 239, 267-294
2002	79-86, 105, 253-265, 292
2003	351-357
2004	
2005	
2006	301
2007	33, 316, 317
2008	356, 357
2009	219, 329
2010	0-54, 117-118, 219-230, 342-366

Aqua	
Year	Missing days
2002	1-184, 211-219, 256
2003	
2004	
2005	
2006	186
2007	18, 158, 336
2008	
2009	
2010	141

Data set Characteristics

Temporal Coverage	February 24, 2000 -
Area	Global
File Size	~985 MB
Projection	Latitude/Longitude
Data Format	HDF-EOS
Dimensions	3600 x 7200 rows/columns
Resolution	0.05 degrees (5600 meters)
Science Data Sets (SDS HDF Layers)	21
Location	/VIP/DATA/MEASURES/MODIS/TERRA/MOD09CMG/

Layers

Layer Specifications and QA/QC Descriptions

Science Data Sets for MODIS Terra Surface Reflectance Daily L3 Global 0.05Deg CMG V005 (MOD09CMG):

Science Data Sets (HDF Layers) (21)	UNITS	BIT TYPE	FILL	VALID RANGE	MULTIPLY BY SCALE FACTOR
Coarse Resolution Surface Reflectance Band 1 (620–670 nm)	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution Surface Reflectance Band 2 (841–876 nm)	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution Surface Reflectance Band 3 (459–479 nm)	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution Surface Reflectance Band 4 (545–565 nm)	Reflectance	16-bit signed integer	-28672	-100 - 16000	0.0001
Coarse Resolution Surface Reflectance Band 5 (1230–1250 nm)	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution Surface Reflectance Band 6 (1628–1652 nm)	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution Surface Reflectance Band 7 (2105–2155 nm)	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution Solar Zenith Angle	Degree	16-bit signed integer	0	0–18000	0.01
Coarse Resolution View Zenith Angle	Degree	16-bit signed integer	0	0–18000	0.01

Coarse Resolution Relative Azimuth Angle	Degree	16-bit signed integer	0	-18000–180000	0.01
Coarse Resolution Ozone	cm atm	8-bit unsigned integer	0	0–255	0.04
Coarse Resolution Brightness Temperature Band 20	Kelvin	16-bit unsigned integer	0	0–40000	0.01
Coarse Resolution Brightness Temperature Band 21	Kelvin	16-bit unsigned integer	0	0–40000	0.01
Coarse Resolution Brightness Temperature Band 31	Kelvin	16-bit unsigned integer	0	0–40000	0.01
Coarse Resolution Brightness Temperature Band 32	Kelvin	16-bit unsigned integer	0	0–40000	0.01
Coarse Resolution Granule Time	HHMM	16-bit signed integer	0	0–2355	1.0
Coarse Resolution Band 3 Path Radiance	Reflectance	16-bit signed integer	-28672	-100–16000	0.0001
Coarse Resolution QA	Bit Field	32-bit unsigned integer	0	0–1073741824	na
Coarse Resolution Internal CM	Bit Field	16-bit unsigned integer	0	0–8191	na
Coarse Resolution State QA	Bit Field	16-bit unsigned integer	0	0–65535	na
N pixels averaged	none	8-bit unsigned integer	0	0–40	na

The QA information below is excerpted from an HDF-EOS file of the MODIS Surface Reflectance product MOD09CMG.

The V005 MOD09CMG product includes two QA layers, one relating band specific quality (Table 1), and the other presenting the surface reflectance state (Table 2).

Table 1: MOD09CMG.005 0.05 Deg CMG
Surface Reflectance Data QA Descriptions (32-bit)

Bit No.	Long Name	Bit Comb.	Coarse Resolution QA
31	adjacency correction performed	1	yes
		0	no
30	atmospheric correction performed	1	yes
		0	no
26–29	band 7 data quality four bit range	0000	highest quality
		0111	noisy detector
		1000	dead detector; data interpolated in L1B
		1001	solar zenith ≥ 86 degrees
		1010	solar zenith ≥ 85 and < 86 degrees
		1011	missing input
		1100	internal constant used in place of climatological data for at least one atmospheric constant
		1101	correction out of bounds pixel constrained to extreme allowable value
		1110	L1B data faulty
		1111	not processed due to deep ocean or clouds
22–25	band 6 data quality four bit range		SAME AS BAND ABOVE
18–21	band 5 data quality four bit range		SAME AS BAND ABOVE
14–17	band 4 data quality four bit range		SAME AS BAND ABOVE
10–13	band 3 data quality four bit range		SAME AS BAND ABOVE
6–9	band 2 data quality four bit range		SAME AS BAND ABOVE
2–5	band 1 data quality four bit range		SAME AS BAND ABOVE
0–1	MODLAND QA bits	00	corrected product produced at ideal quality all bands
		01	corrected product produced at less than ideal quality some or all bands
		10	corrected product not produced due to cloud effects all bands
		11	corrected product not produced due to other reasons some or all bands may be fill value [Note that a value of (11) overrides a value of (01)].

Table 2: MOD09CMG.005 0.05 Deg CMG Surface Reflectance Data State QA Descriptions (16-bit) *Bits are listed from the MSB (bit 15) to the LSB (bit 0)*

Bit No.	Parameter Name	Bit Comb.	Coarse Resolution State QA
15	internal snow algorithm flag	1	yes
		0	no
14	BRDF correction performed	1	yes
		0	no
13	Pixel is adjacent to cloud	1	yes
		0	no
12	MOD35 snow/ice flag	1	yes
		0	no
11	internal fire algorithm flag	1	fire
		0	no fire
10	internal cloud algorithm flag	1	cloud
		0	no cloud
8–9	cirrus detected	00	none
		01	small
		10	average
		11	high
6–7	aerosol quantity	00	climatology
		01	low
		10	average
		11	high
3–5	land/water flag	000	shallow ocean
		001	land
		010	ocean coastlines and lake shorelines
		011	shallow inland water
		100	ephemeral water
		101	deep inland water
		110	continental/moderate ocean
		111	deep ocean
2	cloud shadow	1	yes
		0	no
0–1	MOD35 cloud	00	clear
		01	cloudy
		10	mixed
		11	not set, assumed clear

References:

MODIS webpage, <http://modis.gsfc.nasa.gov/>