MOD08 Level-3 (L3) Products

(& MODIS-Atmos website review)

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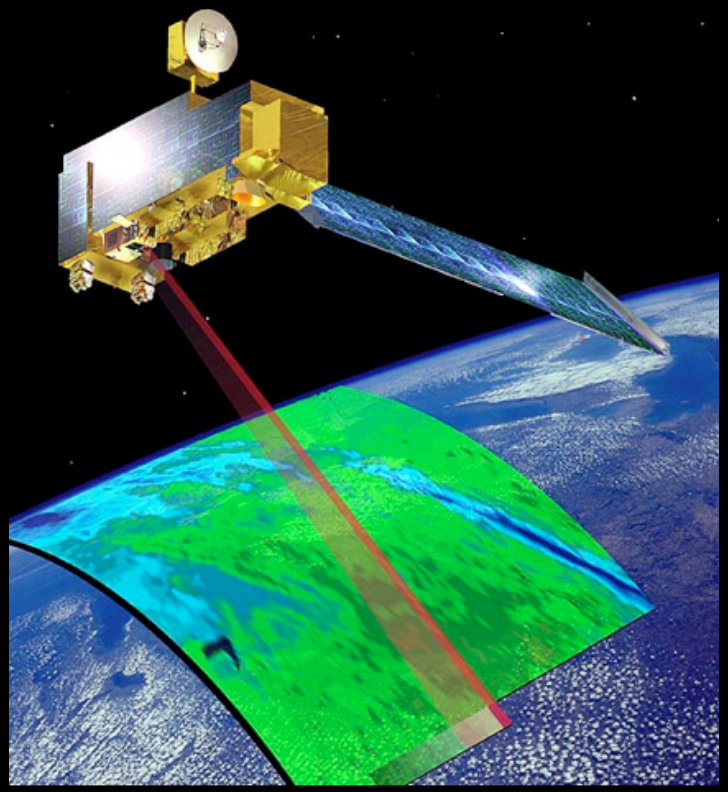
24 September 2014

Outline of Today's Talk

Part 1: MODIS Atmosphere L3 Product Review (Paul Hubanks)
Part 2: MODIS Atmosphere Website Review (Paul Hubanks)
Part 3: Definition of "Day" change in Collection 6 (Bill Ridgway)
Part 4: Q & A (Paul Hubanks, Bill Ridgway, & Steve Platnick)

Will try to answer everything today,
but you can always email me with questions at
Paul.A.Hubanks@nasa.gov



Thank You's and Acknowledgments

It's a TEAM effort!

L3 Team: Steve Platnick, Michael King, Paul Hubanks, Bill Ridgway, Gala Wind, Vani Starry Manoharan, (CRG Team), (L2 Teams)

Webinar Organization & Support: Rich Kleidman

L2 Atmosphere Teams: (without the L2 input, L3 would be nowhere)

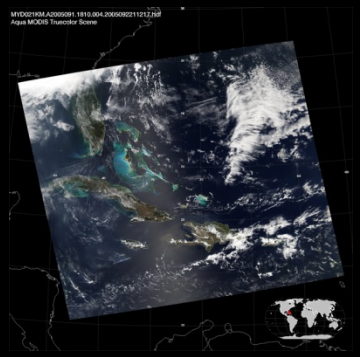
Operational/Production Support: Gang Ye, Kurt Hoffman, T.K.Lim, others

Original Authors of L3 Production Software: Robert Pincus & Xu Liang

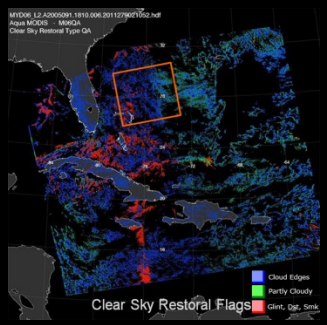
Part 1:
MODIS-Atmosphere Level-3 Product Review (MOD08)

What is Level-3 (L3)?

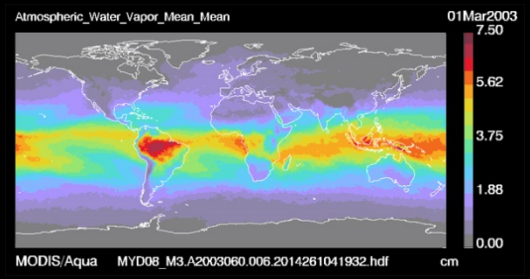
First, let's review Level-1B and Level-2.



Level-1B (L1B) denotes calibrated, geolocated instrument data processed to sensor units stored at a granule-level scale. Each L1B granule (36 spectral bands) is stored in a separate HDF file each covering a 5 minute time interval.



Level-2 (L2) denotes "science products" that are derived from the L1B data and other ancillary data on a granule-level scale. Each L2 granule (with multiple science parameters) is stored in a separate HDF file each covering a 5 minute time interval.



Level-3 (L3) denotes "science products" that are derived from L2 granule-level science products and then mapped to uniform space/time grid scales. (For MODIS Atmosphere, that's global maps at daily or multiday time scales).

What are M-A Level-3 (L3) Characteristics?

Global Gridded Products at daily or multiday temporal scales

For MODIS-Atmosphere L3:

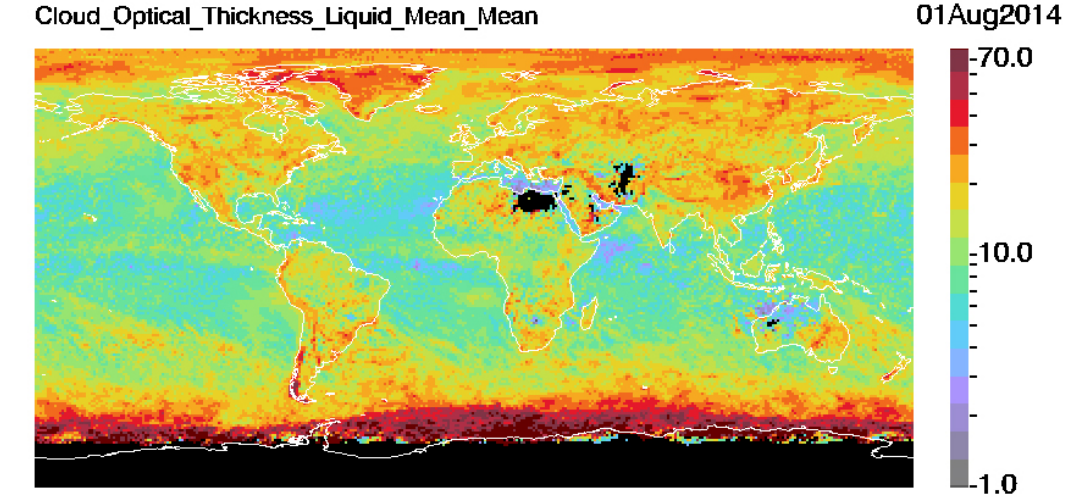
Q1: What grid projection is used? L3 data uses "Equal Angle" projection (Poles are distorted) *

Q2: How big are the L3 grid cells? Each L3 grid cell is 1x1° (~ 12,000 km^2 at Equator < 100 km^2 at Poles)

Q3: How big are the L3 data maps? Each L3 map is 360x180 pixels (360 pixel width & 180 pixel height)

Q4: What temporal scales are offered? Daily (D3), 8-Day (E3), & Monthly (M3)

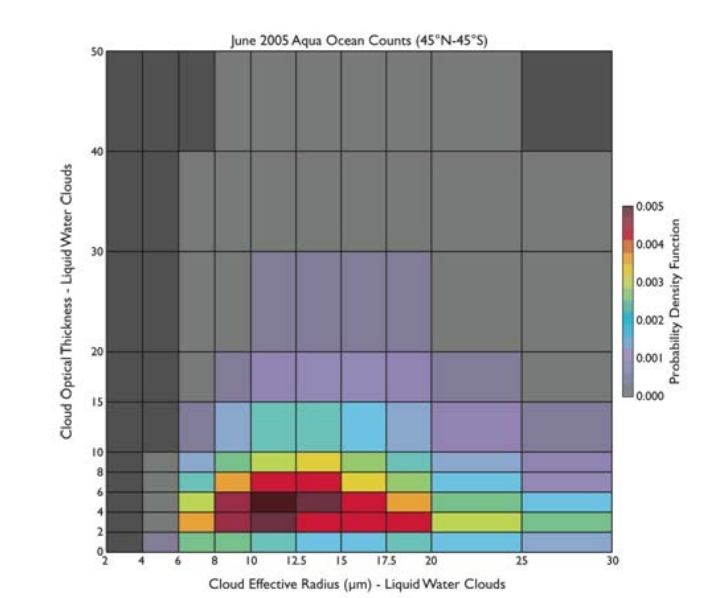
* Note that Hammer-Aitoff elliptical projection images are available on the website for Monthly (M3)



Some Strengths of Standard Level-3:

- Fairly large number of science parameters offered (approximately 180)
- Many different statistics offered (approximately 20 to 30)
- Multiday files fill orbital gaps (nearly complete global coverage)
- Efficient study of global statistics & longer term trends
- Joint histograms show cross-parameter relationships *
- Useful in quality checking and debugging efforts of L2 inputs **

*



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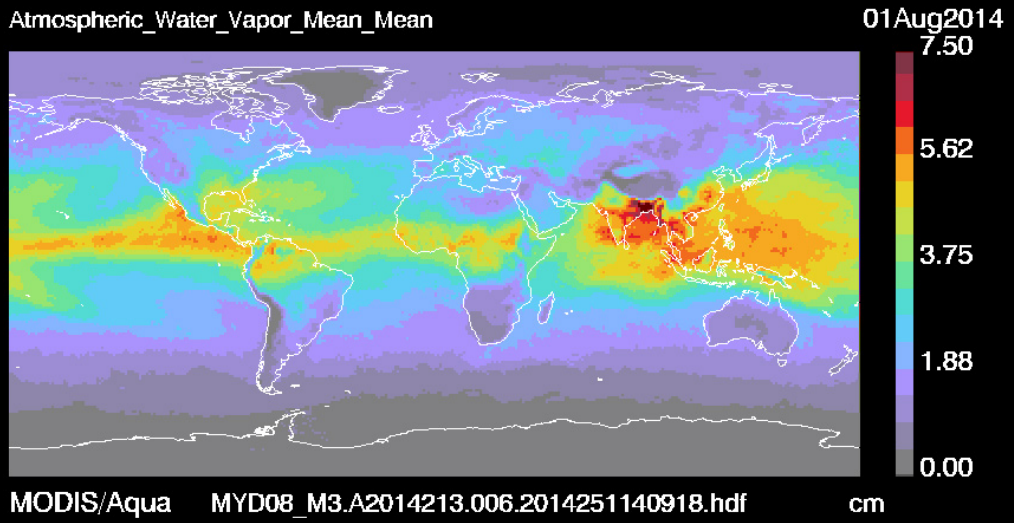

Some Limitations of Standard Level-3:

- Fixed map projection with a relatively coarse resolution (1x1°)
- Fixed parameter set (file size issues in L3, esp. multiday)
- Fixed statistical set (not amenable to complex computations)
- L2 data is sampled at the resolution of the L2 geolocation (1km to 5km)
- Limited set of histograms with preset bin boundaries
- Input to the 08_E3 and 08_M3 … is 08_D3 (not L2)
- Overlapping orbits are averaged * (D3 polar data tends to be "smeared" with overlapping orbital overpasses over many hours, while D3 equatorial data tends to be a snapshot with a single overpass)

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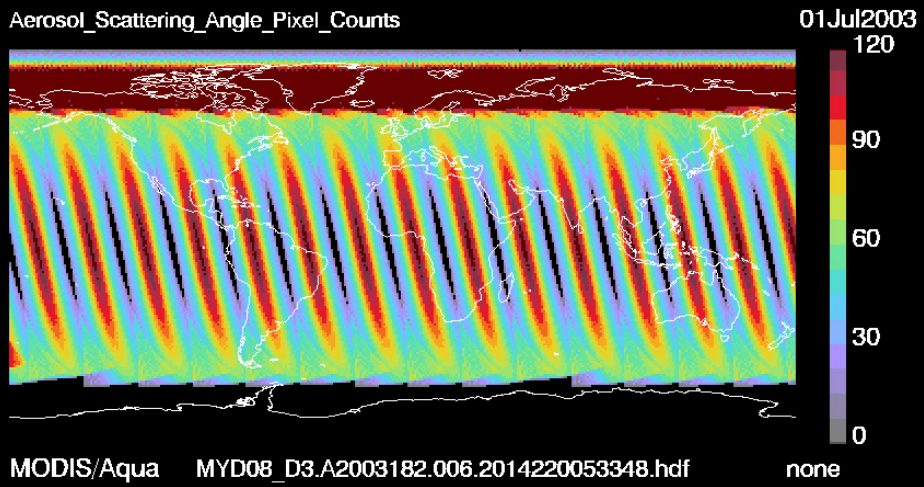
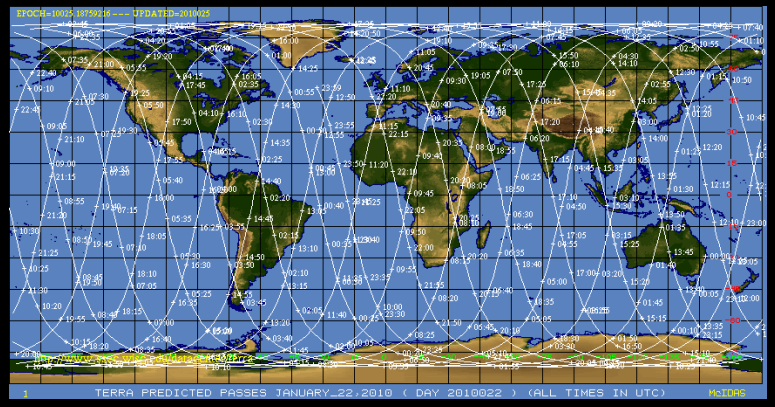




L3 Sub-sampling Impact

Product Family	Data Resolution	Geolocation Resolution	L2 Input Pixels (Max) per 1° Grid (Equator)	Impact
Aerosol 04	10km	10 km	121 out of 121	No
Water Vapor 05	1 km	5 km	484 out of 12,231	Yes
Cirrus Detection 06_CD	1 km	5 km	484 out of 12,231	Yes
Cloud Top Properties * 06_CT	5 km	5 km	484 out of 484	No
Cloud Optical Properties 06_OD	1 km	5 km	484 out of 12,321	Yes
Atmosphere Profile 07	5 km	5 km	484 out of 484	No

* Note there are both 5km and new 1km data sets for CTP in Collection 6

The MODIS-Atmosphere L3 Products

Nearly 200 science parameters and well over 1,000 statistical SDS's

Derived from:

1. Aerosol Product (04_L2)
2. Water Vapor Product (05_L2)
3. Cloud Product (06_L2) *Note that 06_L2 includes some Cloud Mask Product (35_L2) parameters
4. Atmosphere Profile Product (07_L2)

Statistics can include:

1. Simple Statistics (Mean, Minimum, Maximum, Standard Deviation)
2. QA-weighted Mean and QA-weighted Standard Deviation (using L2 QA Confidence Flags)
3. Log Mean and Log Standard Deviation (used for Cloud Optical Thickness)
4. Mean Uncertainty and Log Mean Uncertainty (if uncertainty is computed at L2)
5. Fraction of pixels that satisfy some condition (e.g., cloudy vs. clear)
6. Pixel Counts that satisfy some condition (e.g. liquid water vs. ice clouds)
7. Histograms of the categorical quantity within each grid box (1D Histograms)
8. Histograms of the confidence placed in each measurement (Confidence Histograms)
9. Joint Histograms and/or Regressions derived from comparing one science parameter to another, statistics may be computed for a subset that satisfies some condition. (Joint Histograms and/or Regression Statistics)

A brief note about

Aerosol Parameter/SDS Name Changes

in the C6 Level-3 Products

Aerosol SDS Name Changes in the C6 Level-3 Products

http://modis-atmos.gsfc.nasa.gov/products_C006update.html

Level-3 Aerosol Parameter Mapping Table (C005/051 to C006)

See Green shaded boxes for Final Aerosol L3 Parameter Names

Combined Land and Ocean

Input L2 SDS	Old C005/051 L3 SDS	New C006 L3 SDS	L3 Statistics
Scattering_Angle	Scattering_Angle	Aerosol_Scattering_Angle *	S, PC, HC
Optical_Depth_Land_And_Ocean	Optical_Depth_Land_And_Ocean	Aerosol_Optical_Depth_Land_Ocean *	S, PC, HC
Average_Cloud_Pixel_Distance_Land_Ocean	(not in C005/051)	Aerosol_Avg_Cloud_Distance_Land_Ocean *	S, PC

* Note that these three "Combined Land and Ocean" parameters are the ONLY Aerosol related parameters that are NOT being "masked by the Usefulness Flag" in L3 (since no Combined Land and Ocean Usefulness QA exists in L2)

Land Only

Input L2 SDS	Old C005/051 L3 SDS	New C006 L3 SDS	L3 Statistics
Corrected_Optical_Depth_Land	Corrected_Optical_Depth_Land	Aerosol_Optical_Depth_Land	S, QA, HC
Number_Pixels_Used_Land	Number_Pixels_Used_Land	Aerosol_Number_Pixels_Used_Land	S, QA, HC

Deep Blue Aerosol & Deep Blue/Dark Target Combined

Input L2 SDS	Old C005/051 L3 SDS	New C006 L3 SDS	L3 Statistics
Deep_Blue_Spectral_Aerosol_Optical_Depth_Land	Deep_Blue_Aerosol_Optical_Depth_Land	Deep_Blue_Aerosol_Optical_Depth_Land	S, HC
Deep_Blue_Aerosol_Optical_Depth_550_Land	Deep_Blue_Aerosol_Optical_Depth_550_Land	Deep_Blue_Aerosol_Optical_Depth_550_Land	S, HC
Deep_Blue_Angstrom_Exponent_Land	Deep_Blue_Angstrom_Exponent_Land	Deep_Blue_Angstrom_Exponent_Land	S, HC
Deep_Blue_Spectral_Single_Scattering_Albedo_Land	Deep_Blue_Single_Scattering_Albedo_Land	Deep_Blue_Single_Scattering_Albedo_Land	S, HC
Deep_Blue_Number_Pixels_Used_550_Land	(not in C005/051)	Deep_Blue_Number_Pixels_Used_550_Land	S, HC
AOD_550_Dark_Target_Deep_Blue_Combined	(not in C005/051)	AOD_550_Dark_Target_Deep_Blue_Combined	S, HC

Ocean Only

Input L2 SDS	Old C005/051 L3 SDS	New C006 L3 SDS	L3 Statistics
Effective_Optical_Depth_Average_Ocean	Effective_Optical_Depth_Average_Ocean	Aerosol_Optical_Depth_Average_Ocean	S, QA, HC
Optical_Depth_Small_Average_Ocean	(not in C005/051)	Aerosol_Optical_Depth_Small_Ocean	S, QA, HC
PSML003_Ocean	Cloud_Condensation_Nuclei_Ocean	Aerosol_PSML003_Ocean	S, QA, HC
Optical_Depth_by_models_ocean	Optical_Depth_by_models_ocean	Aerosol_Optical_Depth_by_models_ocean	S, QA
Number_Pixels_Used_Ocean	Number_Pixels_Used_Ocean	Aerosol_Number_Pixels_Used_Ocean	S, QA, HC

NEW JOINT HISTOGRAMS:

Ocean (Joint Histograms ONLY)

Input L2 SDS #1	Input L2 SDS #2	New C006 L3 SDS	L3 Statistics
Angstrom_Exponent_1_Ocean	Effective_Optical_Depth_0p55um_Ocean	Aerosol_AE1_Ocean_Joint_Histogram_vs_Opt_Depth	JH only
Angstrom_Exponent_2_Ocean	Effective_Optical_Depth_0p55um_Ocean	Aerosol_AE2_Ocean_Joint_Histogram_vs_Opt_Depth	JH only
Optical_Depth_Ratio_Small_Ocean_0.55micron	Effective_Optical_Depth_0p55um_Ocean	Aerosol_OD_Ratio_Small_Ocean_055_Joint_Histogram_vs_Opt_Depth	JH only

L3 Statistics Key: S = Simple QA = QA Weighted HC = Histogram Counts PC = Pixel Counts JH = Joint Histogram

An Inventory of the SDS's in the C6 Level-3 Products

Documentation that follows is for Daily (D3) only
(E3 and M3 are very similar)

Summary of Statistical SDS's in the L3 Daily Product (08_D3)

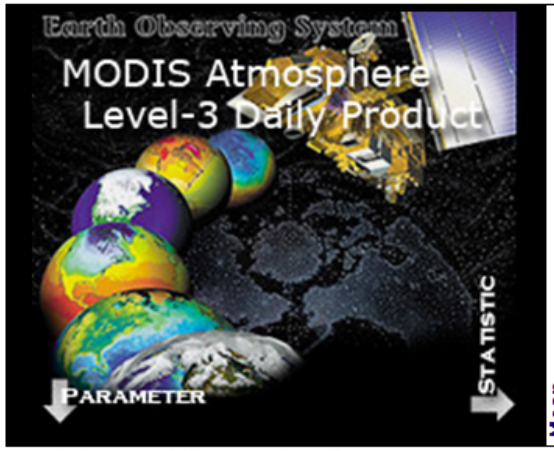
http://modis-atmos.gsfc.nasa.gov/products_C006update.html

http://modis-atmos.gsfc.nasa.gov/MOD08_D3/format.html

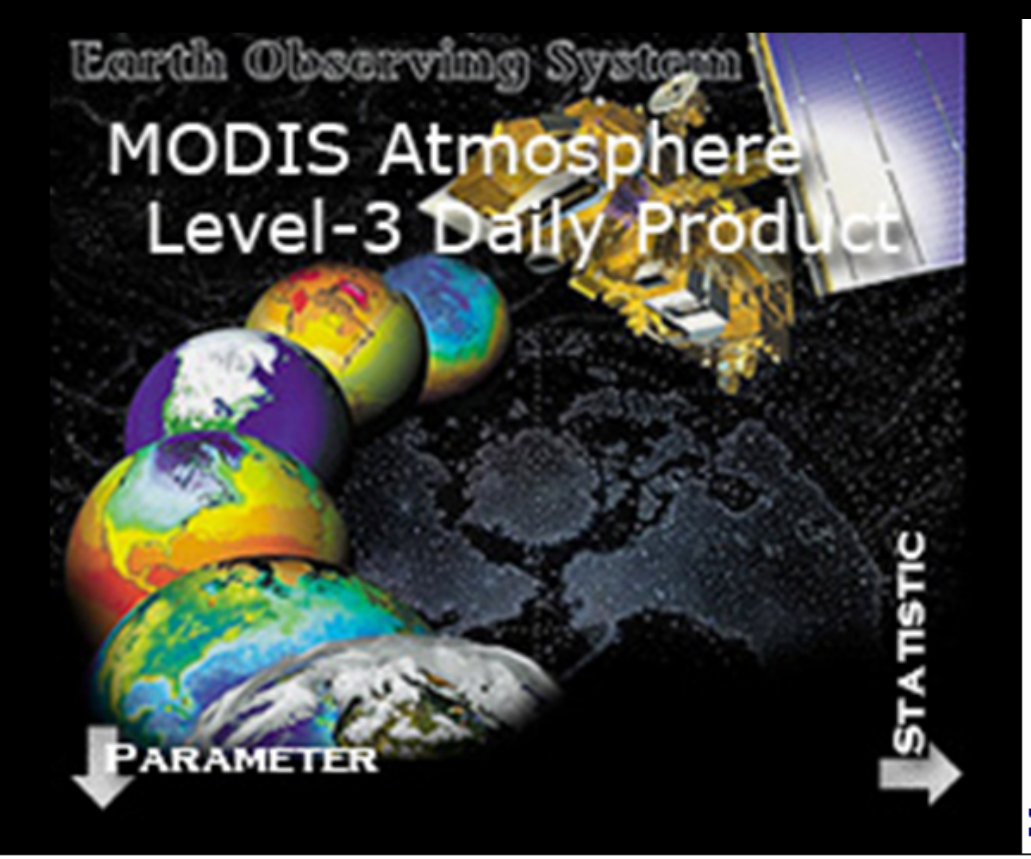
L3 Daily Global (08_D3) Statistics

Collection 006 Updates

= Added = Renamed = Deleted = Modified



	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
Solar and Sensor Angles																			
Angles																			
01. Solar_Zenith [CTP definition of daytime]	•	•	•	•						•									
02. Solar_Azimuth [CTP definition of daytime]	•	•	•	•						•									
03. Sensor_Zenith [CTP definition of daytime]	•	•	•	•						•									
04. Sensor_Azimuth [CTP definition of daytime]	•	•	•	•						•									
Derived from L2 Aerosol (04_L2)																			
Combined Land & Ocean																			
01. Aerosol_Scattering_Angle	•	•	•	•			•			•									
02. Aerosol_Optical_Depth_Land_Ocean	•	•	•	•						•									
03. Aerosol_Avg_Cloud_Distance_Land_Ocean	•	•	•	•						•									
Land Only																			
01. Aerosol_Optical_Depth_Land (3) [previously Corrected]	•	•	•	•	•	•	•	•											
02. Aerosol_Number_Pixels_Used_Land (2) to (10)	•	•	•	•	•	•	•												



Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)

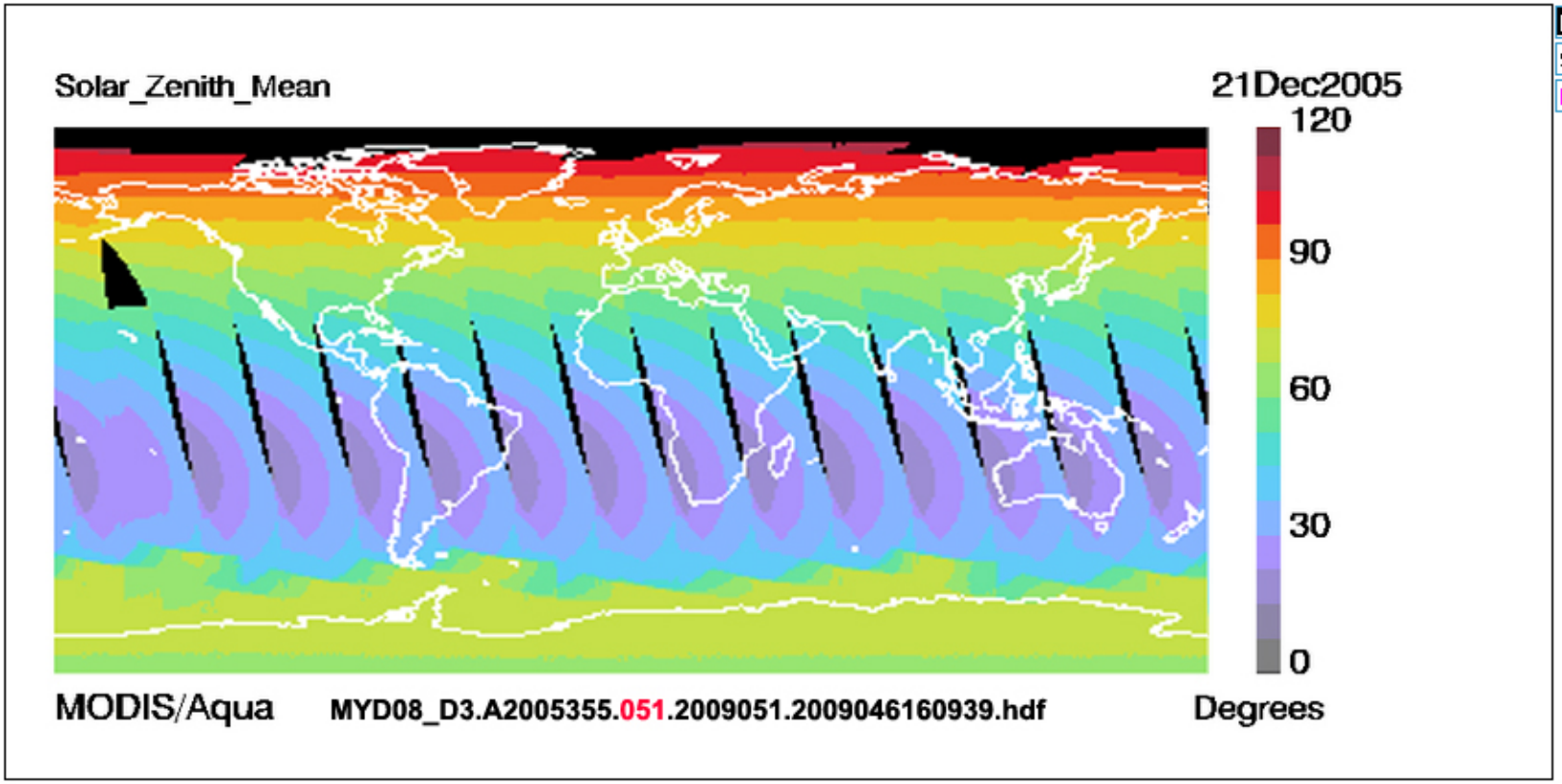
Solar and Sensor Angles

Angles

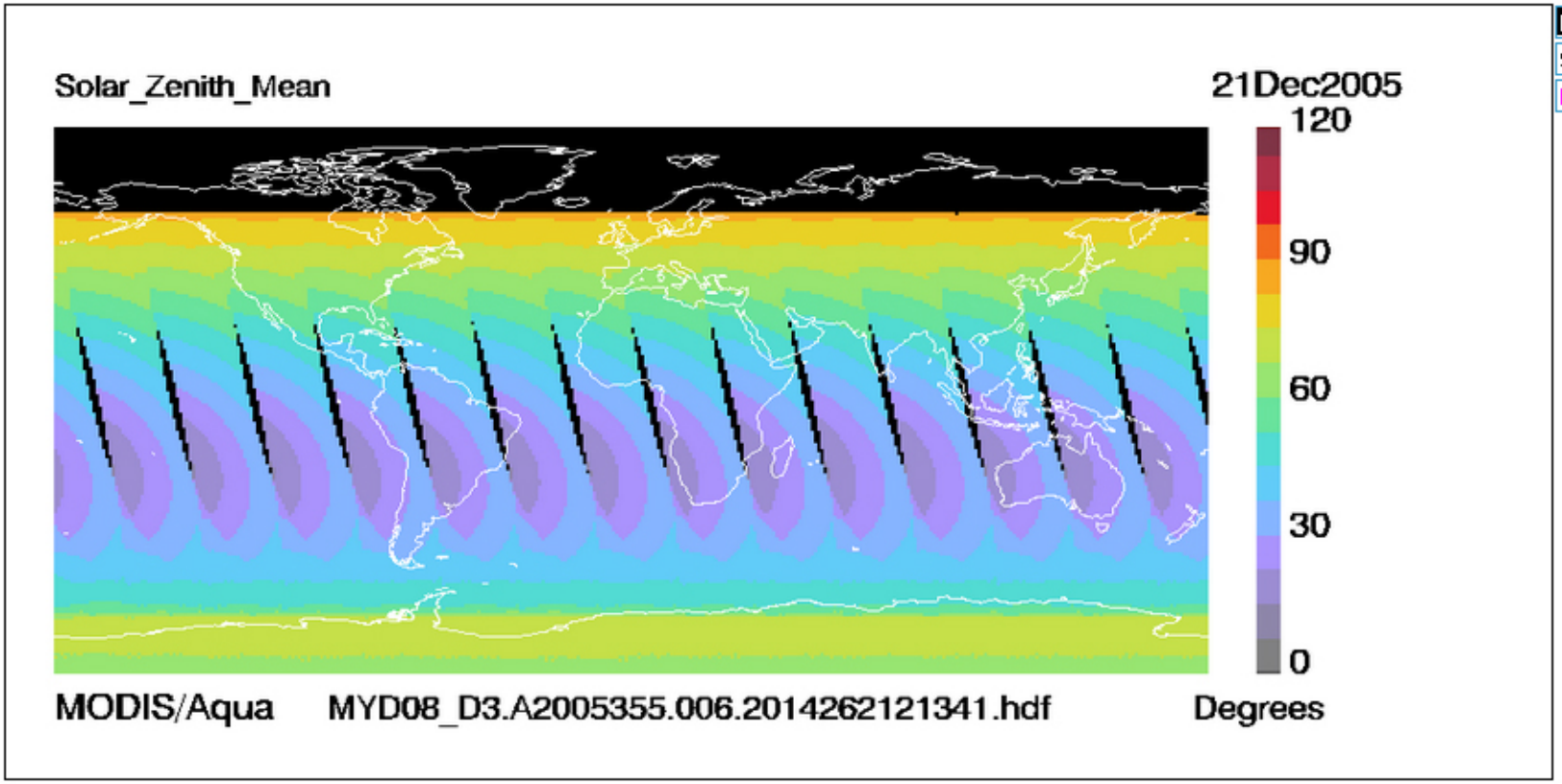
01. Solar_Zenith [CTP definition of daytime]	•	•	•	•						•								
02. Solar_Azimuth [CTP definition of daytime]	•	•	•	•						•								
03. Sensor_Zenith [CTP definition of daytime]	•	•	•	•						•								
04. Sensor_Azimuth [CTP definition of daytime]	•	•	•	•						•								

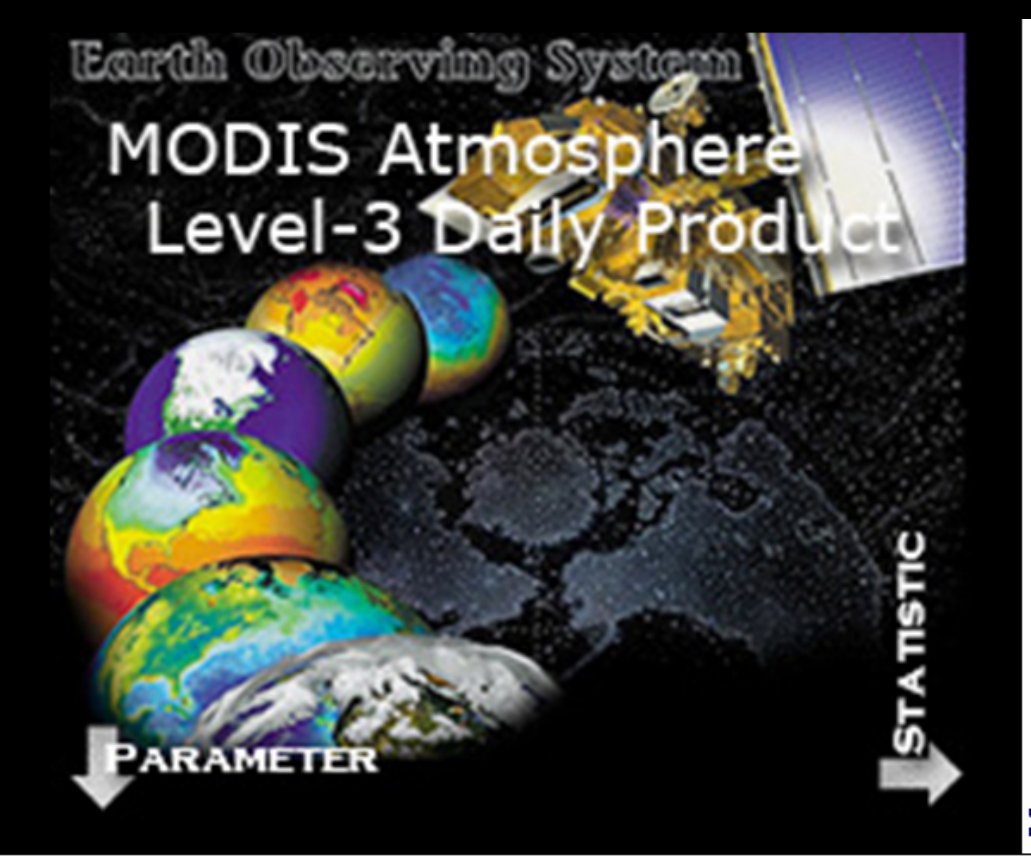
= Added = Renamed = Deleted = Modified

Old C5 Solar Zenith Angle
using Day Flags in the L2 Granules with “Any Sunlit View”



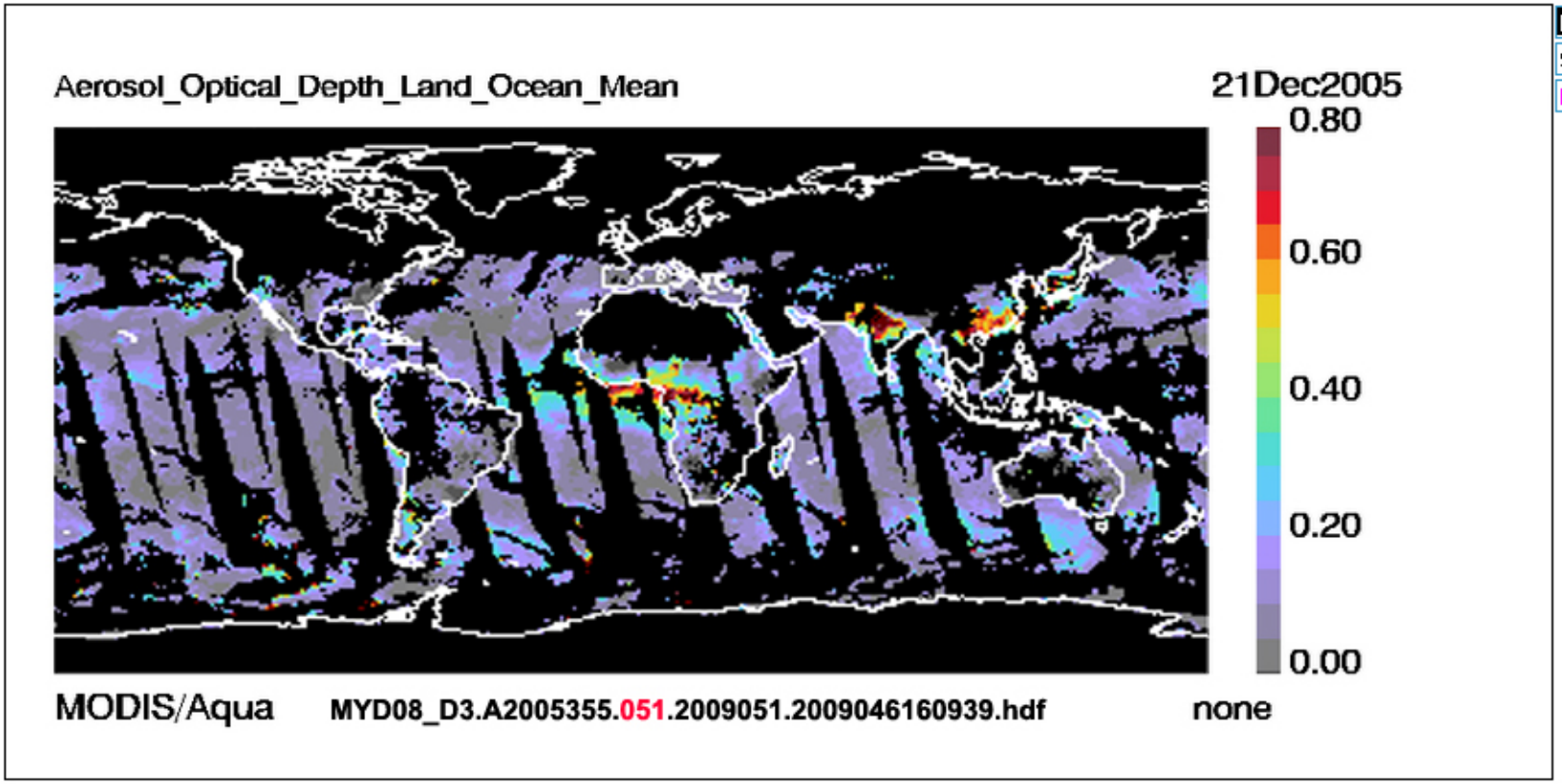
New C6 Solar Zenith Angle
using CTP definition of “Daytime” (Solar Zenith Angle ≤ 85°)



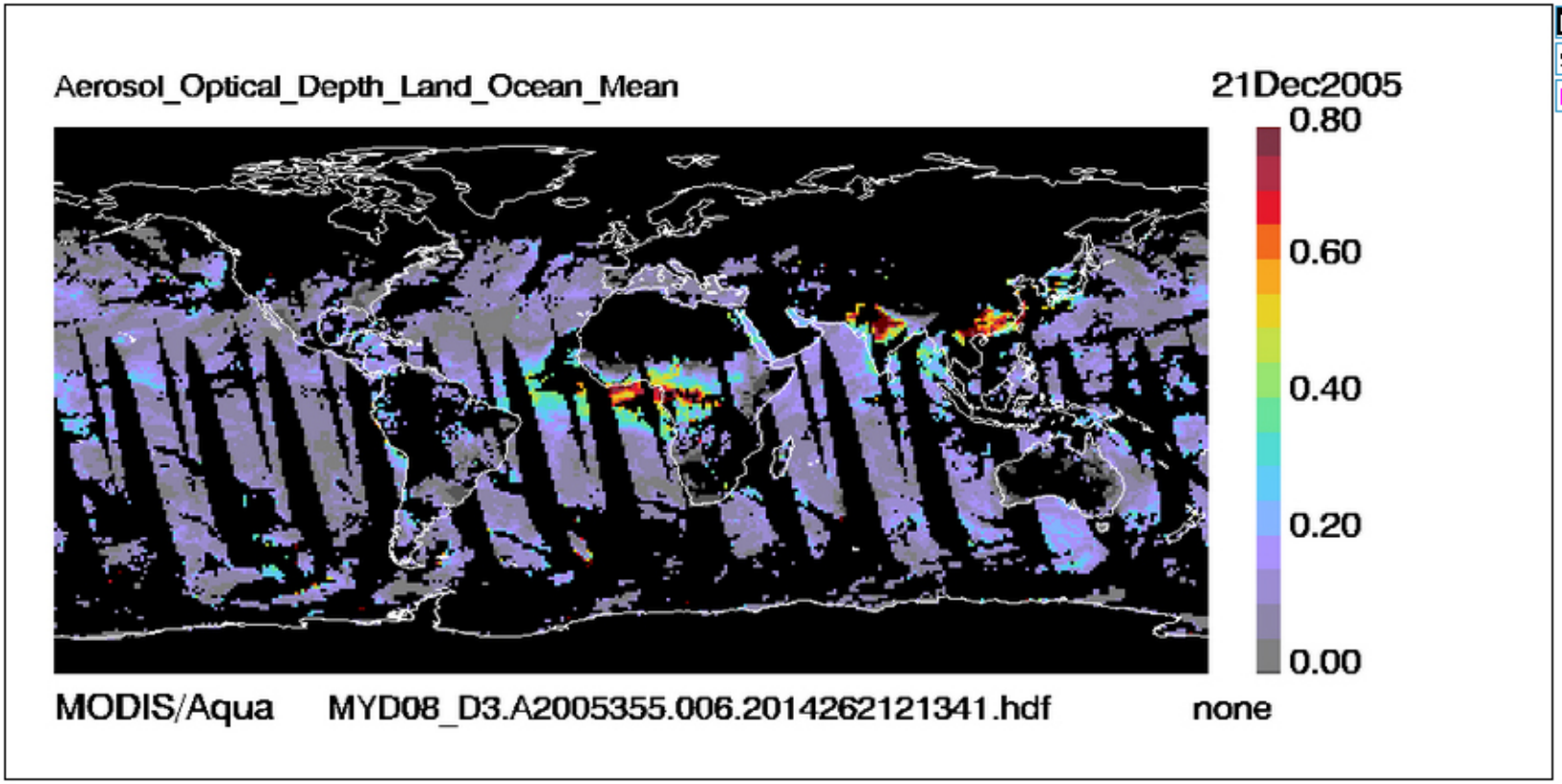


Parameter	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
Derived from L2 Aerosol (04_L2)																			
Combined Land & Ocean																			
01. Aerosol_Scattering_Angle	•	•	•	•			•			•									
02. Aerosol_Optical_Depth_Land_Ocean	•	•	•	•						•									
03. Aerosol_Avg_Cloud_Distance_Land_Ocean	•	•	•	•						•									
Land Only																			
01. Aerosol_Optical_Depth_Land (3) [previously Corrected]	•	•	•	•	•	•	•	•											
02. Aerosol_Number_Pixels_Used_Land (2) to (10)	•	•	•	•	•	•	•												

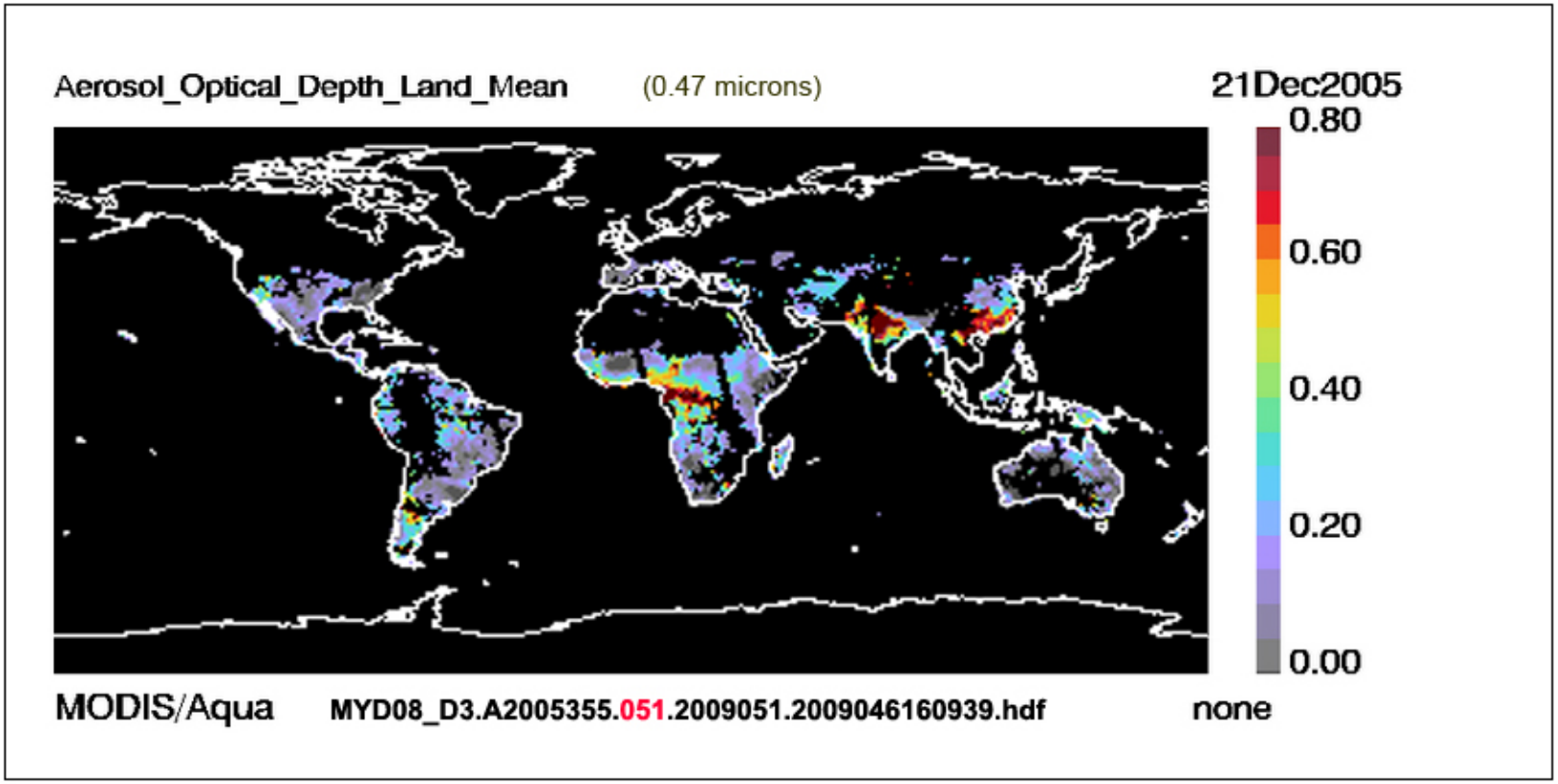
Old C5 Aerosol Optical Depth Land and Ocean



New C6 Aerosol Optical Depth Land and Ocean



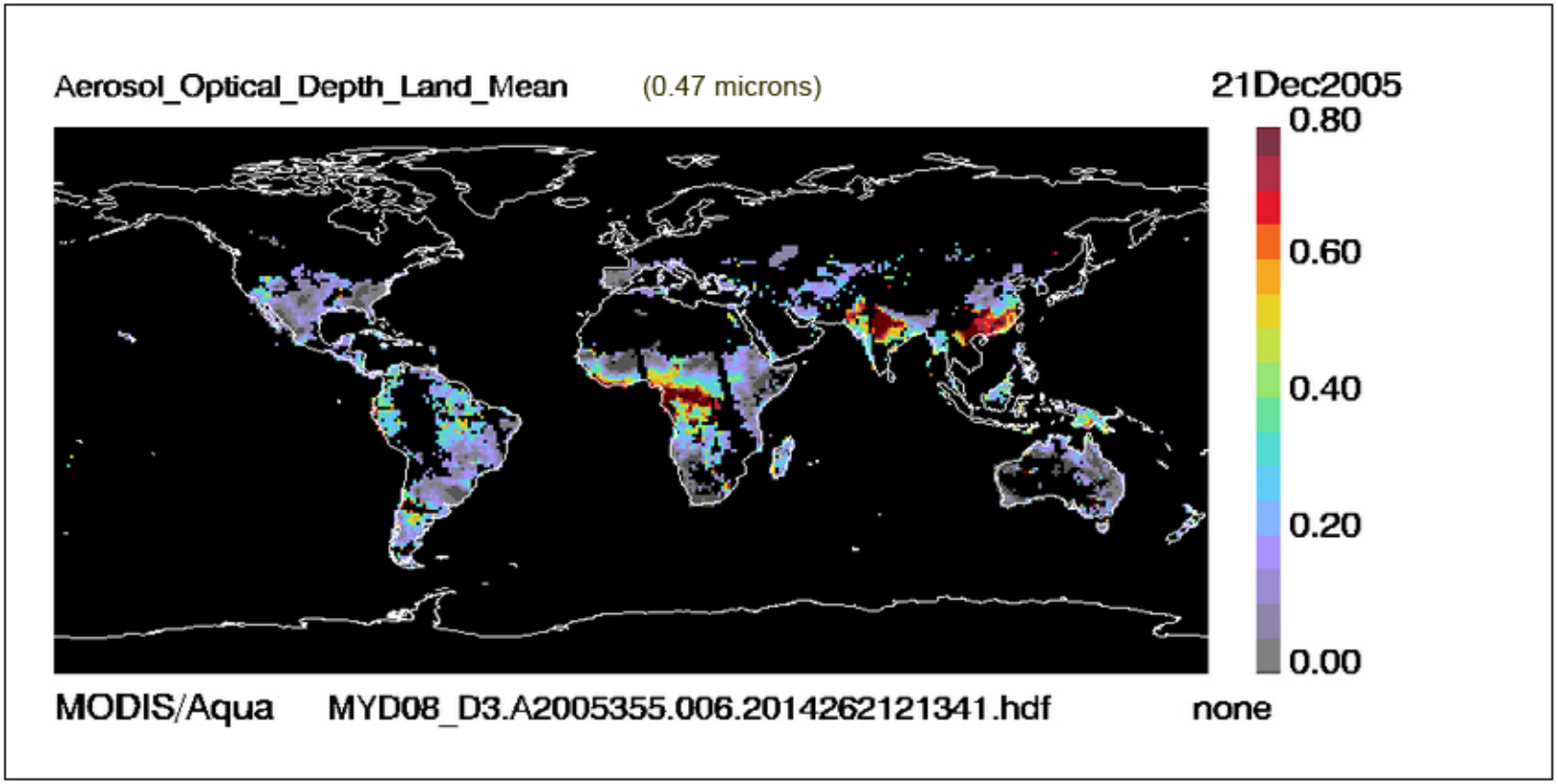
Old C5 Aerosol Optical Depth Land



Mean

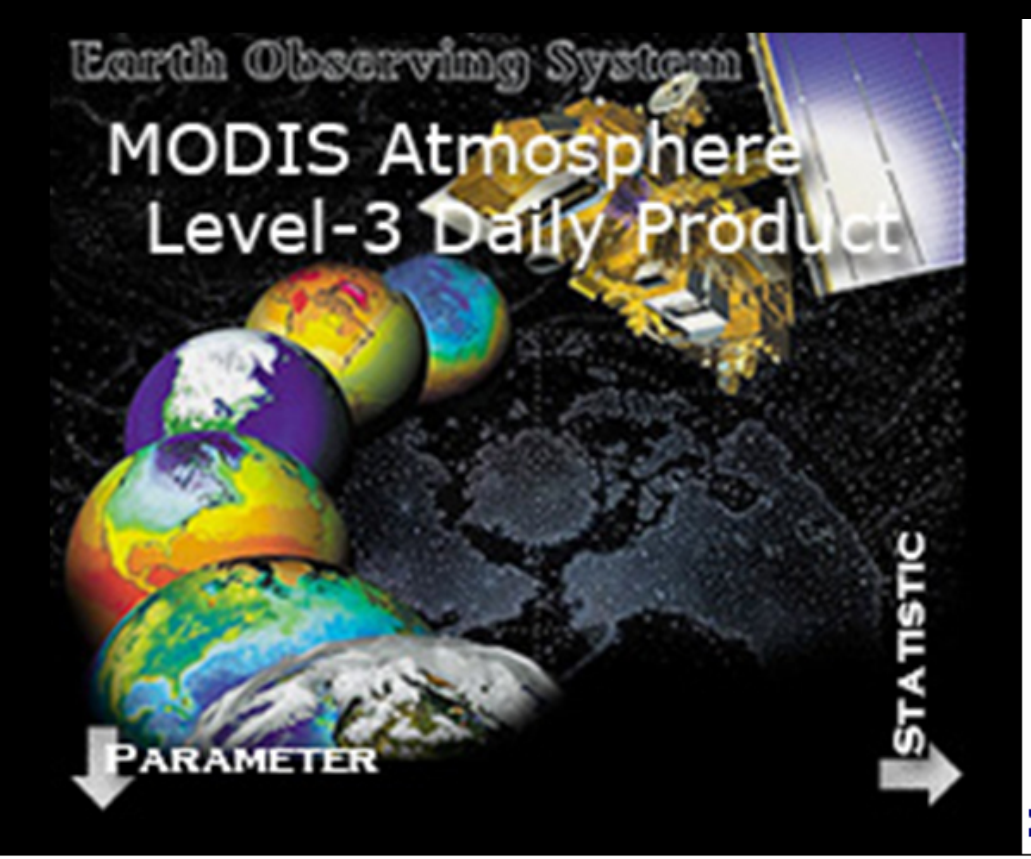
Standard_Deviation

New C6 Aerosol Optical Depth Land



Mean

Standard_Deviation

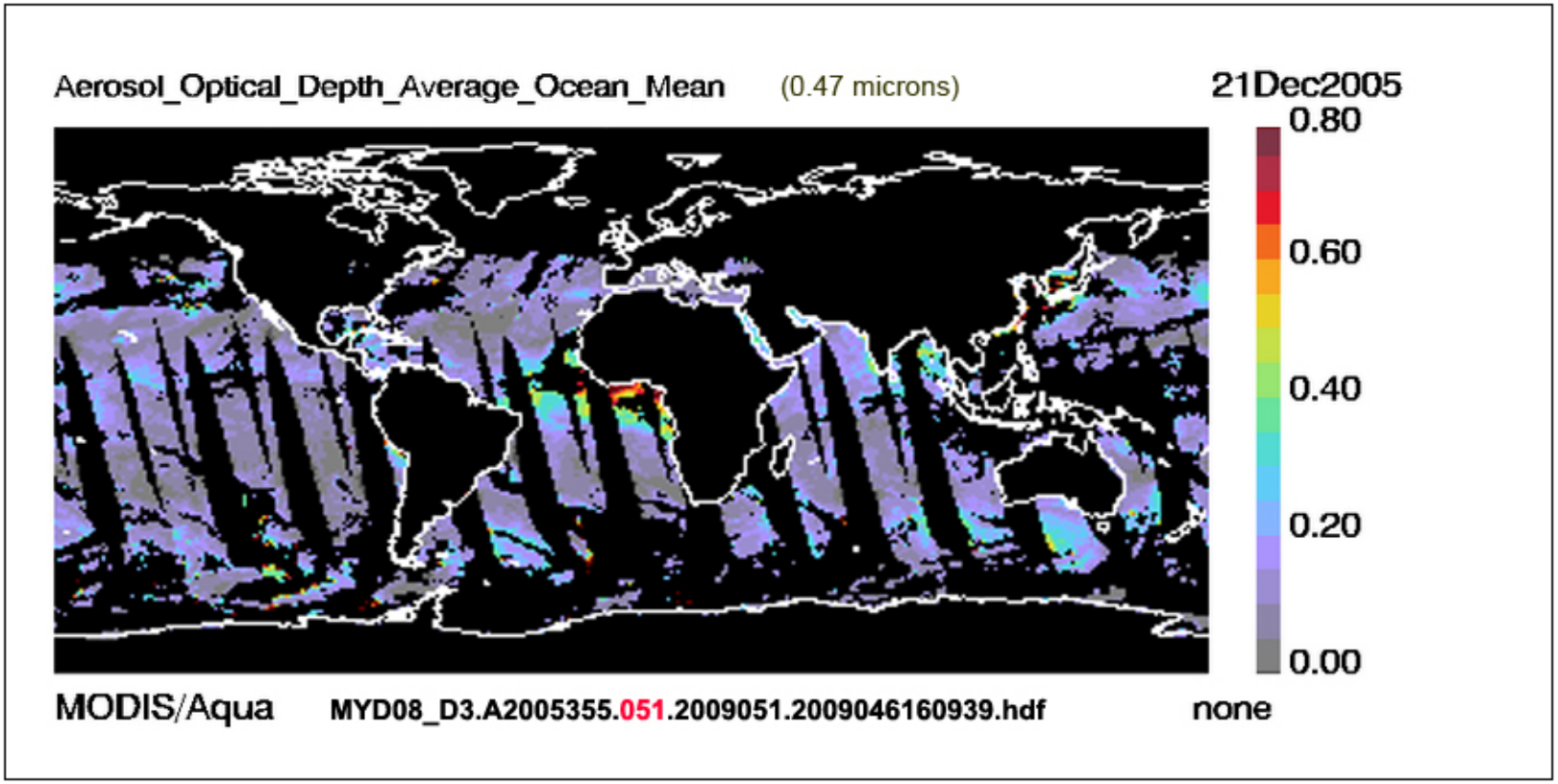


Derived from L2 Aerosol (04_L2)

Ocean Only

	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
01. Aerosol_Optical_Depth_Average_Ocean (7) [prev Eff.]	•	•	•	•	•	•	•	•											
02. Aerosol_Optical_Depth_Small_Ocean	•	•	•	•	•	•	•	•											
03. Aerosol_PSML003_Ocean [prev. CCN_Ocean]	•	•	•	•	•	•	•	•											
04. Aerosol_Optical_Depth_by_models_Ocean (9)	•	•	•	•	•	•		•											
05. Aerosol_Number_Pixels_Used_Ocean (1) to (10)	•	•	•	•	•	•	•												
06. Aerosol_AE1_Ocean															•				
07. Aerosol_AE2_Ocean															•				
08. Aerosol_OD_Ratio_Small_Ocean															•				

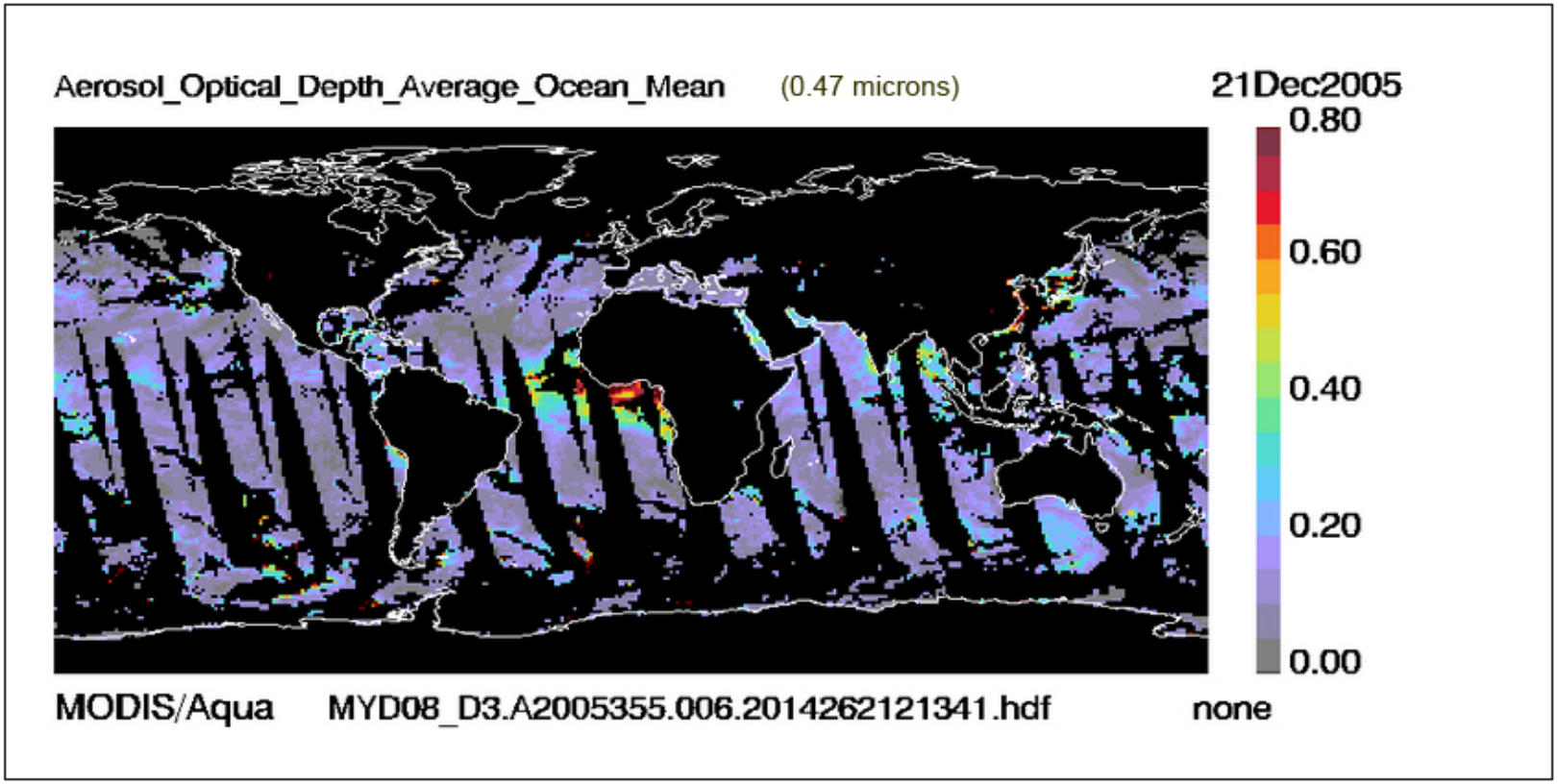
Old C5 Aerosol Optical Depth Average Ocean

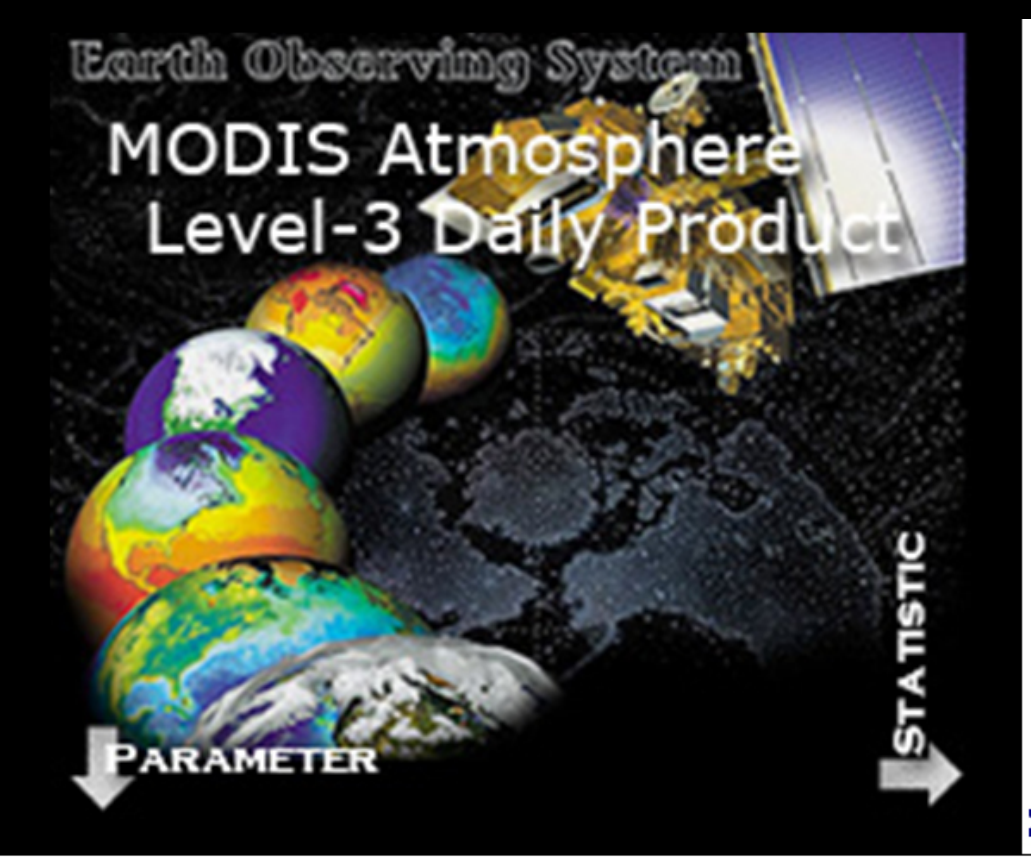


Mean

Standard_Deviation

New C6 Aerosol Optical Depth Average Ocean





Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)

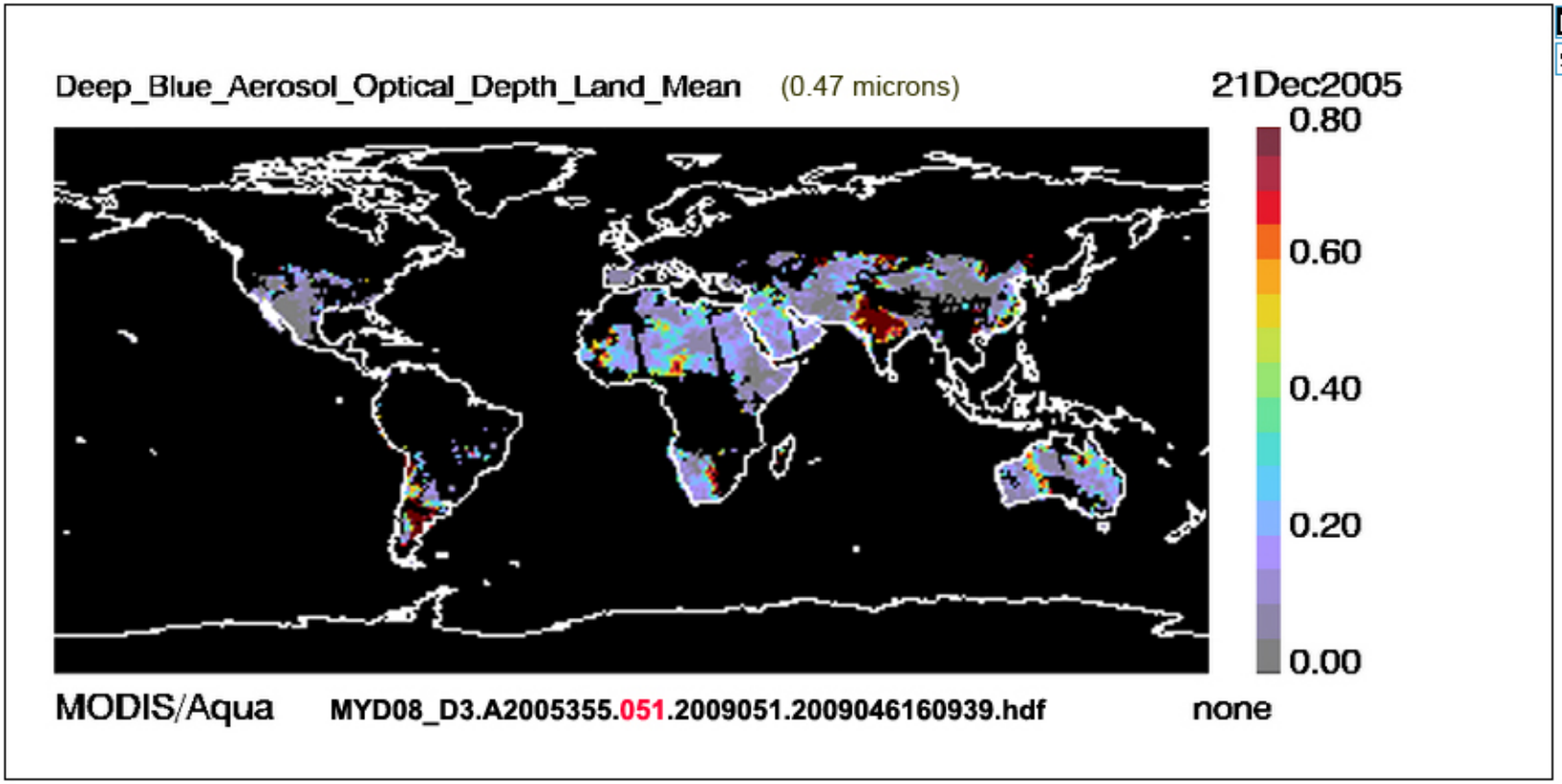
Derived from L2 Aerosol (04_L2)

Deep Blue Aerosol *(No QA SDS's but still QAMasked)*

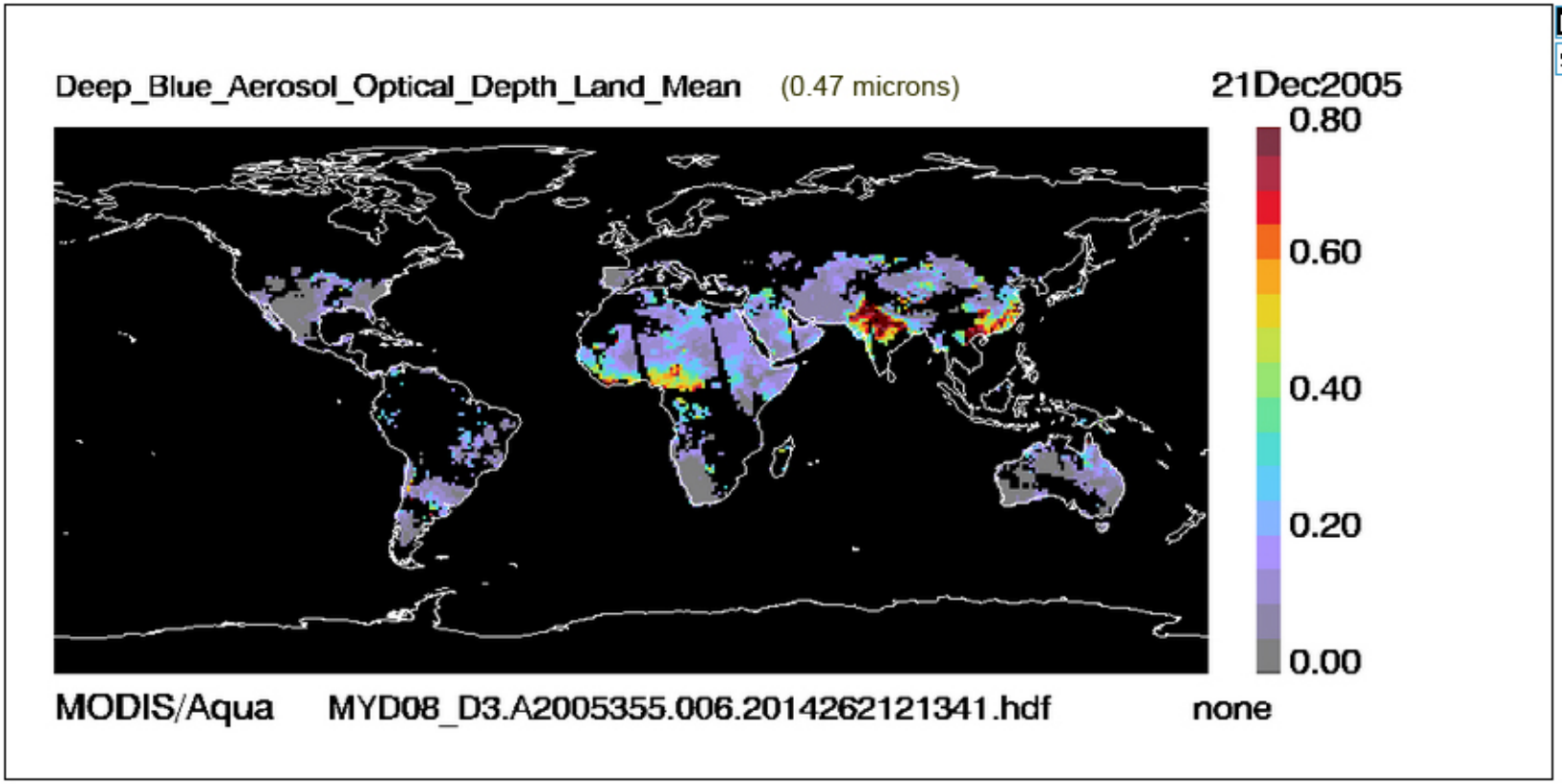
01. Deep_Blue_Aerosol_Optical_Depth_Land	•	•	•	•			•											
02. Deep_Blue_Aerosol_Optical_Depth_550_Land	•	•	•	•			•											
03. Deep_Blue_Angstrom_Exponent_Land	•	•	•	•			•											
04. Deep_Blue_Single_Scattering_Albedo_Land (3)	•	•	•	•			•											
05. Deep_Blue_Number_Pixels_Used_550_Land	•	•	•	•			•											
06. AOD_550_Dark_Target_Deep_Blue_Combined	•	•	•	•			•											

= Added = Renamed = Deleted = Modified

Old C5 Deep Blue Aerosol Optical Depth Land

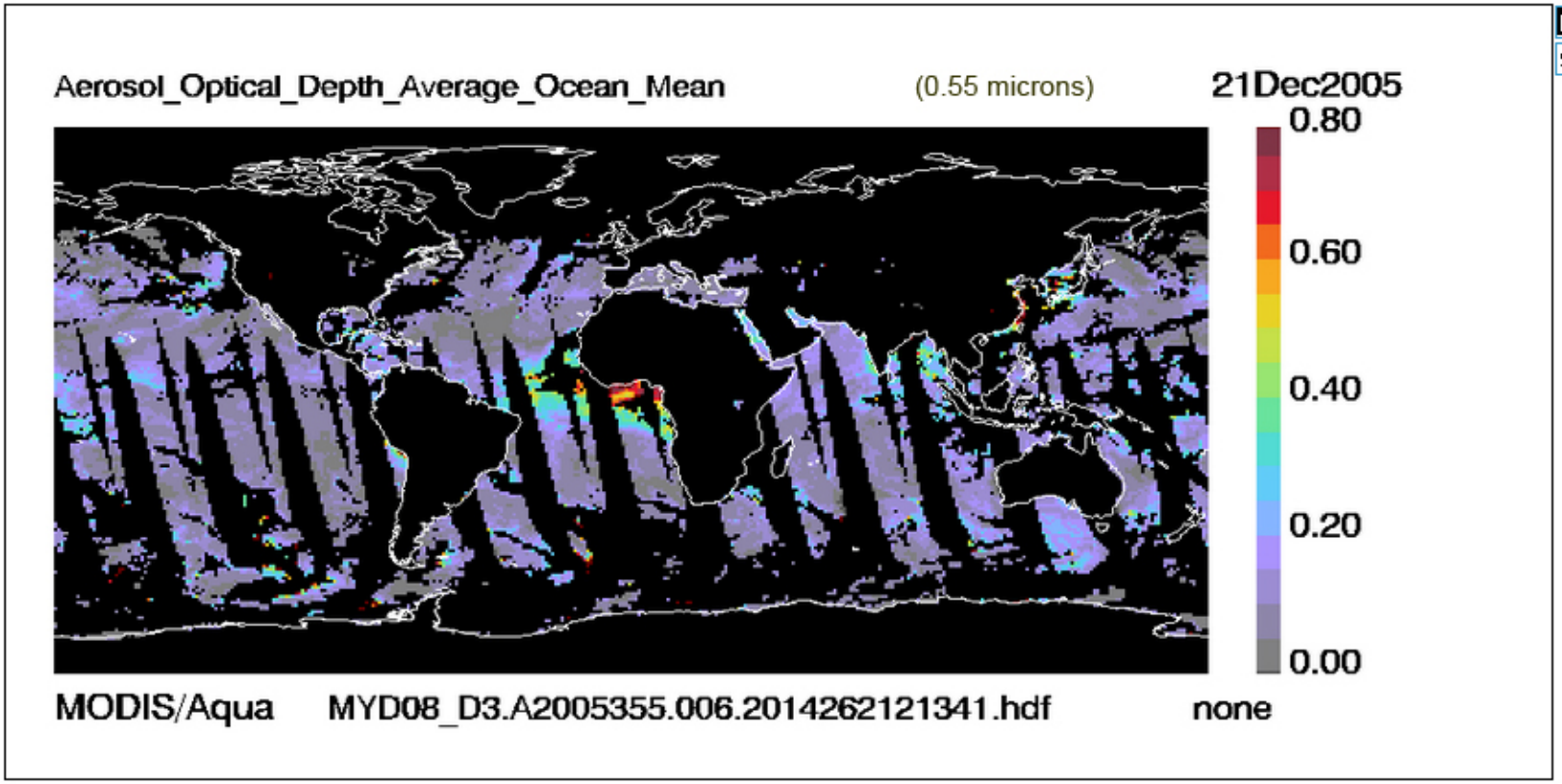


New C6 Deep Blue Aerosol Optical Depth Land

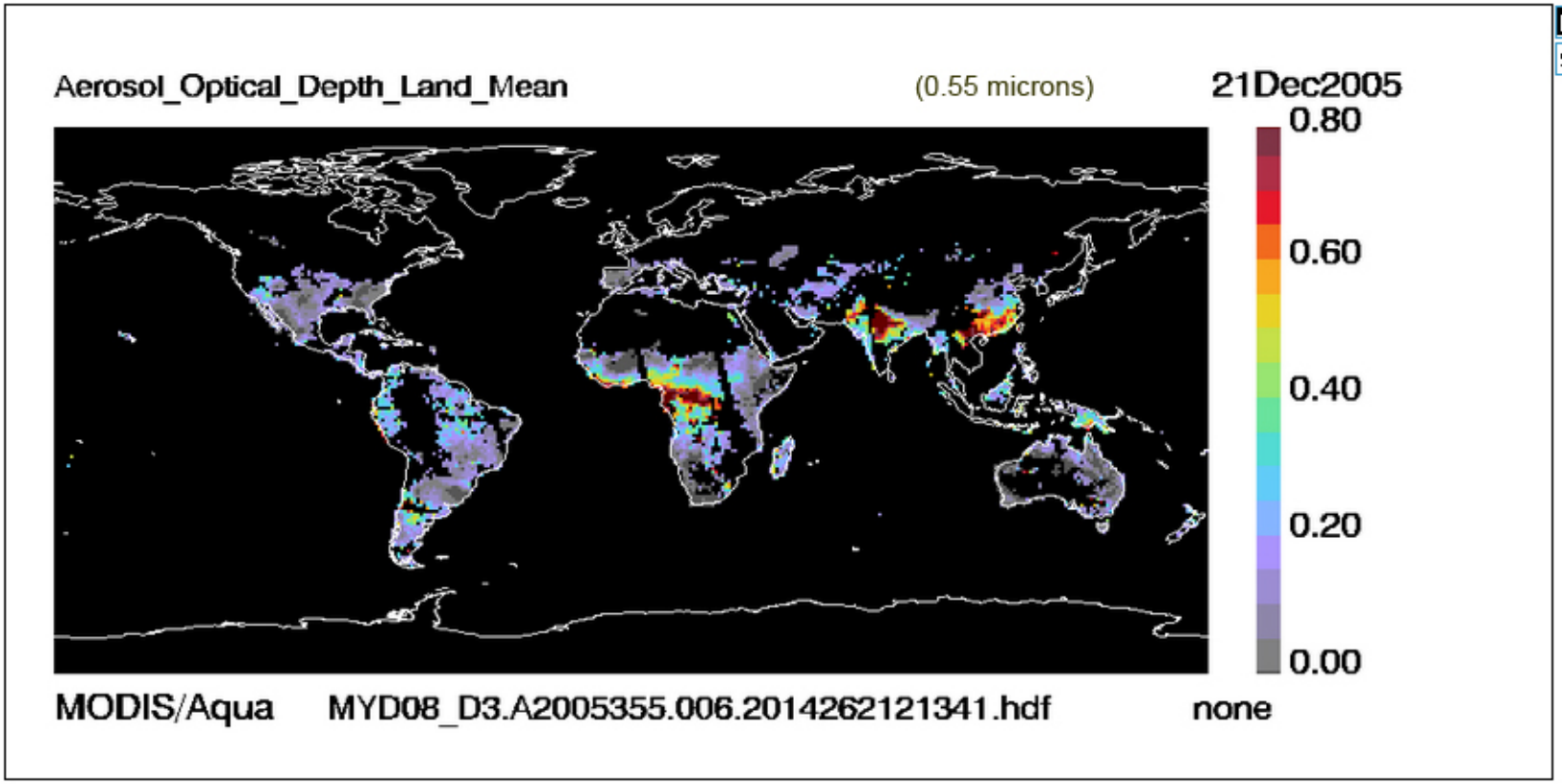


Now let’s take a look at the
New C6 “Combined” Deep Blue + Dark Target
Aerosol Optical Depth (AOD)
at 0.550 microns

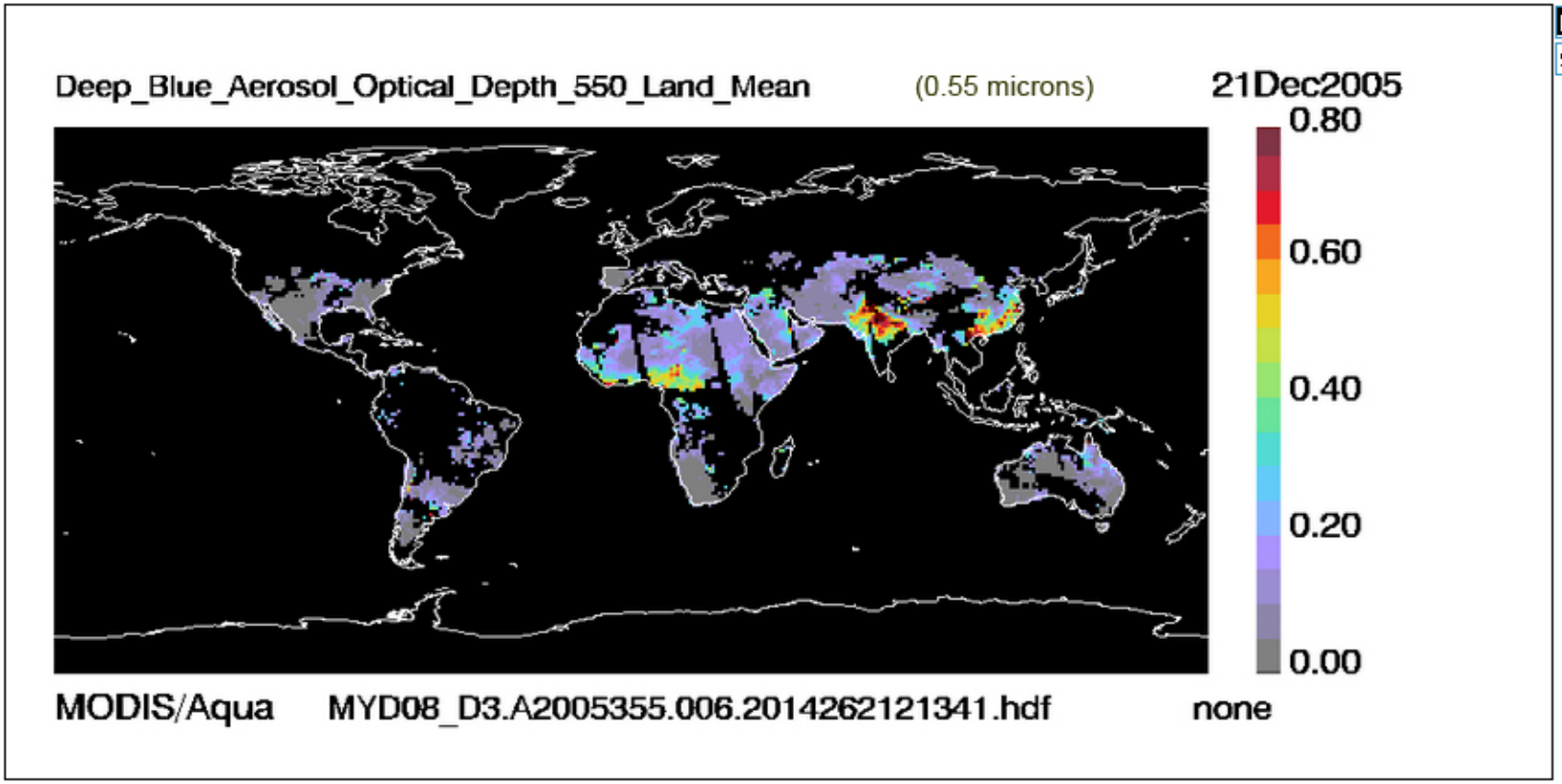
New C6 Aerosol Optical Depth (AOD) Average Ocean (0.550 microns)



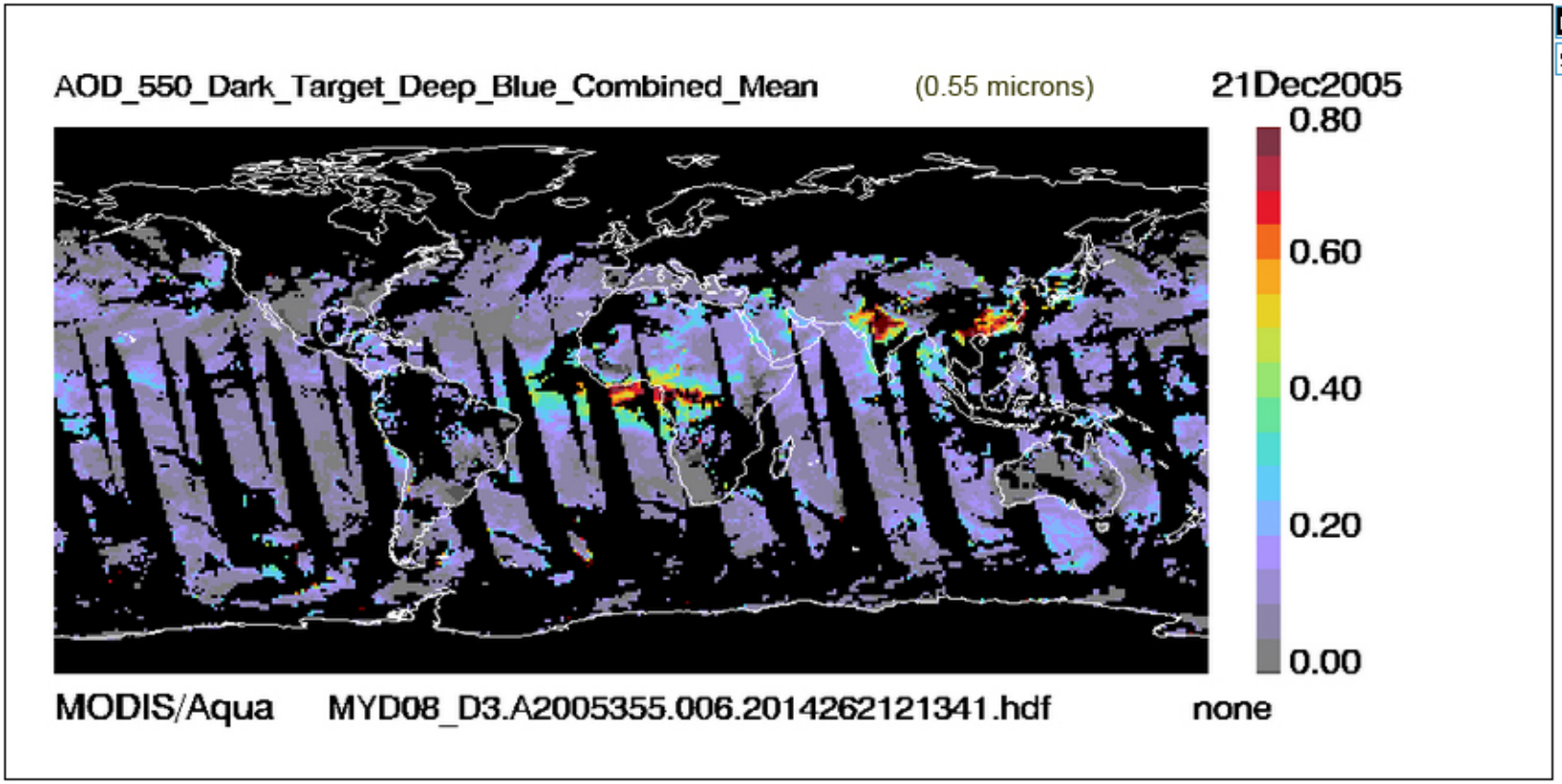
New C6 Aerosol Optical Depth (AOD) Land (0.550 microns)

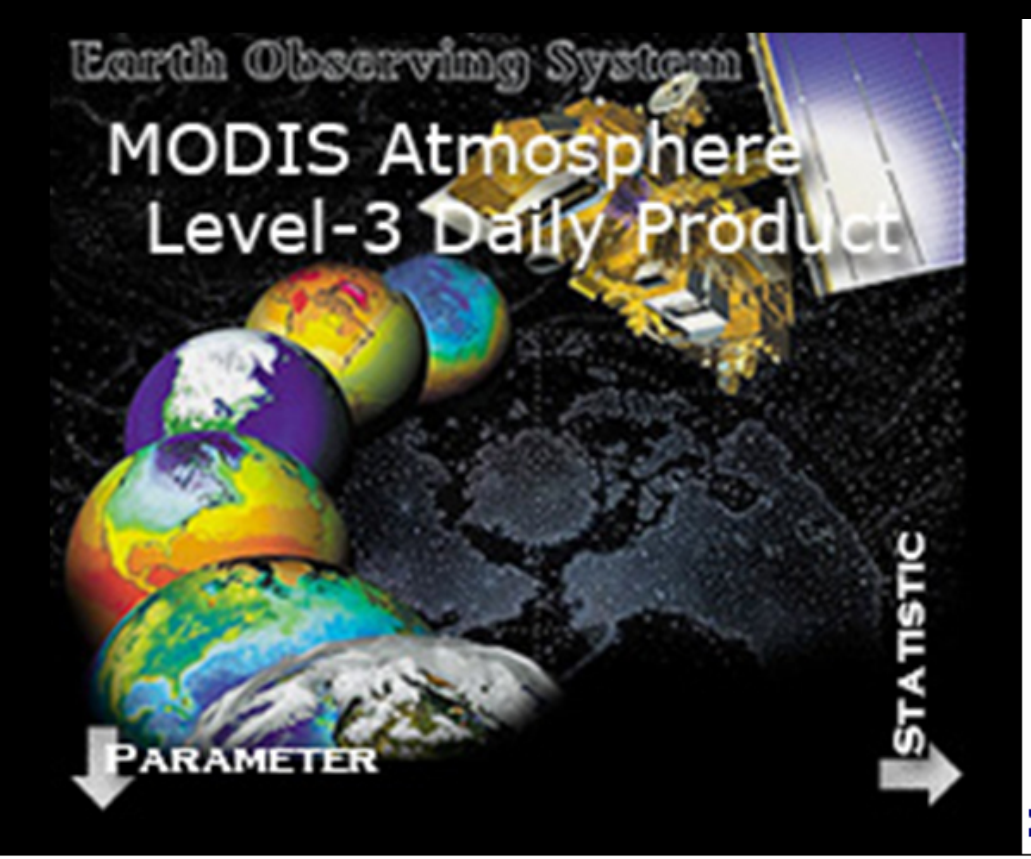


New C6 Deep Blue Aerosol Optical Depth (AOD) Land (0.550 microns)



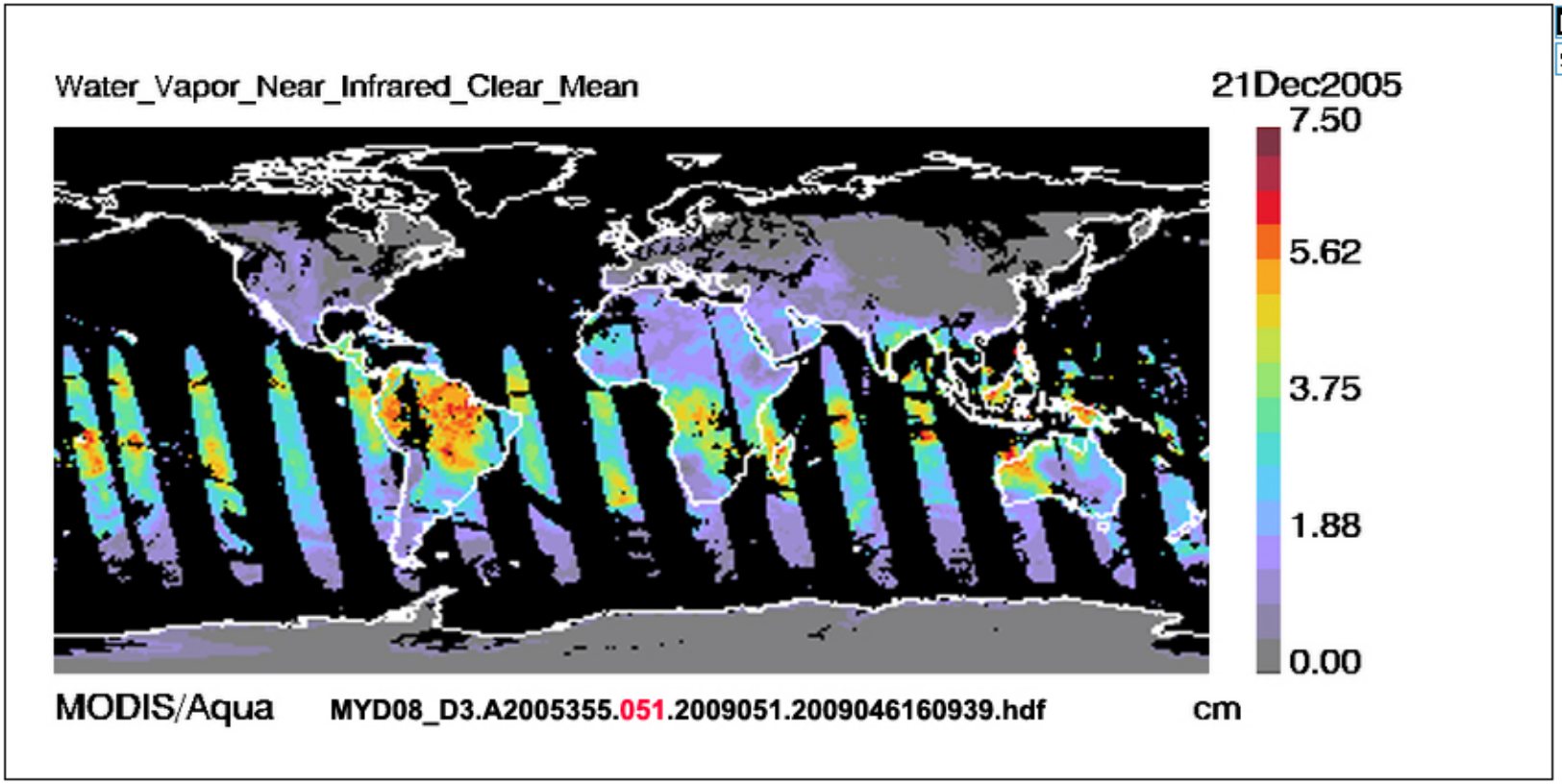
New C6 "Combined" Deep Blue + Dark Target AOD



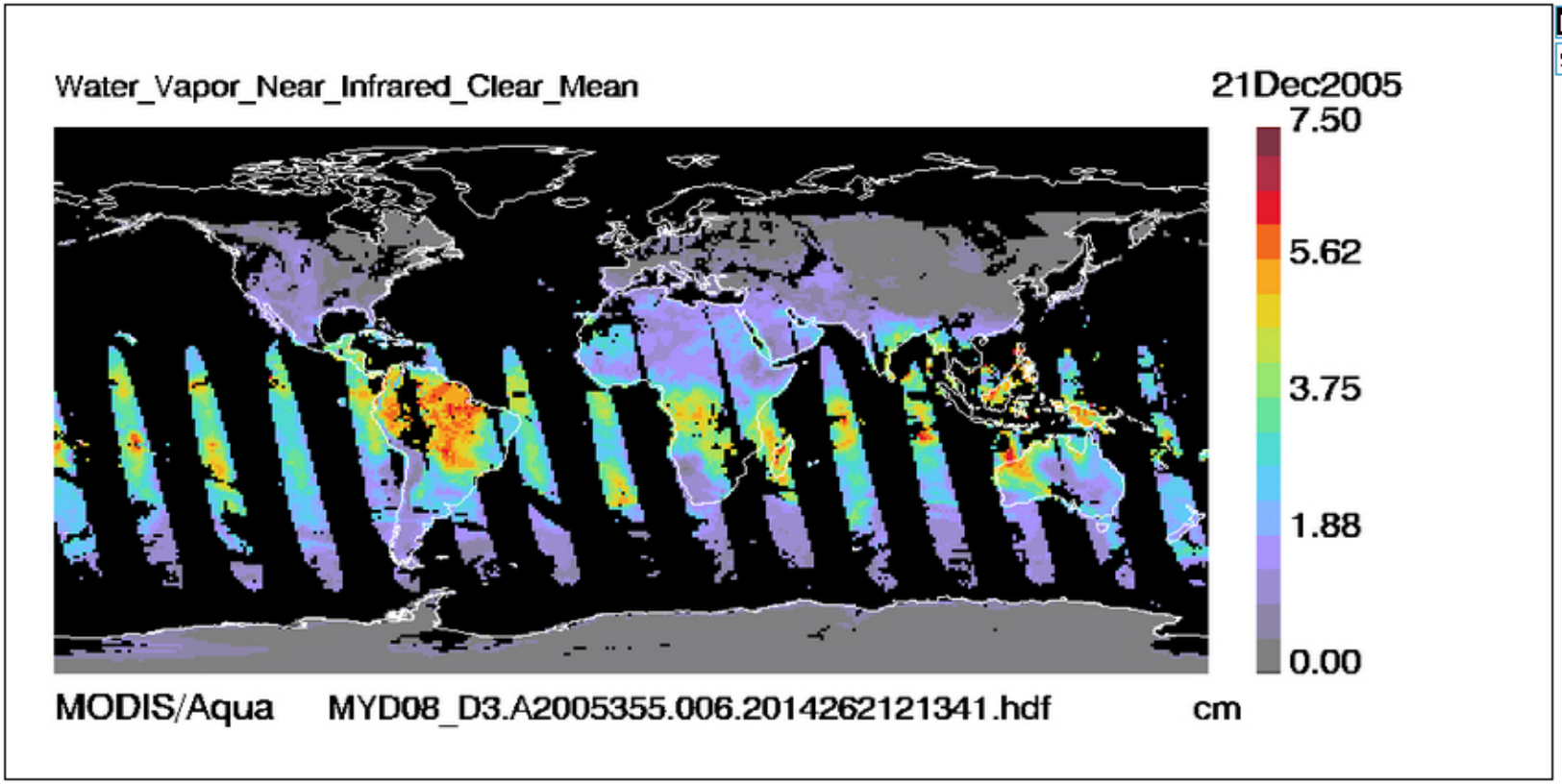


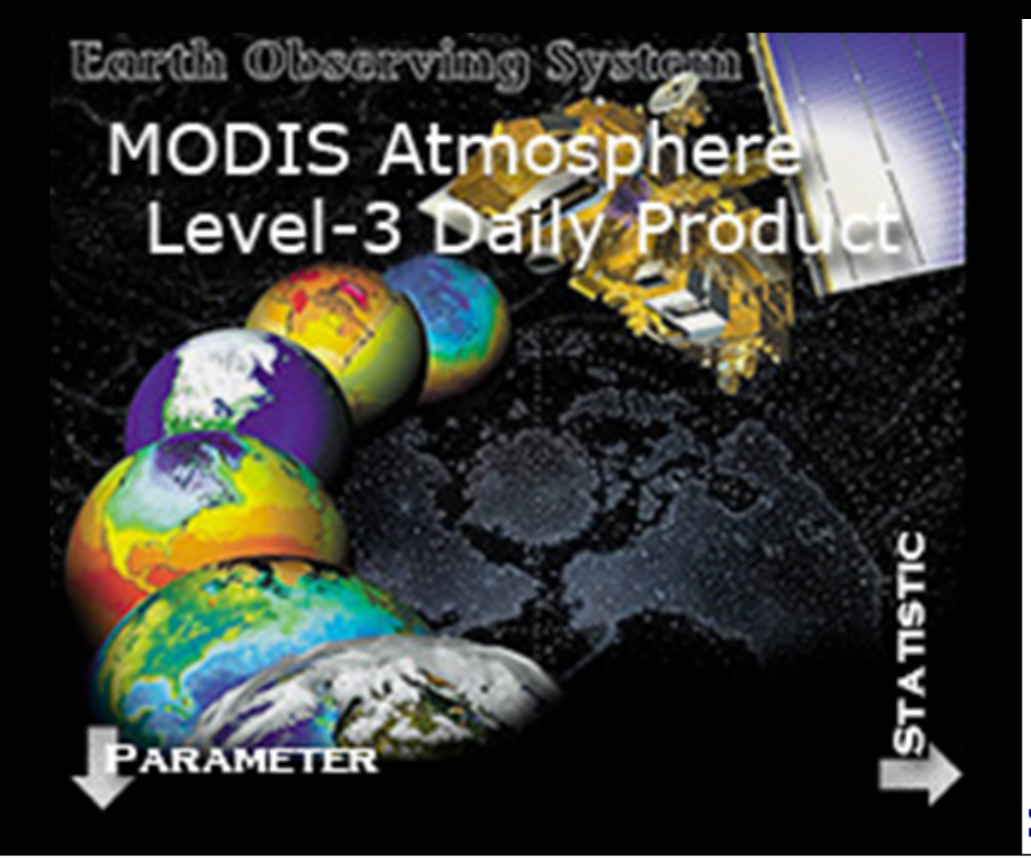
Parameter	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
Derived from L2 Water Vapor (05_L2)																			
01. Water_Vapor_Near_Infrared_Clear	•	•	•	•			•												
02. Water_Vapor_Near_Infrared_Cloud	•	•	•	•			•												
Derived from L2 Cloud (06_L2)																			
Cirrus Detection																			
01. Cirrus_Reflectance	•	•	•	•			•												
02. Cirrus_Fraction_SWIR									•	•									

Old C5 Water Vapor (NIR) Clear (& Sunglint)



New C6 Water Vapor (NIR) Clear (& Sunglint)



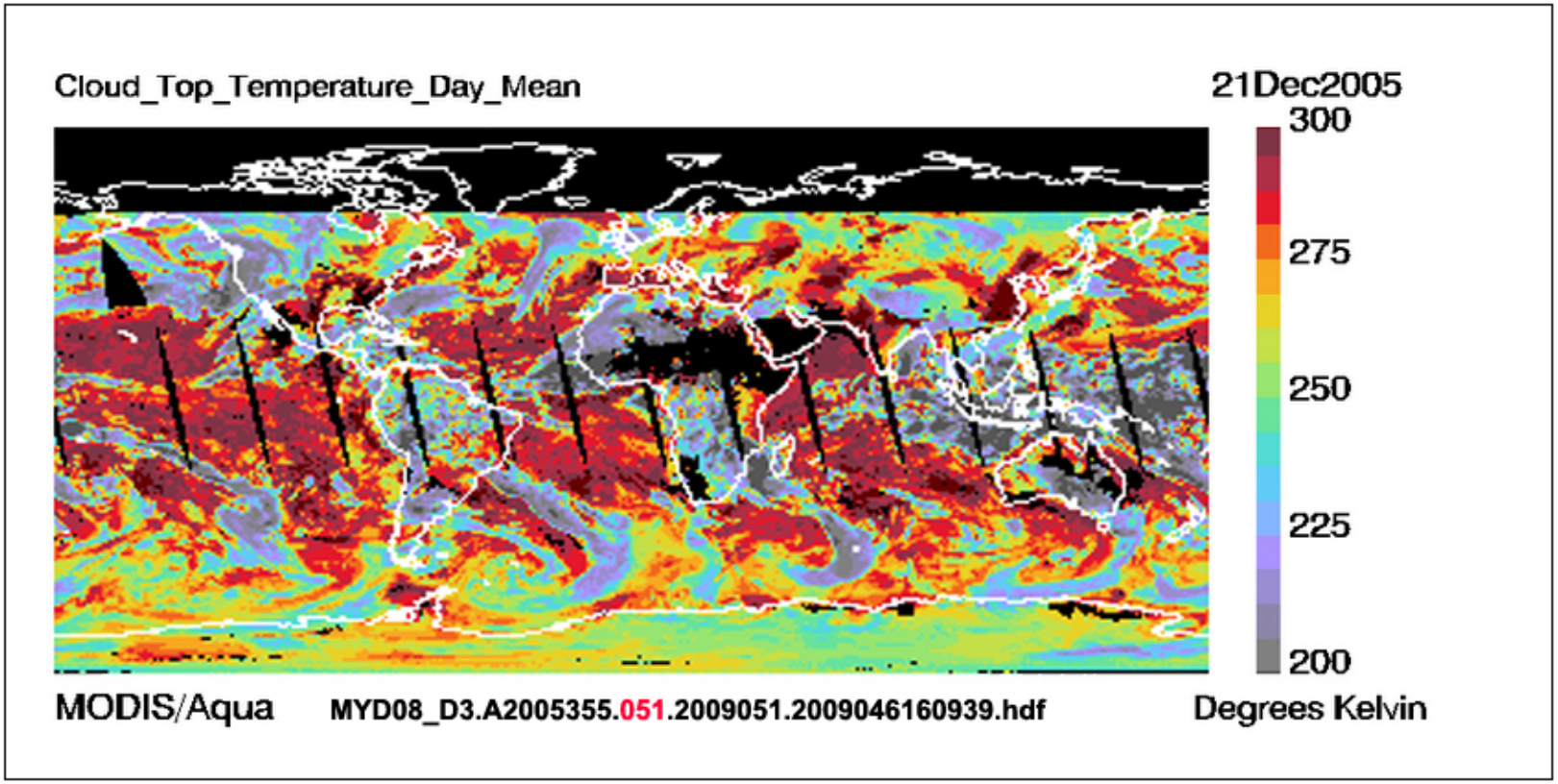


Derived from L2 Cloud (06_L2)

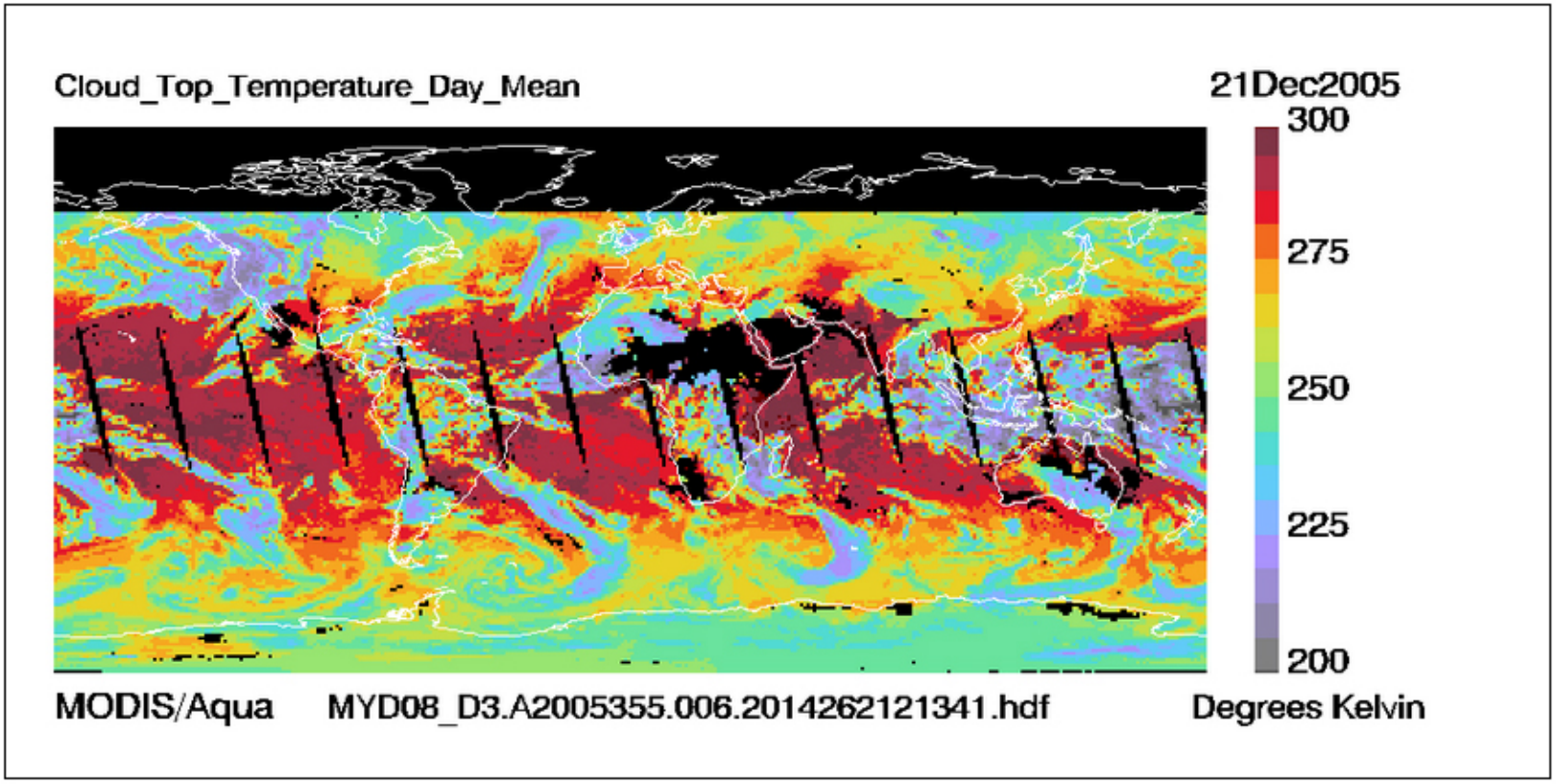
Cloud Top Properties [Note: Nadir means SZA ≤ 32°]

	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
01. Cloud_Top_Pressure [L/M/H Histograms]	•	•	•	•			•			•								•	
02. Cloud_Top_Pressure_Day ["]	•	•	•	•			•			•								•	
03. Cloud_Top_Pressure_Night ["]	•	•	•	•			•			•								•	
04. Cloud_Top_Pressure_Nadir [L/M/H Histograms]	•	•	•	•			•			•									
05. Cloud_Top_Pressure_Nadir_Day ["]	•	•	•	•			•			•									
06. Cloud_Top_Pressure_Nadir_Night ["]	•	•	•	•			•			•									
07. Cloud_Top_Temperature [L/M/H Histograms]	•	•	•	•						•									•
08. Cloud_Top_Temperature_Day ["]	•	•	•	•						•									•

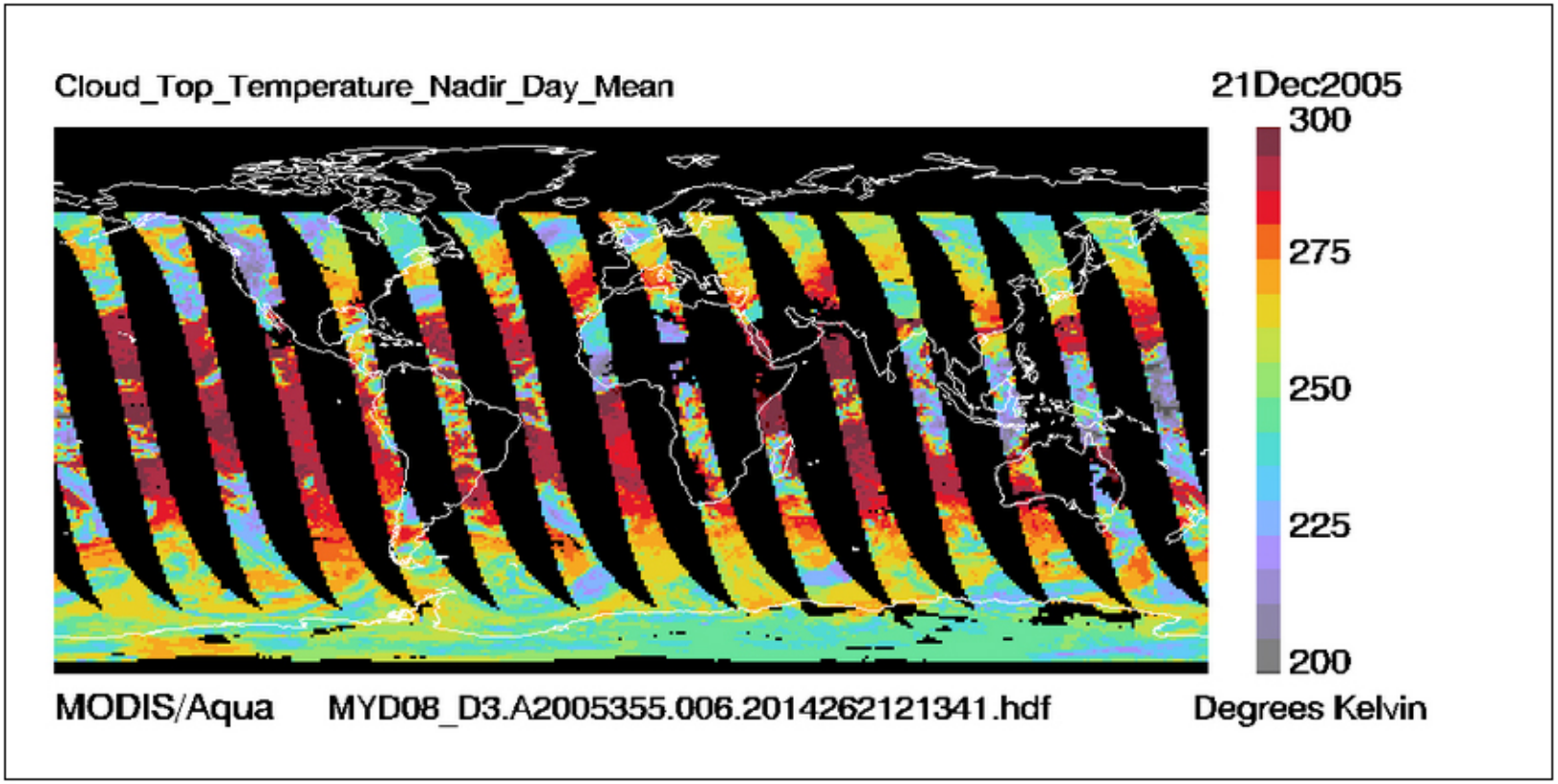
Old C5 Cloud Top Temperature (Daytime)



New C6 Cloud Top Temperature (Daytime)



New C6 Cloud Top Temperature Nadir (Daytime) using “Nearer-Nadir” (Sensor Zenith Angle ≤ 32°) Pixels Only



Day

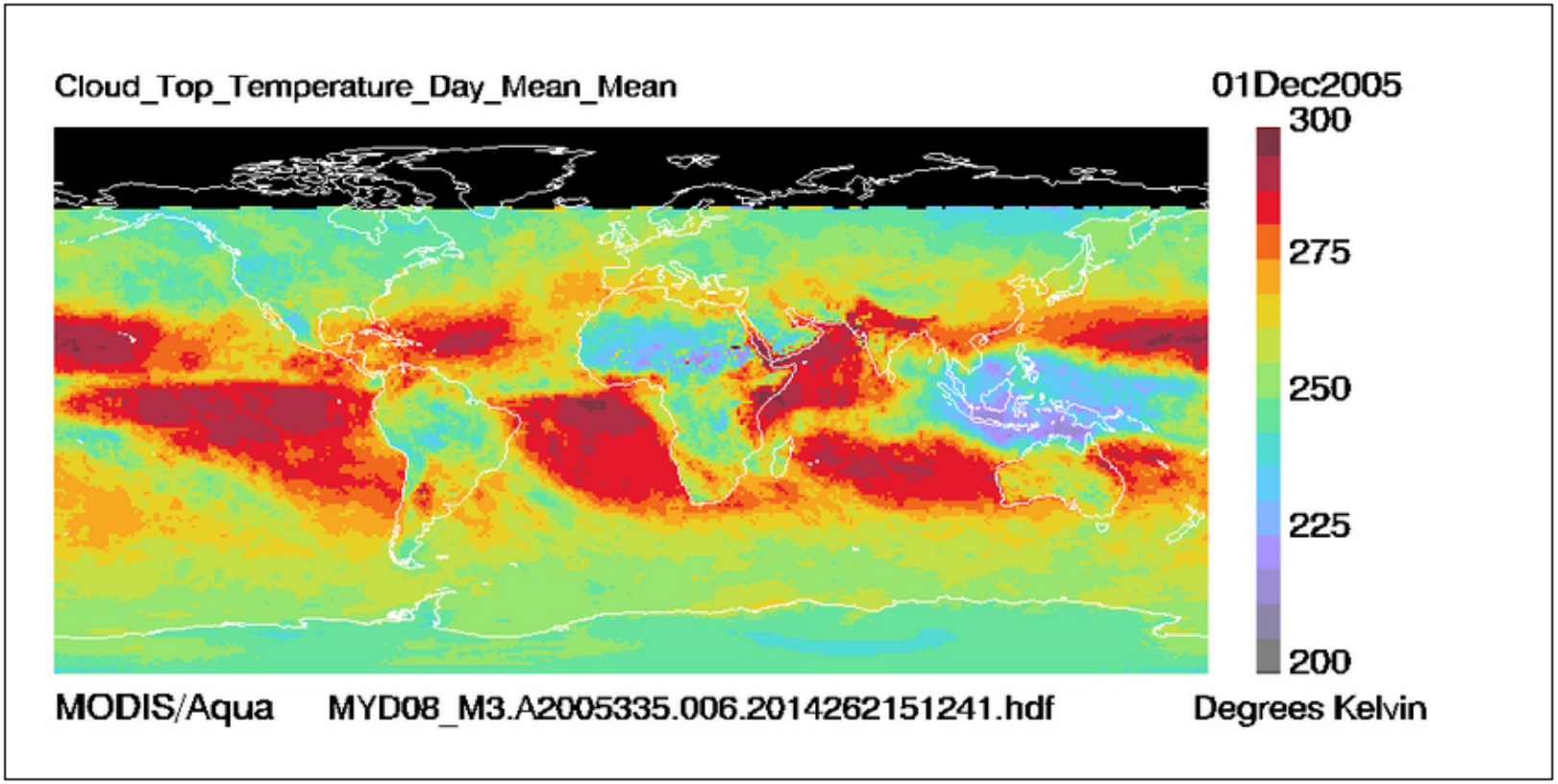
Standard_Deviation

Question:

DID THE “NADIR VIEW” DAILY (D3)
MAKE A DIFFERENCE IN THE MONTHLY (M3) MEAN?

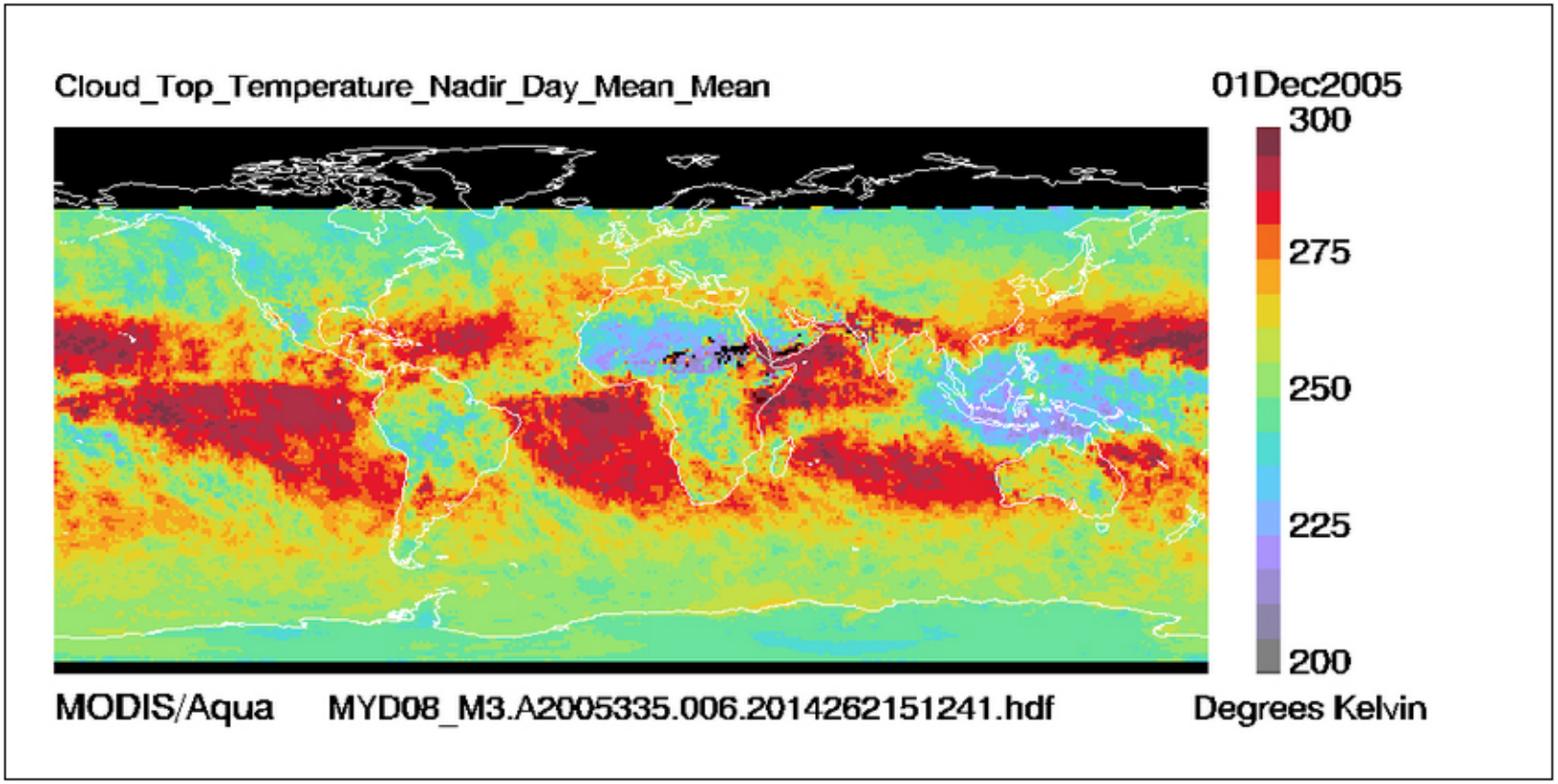
Q: DID THE “NADIR VIEW” MAKE A DIFFERENCE IN THE MONTHLY MEAN?

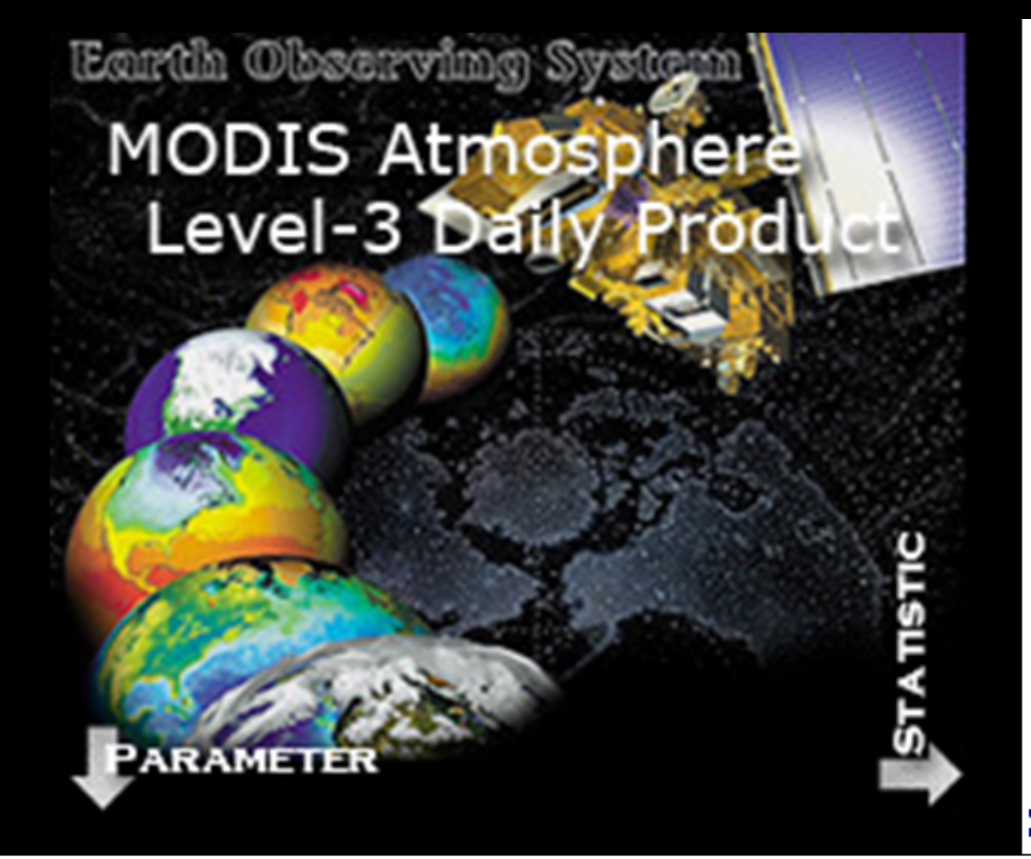
New C6 Cloud Top Temperature (Daytime) -- Monthly Mean



A: YES, MORE VARIATION IN CTT's AT NEARER NADIR VIEWS

New C6 Cloud Top Temperature Nadir (Daytime) -- Monthly Mean





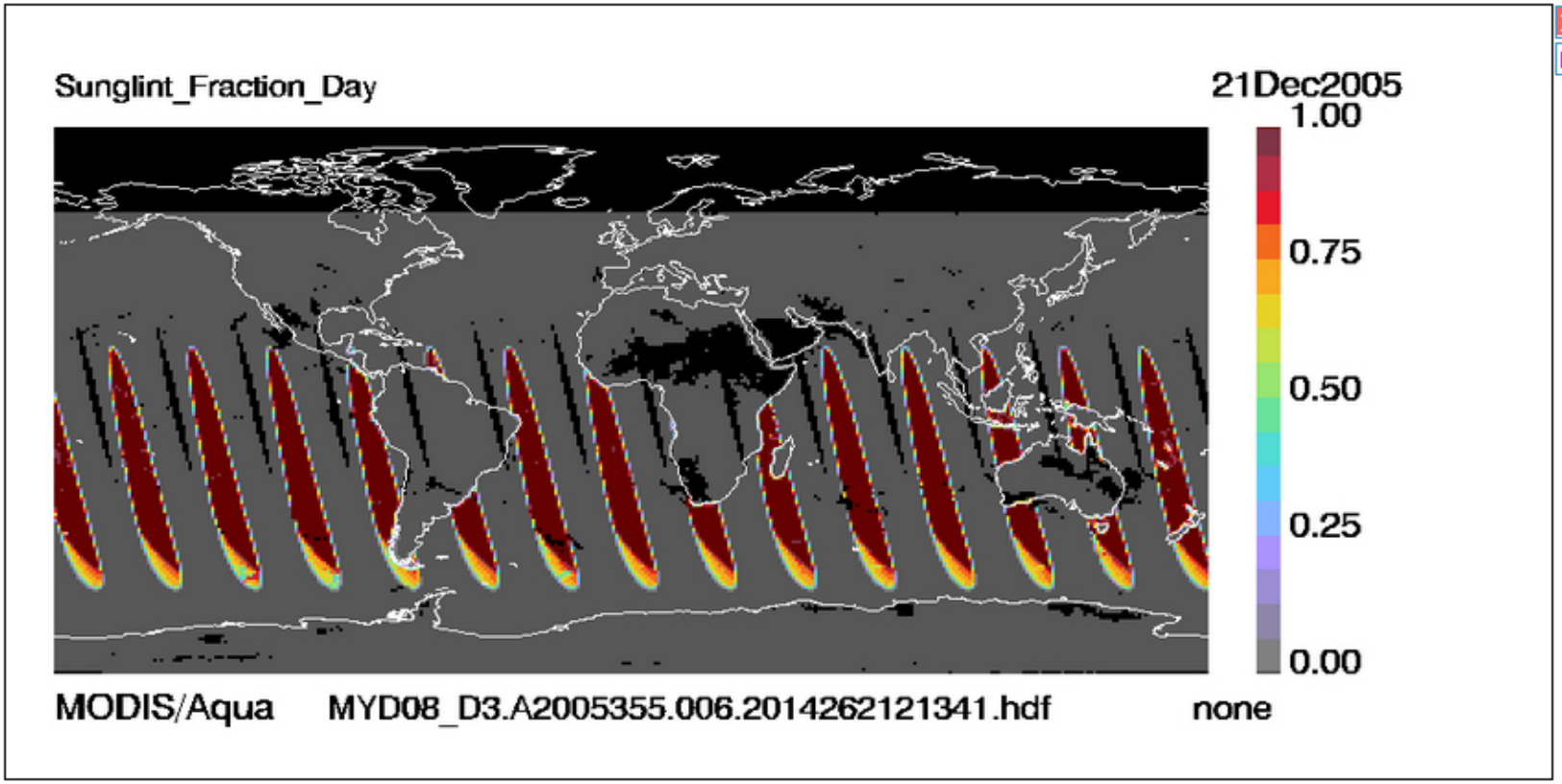
Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
						●												
						●										●		●
						●										●		●
																		●
																		●
								●	●									
								●	●									
								●	●									

Derived from L2 Cloud (06_L2)

Cloud Top Properties [Note: Nadir means SZA ≤ 32°]

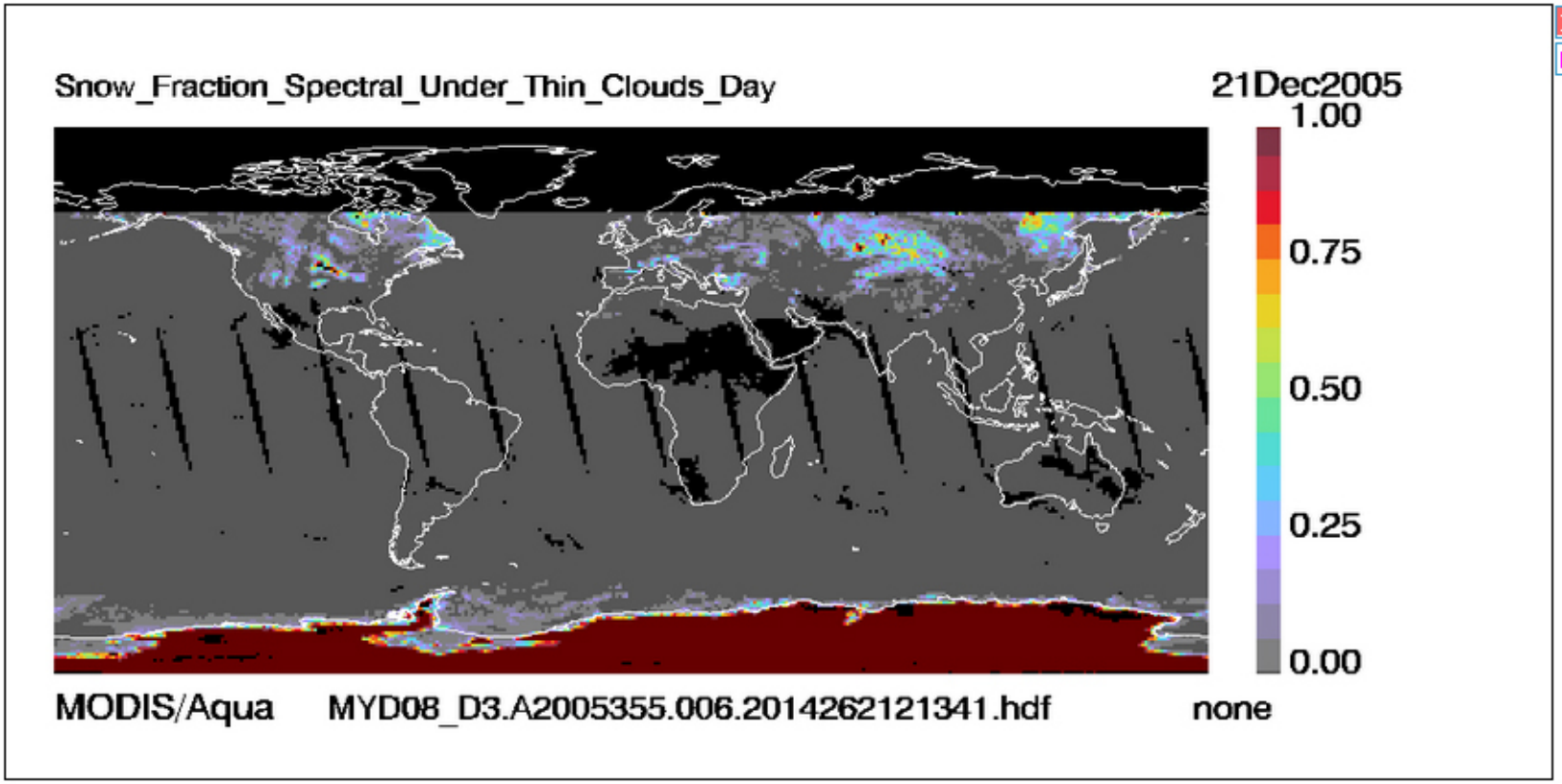
33. **Cloud_Phase_Infrared**
34. **Cloud_Phase_Infrared_Day**
35. **Cloud_Phase_Infrared_Night**
36. **Cloud_Top_Pressure_1km_Nadir_Day** [sample vs. avg.]
37. **Cloud_Top_Pressure_1km_Nadir_Night** [sample vs. avg.]
38. **Sunglint_Fraction_Day** [daytime only phenomenon]
39. **Snow_Fraction_Spectral_Under_Thin_Clouds_Day**
40. **Snow_Fraction_Ancillary_Under_All_Clouds_Night**

New C6 Sunglint Fraction (Daytime)



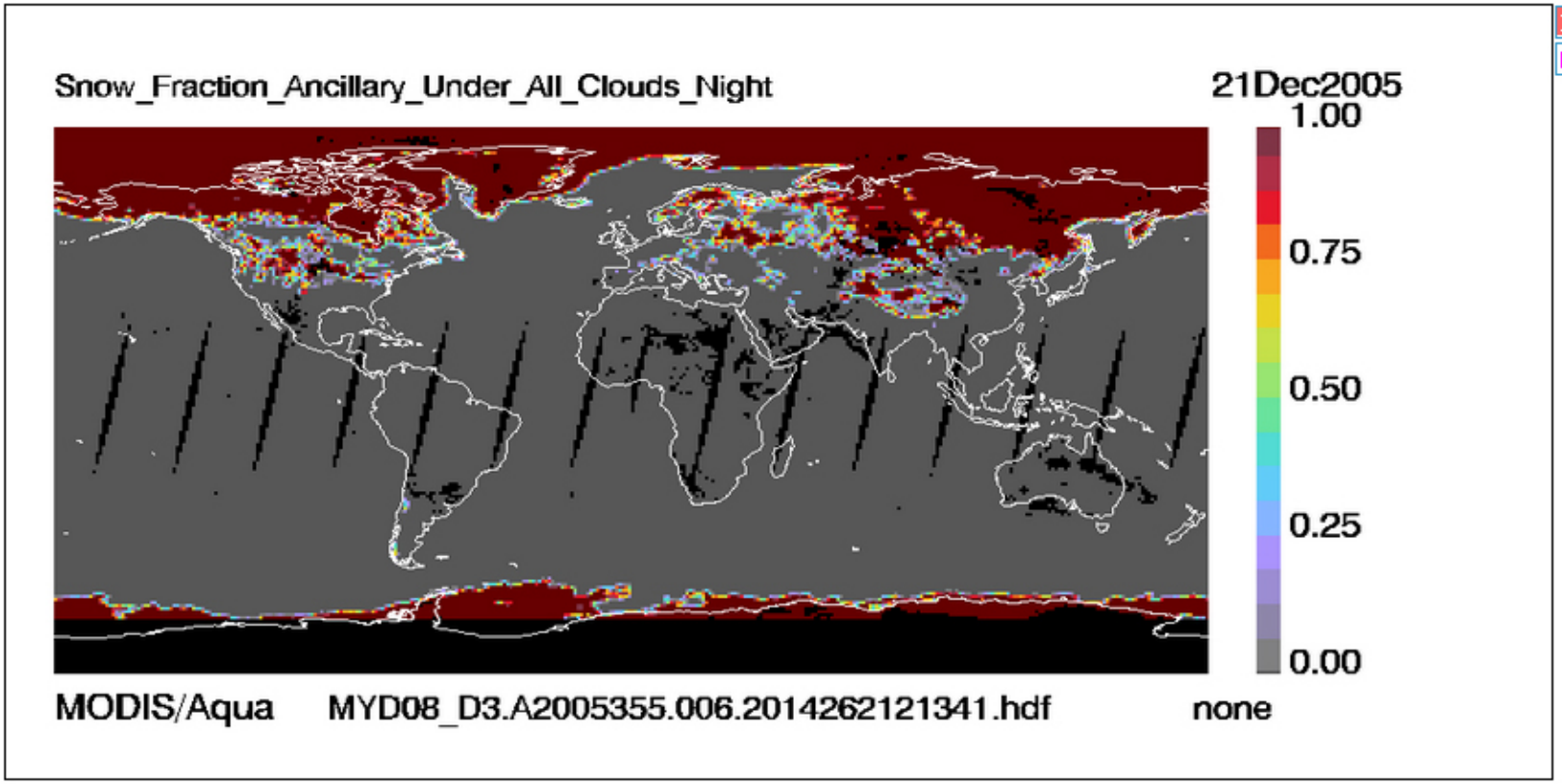
New C6 Snow Fraction (Daytime)

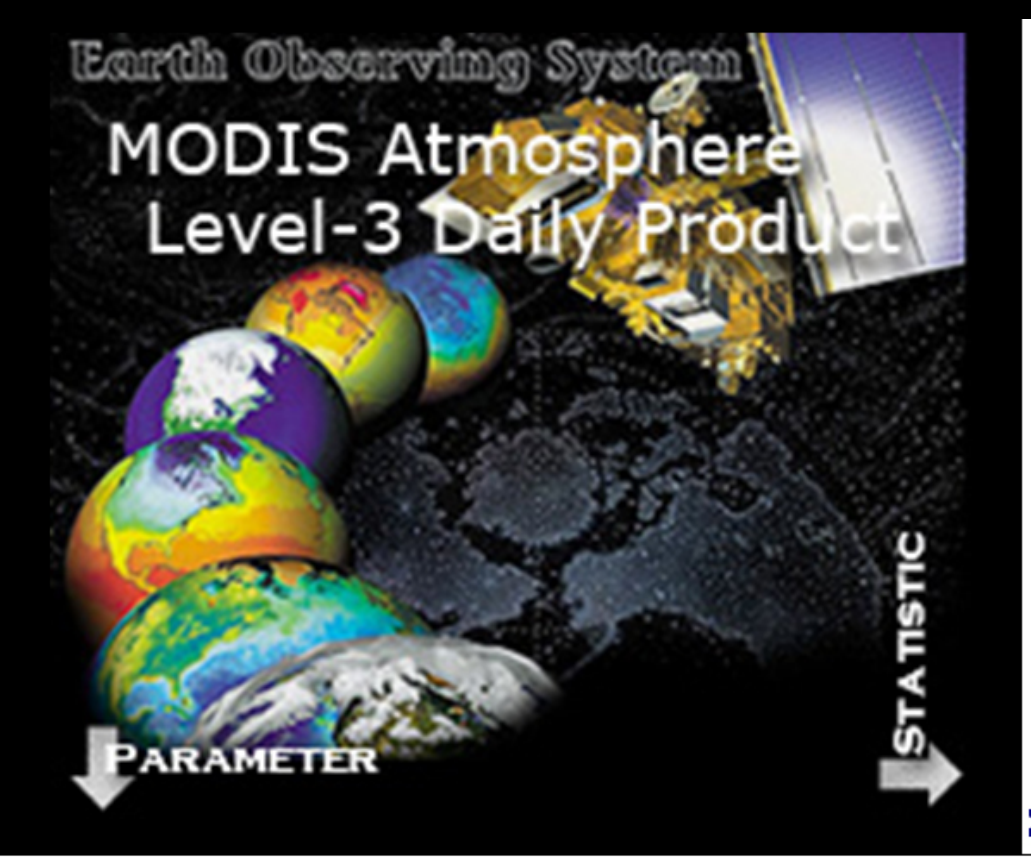
Using Spectral Tests under (CTP Retrieved) Thin Clouds only (Antarctica hardwired to 100%)



New C6 Snow Fraction (Nighttime)

Using Ancillary Snow Mask Data under (CTP Retrieved) Clouds Only (All Clouds)





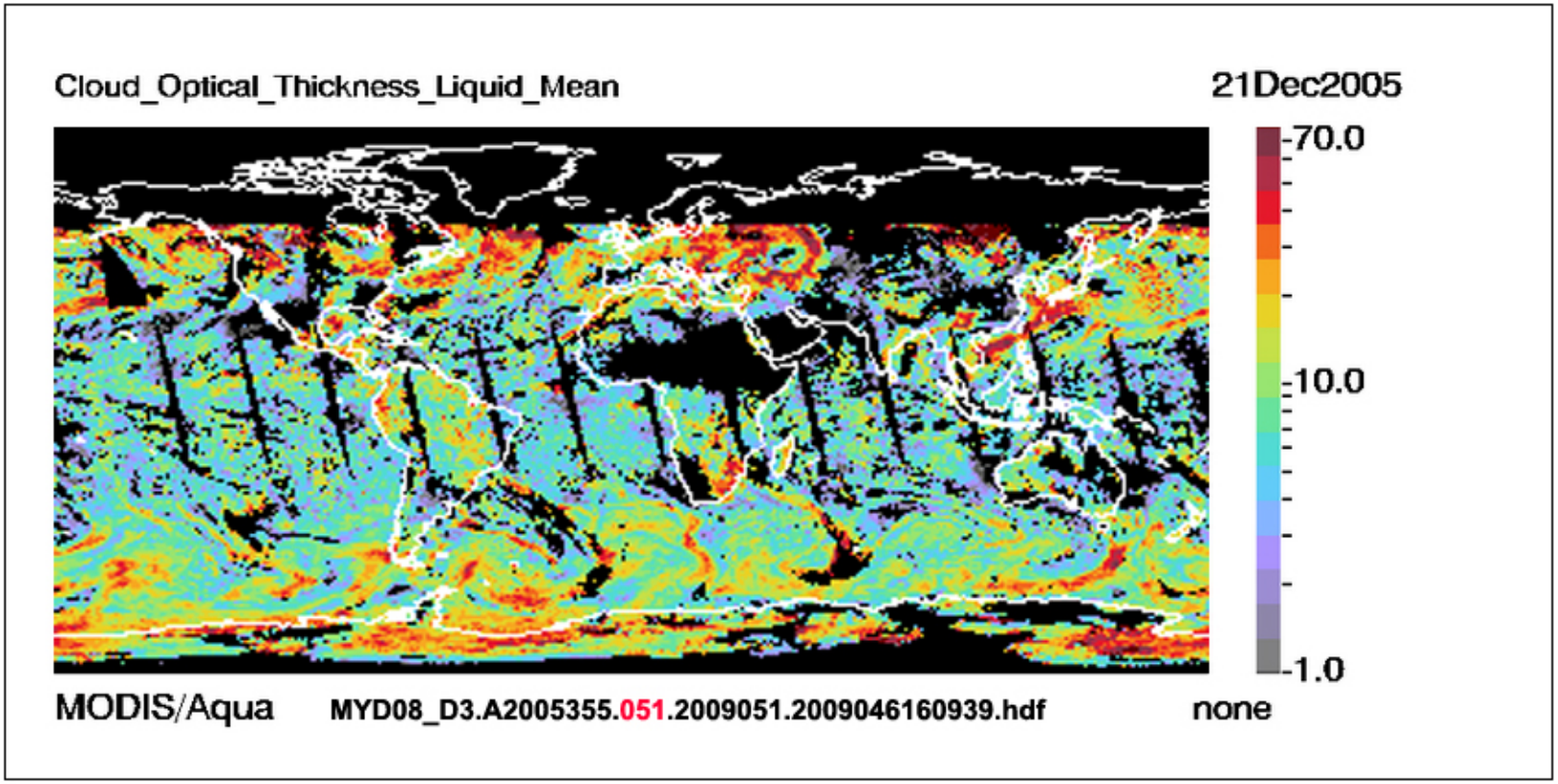
Derived from L2 Cloud (06_L2)

Cloud Optical Properties [Note: PCL means Partly Cloudy Retrievals]

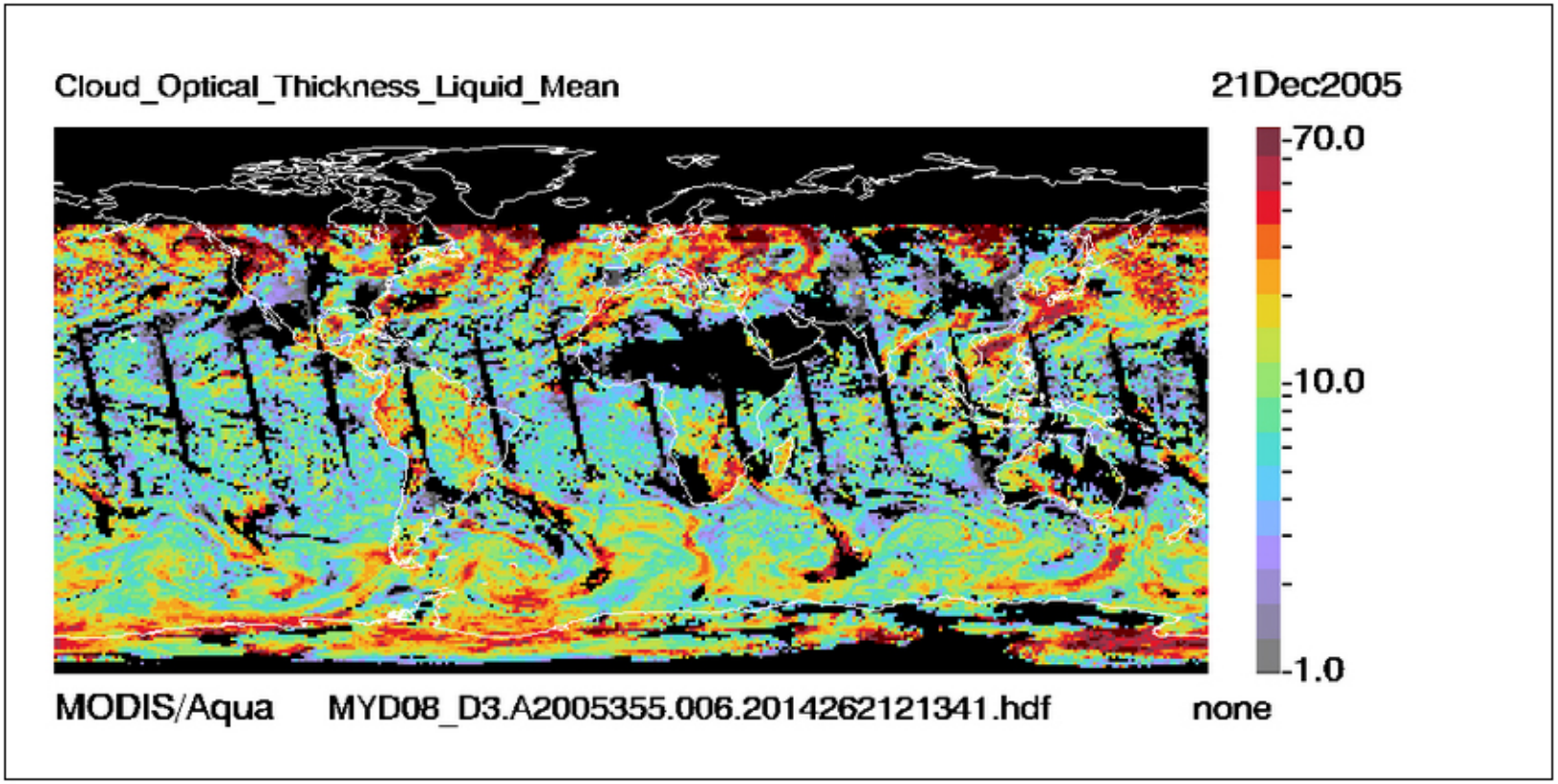
(Primary 2.1 Retrieval)

	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
01. Cloud_Optical_Thickness_Liquid	•	•	•	•			•				•	•	•	•		•	•		•
02. Cloud_Optical_Thickness_Ice	•	•	•	•			•				•	•	•	•		•	•		•
03. Cloud_Optical_Thickness_Undetermined	•	•	•	•									•	•					
04. Cloud_Optical_Thickness_Combined	•	•	•	•									•	•					•
05. Cloud_Optical_Thickness_PCL_Liquid	•	•	•	•			•				•								•
06. Cloud_Optical_Thickness_PCL_Ice	•	•	•	•							•								•
07. Cloud_Optical_Thickness_PCL_Undetermined	•	•	•	•															

Old C5 Cloud Optical Thickness (Liquid Water Clouds)

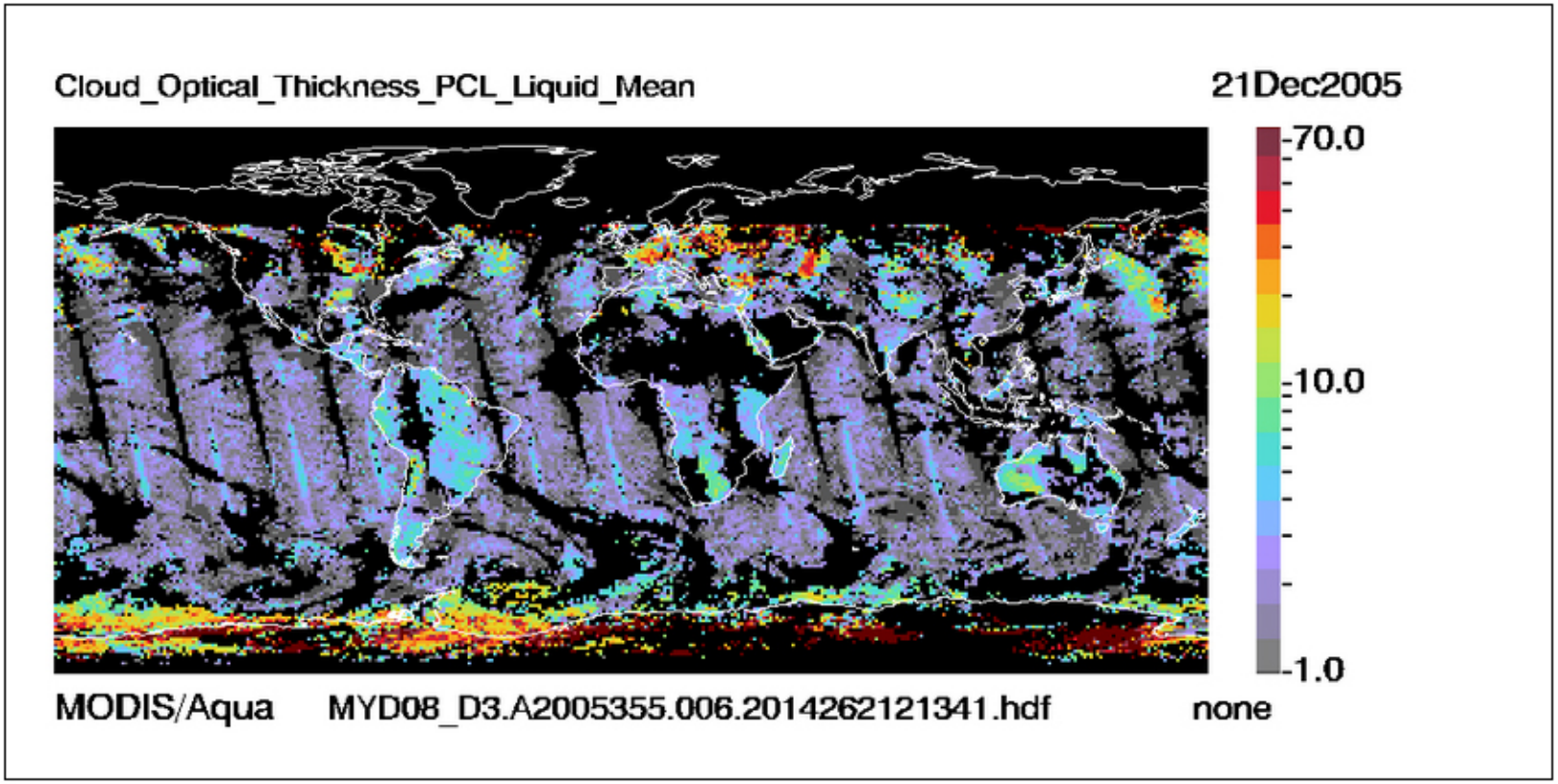


New C6 Cloud Optical Thickness (Liquid Water Clouds)

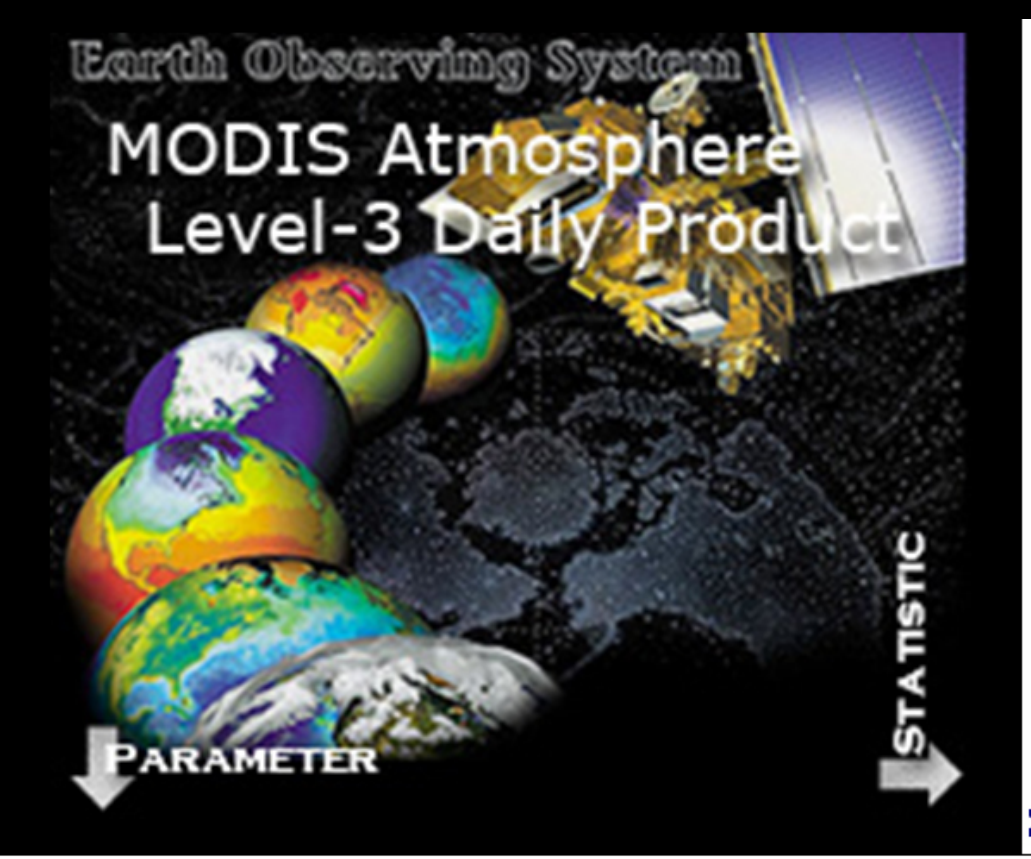


Liquid
Ice
Undetermined
Combined
PCL_Liquid
PCL_Ice
PCL_Undetermined
PCL_Combined

New C6 Cloud Optical Thickness PCL (Liquid Water Clouds)
PCL = Partly Cloudy Retrievals Only

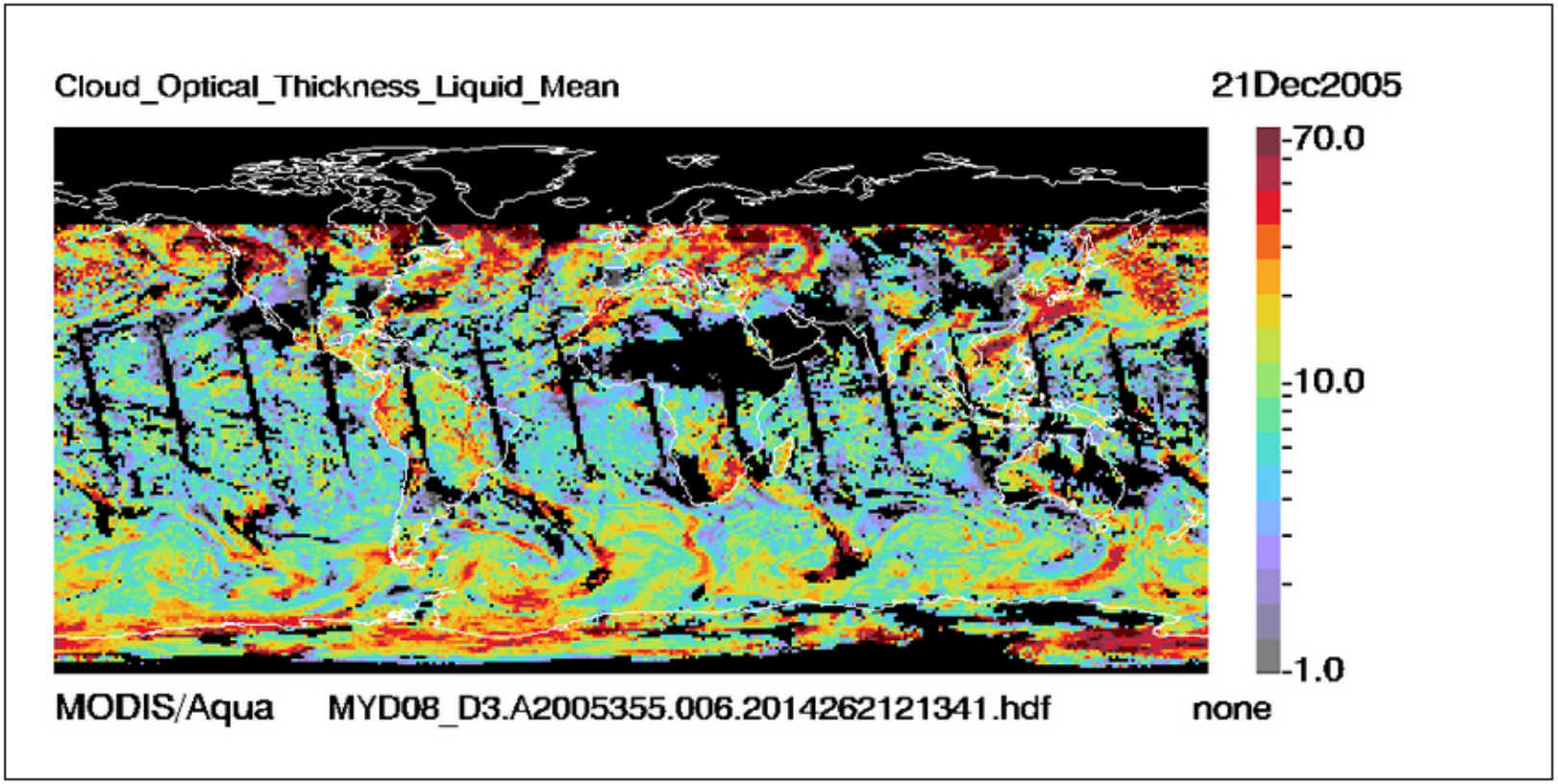


Liquid
Ice
Undetermined
Combined
PCL_Liquid
PCL_Ice
PCL_Undetermined
PCL_Combined

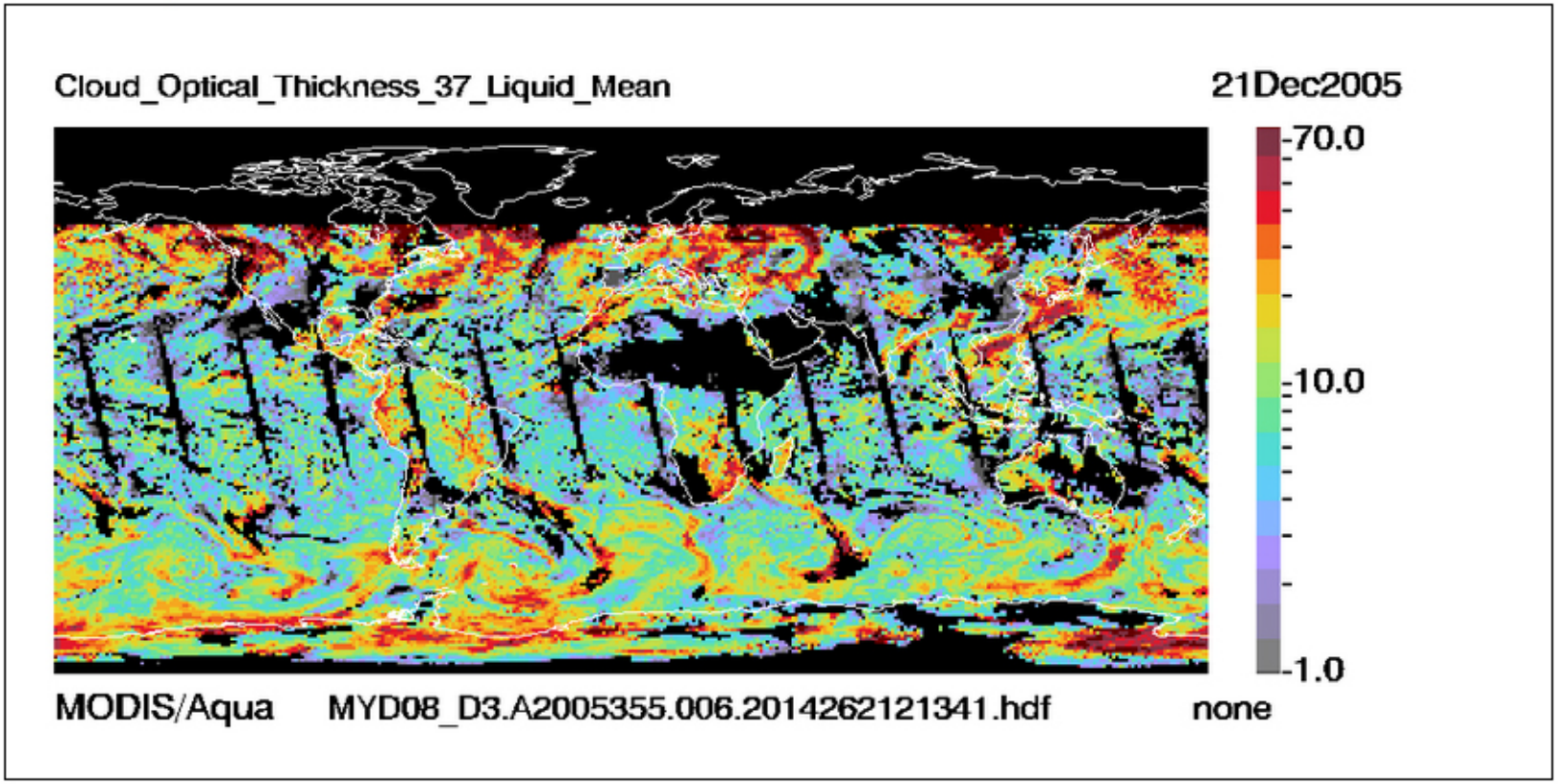


Parameter	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
Derived from L2 Cloud (06_L2)																			
Cloud Optical Properties [Note: PCL means Partly Cloudy Retrievals]																			
(Supplementary 1.6 Retrieval)																			
66. Cloud_Optical_Thickness_16_Liquid	•	•	•	•							•								
67. Cloud_Optical_Thickness_16_Ice	•	•	•	•							•								
68. Cloud_Effective_Radius_16_Liquid	•	•	•	•							•					•	•		
69. Cloud_Effective_Radius_16_Ice	•	•	•	•							•					•	•		
74. Cloud_Optical_Thickness_16_PCL_Liquid	•	•	•	•							•								
75. Cloud_Optical_Thickness_16_PCL_Ice	•	•	•	•							•								
76. Cloud_Effective_Radius_16_PCL_Liquid	•	•	•	•							•								

New C6 Cloud Optical Thickness (Liquid Water Clouds)
Primary 2.1 micron Retrieval

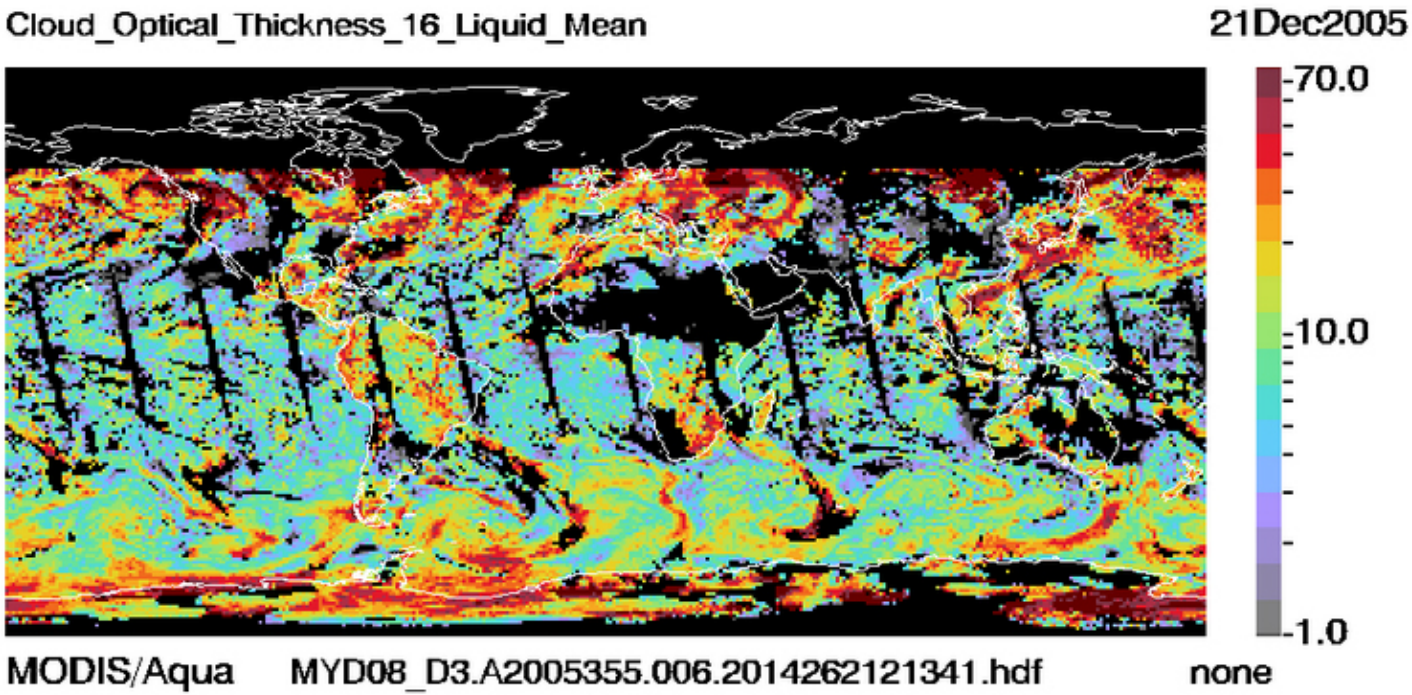


New C6 Cloud Optical Thickness (Liquid Water Clouds)
3.7 micron Retrieval



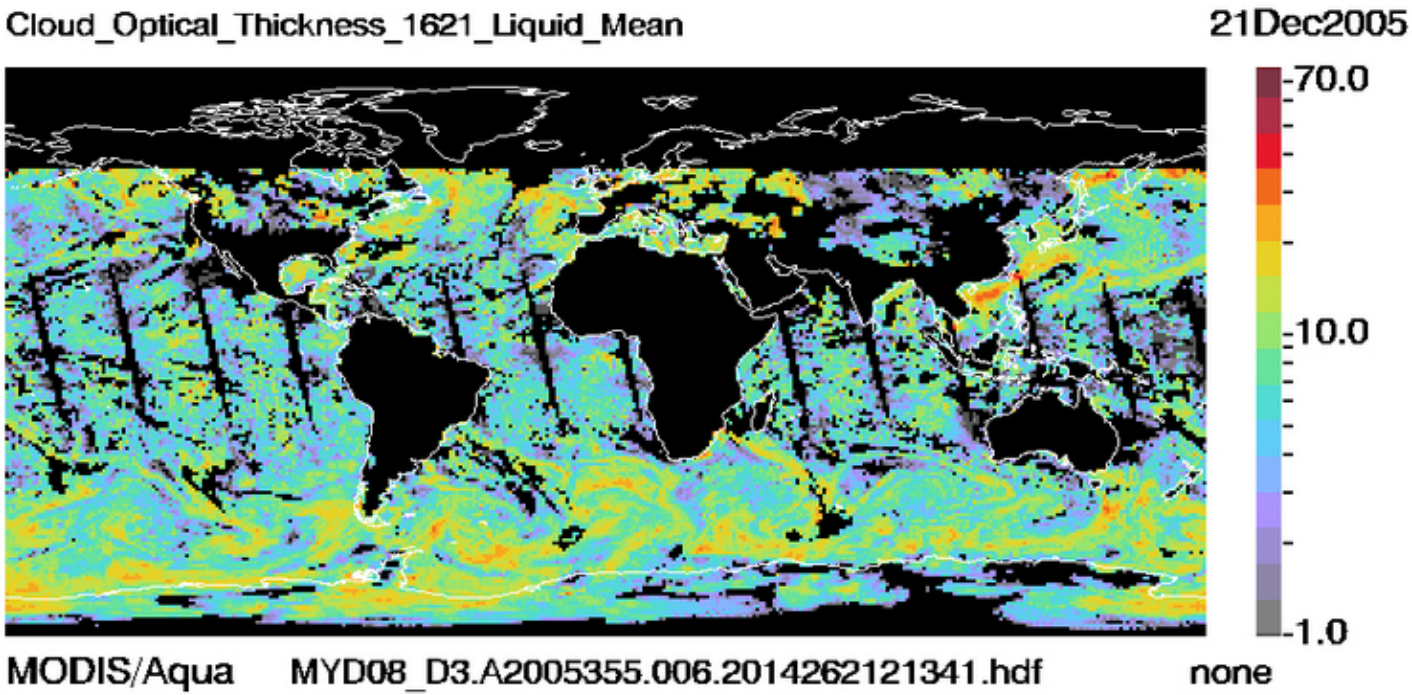
1621Liquid
1621 Ice
1621 PCL_Liquid
1621 PCL_Ice
16 Liquid
16 Ice
16 PCL_Liquid
16 PCL_Ice
37 Liquid
37 Ice
37 PCL_Liquid
37 PCL_Ice

New C6 Cloud Optical Thickness (Liquid Water Clouds)
1.6 micron Retrieval

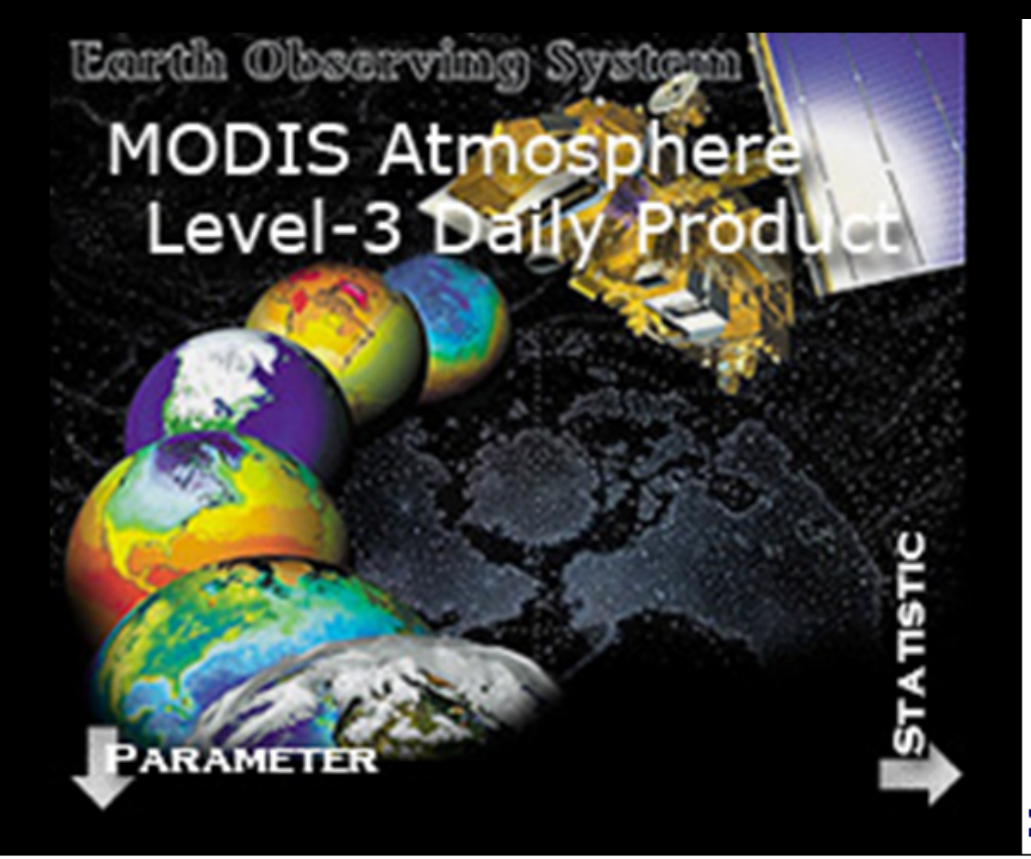


1621Liquid
1621 Ice
1621 PCL_Liquid
1621 PCL_Ice
16 Liquid
16 Ice
16 PCL_Liquid
16 PCL_Ice
37 Liquid
37 Ice
37 PCL_Liquid
37 PCL_Ice

New C6 Cloud Optical Thickness (Liquid Water Clouds)
1.6 / 2.1 micron Retrieval



- 1621 Liquid
- 1621 Ice
- 1621 PCL_Liquid
- 1621 PCL_Ice
- 16 Liquid
- 16 Ice
- 16 PCL_Liquid
- 16 PCL_Ice
- 37 Liquid
- 37 Ice
- 37 PCL_Liquid
- 37 PCL_Ice

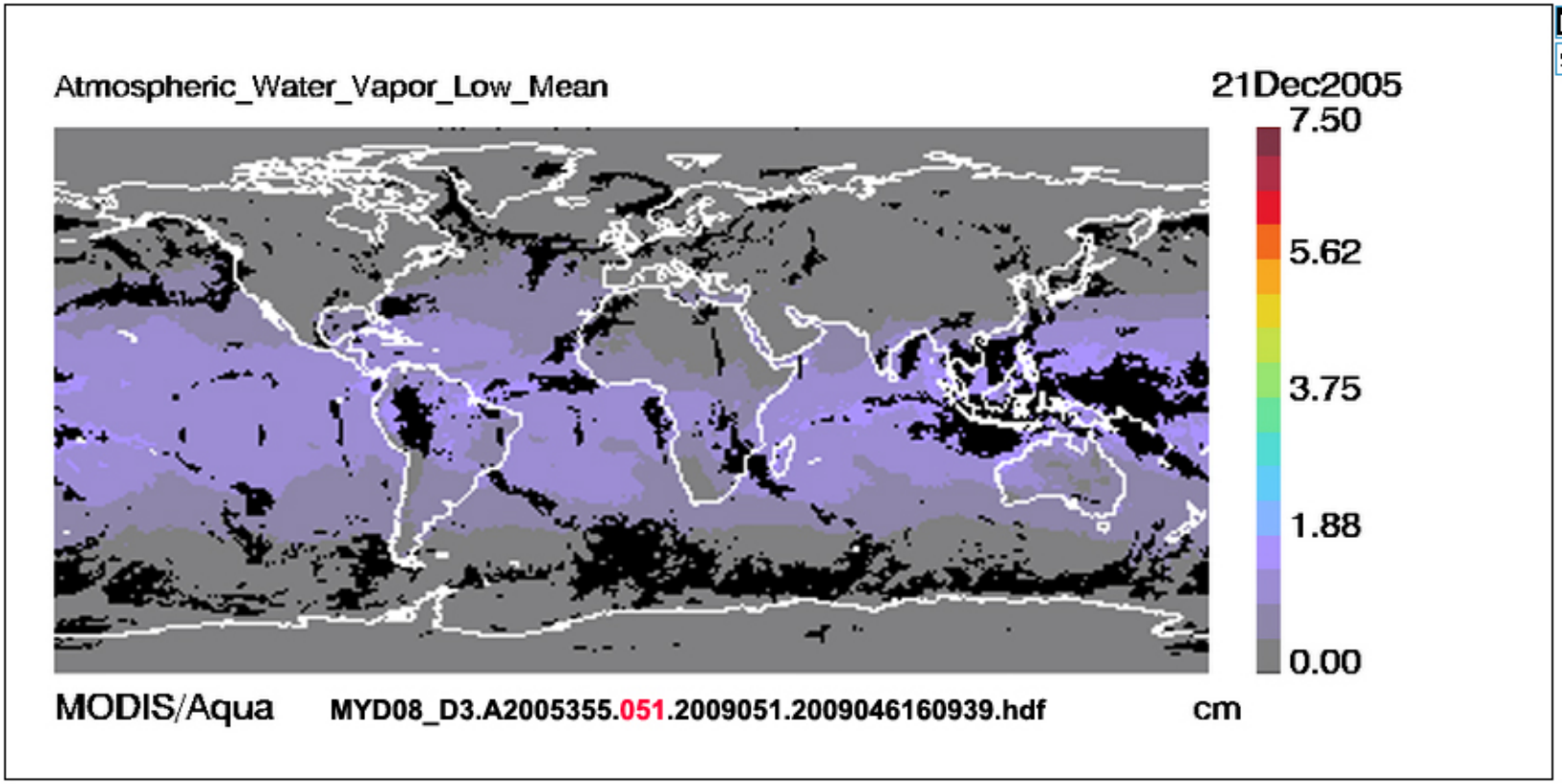


Derived from L2 Atm Profile (07_L2)

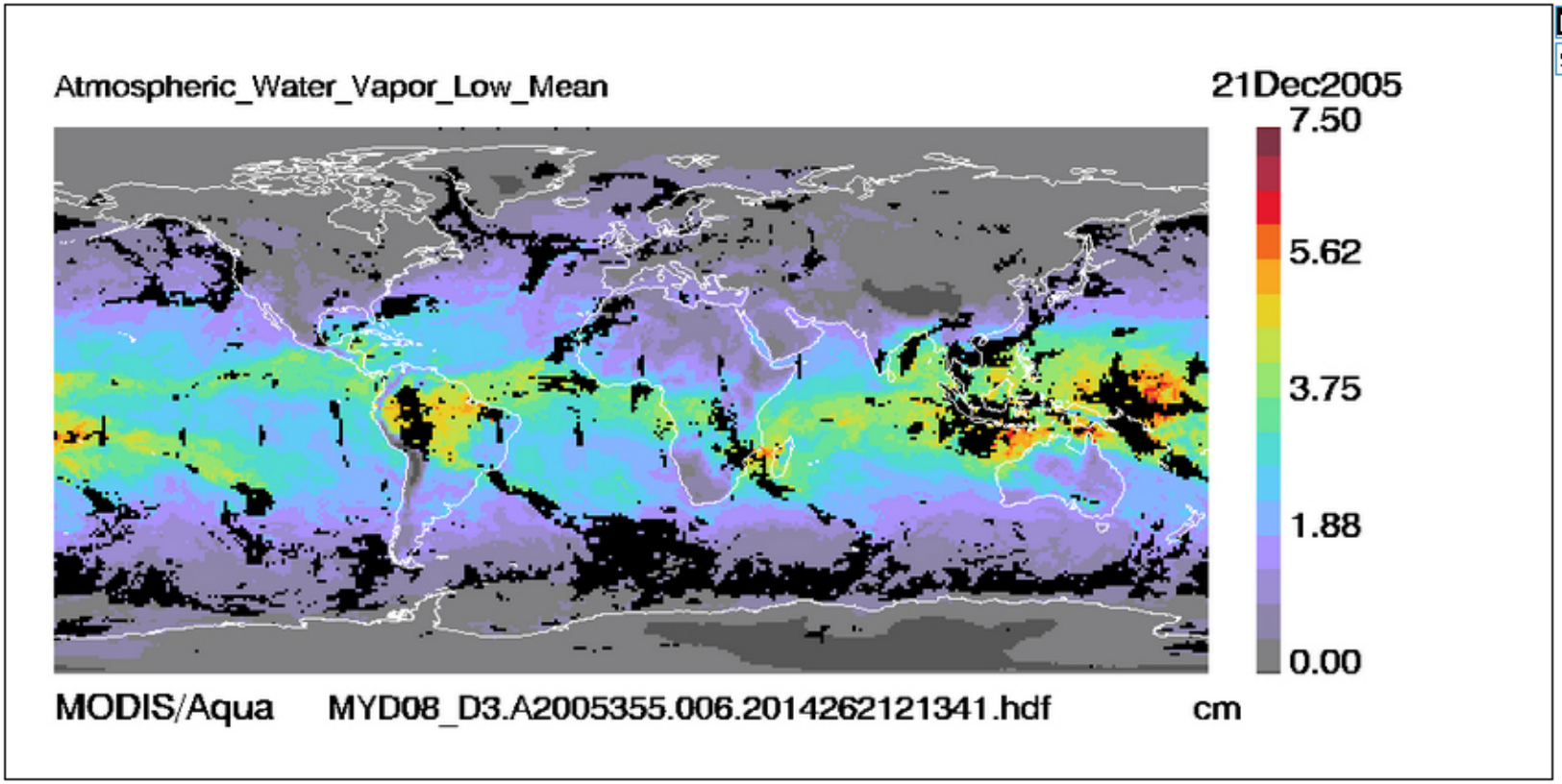
[Note: Low (Sfc-680 hPa) & High (440-10 hPa) def'n changed from C51 to C6]

	Mean	Standard_Deviation	Minimum	Maximum	QA_Mean	QA_Standard_Deviation	Histogram_Counts (n)	Confidence_Histogram (4)	Fraction	Pixel_Counts	Mean_Uncertainty	Log_Mean_Uncertainty	Log_Mean	Log_Standard_Deviation	Joint_Histo_vs_Opt_Depth (nxn)	Joint_Histo_vs_Effect_Radius (nxn)	Joint_Histo_vs_Temperature (nxn)	Joint_Histo_vs_Emissivity (nxn)	Joint_Histo_vs_Pressure (nxn)
01. Total_Ozone	•	•	•	•	•	•	•	•											
02. Total_Totals	•	•	•	•	•	•	•	•											
03. Lifted_Index	•	•	•	•	•	•	•	•											
04. Atmospheric_Water_Vapor	•	•	•	•	•	•	•	•											
05. Atmospheric_Water_Vapor_Low	•	•	•	•	•	•	•	•											
06. Atmospheric_Water_Vapor_High	•	•	•	•	•	•	•	•											
07. Retrieved_Temperature_Profile	•	•	•	•						•									

Old C5 Atmospheric Water Vapor “Low”
(In C5 ”Low” was Surface to 920 mb)



New C6 Atmospheric Water Vapor “Low”
(In C6 ”Low” is Surface to 680 mb)



More about Level-3

Want to emphasize the

Importance of the local attributes attached to each SDS

which can be found in the CDL File Spec and/or the HDF File itself

(HDF Files are self describing!)

The "Inner Workings" of Level-3

1. Four L3 PGE's are required: Tile (interim 5° latitude strips), Daily, Eight Day, Monthly
2. MODIS Atmosphere L3 software was designed using "generalized logic"
   - No special cases. KIS "Keep it Simple" to reduce software maintenance and "spaghetti logic"
   - Statistics are computed the same way each time (a few "fixed case" choices sometimes offered)
3. Logical Branching in L3 software is determined through "local attribute" settings
   - local attributes can be seen/read in the Common Data Language (CDL) File Spec (see M-A website)
   - local attributes are also attached to each Scientific Data Set (SDS) in the HDF File itself (self described)

Pros:

Upside is the L3 SDS's never get "out of sync" with the File Spec. Which can happen in L2.

File Specs (including Local attributes attached to each SDS) will tell 90% of the story on processing.

(The other 10% can be gleaned from the L3 Algorithm Theoretical Basis Document (ATBD).)

The operational software, in this case, is easier to maintain, with fewer changes needed.

Cons:

- Downside is huge File Specs (and sometimes time consuming effort needed for changes)
- File Specs for each L3 PGE are around 25,000 lines in length (close to 100,000 lines total)
- Have to be meticulous when editing. 90% of the maintenance and updates are done in the File Specs.

* **Upshot: Local attributes attached to each SDS gives info on "how " (& "what")**

Some Key Local Attributes of Level-3

Most common question from new users: "How do I unpack L3 data from HDF Files?"

```
short    Cloud_Top_Temperature_Mean ( YDim:mod08 , XDim:mod08 ) ;
            Cloud_Top_Temperature_Mean:long_name = "Cloud Top Temperature: Mean" ;
            Cloud_Top_Temperature_Mean:units = "Degrees Kelvin" ;
            Cloud_Top_Temperature_Mean:valid_range = 0s, 20000s ;
            Cloud_Top_Temperature_Mean:_FillValue = -9999s ;
            Cloud_Top_Temperature_Mean:scale_factor = 0.01d ;
            Cloud_Top_Temperature_Mean:add_offset = -15000.0d ;
            Cloud_Top_Temperature_Mean:Derived_From_Level_2_Data_Set = "Cloud_Top_Temperature" ;
            Cloud_Top_Temperature_Mean:Level_2_Pixel_Values_Read_As = "Real" ;
            Cloud_Top_Temperature_Mean:Included_Level_2_Nighttime_Data = "True" ;
            Cloud_Top_Temperature_Mean:Statistic_Type = "Simple" ;
            Cloud_Top_Temperature_Mean:Quality_Assurance_Data_Set = "None" ;
            Cloud_Top_Temperature_Mean:Aggregation_Data_Set = "None" ;
```

How to Unpack the HDF data

"_FillValue" is the value of the Fill or Missing data that should be thrown out before descaling.

The local attributes "scale_factor" and "add_offset" are used for the conversion of stored integer data to geophysical floating point numbers. The implementation follows conventional HDF usage (See HDF Users Guide)

float value = scale_factor * (stored integer - add_offset)
float value = 0.01 * (10000 - (-15000))
float value = 250.0 Degrees Kelvin

The units of the derived floating point value is indicated by the "units" local attribute also provided.

Note the "valid_range" values apply to the packed data (before descaling). It is obtained from the L2 input file specification. However it should be remembered that no "valid_range" screening on the input L2 data is performed in L3.

Some Key Local Attributes of Level-3

If you are confused by the SDS Name, try reading the "long_name" local attribute!

```
short    Snow_Fraction_Spectral_Under_Thin_Clouds_Day ( YDim:mod08 , XDim:mod08 ) ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:long_name = "Snow/ice under thin clouds only (using spectral
test, which cannot detect snow under thk clds). Flag hardwired to snow over Antarctic land (Day): Mean Fraction" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:units = "none" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:valid_range = 0s, 10000s ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:_FillValue = -9999s ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:scale_factor = 0.0001d ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:add_offset = 0.0d ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Derived_From_Level_2_Data_Set = "Cloud_Mask_5km" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Level_2_Pixel_Values_Read_As = "Bit_String" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Included_Level_2_Nighttime_Data = "False" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Statistic_Type = "Area_Fraction" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Quality_Assurance_Data_Set = "None" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Aggregation_Data_Set = "None" ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Level_2_Byte = 1s ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Level_2_Start_Bit = 2s ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Level_2_Num_Bits = 6s ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Fraction_Valid_Category_Values = 33s, 34s, 37s, 38s, 41s,
42s, 45s, 46s, 49s, 50s, 53s, 54s ;
           Snow_Fraction_Spectral_Under_Thin_Clouds_Day:Fraction_Category_Values = 34s, 38s, 42s, 46s, 50s, 54s ;
```

"long_name" can provide useful added information!

Note there is a character length limit on SDS names. So sometimes SDS names do not provide enough detail.

Always look at the "long_name" local attribute for added information.

Also with the "Derived_From_Level_2_Data_Set" given for each SDS, you can always refer back to the Level 2 input file For added information

Level-3 SDS Statistic Suffix's

Scientific Data Set (SDS) Statistical "Suffix's" occasionally "tell a story".

In D3, the mean statistic has an SDS suffix of "_Mean", which defined as the subsampled mean of the L2 input pixels (which meet the specified criteria).

In E3 and M3, the mean statistic has an SDS suffix of "_Mean_Mean", which was initially implemented with the thought that it might help data users remember that it's the "mean of a mean" or "Mean of the Daily Mean".

There are 3 options on how the E3/M3 "Mean of the Daily Mean" is computed:

1. Unweighted Mean (each D3 mean has the same weight)
2. Pixel-Weighted Mean (each D3 mean is weighted by the pixel counts for that day)
3. Pixel-Weighted Mean with Pixel Count Screen (same as 2, except a min number of counts is req'd)

Weighting Options are set in the "local attributes" (can be viewed in the CDL File Spec, or can be read from the HDF file itself)

An Obvious FYI: Note that Histograms and Joint Histograms are never weighted (makes no sense) they are simple counts.

Mean Statistic Weighting Options in E3 and M3

1. Unweighted Mean (each D3 Mean has the same weight)
2. Pixel-Weighted Mean (each D3 Mean is weighted by the number of L2 input Pixel Counts for that day)
3. Pixel-Weighted Mean with Pixel Count Screen (same as 2, except a min number of counts is req'd)

Case 1 Example:

```
short    Aerosol_Optical_Depth_Land_Mean_Mean ( Corrected_Optical_Depth_Land_Micron_Levels:mod08 , YDim:mod08 , XDim:mod08 ) ;
           Aerosol_Optical_Depth_Land_Mean_Mean:long_name = "Corrected aerosol optical depth (Land) at 0.47, 0.55, and 0.66 microns: Mean of Daily Mean" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:units = "none" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:valid_range = -100s, 5000s ;
           Aerosol_Optical_Depth_Land_Mean_Mean:_FillValue = -9999s ;
           Aerosol_Optical_Depth_Land_Mean_Mean:scale_factor = 0.001d ;
           Aerosol_Optical_Depth_Land_Mean_Mean:add_offset = 0.0d ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Derived_From_Level_3_Daily_Data_Set = "Aerosol_Optical_Depth_Land_Mean" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Level_2_Pixel_Values_Read_As = "Real" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Included_Level_2_Nighttime_Data = "False" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Quality_Assurance_Data_Set = "Quality_Assurance_Land" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:QA_Byte = 0s ;
           Aerosol_Optical_Depth_Land_Mean_Mean:QA_Useful_Flag_Bit = 0s ;
           Aerosol_Optical_Depth_Land_Mean_Mean:QA_Value_Start_Bit = 1s ;
           Aerosol_Optical_Depth_Land_Mean_Mean:QA_Value_Num_Bits = 3s ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Statistic_Type = "Simple" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Aggregation_Data_Set = "None" ;
           Aerosol_Optical_Depth_Land_Mean_Mean:Weighting = "Unweighted" ;
```

Mean Statistic Weighting Options in E3 and M3

1. Unweighted Mean (each D3 Mean has the same weight)
2. Pixel-Weighted Mean (each D3 Mean is weighted by the number of L2 input Pixel Counts for that day)
3. Pixel-Weighted Mean with Pixel Count Screen (same as 2, except a min number of counts is req'd)

Case 2 Example:

```
short    Cloud_Optical_Thickness_Liquid_Mean_Mean ( YDim:mod08 , XDim:mod08 ) ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:long_name = "Liquid Water Cloud Optical Thickness: Mean of Daily Mean" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:units = "none" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:valid_range = 0s, 15000s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:_FillValue = -9999s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:scale_factor = 0.01d ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:add_offset = 0.0d ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Derived_From_Level_3_Daily_Data_Set = "Cloud_Optical_Thickness_Liquid_Mean" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Level_2_Pixel_Values_Read_As = "Real" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Included_Level_2_Nighttime_Data = "False" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Statistic_Type = "Simple" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Quality_Assurance_Data_Set = "Quality_Assurance_1km" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:QA_Byte = 0s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:QA_Useful_Flag_Bit = 0s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:QA_Value_Start_Bit = 1s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:QA_Value_Num_Bits = 2s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Aggregation_Data_Set = "Quality_Assurance_1km" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Aggregation_Byte = 2s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Aggregation_Value_Start_Bit = 0s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Aggregation_Value_Num_Bits = 3s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Aggregation_Valid_Category_Values = 1s, 2s, 3s, 4s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Aggregation_Category_Values = 2s ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Weighting = "Pixel_Weighted" ;
           Cloud_Optical_Thickness_Liquid_Mean_Mean:Weighted_Parameter_Data_Set = "Cloud_Retrieval_Fraction_Liquid_Pixel_Counts" ;
```

Multiday (E3 and M3) Statistics

One final note about Standard Deviations in the Multiday.

We have 2 Standard Deviation statistics stored in the E3 and M3, with these SDS suffix's:

1. _Mean_Std (Standard Deviation of the Daily Mean)
2. _Std_Deviation_Mean (Mean of the Daily Standard Deviation)

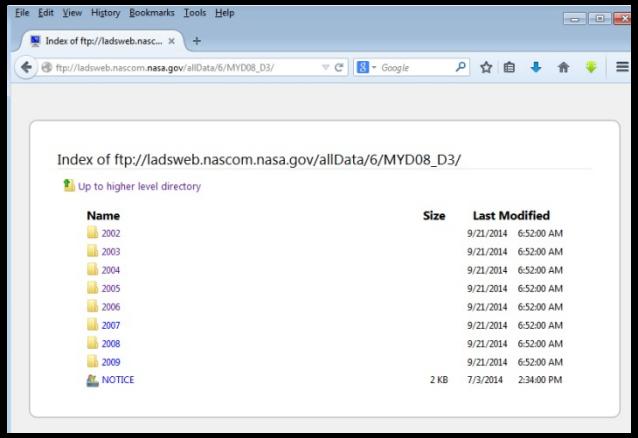
But there is no Standard Deviation of the input L2 Pixels in the Multiday (E3 or M3) files. (However, we do have this statistic in the Daily (D3) file.) This is something we would like to look into for Collection 7 in the E3 and M3 files. It would require calculating and keeping some additional intermediate statistics (Sum of Squares, etc.) in the D3. TBD

How do you order L3 Data?

Acquire MODIS Atmosphere Level 3 Data

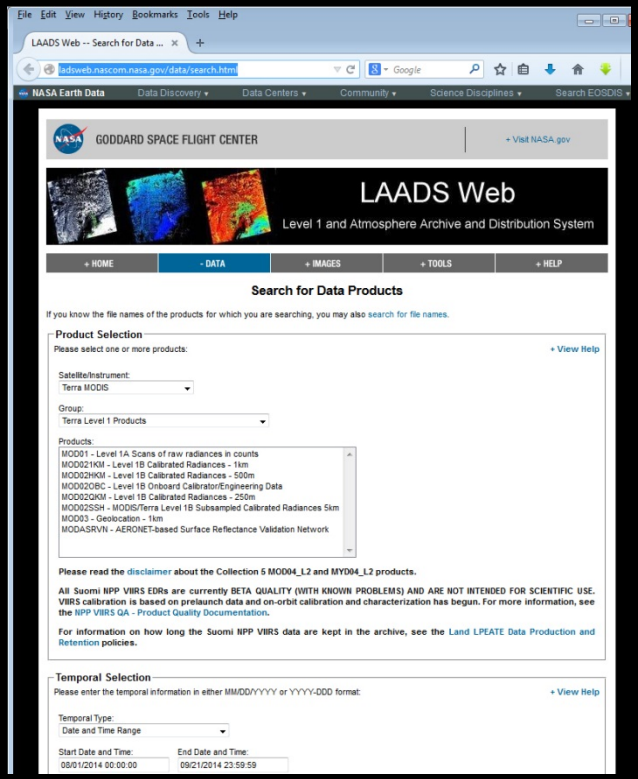
For downloading few files
or monitoring processing progress,
FTP is useful:

ftp://ladsweb.nascom.nasa.gov/allData/6/



For larger orders, or sub-setting data,
use the LAADS website:

http://ladsweb.nascom.nasa.gov/data/search.html



What do the HDF filenames mean?

HDF filename “field” structure

The HDF File “Production Date“ is a good way to track the data generation (problems), but reading the “PGE Version Number” in the HDF file metadata is more rigorous.

Note that for E3 and M3 HDF Files, the “Data Date” YYYYDDD, denotes the start day for the multiday period. For E3, the beginning of the 8-day period is always reset to 001 for a new year; and the previous 8-day period runs for the full 8 days (overlap is possible).

How to Track MODIS Data File "Versions" (Important for Tracking Problems and Fixes)

Problems and fixes in MODIS Atmosphere Product HDF files can be tracked in one of two ways:

1. the **Product Generation Executive (PGE) Version Number** that can be queried from any HDF file using the command:
   ncdump -h *.hdf
2. the **HDF File "Production Date"**.

The HDF File "Production Date", which is the date the HDF file was actually generated or produced, can be found in the HDF filename itself **(shown in green color below)**:

Level 2 Product Names:

MOD06_L2.AYYYYDDD.HHMM.VVV.YYYYDDDHHMMSS.hdf

Definitions:

MOD06_L2 = Earth Science Data Type Name
A = Data Date (A = Acquisition)
YYYYDDD = Data Year and Julian Date
HHMM = Data Hour & Minute Start Time
VVV = Collection Version
YYYYDDDHHMMSS = Production Date (& Time)
hdf = Suffix denoting HDF file

Level 3 Product Names:

MOD08_D3.AYYYYDDD.VVV.YYYYDDDHHMMSS.hdf

Definitions:

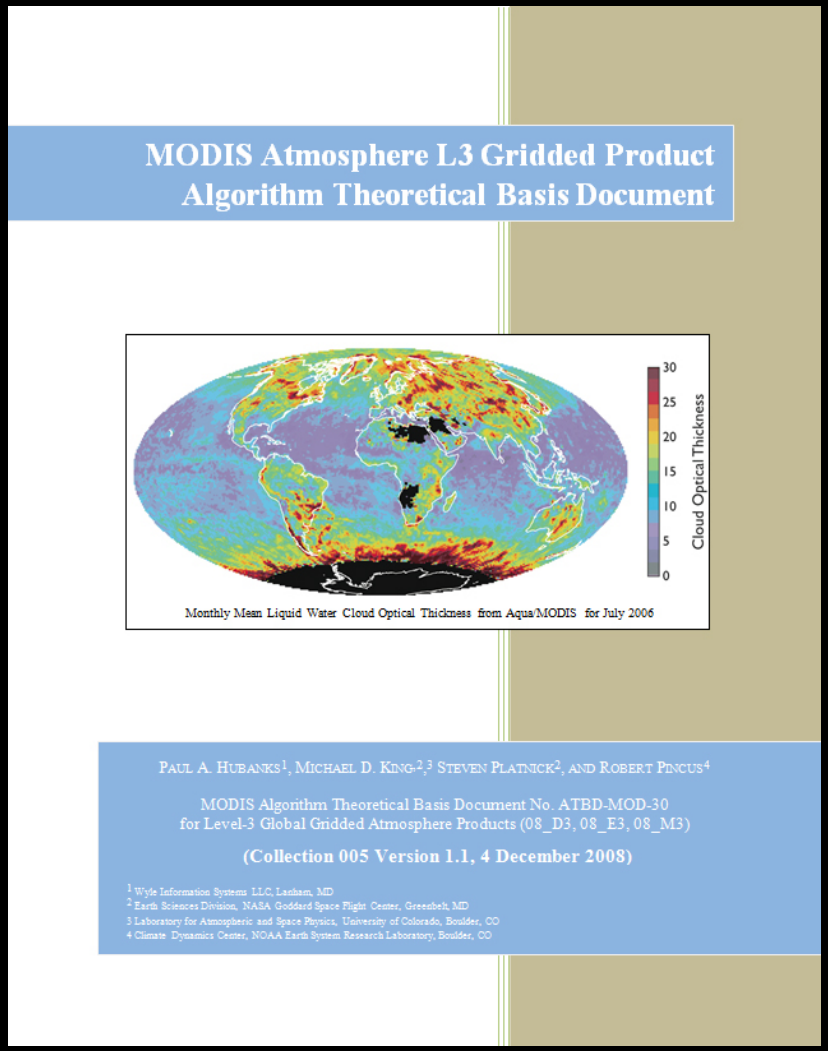
MOD08_D3 = Earth Science Data Type Name
A = Data Date (A = Acquisition)
YYYYDDD = Data Year and Julian Date
VVV = Collection Version
YYYYDDDHHMMSS = Production Date (& Time)
hdf = Suffix denoting HDF file

Note that 1.) all times are UTC time, not local time 2.) the DDD in the date denotes the Julian Date (001-366), and 3.) the MOD06_L2 (or MOD08_D3) prefix is only an example (MYD04_L2, MOD05_L2, MYD05_L2, MYD06_L2, etc. ... or MYD08_D3, MOD08_E3, MYD08_E3, MOD08_M3, MYD08_M3 could be substituted).

Where can I find more detailed information on MODIS-Atmosphere Level-3?

Users should review the MODIS-Atmosphere L3 Algorithm Theoretical Basis Document

http://modis-atmos.gsfc.nasa.gov/MOD08_D3/atbd.html



MODIS Atmosphere L3 Gridded Product Algorithm Theoretical Basis Document

Monthly Mean Liquid Water Cloud Optical Thickness from Aqua/MODIS for July 2006

PAUL A. HUBANKS[1], MICHAEL D. KING[2,3], STEVEN PLATNICK[2], AND ROBERT PINCUS[4]

MODIS Algorithm Theoretical Basis Document No. ATBD-MOD-30
for Level-3 Global Gridded Atmosphere Products (08_D3, 08_E3, 08_M3)

(Collection 005 Version 1.1, 4 December 2008)

[1] Wyle Information Systems, LLC, Lanham, MD
[2] Earth Sciences Division, NASA Goddard Space Flight Center, Greenbelt, MD
[3] Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO
[4] Climate Dynamics Center, NOAA Earth System Research Laboratory, Boulder, CO

End of Part 1 !

Part 2:
MODIS-Atmosphere Website Overview

MODIS-Atmosphere Web Site

http://modis-atmos.gsfc.nasa.gov

Highlights

Images:

a. L1 & L2 high-res global mosaics [Subset of L1 & L2 SDS's -- Mapped Globally w. Zoom Capability]
b. L1 high-res Granules [3 channel RGB, daytime only, mapped]
c. L3 standard: D3 & E3 (native LL) ; M3 on two projections (LL & HA) [Subset of Stats Only]

Documentation:

a. Processing and Data Availability Calendar
b. Known Problems of C6
c. New Collection Documentation (C6 is most recent)
d. Other Resources: File Specs, QA Plan, ATBDs, Users Guides, Science Papers

Home Page

(navigation primer)

http://modis-atmos.gsfc.nasa.gov

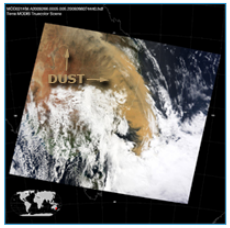
Introduction

Overview

One of the most important ecological issues concerning our planet is climate change. It is generally agreed that the Earth's climate will modify in response to radiative forcing induced by changes in atmospheric trace gases, cloud cover, cloud type, solar radiation, and tropospheric aerosols (liquid or solid particles suspended in the air). In order to develop conceptual and predictive global climate models, it is vital to monitor these properties. Two MODIS (Moderate Resolution Imaging Spectroradiometer) instruments, the first launched on 18 December 1999 onboard the Terra Platform and the second on 4 May 2002 onboard the Aqua platform, are uniquely designed (wide spectral range, high spatial resolution, and near daily global coverage) to observe and monitor these and other Earth changes.

Feature L1B Granule Image

Armageddon-like Dust Storm



MODIS/Terra 9/23/09 00:05 UTC

Dawn breaks over Sydney 9/23/09

click images to zoom

In September 2009, a record-breaking dust storm swept across the Australian states of New South Wales and Queensland. By 24 September, analysis using MODIS at NASA measured the length of the huge dust plume at 3,450 km. Dust particle concentration levels reached 15,400 micrograms per cubic meter of air. (Normal days register up to 20 micrograms and bushfires generate 500 micrograms.) It was estimated that the storm carried some 16 million tons of dust from the deserts of Central Australia. During the peak of the storm, the Australian continent was estimated to be losing 75,000 tons of dust per hour off the New South Wales coast north of Sydney. While the cloud was visible from space, on the ground the intense red-orange color and drop in temperature drew comparisons with nuclear winter (Armageddon), as well as the planet Mars. Some of the thousands of tons of soil lifted in the dust storm were dumped in Sydney Harbour and the Tasman Sea. This increased the nitrogen and phosphate levels in the water significantly. Measurements taken two weeks after the event indicated an explosion of microscopic plant life which led to an increase in fish population some months later. (Source: Wikipedia.org) Additional MODIS RGB images can be viewed in the L1B Granules section.

Frequently Asked Questions (Quick Start Guide)

What are MODIS Data "Collections"?

A MODIS data "Collection" is basically a MODIS data version. When new & improved science algorithms are developed, the entire MODIS dataset (from launch) is reprocessed and then tagged & distributed as a new "Collection". During the processing of a Collection, an attempt is made to use the same version of the Science Algorithms or Program Executables (PGEs). However, sometimes a bug is found in one or more of the PGEs in the middle of Collection processing; and if the bug is not serious, processing will complete with the new corrected PGE. These anomalies and problems in processing are noted on the Known Problems page. One can always identify the Collection number for a particular HDF file as it's always included (as a 3 digit number) as part of the HDF filename. There have been six MODIS data Collections (or Versions) processed since MODIS/Terra was launched in early 2000. The Collection versions created thus far are 001, 003, 004, 005, 051, and 006. It should be noted that Collection 051 only contained updates for some MODIS Data Products, which is why it was tagged with a 051 (a surrogate for

Collection 6 (C6) News

C6 Data Released -
[L2 & L3 AVAILABILITY CALENDAR]

L3 Aqua: Daily, Eight Day, and Monthly Data Released - MODIS Atmosphere Level-3 (L3) C6 data has been released for the Aqua Instrument for Daily (MYD08_D3), Eight Day (MYD08_E3), and Monthly (MYD08_M3) products. In addition, the C6 Joint Atmosphere Product (MYDATML2) has also been released.

L2 Aqua: Aerosol, Water Vapor, & Cloud Data Released - C6 MODIS Atmosphere Level-2 (L2) data has been released for the Aqua Instrument for Aerosol (MYD04_L2, MYD04_3K), Water Vapor (MYD05_L2), and Cloud (MYD06_L2) products.

L2 Aqua & Terra: Cloud Mask and Profiles Data Released - C6 MODIS Atmosphere Level-2 (L2) data has been released for both the Terra and Aqua instruments for Cloud Mask (35_L2) and Profiles (07_L2).

C6 Known Problems - A known problems section for all C6 MODIS-Atmosphere data has been developed. This highlights known issues with the C6 MODIS-Atmosphere data.
[C6 KNOWN PROBLEMS]

C6 L3 Aqua: Daily, Eight Day, and Monthly Data Images Available - Collection 6 Level-3 data for the AQUA platform have been imaged for online browsing.
[L3 MONTHLY IMAGES]
[L3 EIGHT-DAY IMAGES]
[L3 DAILY IMAGES]

C6 Change Documentation - C6 Update page describes Collection 6 changes to all L2 and L3 MODIS data products. This page also includes C6 MODIS Atmospheric Product Webinar Presentations.
[C6 UPDATE PAGE]

MODIS Atmosphere Spotlight

Notice to Terra Data Users - The reflective solar bands (RSB) of Terra MODIS have experienced relatively large degradation in recent years. The current calibration algorithm used in deriving the Collection 5 LUTS does not completely capture and correct for this degradation, which is both wavelength and angle-of-incidence dependent. Science data products that utilize the shorter wavelength bands, especially Bands 8 (412 nm), 9 (443 nm) and 3 (469 nm), can expect to see an observable impact in data quality. The proposed calibration algorithm improvements in development for Collection 6 LUTs are expected to significantly reduce these impacts. These LUTs will be put into production after a thorough review and testing process is completed. [MCST STATEMENT]

Near Real-time Hi-Res L1 & L2 Mosaics - View near-real time mosaic images of MODIS granules from either the Terra (February 2000 to current) or Aqua (June 2002 to current) platforms. [HI-RES MOSAICS]

MODIS Cloud Mask User's Guide - This MODIS Cloud Mask User's Guide was written by Kathy Strabela (UW) in 2008. [Cloud

Products Section:
Calendar Page

(Data Processing and Availability Calendar)

http://modis-atmos.gsfc.nasa.gov/products_calendar.html

PRODUCTS

OVERVIEW
AVAILABILITY CALENDAR
COLLECTION 006
COLLECTION 051
COLLECTION 005
ACQUISITION
HDF FILENAMES
FLOW DIAGRAM

Processing and Availability Calendar

Last Updated: Tuesday, 23-September-2014 6:00 AM EDT

=006 =006 (Reprocessing Soon) =051 =051 (No Deep Blue) = Not Yet Processed = No Instrument Data 5.0.1 = PGE Version

				Level 2 Products										Level 3 Products					
				PGE04 History		PGE06 History		PGE03 History		PGE83 History		PGE56 History		PGE70 History		PGE57 History	
			DATA DATE	AEROSOL 04_L2		H2O VAPOR 05_L2		CLOUD 06_L2		PROFILE 07_L2		CLD.MASK 35_L2		JOINT ATML2		DAILY 08_D3		EIGHT DAY 08_E3		MONTHLY 08_M3	
Y	M	JulianDays		Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua
2014	S	244-273		51.0.11	6.0.38	51.0.11	6.0.38	51.0.8	6.0.75	6.0.34	6.0.40	6.0.34	6.0.40	51.0.1	6.0.4	51.0.2	6.1.4	51.0.1	6.1.4	-	-
	A	213-243		51.0.11	6.0.38	51.0.11	6.0.38	51.0.8	6.0.75	6.0.34	6.0.40	6.0.34	6.0.40	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	182-212		51.0.11	6.0.38	51.0.11	6.0.38	51.0.8	6.0.75	6.0.34	6.0.40	6.0.34	6.0.40	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	152-181		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	121-151		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	A	091-120		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	060-090		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	F	032-059		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
2013	D	335-365		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	N	305-334		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	O	274-304		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	S	244-273		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	A	213-243		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	182-212		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	152-181		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	121-151		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	A	091-120		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	060-090		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.80	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	F	032-059		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.80	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.80	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
2012	D	336-366		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	N	306-335		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	O	275-305		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	S	245-274		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	215-244		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	184-214		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	154-183		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	123-153		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	093-122		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	062-092		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	F	032-061		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
2011	D	335-365		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	N	305-334		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	O	274-304		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	S	244-273		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	213-243		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	182-212		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	152-181		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	121-151		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	091-120		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	060-090		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	F	032-059		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
2010	D	335-365		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.34	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	N	305-334		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.34	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5

Products Section:
Collection 006 Update Page

(Summary Changes)

http://modis-atmos.gsfc.nasa.gov/products_C006update.html

PRODUCTS

OVERVIEW
AVAILABILITY CALENDAR
COLLECTION 006
COLLECTION 051
COLLECTION 005
ACQUISITION
HDF FILENAMES
FLOW DIAGRAM

Collection 006 Update

The documents below describe Collection 6 (C6) changes to all L2 and L3 MODIS data.

C6 Atmosphere Team Webinar Series

Presentation #1:
Overview of Collection 6 Atmosphere Products and Level-1B Calibration
by Steven Platnick & Jack Xiong (06/25/2014)

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Presentation #2:
Overview of Collection 6 Dark-Target Aerosol Product
by Robert Levy (07/09/2014)

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Presentation #3:
Collection 6 'e-Deep Blue' Aerosol Products
by Andrew Sayer & Christina Hsu (07/16/2014)

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C6 Level-2 Change Summary Documents

C6 Level-2 Change Documentation

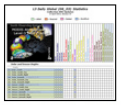
Aerosol (04_L2)	(v28, 04/08/2011)	View PDF
Aerosol, Deep Blue (04_L2)	(JGR, 2013)	View PDF
Water Vapor (05_L2)	(v27, 01/11/2010)	View PDF
Cloud Optical Summary (06_L2)	(final, 12/20/2013)	View PDF
Cloud Optical User Guide (06_L2)	(beta, 9/17/2014)	View PDF
Cloud Top (06_L2)	(ATBD, 2013)	View PDF
Cloud Top (06_L2)	(v28, 04/11/2011)	View PDF
Cloud Top (06_L2)	(PPT, 05/08/2012)	View PDF
Profiles (07_L2)	(v29, 12/26/2013)	View PDF
Profiles (07_L2)	(PPT, 06/22/2012)	View PDF
Cloud Mask (35_L2)	(v28, 04/13/2011)	View PDF
Cloud Mask (35_L2)	(ATBD, 2010)	View PDF
Cloud Mask (35_L2)	(PPT, 05/08/2012)	View PDF
Joint L2 (ATML2)	(SDSs, 12/24/2013)	View PDF

C6 Level-2 CDL File Specifications

CDL File Spec for L2 Aerosol Product (04_L2)	(03/21/2013)	View TXT
CDL File Spec for L2 Cloud Product (06_L2)	(03/28/2013)	View TXT

C6 Level-3 Change Summary Documents

C6 Level-3 Change Documentation



Global (08) - SDS Change Table	(Final C6)	View PDF
Global (08) High-Level L3 Change Summary/Status	(04/13/2013, v10)	View PDF
Global Aerosol (04->08) Parameter Mapping	(03/23/2013, v05)	View PDF

C6 Level-3 CDL File Specifications

CDL File Spec for L3 Daily (08_D3)	(9/14/2014, v3035)	View TXT
CDL File Spec for L3 Eight Day (08_E3) & Monthly (08_M3)	(9/14/2014, v3035)	View TXT

Images Section

(L1, L2, L3 Images)

http://modis-atmos.gsfc.nasa.gov/IMAGES

Global Browse of MODIS Atmosphere

Select a Satellite/Collection:

- (•) Aqua, Collection 6
- ( ) Aqua, Collection 5
- ( ) Terra, Collection 5

Enter the dates:

2014243 Start date

2014253 End date

(Format: YYYYDDD)

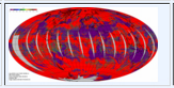
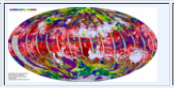
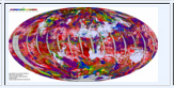
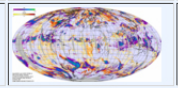
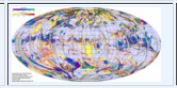
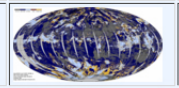
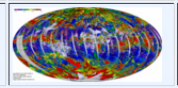
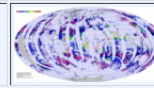
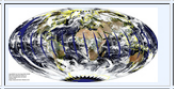
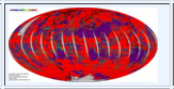
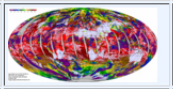
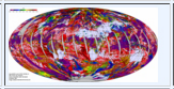
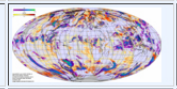
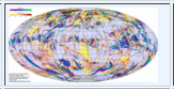
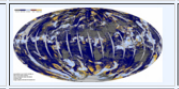
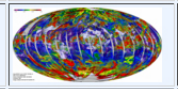
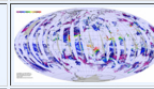
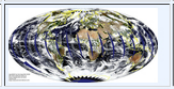
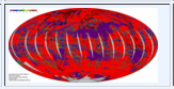
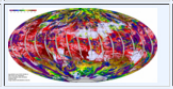
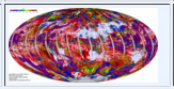
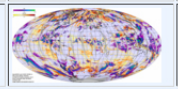
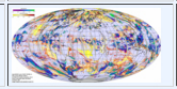
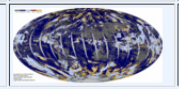
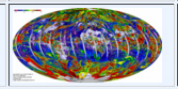
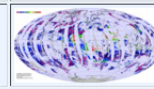
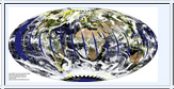
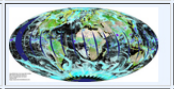
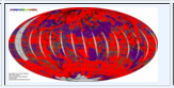
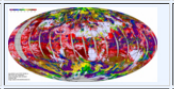
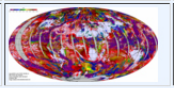
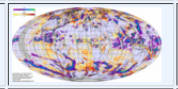
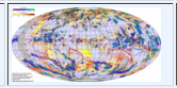
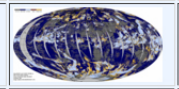
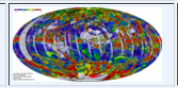
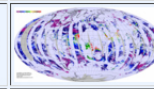
Submit Selection

Calendars:

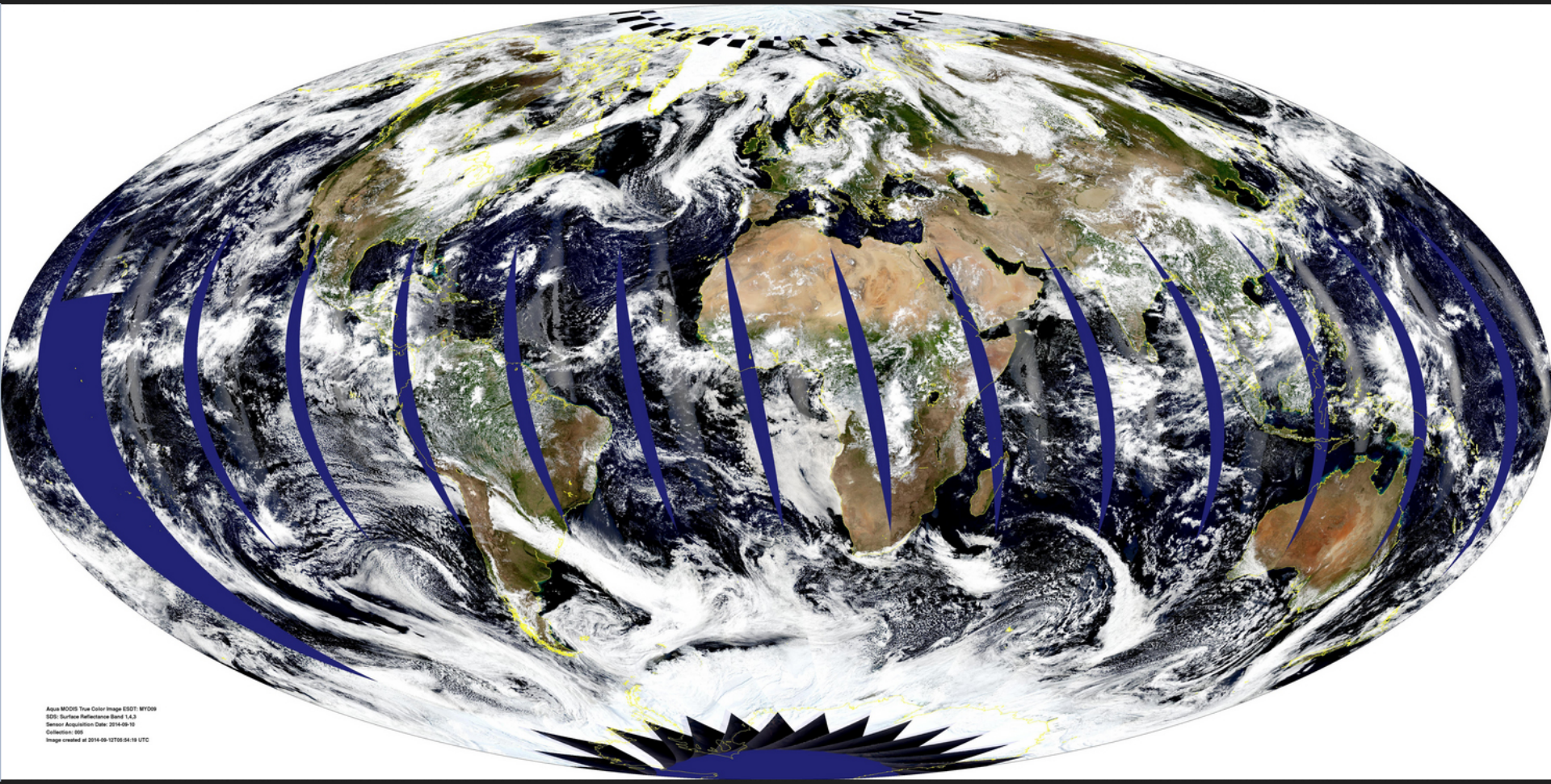
Images Availability:

Collection 6, Aqua:	2002185 - 2002365 2003001 - 2003365 2004001 - 2004366 2005001 - 2005365 2006001 - 2006365 2010365 2011001 - 2011365 2012001 - 2012366 2013001 - 2013365 2014001 - 2014253
Collection 5, Aqua:	2011269 - 2011365 2012001 - 2012366 2013001 - 2013365 2014001 - 2014255
Collection 5, Terra:	2011269 - 2011365 2012001 - 2012366 2013001 - 2013365 2014001 - 2014254

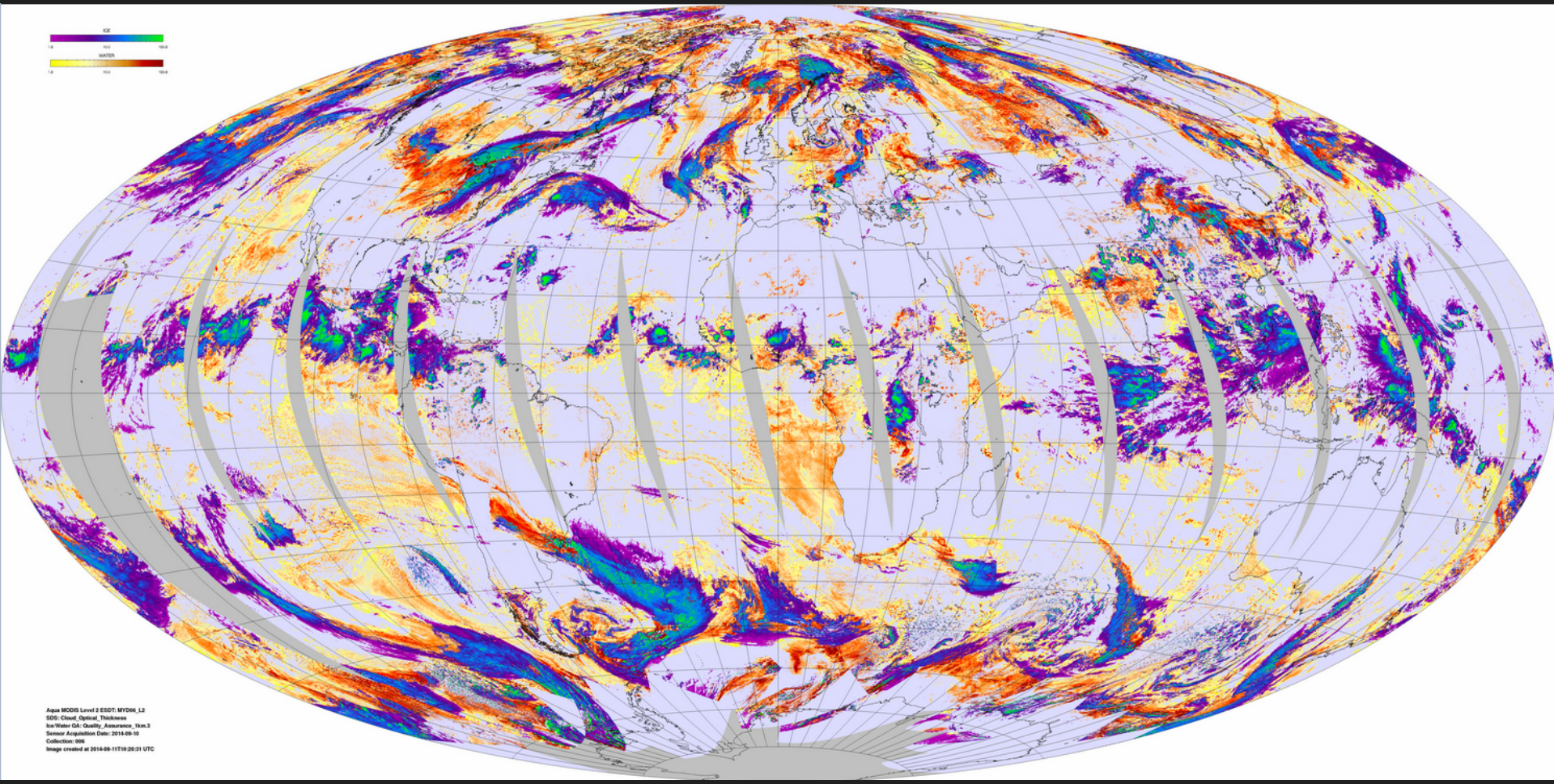
Aqua, Collection 6

Julian day		RGB True Color Image MYD09	RGB False Color Image MYD09	Cloud Fraction from Cloud Mask MYD06_L2	Cloud Top Temperature MYD06_L2	Cloud Top Pressure MYD06_L2	Cloud Optical Thickness MYD06_L2	Cloud Effective Radius MYD06_L2	Cloud Phase Infrared MYD06_L2	Cirrus Reflectance MYD06_L2	Aerosol Optical Depth Land and Ocean MYD04_L2
2014 253 09/10	Orbits										
2014 252 09/09	Orbits										
2014 251 09/08	Orbits										
2014 250 09/07	Orbits										
2014 249 09/06	Orbits										
2014 248 09/05	Orbits										
2014 247 09/04	Orbits										
2014 246 09/03	Orbits										
2014 245 09/02	Orbits										

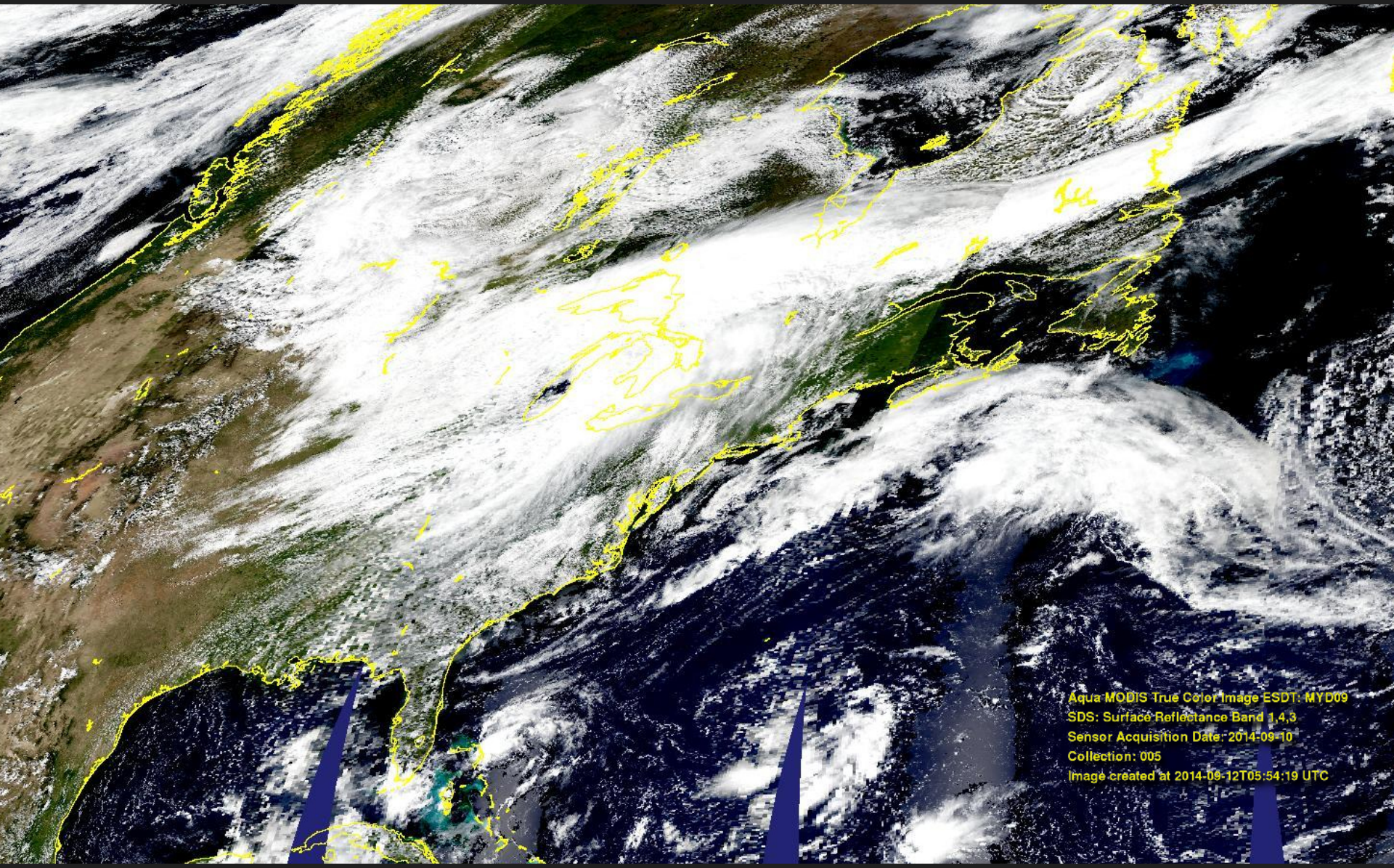
L1B Composite Image: R:G:B = 1:4:3 produces near “True Earth Color”



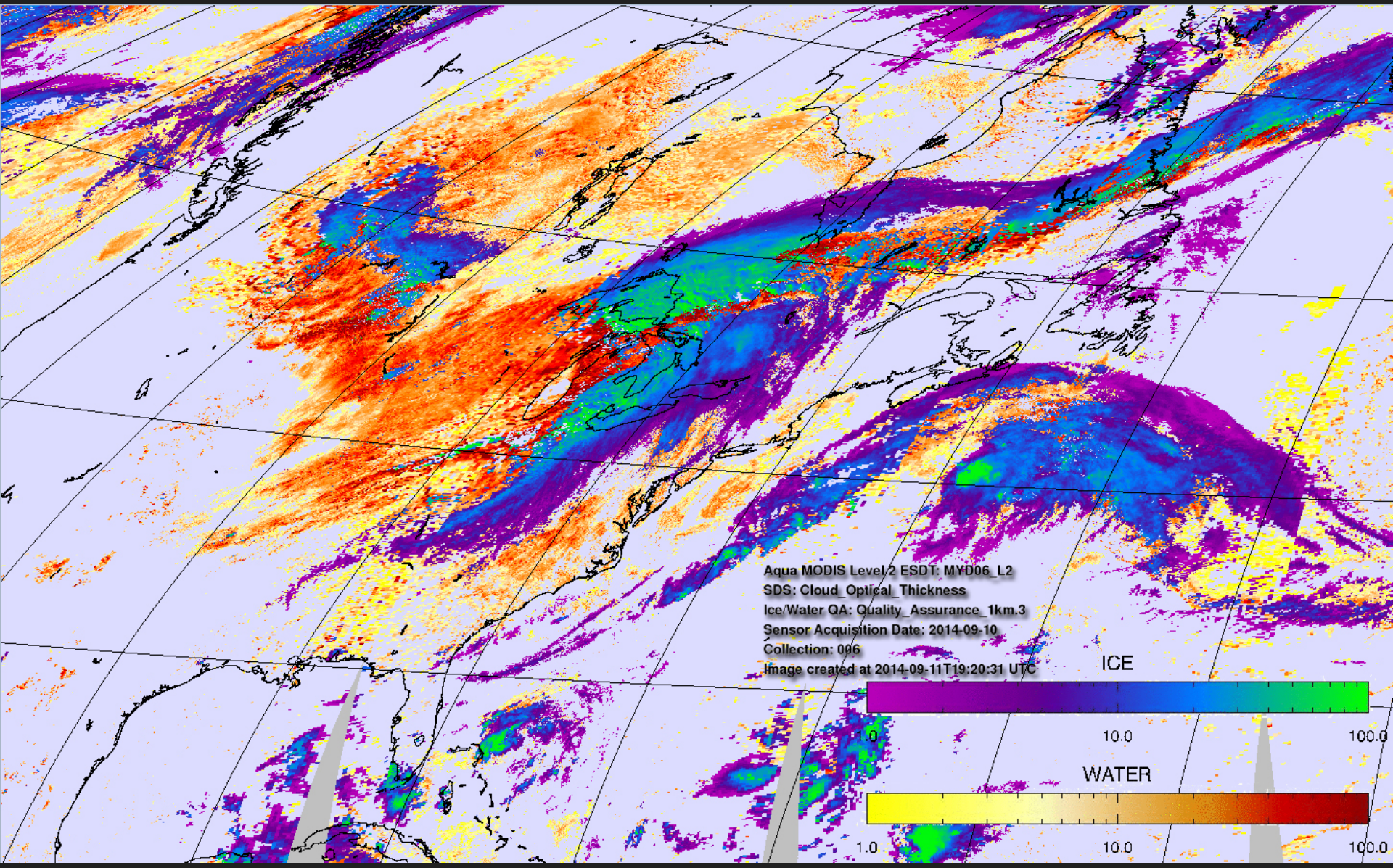
Cloud Optical Thickness: ”warm” (ROY) color bar for liquid ”cool” (GBIV) color bar for ice



Clickable Zoom of L1B Composite



Clickable Zoom of Cloud Optical Thickness



IMAGES

L1 & L2 HI-RES GLOBAL

L1B GRANULES

L3 LOW-RES DAILY

L3 LOW-RES EIGHT-DAY

L3 LOW-RES MONTHLY

L1B Granule Images

1. Select MODIS Platform and Viewing Interface for Browsing L1B Granule Images:

AQUA Platform
Day Overpass: ~1330 (LST, Equator, Asc.)
Night Overpass: ~0130 (LST, Equator, Desc.)

- JAVA ENHANCED 
- TEXT LINKS 

TERRA Platform
Day Overpass: ~1030 (LST, Equator, Desc.)
Night Overpass: ~2230 (LST, Equator, Asc.)

- JAVA ENHANCED 
- TEXT LINKS 

2. Click ***Go***:

Go!

Designed and engineered by:
Paul Hubanks Mark Gray
Bill Ridgway Jay Dinsick

Authorized by:
Dr. Michael King

IMAGES

L1 & L2 HI-RES GLOBAL

L1B GRANULES

L3 LOW-RES DAILY

L3 LOW-RES EIGHT-DAY

L3 LOW-RES MONTHLY

Menu

click to view

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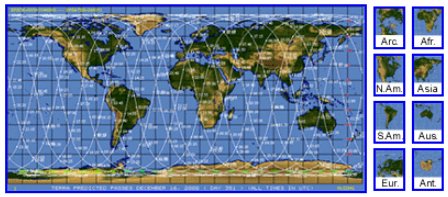
20 September 2014 (Day 263)

HELP

MODIS Orbit Track Maps (Predicted)

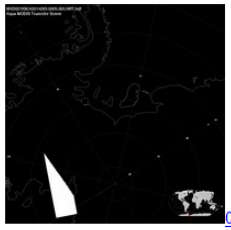
Click on thumbnail map to load full-res version. Maps by UWisc SSEC.



Arc. Afr. N.Am. Asia S.Am. Aus. Eur. Ant.

MODIS L1B Granule Images (RGB=4:3:1)

Click on thumbnail image (or UTC time tag) to load full-res version.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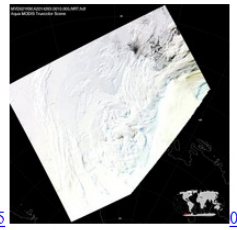
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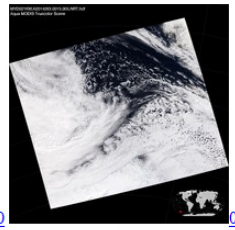
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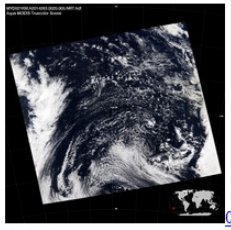
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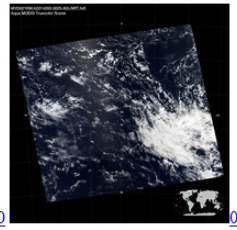
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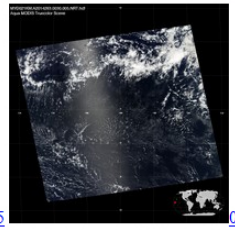
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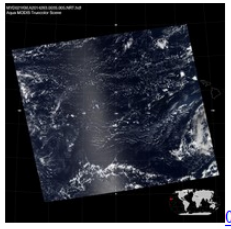
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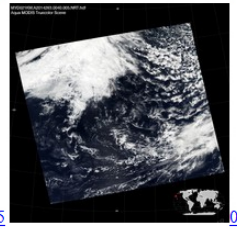
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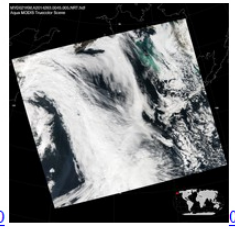
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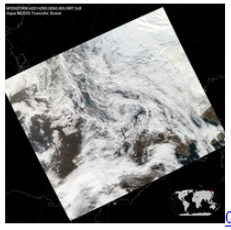
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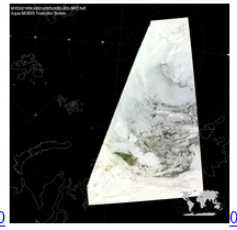
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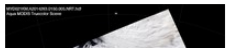
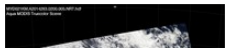
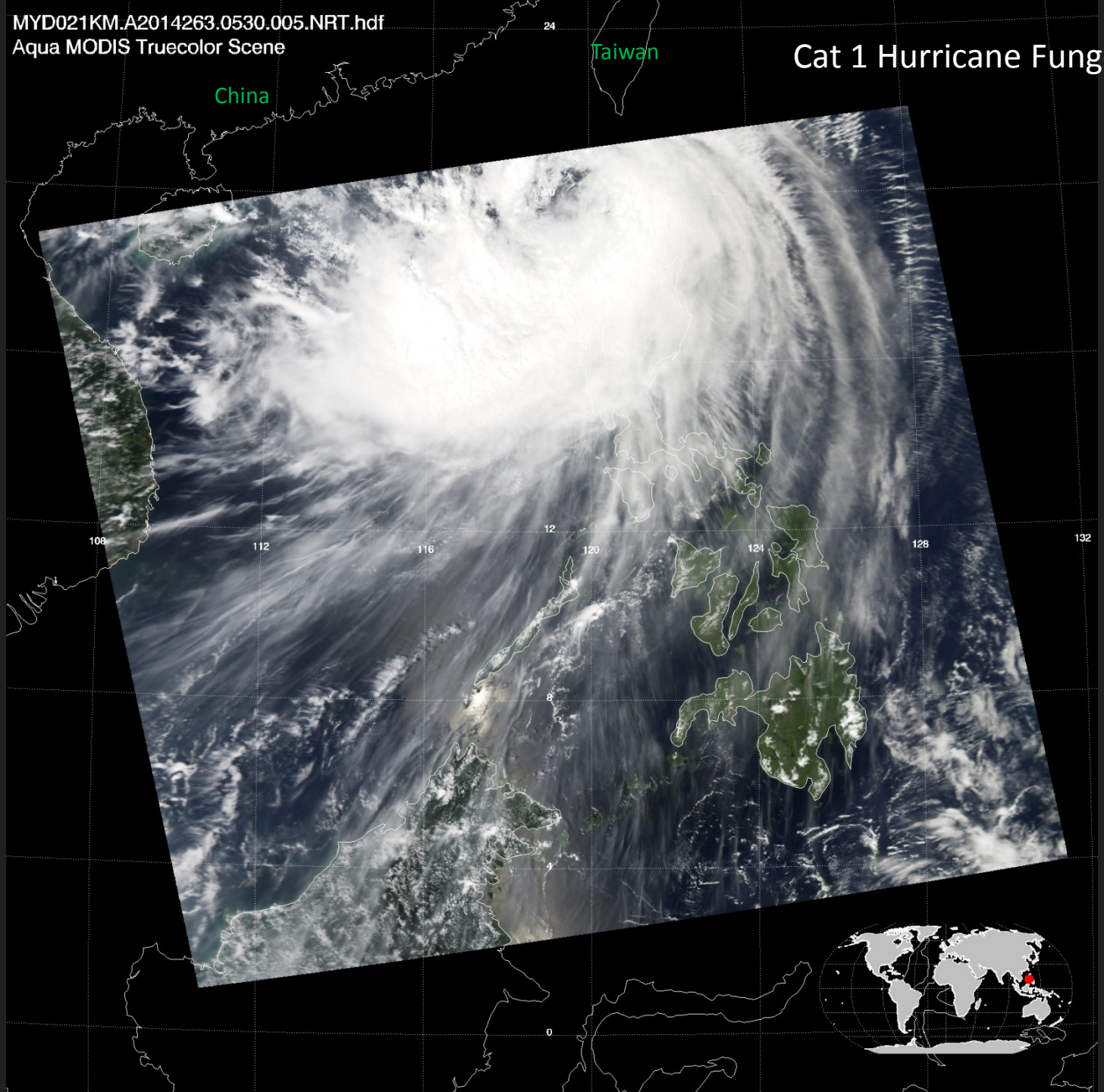
0145






MYD021KM.A2014263.0530.005.NRT.hdf
Aqua MODIS Truecolor Scene
China
Taiwan
Cat 1 Hurricane Fung-Wong
24
20
16
12
8
4
0
108
112
116
120
124
128
132


FUNG-WONG IMPACTS
SAT PM-MON
China
LOCALLY
50-100 mm
Ryukyu
Islands
Taiwan
LOW ELEVATIONS:
100-200 mm
MOUNTAINS: 250 mm
(LOCALLY 500 mm)
STRONGEST WINDS
Philippine Sea
AccuWeather.com
13:19Z 09/19/2014

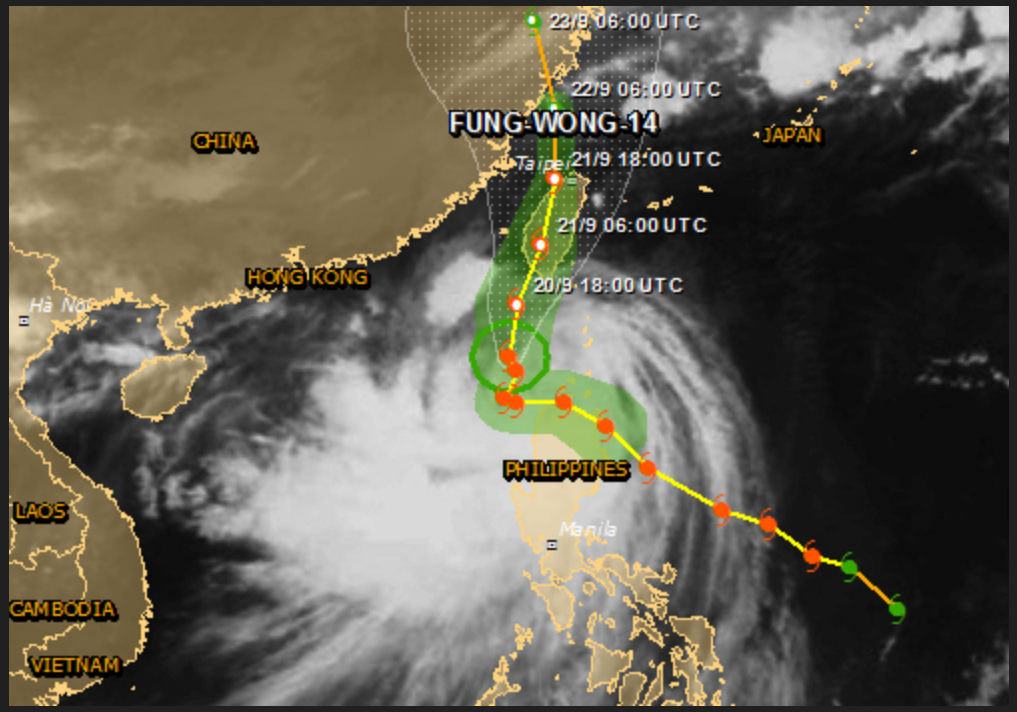

22/9 06:00 UTC
22/9 06:00 UTC
FUNG-WONG-14
CHINA
JAPAN
Taipei
21/9 18:00 UTC
21/9 06:00 UTC
HONG KONG
Ha Noi
20/9 18:00 UTC
PHILIPPINES
LAOS
Manila
CAMBODIA
VIETNAM


Photo courtesy of The Vineyard Gazette/Sam Low

IMAGES

L1 & L2 HI-RES GLOBAL

L1B GRANULES

L3 LOW-RES DAILY

L3 LOW-RES EIGHT-DAY

L3 LOW-RES MONTHLY

First: Update Selections from Available Days for Aqua or Terra

Version: Collection 6 | Collection 51 | Collection 5

Mission: Aqua

Year: 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014

Month: 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09

Day: 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10

Next: Select a Parameter Group to Load Images for Aqua 2014 09 10 (Day 253)

Parameter Group: Aerosol Global | Aerosol Land | Aerosol Ocean | Water Vapor | Cirrus | Cirrus | Cloud Top | Cloud Optical | Profiles

IMAGES

L1 & L2 HI-RES GLOBAL

L1B GRANULES

L3 LOW-RES DAILY

L3 LOW-RES EIGHT-DAY

L3 LOW-RES MONTHLY

First: Update Selections from Available Days for Aqua or Terra

Version: Collection 6 | Collection 51 | Collection 5

Mission: Aqua

Year: 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014

Month: 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08

Select Parameter Group to Load Images for Aqua 2014 08 : Lat-Lon Equal-Angle Projection

Parameter Group: Aerosol Global | Aerosol Land | Aerosol Ocean | Water Vapor | Cirrus | Cloud Top | Cloud Optical | Profiles

Select Parameter Group to Load Images for Aqua 2014 08 : Hammer-Aitoff Equal-Area Projection

Parameter Group: Aerosol Global | Aerosol Land | Aerosol Ocean | Water Vapor | Cirrus | Cloud Top | Cloud Optical | Profiles

Aqua Browse Imagery

NOTE: On the color bar Grey denotes data values equal to (or less than) the bottom scale number. Maroon denotes data values equal to (or greater than) the top scale number.

Quick Navigation Links (same day, same projection)

MYD04_L2 Aerosol Global

MYD04_L2 Aerosol Land

MYD04_L2 Aerosol Ocean

MYD05_L2 Water Vapor

MYD06_L2 Cirrus Detection

MYD06_L2 Cloud Top Properties

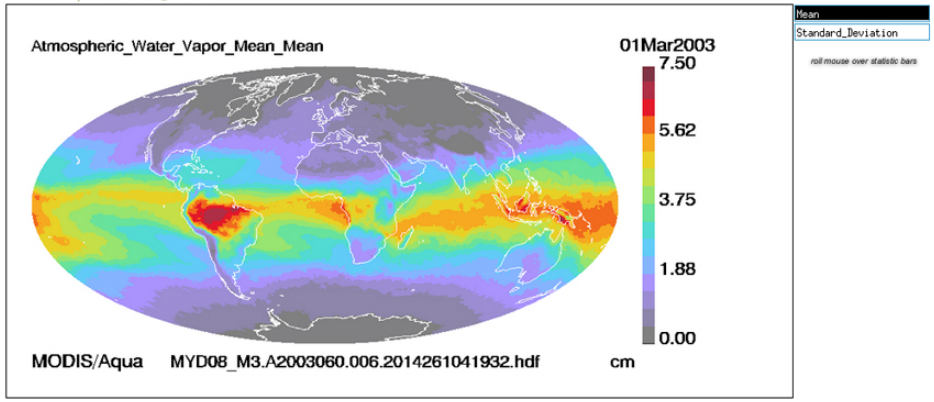
MYD06_L2 Cloud Optical Properties

MYD07_L2 Atmospheric Profile

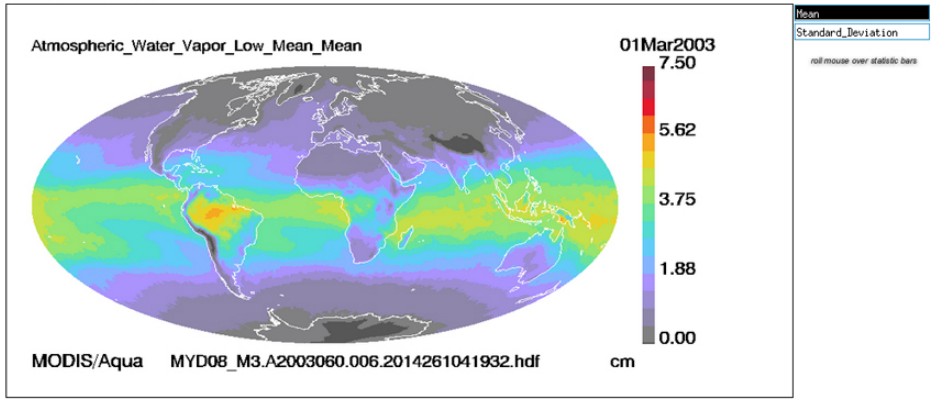
Return To Browse Menu

Load Print Friendly Version

Water Vapor



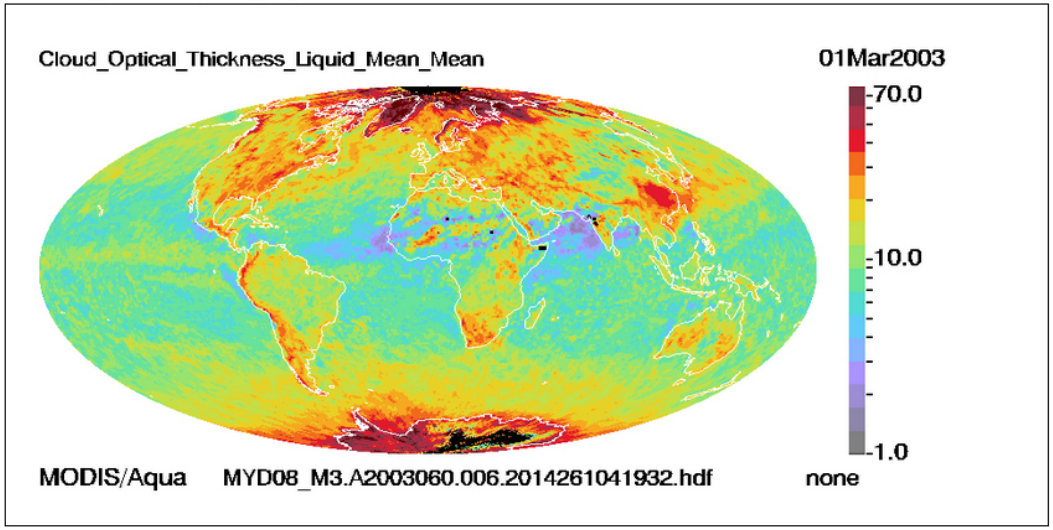
Surface to 680 hPa



440 to 10 hPa

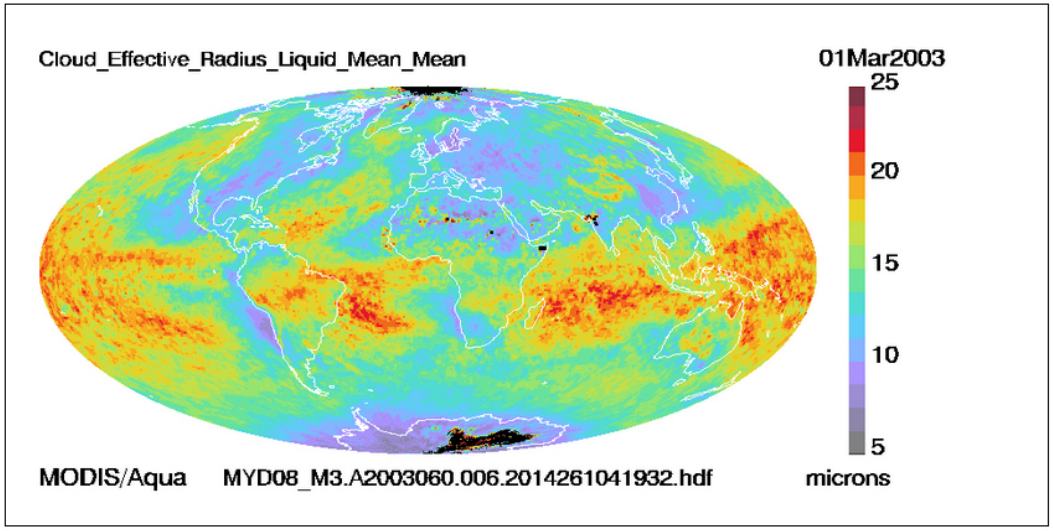
Cloud Optical Properties

Standard 2.1 µm-derived retrievals. With the exception of pixels identified as partly cloudy (PCL) by the Clear Sky Restoral (CSR) algorithm, all datasets were available in Collection 5.



Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
Combined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation
PCL_Combined		Standard_Deviation

roll mouse over statistic bars

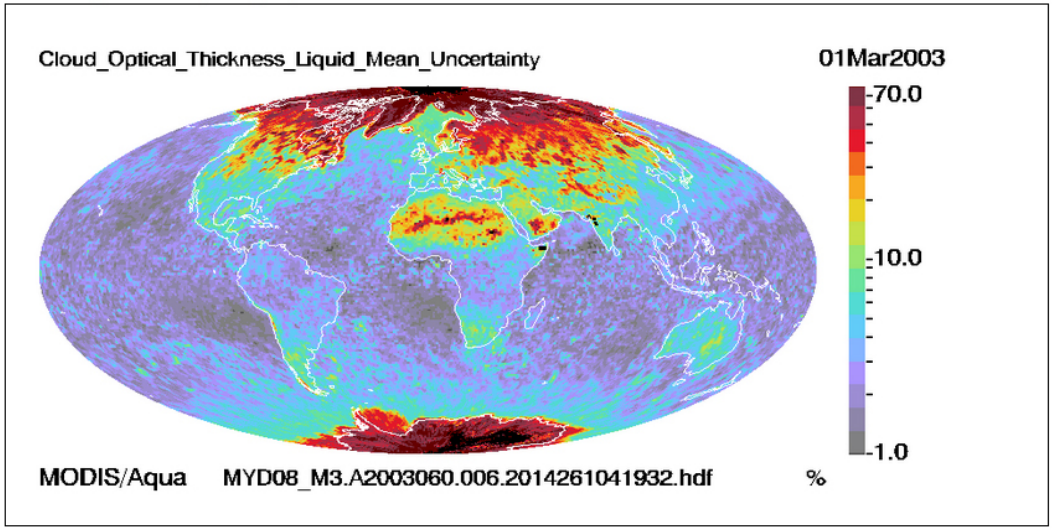


Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation

roll mouse over statistic bars

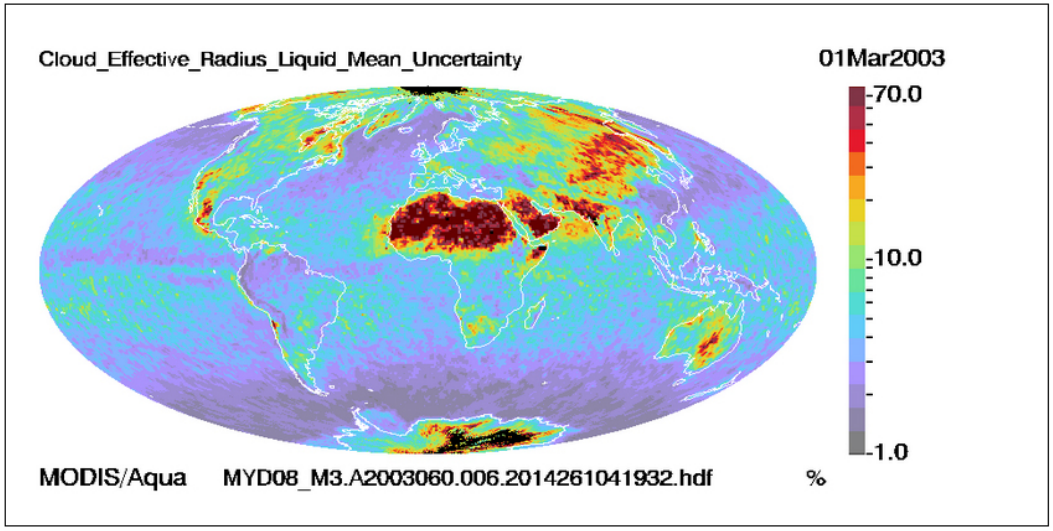
Cloud Optical Properties

Standard 2.1 µm-derived retrievals. With the exception of pixels identified as partly cloudy (PCL) by the Clear Sky Restoral (CSR) algorithm, all datasets were available in Collection 5.



Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
Combined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation
PCL_Combined		Standard_Deviation

roll mouse over statistic bars



Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation

roll mouse over statistic bars

Cloud Optical Properties

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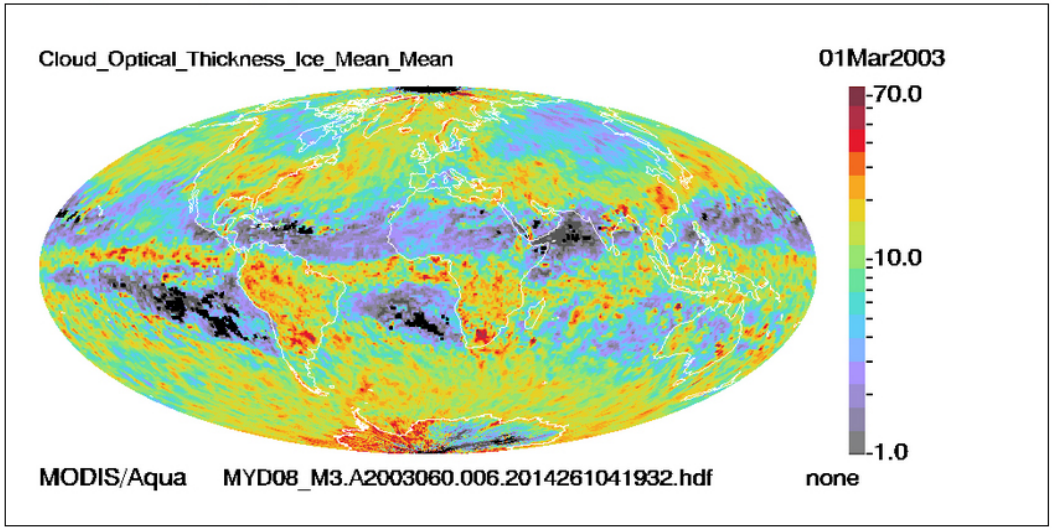
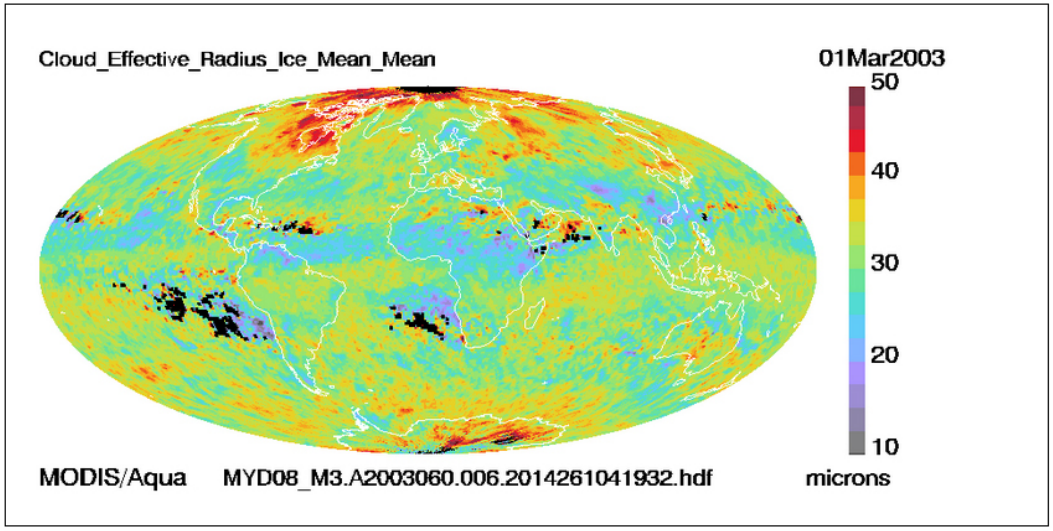


Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
Combined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation
PCL_Combined		Standard_Deviation

roll mouse over statistic bars



Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation

roll mouse over statistic bars

Cloud Optical Properties

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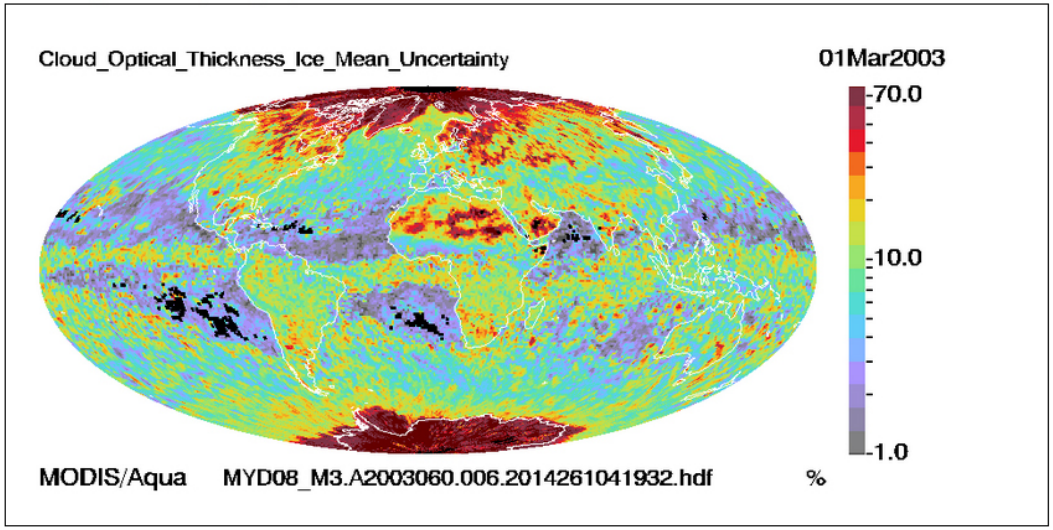
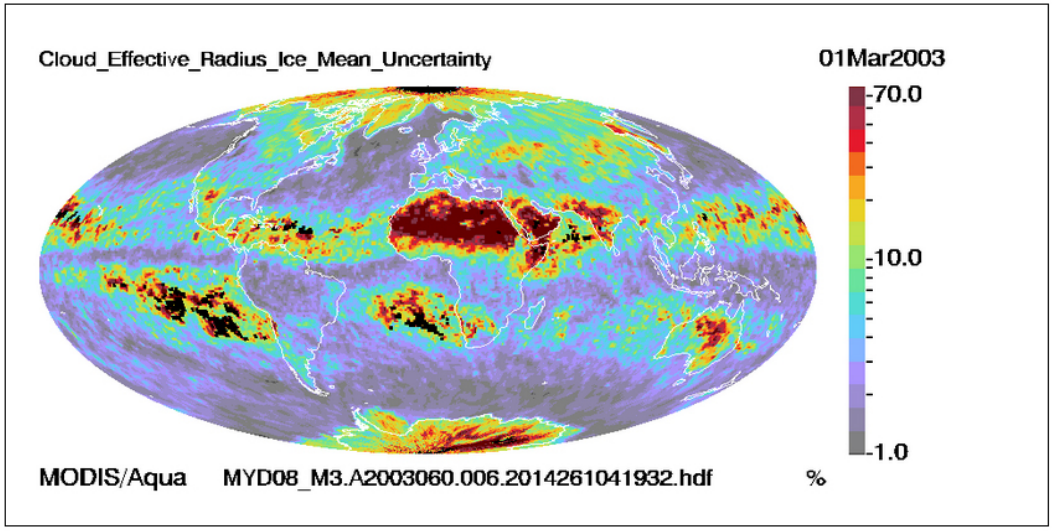


Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
Combined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation
PCL_Combined		Standard_Deviation

roll mouse over statistic bars



Liquid	Uncertainty_Mean	Standard_Deviation
Ice	Uncertainty_Mean	Standard_Deviation
Undetermined		Standard_Deviation
PCL_Liquid	Uncertainty_Mean	Standard_Deviation
PCL_Ice	Uncertainty_Mean	Standard_Deviation
PCL_Undetermined		Standard_Deviation

roll mouse over statistic bars

Data Issues Section

Known Problem Pages
of all Collection 6 L2 and L3 Products

http://modis-atmos.gsfc.nasa.gov/validation.html

DATA ISSUES

KNOWN PROBLEMS

- 04_L2 Problems
- 05_L2 Problems
- 06_L2 Problems
- 07_L2 Problems
- 35_L2 Problems
- ATML2 Problems
- 08_D3 Problems
- 08_E3 Problems
- 08_M3 Problems

Known Problems (for Collection 6)

Tracking of known problems and subsequent fixes is an important issue for MODIS data users. This page will act as a repository of all known MODIS Atmosphere Data Product problems, as well as how to determine the problematic version (and the fixed version) of the HDF data -- therefore data users should check this page for updates regularly. Data Users unfamiliar with how to properly track problems and fixes by determining the version of their downloaded HDF files should refer to the documentation at the bottom of this page.

Collection 006 Known Problems

Click on the colored buttons below to see the known problems associated with each MODIS Atmosphere data product in Collection 6.

04_L2 Aerosol | 05_L2 Water Vapor | 06_L2 Cloud | 07_L2 Atm Profile | 35_L2 Cloud Mask | ATML2 Joint Atm. | 08_D3 Daily Global | 08_E3 Eight-Day Global | 08_M3 Monthly Global

04_L2, 04_3K (Aerosol Product) Known Problems ...

- **Three Minor Issues in Aerosol Data**

Description: There are three known problems in 04_L2 (10km res.) and 04_3K (3km res.) files for Collection 6. None of these problems are planned to be fixed at this time, but could be fixed in a future delivery. The problems are:

Impact Meter

1. **Non-populating Mean_Reflectance_Ocean SDS in some scenerios (04_L2):** The SDS Mean_Reflectance_Ocean is not populating when Aerosol_Optical_Depth = 0.
2. **Long Name descriptor omission (04_L2):** There is an omission in the "long_name" local attribute for one parameter: PSML003_Ocean. It should be noted that this abbreviated SDS name is an acronym for "Particles of the Small Mode Aerosol larger than 0.03 microns". The long_name currently reads "Inferred column number concentration (number per area) of particles larger than 0.03 micron for 'best' (1) and 'average' (2) solutions"; and it should read "Inferred column number concentration (number per area) of particles of Small Mode Aerosol larger than 0.03 micron for 'best' (1) and 'average' (2) solutions".
3. **Scan_Start_Time SDS issue for 3km Aerosol (04_3K):** For the Aerosol 3km Product (04_3K), there is a bug in interpolation routine to compute SDS "Scan_Start_Time", causing some incorrect values. Scanline 1 in the 04_3K granule has the correct start time. However an interpolation error causes the start time to increment too fast for subsequent scans, and by the end of the 04_3K granule, the start time is off by nearly 7000 seconds (nearly 12 minues).

Impact: Low

Data Dates Affected: 7/2002-current

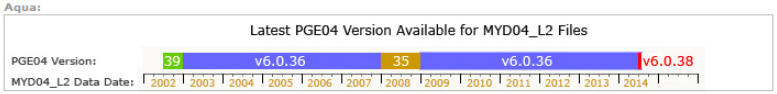
Platform Affected: Aqua Only

Problematic Data		Corrected Data	
PGE Version	**Production Dates**	**PGE Version**	**Production Dates**
≤ PGE04 v6.0.39	≤ Current Date	(Not Corrected)	(Not Corrected)

Latest PGE Version Available (by Data Date)

Shown below is a bar chart graphic summarizing the latest Product Generation Executive (PGE) Version used to produce Collection 6 (C6) 04_L2 HDF files available for public distribution (download) in the LAADS data archive. This graphical representation gives MODIS data users a summary guide (digestable at a glance) on how the PGE Version varies across the multi-year data record. Each PGE version contains a unique set of fixes and improvments and show where data quality discontinuities can occur. If MODIS data users have older versions of any of the data shown below, they should download the newer (more correct) version from either: LAADS FTP (Download C6 MYD04_L2 Data) or LAADS Web (Search & Order MODIS Data)

Aqua:



PGE Version Key

- v6.0.35 = Initial version used to process 2002, 2003, & 2008 as first-cut C6 data testbed. Data from 2002 & 2003 was later replaced.
- v6.0.36 = Minor update to remove the "PGE04:" prefix from the PGEVERSION in the HDF header file metadata.
- v6.0.38 = Latest version of PGE04 being used to produce both MYD04_L2 and corrected MYD05_L2 using un-aggregated L1B input.
- v6.0.39 = Special PGE used to reprocess & correct MYD05_L2 files only (using un-aggregated L1B input). Mistake using this in 2002.

DATA ISSUES

KNOWN PROBLEMS

- 04_L2 Problems
- 05_L2 Problems
- 06_L2 Problems
- 07_L2 Problems
- 35_L2 Problems
- ATML2 Problems
- 08_D3 Problems
- 08_E3 Problems
- 08_M3 Problems

Known Problems (for Collection 6)

Tracking of known problems and subsequent fixes is an important issue for MODIS data users. This page will act as a repository of all known MODIS Atmosphere Data Product problems, as well as how to determine the problematic version (and the fixed version) of the HDF data -- therefore data users should check this page for updates regularly. Data Users unfamiliar with how to properly track problems and fixes by determining the version of their downloaded HDF files should refer to the documentation at the bottom of this page.

Collection 006 Known Problems

Click on the colored buttons below to see the known problems associated with each MODIS Atmosphere data product in Collection 6.

04_L2 Aerosol | 05_L2 Water Vapor | 06_L2 Cloud | 07_L2 Atm Profile | 35_L2 Cloud Mask | ATML2 Joint Atm. | 08_D3 Daily Global | 08_E3 Eight-Day Global | 08_M3 Monthly Global

05_L2 (Water Vapor Product) Known Problems ...

- **Bad Near-Infrared (NIR) Water Vapor Data**

Description: There was a problem in the Near IR (NIR) Water Vapor Product in Collection 006 related to the use of re-aggregated L1B as input. The solution was to use the original non-aggregated L1B and reprocess the entire Aqua data record.

Impact Meter

Impact: High

Data Dates Affected: 7/2002-7/2014

Platform Affected: Aqua Only

Problematic Data		Corrected Data	
PGE Version	**Production Dates**	**PGE Version**	**Production Dates**
≤ PGE04 v6.0.37	≤ 2014 191 (7/10/2014)	≥ PGE04 v6.0.38	≥ 2014 195 (7/14/2014)

Latest PGE Version Available (by Data Date)

Shown below is a bar chart graphic summarizing the latest Product Generation Executive (PGE) Version used to produce Collection 6 (C6) 05_L2 HDF files available for public distribution (download) in the LAADS data archive. This graphical representation gives MODIS data users a summary guide (digestable at a glance) on how the PGE Version varies across the multi-year data record. Each PGE version contains a unique set of fixes and improvments and show where data quality discontinuities can occur. If MODIS data users have older versions of any of the data shown below, they should download the newer (more correct) version from either: LAADS FTP (Download C6 MYD05_L2 Data) or LAADS Web (Search & Order MODIS Data)

Aqua:

PGE Version Key

v6.0.38 = Latest forward-stream version producing both MYD04_L2 & corrected MYD05_L2 using un-aggregated L1B input.

v6.0.39 = Reprocess MYD05_L2 files only: 1.) correct WV NIR using un-aggregated L1B input & 2.) correct WV IR Night from 07_L2.

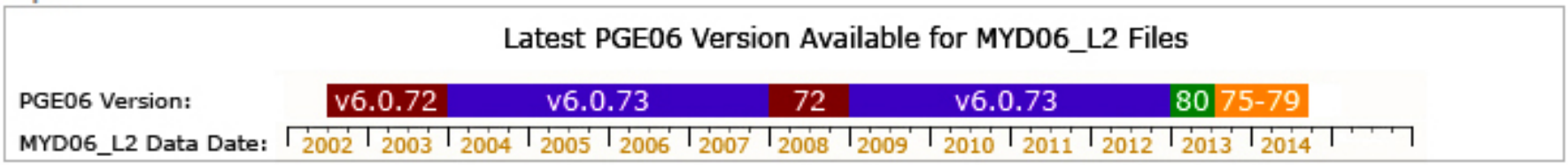
A Closer Look at the “Latest PGE Version Available” Graphic

Sample for PGE06 (Aqua) that creates 06_L2 (Cloud Product) HDF Files:

Latest PGE Version Available (by Data Date)

Shown below is a bar chart graphic summarizing the latest Product Generation Executive (PGE) Version used to produce Collection 6 (C6) 06_L2 HDF files available for public distribution (download) in the LAADS data archive. This graphical representation gives MODIS data users a summary guide (digestable at a glance) on how the PGE Version varies across the multi-year data record. Each PGE version contains a unique set of fixes and improvments and show where data quality discontinuities can occur. If MODIS data users have older versions of any of the data shown below, they should download the newer (more correct) version from either: LAADS FTP (Download C6 MYD06_L2 Data) or LAADS Web (Search & Order MODIS Data)

Aqua:

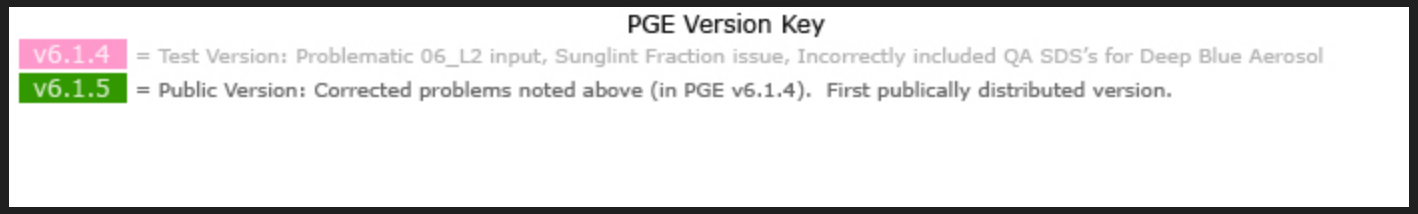


PGE Version Key

- v6.0.72 = Initial version used to process 2002, 2003, and 2008 as first-cut C6 data testbed.
- v6.0.73 = Correction to handle a single GDAS file (ancillary input), under normal circumstances there are two GDAS files input.
- v75 -79 = Due to an error in integration, this version did not fix an issue that began in data year 2013. (Replace files with v6.0.80)
- v6.0.80 = Correction to handle new Albedo files (ancillary input) for data years 2013 & beyond; ASL update; Cap Tau16 & 37 at 150.

Now for L3 Processing Status!
"Latest PGE Version Available" Graphics

PGE56 creates 08_D3 (Daily) PGE70 creates 08_E3 (Eight Day) PGE57 creates 08_M3 (Monthly)



*Upshot: C6 L3 Data (for Aqua) is now available from July 2002 – Dec 2012

PRODUCTS

OVERVIEW
AVAILABILITY CALENDAR
COLLECTION 006
COLLECTION 051
COLLECTION 005
ACQUISITION
HDF FILENAMES
FLOW DIAGRAM

Processing and Availability Calendar

Last Updated: Tuesday, 23-September-2014 6:00 AM EDT

=006 =006 (Reprocessing Soon) =051 =051 (No Deep Blue) = Not Yet Processed = No Instrument Data 5.0.1 = PGE Version

				Level 2 Products										Level 3 Products					
				PGE04 History		PGE06 History		PGE03 History		PGE83 History		PGE56 History		PGE70 History		PGE57 History	
			DATA DATE	AEROSOL 04_L2		H2O VAPOR 05_L2		CLOUD 06_L2		PROFILE 07_L2		CLD.MASK 35_L2		JOINT ATML2		DAILY 08_D3		EIGHT DAY 08_E3		MONTHLY 08_M3	
Y	M	JulianDays		Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua	Terra	Aqua
2014	S	244-273		51.0.11	6.0.38	51.0.11	6.0.38	51.0.8	6.0.75	6.0.34	6.0.40	6.0.34	6.0.40	51.0.1	6.0.4	51.0.2	6.1.4	51.0.1	6.1.4	-	-
	A	213-243		51.0.11	6.0.38	51.0.11	6.0.38	51.0.8	6.0.75	6.0.34	6.0.40	6.0.34	6.0.40	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	182-212		51.0.11	6.0.38	51.0.11	6.0.38	51.0.8	6.0.75	6.0.34	6.0.40	6.0.34	6.0.40	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	152-181		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	121-151		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	A	091-120		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	060-090		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	F	032-059		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
2013	D	335-365		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	N	305-334		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	O	274-304		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	S	244-273		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	A	213-243		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	182-212		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	152-181		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	121-151		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	A	091-120		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.75	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	M	060-090		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.80	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	F	032-059		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.80	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.80	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.4	51.0.1	6.1.4	51.0.1	6.1.4
2012	D	336-366		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	N	306-335		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	O	275-305		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	S	245-274		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	215-244		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	184-214		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	154-183		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	123-153		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	093-122		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	062-092		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	F	032-061		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
2011	D	335-365		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	N	305-334		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	O	274-304		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	S	244-273		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	213-243		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	182-212		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	152-181		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	121-151		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	A	091-120		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	M	060-090		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.39	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	F	032-059		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	J	001-031		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.39	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
2010	D	335-365		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.34	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5
	N	305-334		51.0.11	6.0.36	51.0.11	6.0.39	51.0.8	6.0.73	6.0.34	6.0.34	6.0.34	6.0.34	51.0.1	6.0.7	51.0.2	6.1.5	51.0.1	6.1.5	51.0.1	6.1.5

News Section

What's New Page

http://modis-atmos.gsfc.nasa.gov/news.html

What's New

- Updated the Collection 6 Known Problems section, which describes known issues in MODIS Atmosphere Data Products. Tracking of known problems and subsequent fixes is an important issue for MODIS data users. This section will act as a repository of all known MODIS Atmosphere Data Product problems, as well as how to determine the problematic version (and the fixed version) of the HDF data. (16 September 2014)

- Updated the MODIS Data Products Calendar, which shows the processing status, data availability, and PGE version evolution for all MODIS Atmosphere HDF data products. The calendar was updated to show the Collection 006 (green shading) processing status. (16 September 2014)

- Updated the Collection 006 Documentation page with new weekly Webinar presentations. (16 September 2014)

- Selected Collection 6 L3 Images are available for viewing. (16 September 2014)

- Updated the Collection 006 Documentation for Level-3. Included are Release Documents for C006 Products. (11 January 2014)

- Updated the Cloud Top Properties and Cloud Phase - Algorithm Theoretical Basis Document for Collection 006, (13 April 2013)

- Updated the Collection 006 Documentation (Prior To Release). (22 June 2012)

- An updated version of the MODIS Atmosphere Quality Assurance (QA) Plan is available. This plan contains corrections to the to the Cloud Mask Quality_Assurance Bit Flags listed on pages 32-35. (17 January 2012)

- Corrected the Cloud Mask Format and Content page, pointing users to the new QA Plan linked above. The QA Plan listed corrected details to the Coud Mask Quality_Assurance Bit Flag interpretation. (17 January 2012)

- Added Hi-Res Mosaic images for L1B and selected L2 parameters. (5 October 2011)

- Updated the Staff page. (5 October 2011)

- Updated the MODIS Data Products Calendar, which shows the processing status, data availability, and PGE version evolution for all MODIS Atmosphere HDF data products. The calendar was updated to show the Collection 051 (yellow shading) processing status. (5 October 2011)

- Added the Cloud Mask Users Guide in the SPOTLIGHT section. This document is linked from the Home page, in the Cloud Mask Format and Content Section, and in the References section. (15 August 2011)

Reference Section

(Publications, Presentation, ATBD's and Plans)

http://modis-atmos.gsfc.nasa.gov/reference

Publications for ALL YEARS

Also: 2014 2013 2012 2011 2010 2009 2008 2007 2006 2005 2004 2003 2002 2001 2000 1999 1998 1997 1996 1995 1994 1993 1992 1991 1990 1989 1988 1987 1986 1985 1984 1983 1982 1981 1980 1979 1978 1976 ALL YEARS

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REFERENCE

PUBLICATIONS
PRESENTATIONS
ATBDs & PLANS

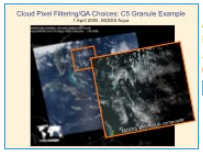
Presentations

Some of the PowerPoint files offered below contain QuickTime movies. For these files, one must download the QuickTime movies individually (links are provided below each PowerPoint presentation). Note that Microsoft PowerPoint and Apple QuickTime must be used to view these files. If you do not have PowerPoint and/or QuickTime, you may download a free version by clicking on the appropriate logo (right). These presentations may be freely reused without copyright restrictions.

PowerPoint Presentations

2012

Sensitivity of Marine Warm Cloud Retrieval Statistics to Algorithm Choices: Examples from MODIS Collection 6 Development Code



Steve Platnick, Gala Wind, Zhibo Zhang, Hyoun-Myoung Cho, G. T. Arnold, Michael D. King, Steve Ackerman, Brent Maddux
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AGU Fall Meeting, San Francisco, CA
6 December 2012
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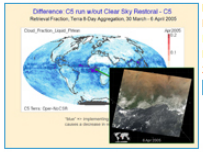
Boundary Layer Cloud Characterization with Passive Satellite Imagers: Capabilities, Limitations, Future Needs



Platnick, Zhang, Hubanks, Holz, Pincus, Ackerman, Maddux, et al.
NASA GSFC, UMBC/GEST, Wyle, U. Wisconsin/CIMSS, CIRES/CU
Innovative Satellite Observations to Characterize the Cloudy Boundary Layer
Keck Institute for Space Studies, Cal Tech
21-24 September 2010
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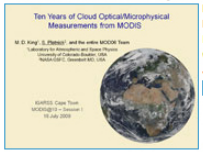
Ten Years of Cloud Optical/Microphysical Measurements from MODIS



Platnick, King
NASA/GSFC, U. of Colorado
IGARSS Cape Town SAFARI 2000 – Session I
Cape Town, South Africa
July 2009
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Optical and Microphysical Satellite Retrievals of Marine Stratocumulus Clouds off the Atlantic Coast of Southern Africa

Platnick, King, Hubanks, Wind, Arnold
NASA/GSFC, U. of Colorado, Wyle, SSAI
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Aerosols, Clouds, and Climate

King

ATBDs & Plans

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QA Plan

MODIS Atmosphere QA Plan for Collection 006
(includes Deep Blue Aerosol, Atmosphere Profile, Cloud Top, Cloud Optical, & Cloud Mask updates)
Version 5 (17 September 2014)
Hubanks, et.al
View

User's Guides

Cloud Mask User's Guide for Collection 005
Version 1.0 (2008)
Strabela
View

Algorithm Theoretical Basis Documents

Aerosol (04_L2)

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Remer, Tanre, Kaufman, Levy, & Mattoo, 2009:
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Menzel, Frey, Baum, 2013:
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Products: 06_L2 (OD). View

Tools Section

(Reading, Manipulating, and Visualizing HDF Files)

http://modis-atmos.gsfc.nasa.gov/tools.html

TOOLS

Tool Type
GRAPHICAL INTERFACE
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Forum
HDF-EOS USER FORUM

Graphical User Interface Tools

Panoply

Panoply \PAN-uh-plee\, noun: 1. "A splendid or impressive array". Panoply is a cross-platform application that plots geo-gridded and other arrays from netCDF, HDF, GRIB, and other datasets. With Panoply 4 you can: 1.) Slice and plot geo-gridded latitude-longitude, latitude-vertical, longitude-vertical, or time-latitude arrays from larger multidimensional variables. 2.) Slice and plot "generic" 2D arrays from larger multidimensional variables. 3,) Slice 1D arrays from larger multidimensional variables and create line plots. 4.) Combine two geo-gridded arrays in one plot by differencing, summing or averaging. 5.) Plot lon-lat data on a global or regional map using any of over 100 map projections or make a zonal average line plot. 6.) Overlay continent outlines or masks on lon-lat map plots. 7.) Use any of numerous color tables for the scale colorbar, or apply your own custom ACT, CPT, or RGB color table. 8.) Save plots to disk GIF, JPEG, PNG or TIFF bitmap images or as PDF or PostScript graphics files. 9.) Export lon-lat map plots in KMZ format. 10.) Export animations as AVI or MOV video or as a collection of invididual frame images. 11.) Explore remote THREDDS and OpenDAP catalogs and open datasets served from them. ACQUIRE ▸▸

Cost: Free
Current Version: 4.0.4
Release Date: July 2014
Requirements: Platform & operating system specific
- Requires Java SE 6 runtime environment, or better, installed.

Rating: ★★★★★
Development Team:
- Dr. Robert B. Schmunk (NASA GISS)

Compatibility:

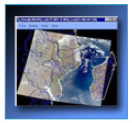
Macintosh
- OS-X

Microsoft Windows
- Windows 7
- Windows 8

Generic Version
- Linux
- OS/2

New GUI viz tool!
Panoply \PAN-uh-plee\
noun: 1. "A splendid or impressive array".

HDFLook



A basic processing and visualization tool for MODIS HDF data within *X-Window* computer environments, HDFLook can visualize structures of an HDF file including: scientific data sets (SDS), vector arrays (Vdatas and Vgroups), and raster images (24 bits or 8 bits with a look-up table). HDFLook can visualize slices of data (up to 6 indexes), display global and local attributes, and automatically detect fill values. HDFLook can also extract SDS ancillary data, export (raw or calibrated) SDS records to binary or HDF files, build reprojected SDS or RGB mosaics, export RGB images to JPEG or HDF files, and print RGB images. For programmers who routinely want jpgs or binary files, HDFLook can be run non-interactively with simple command files to routinely make images or export binary files from hdf (see *HDFLook: How To Examples*). For a more powerful tool, users should consider Msphinx (see below) which incorporates HDFLook as its HDF-EOS reader interface. It should be noted that HDFLook and Msphinx are the only known *graphical user interface* tools that can (correctly and fully) read and visualize the new L2 Joint Atmosphere product. ACQUIRE ▸▸

Cost: Free
Current Version: 6.4
Release Date: June 2005
Requirements: Platform & operating system specific
Rating: ★★★★★
Development Team:
- Laboratoire d'Optique Atmosphérique / U. Lille
- University of Maryland / MODLAND GSFC-923
- Distributed Active Archive Center (DAAC) / GSFC-902

Compatibility:

Macintosh
- OS-X 10.3 Panther
- OS-X 10.2 Jaguar

Linux
- Power PC
- Intel
- Cygwin

Unix
- SUN - Solaris 5.7
- SGI - IRIX 6.5
- IBM - AIX 4.3.2
- HP - HP-UX 10.2
- DEC - OSF/1 v4.0

HYDRA

HYDRA (HYperspectral-viewer for Development of Research Applications) is a freeware-based multispectral data analysis toolkit for satellite data to assist research and development of remote sensing applications as well as education and training of remote sensing scientists. HYDRA provides a fast and flexible interface that allows users to explore and visualize relationships between radiances (or reflectances and brightness temperatures) and wavelength (or wavenumber) using spectra diagrams, cross sections, scatter plots, multi-channel combinations, and color enhancements on a pixel by pixel basis with full access to the underlying metadata of location and time. HYDRA enables

Cost: Free
Current Version: 1.8
Release Date: March 2005
Requirements: Platform & operating system specific
Rating: ★★★★★
Development Team:
- Space Science and Engineering Center / U. Wisconsin
(Tom Rink, Tom Whittaker, Paul Menzel, Paolo Antonelli, Kevin Baggett)

Compatibility:

Microsoft Windows
- Windows XP

Macintosh
- OS-X

Linux
- RedHat

Specific Product Sections

Each MODIS Atmosphere Data Product
has it's own "Section" for added detail

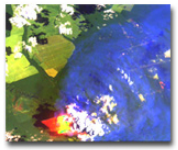
Example Links:
http://modis-atmos.gsfc.nasa.gov/MOD04_L2
http://modis-atmos.gsfc.nasa.gov/MOD06_L2

http://modis-atmos.gsfc.nasa.gov/MOD08_D3
http://modis-atmos.gsfc.nasa.gov/MOD08_M3

Introduction

Product Description

The MODIS Aerosol Product 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 data are produced at the spatial resolution of a 10x10 1-km (at nadir)-pixel array. There are two MODIS Aerosol data product files: **MOD04_L2**, containing data collected from the Terra platform; and **MYD04_L2**, containing data collected from the Aqua platform.



Biomass burning in Brazil generates massive amounts of atmospheric aerosols

Research and Application

Aerosols are one of the greatest sources of uncertainty in climate modeling. Aerosols vary in time in space and can lead to variations in cloud microphysics, which could impact cloud radiative properties and climate. The MODIS aerosol product is 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 to describe the accumulation mode particles (radius < 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.

Additional Information

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
File Frequency: 144/day
Data Format: HDF

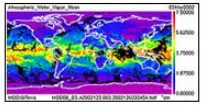
DAILY GLOBAL

Introduction
INTRODUCTION
F.A.Q.
GRIDS & MAPPING
Production
BROWSE IMAGERY
KNOWN PROBLEMS
MODIFICATION HISTORY
FORMAT & CONTENT
FILE SPEC ★
Acquisition
ACQUIRING DATA
HDF FILENAMES
Investigation
ANALYSIS TOOLS
THEORETICAL BASIS
VALIDATION
Creation
SOFTWARE ★
PRODUCTION PLAN
SUPPORT TEAM

★ for the developer

Introduction

Product Summary



The Level-3 MODIS Atmosphere Daily Global Product contains roughly 600 statistical datasets that are derived from approximately 80 scientific parameters from four Level-2 MODIS Atmosphere Products: Aerosol, Water Vapor, Cloud, and Atmosphere Profile. There are two MODIS Daily Global data product files: **MOD08_D3**, containing data collected from the Terra platform; and **MYD08_D3**, containing data collected from the Aqua platform.

A range of statistical summaries are computed, depending on the parameter being considered. Statistics for a given measurement might include:

- Simple (mean, minimum, maximum, standard deviation) statistics
- Parameters of normal and log-normal distributions
- Fraction of pixels that satisfy some condition (e.g. cloudy, clear)
- Histograms of the quantity within each grid box
- Histograms of the confidence placed in each measurement
- Histograms and/or regressions derived from comparing one science parameter to another, statistics may be computed for a subset that satisfies some condition

Statistics are sorted into 1 by 1 degree cells on an equal-angle grid that spans a 24-hour (0000 to 2400 Greenwich Mean Time) interval and then summarized over the globe. It should be noted that browse images (see links at left) are available in both the native equal-angle (lat-lon) grid as well as an equal-area (hammer-aitoff) grid.

Data Documentation (Primer on Computation)

Users working with Level-3 (L3) Daily, Eight-day, or Monthly Global Gridded MODIS data (at 1 degree resolution) are advised to become familiar with the Level-3 Algorithm Theoretical Basis Document. This document details characteristics, properties, and content of Level-3 data. Also included in this document are user caveats and frequently asked questions. The L3 ATBD is linked on the above 'QA Plan & ATBDs' page, as well as individual 'Theoretical Basis' pages in the L3 product sections. The link for the 'Theoretical Basis' page in the L3 Monthly product section is provided below. It should be noted that there is only one L3 ATBD for all L3 products (Daily, Eight-day, & Monthly).

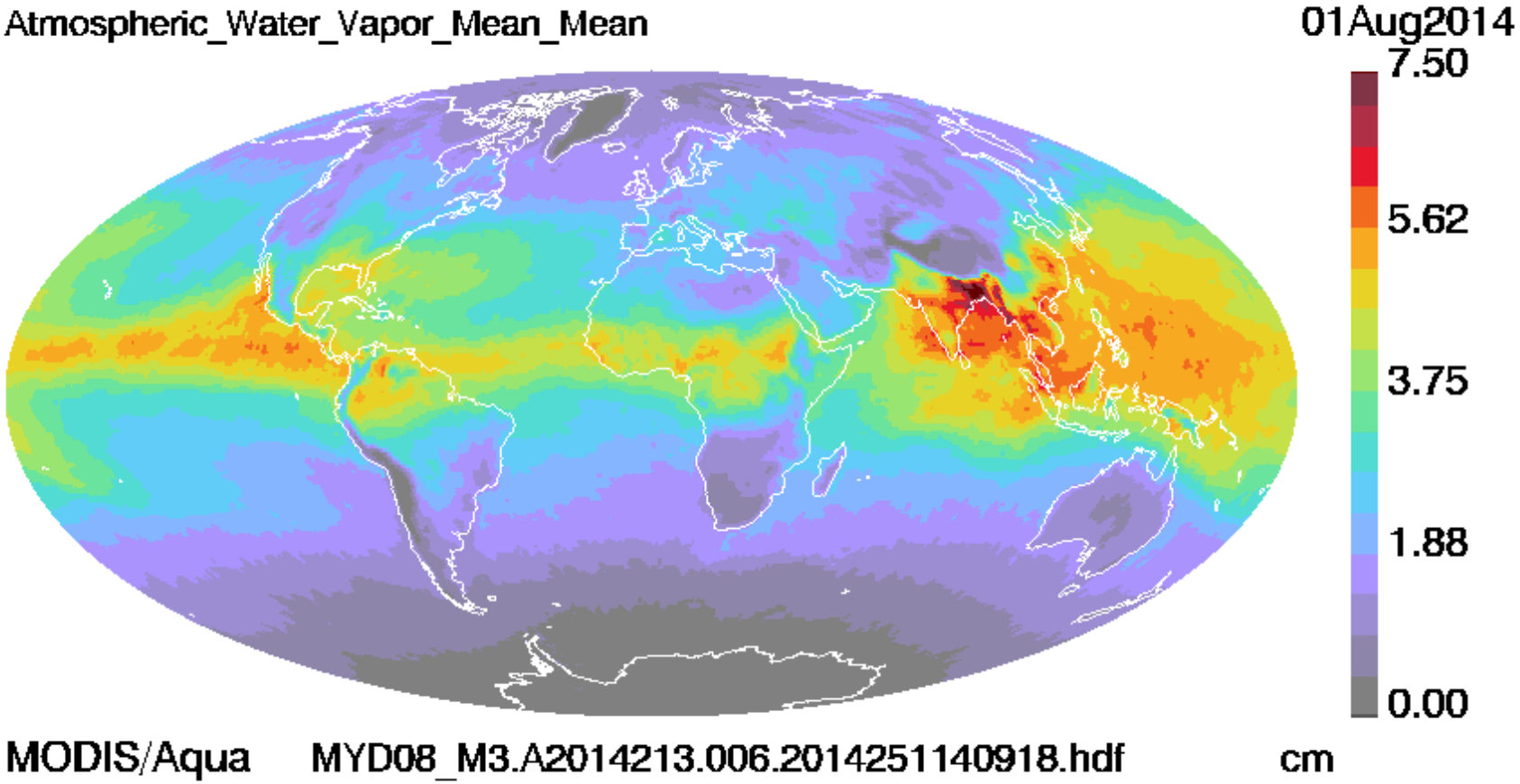
L3 ATBD (L3 primer)

End of Part 2 !

Just for “fun” …

Image Animation

One year time-series of L3 Monthly images
for Atmospheric Water Vapor


Atmospheric_Water_Vapor_Mean_Mean
01Aug2014
7.50
5.62
3.75
1.88
0.00
MODIS/Aqua
MYD08_M3.A2014213.006.2014251140918.hdf
cm

Thank you

Now hand off to Bill Ridgway for Part 3 on the new Definition of “Day” in Collection 6

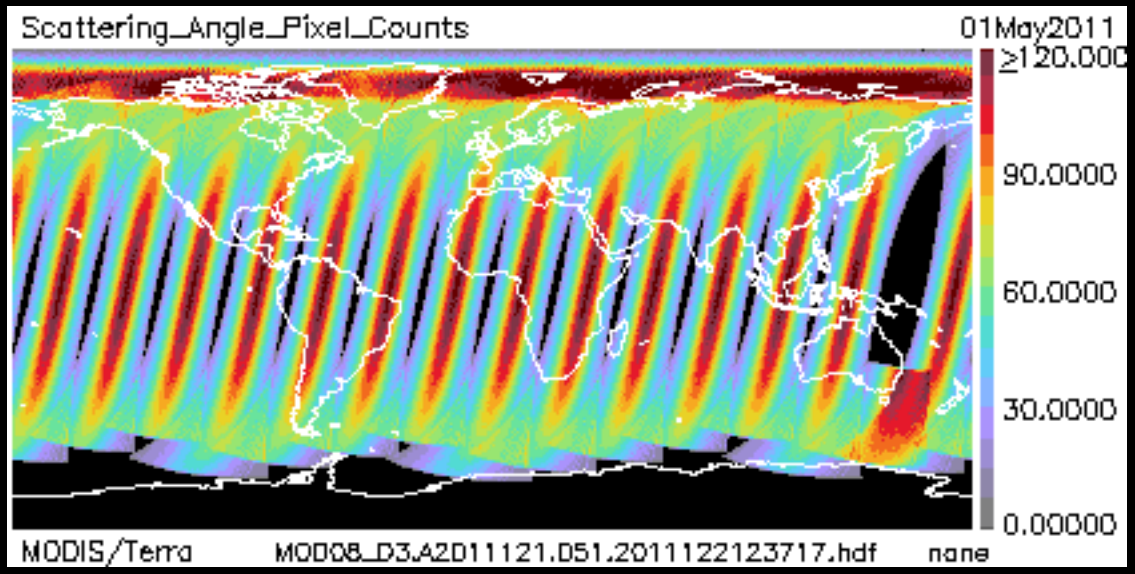
Part 3:
Definition of “Day” Change
in C6 MOD08

Definition of “Day” Change in C6

Bill Ridgway *(NASA GSFC / SSAI)*

Definition of “Day” Problem in C5/C51

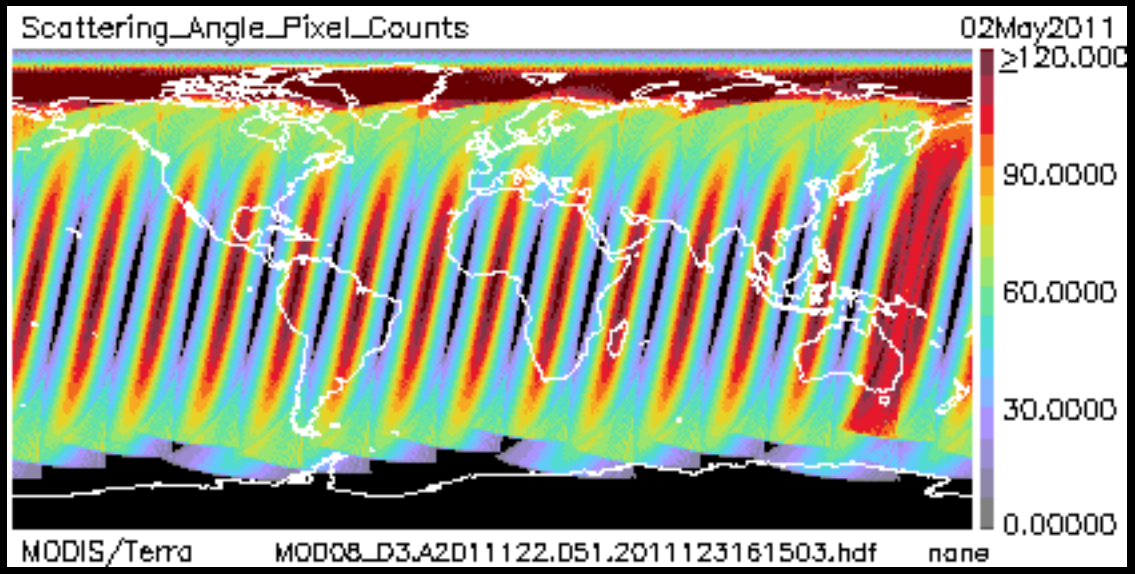
In Collection 5 / 51 (and earlier) a “Day” was defined as 0000-2400 UTC.
This caused an orbital gapping and orbital overlapping problem
most visible (noticeable) near the International Date Line



This problem is clearly visible in L3 browse images for C51.
These D3 browse images loop for 4 consecutive days.

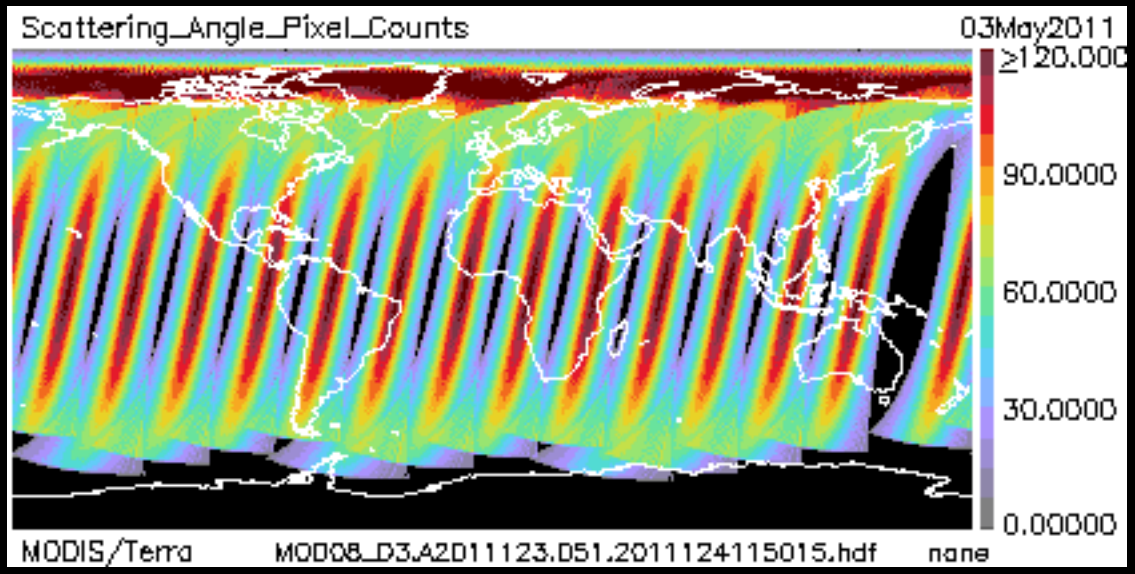
Definition of “Day” Problem in C5/C51

“Overlap” on 2 May 2011



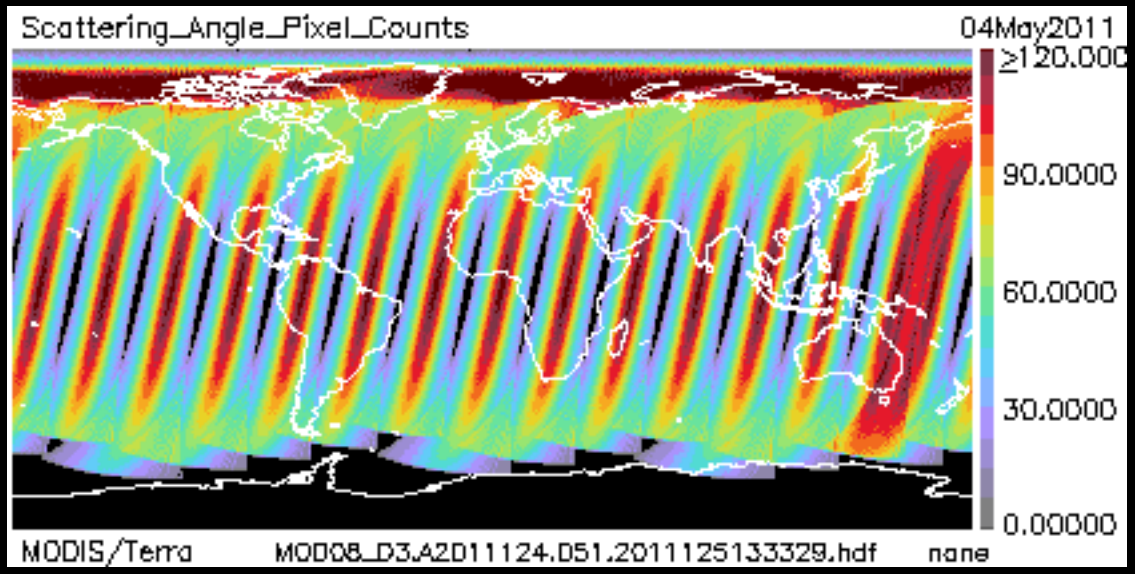
Definition of “Day” Problem in C5/C51

“Gap” on 3 May 2011



Definition of “Day” Problem in C5/C51

“Overlap” on 4 May 2011



The Collection 6 Fix

Starting in Collection 6 (C6)
we use fixed “longitudinal spatial boundaries”
to separate “data days”
(instead of UTC (temporal) boundaries)

1. International Dateline for daytime
2. Greenwich Meridian for nighttime

This fix allows L3 to sample at similar local times for all longitudes
(instead of mixing data taken nearly 24 hours apart in some regions)
and eliminates the orbital gapping / overlapping problem
we were seeing in C5 / C51.

This change in definition of a “data day” in C6 MODIS Atmosphere L3:

1. eliminates the orbital gapping and overlapping issue
2. allows for clean data day boundaries that run along a particular longitude
3. prevents MODIS L2 observations that are roughly 24 hours apart from being mixed

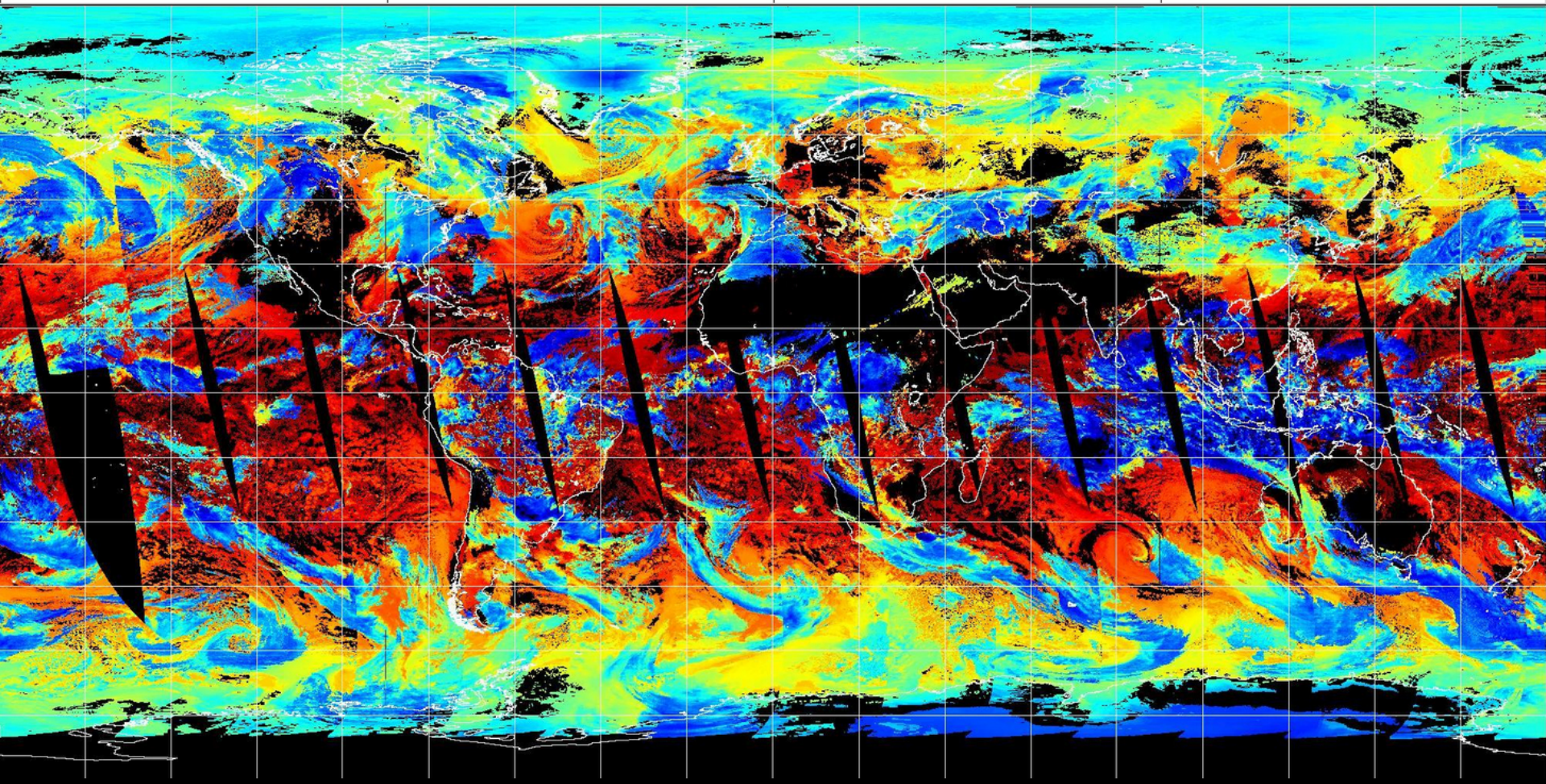
The following 3 slides provides a visual of that correction.

Note that interested MODIS Data Users
may directly compare C5 and C6 daily aggregations
for Aqua (or Terra) and Day (or Night) orbits
by visiting this web link:

http://modis-atmos.gsfc.nasa.gov/Definition_of_Day_Four_Panel/

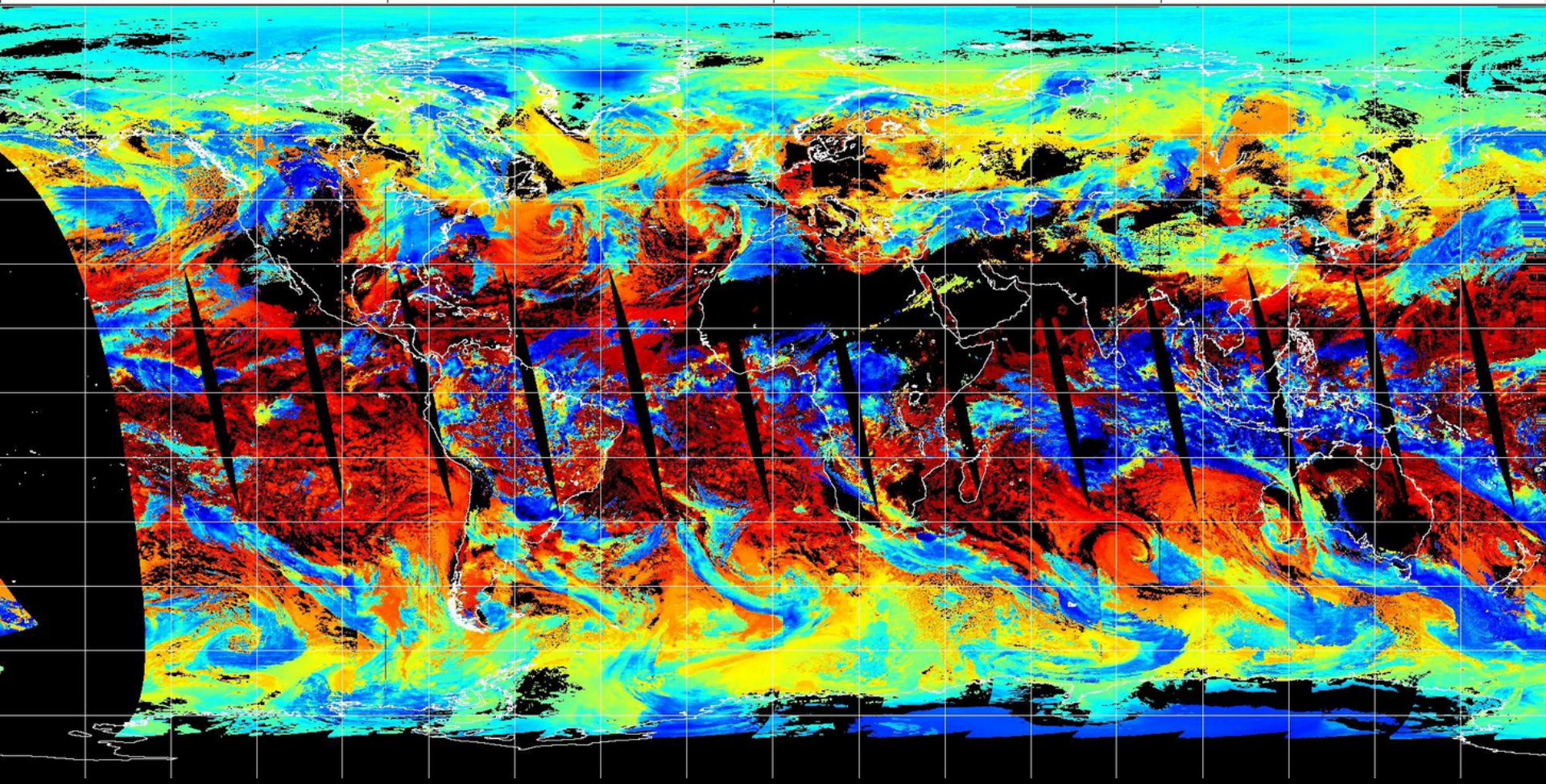
Using the old C5 / C51 definition of “Day”
shows the problem of “orbital gapping” near the International Date Line

Longitude Zone [-180 to -90]	*Longitude Zone [-90 to 0]*	*Longitude Zone [0 to 90]*	*Longitude Zone [90 to 180]*
Aqua Late day only: 24-hrs starting 03:00 GMT	*Aqua Standard day: 24-hrs starting 00:00 GMT*	*Aqua Late day only: 24-hrs starting 03:00 GMT*	*Aqua Standard day: 24-hrs starting 00:00 GMT*



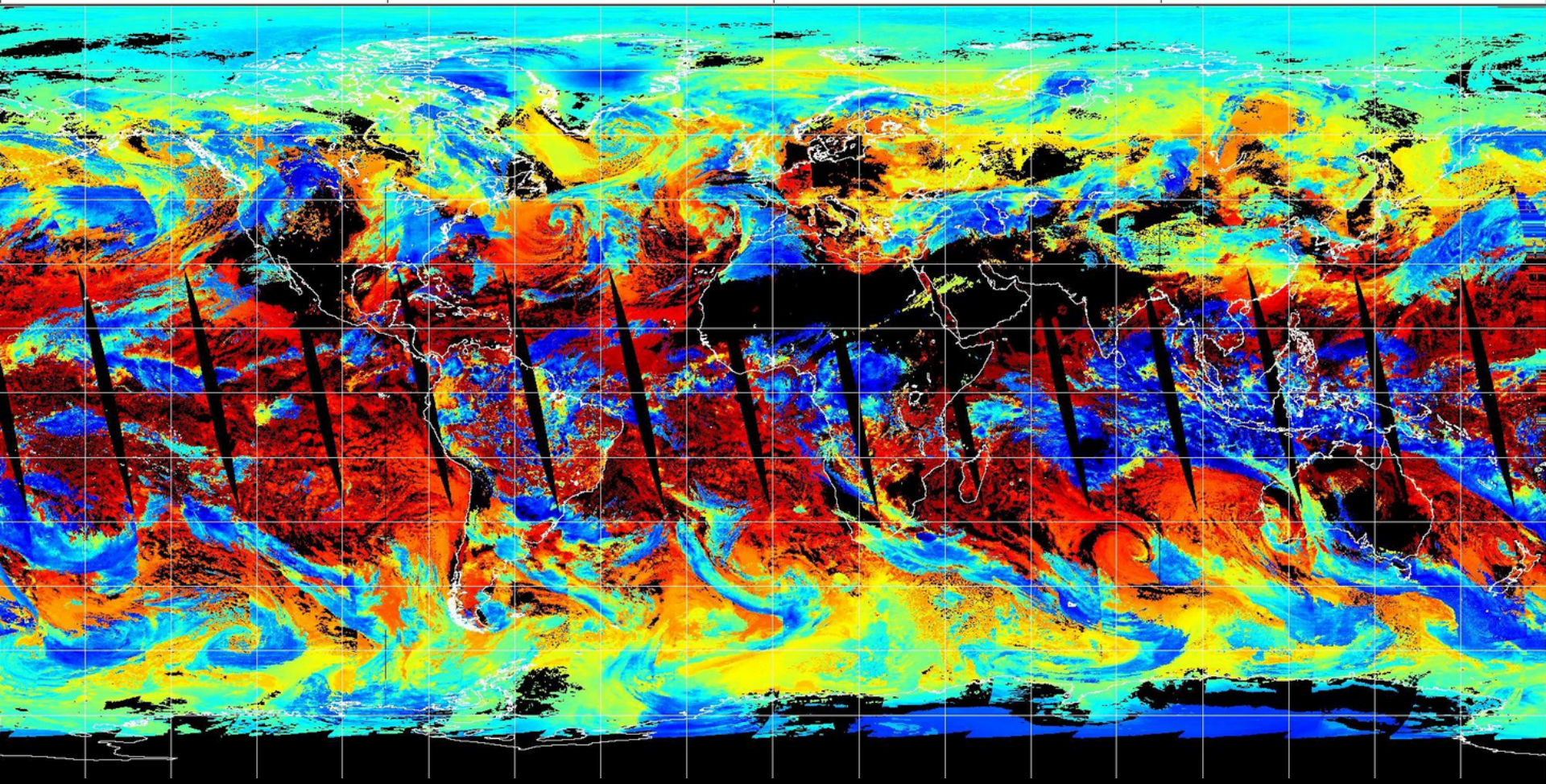
Step 1: To implement the C6 “Definition of Day: Fix, (Aqua Daytime example), we first remove the first 3 hours (0000-0300) of data for the UTC day being processed east of the International Dateline

Longitude Zone [-180 to -90]	*Longitude Zone [-90 to 0]*	*Longitude Zone [0 to 90]*	*Longitude Zone [90 to 180]*
Aqua Late day only: 24-hrs starting 03:00 GMT	*Aqua Standard day: 24-hrs starting 00:00 GMT*	*Aqua Late day only: 24-hrs starting 03:00 GMT*	*Aqua Standard day: 24-hrs starting 00:00 GMT*



Step 2: Finally we add in the early granules from (0000 to 0300) for the following UTC day east of the International Dateline

Longitude Zone [-180 to -90]	*Longitude Zone [-90 to 0]*	*Longitude Zone [0 to 90]*	*Longitude Zone [90 to 180]*
Aqua Late day only: 24-hrs starting 03:00 GMT	*Aqua Standard day: 24-hrs starting 00:00 GMT*	*Aqua Late day only: 24-hrs starting 03:00 GMT*	*Aqua Standard day: 24-hrs starting 00:00 GMT*

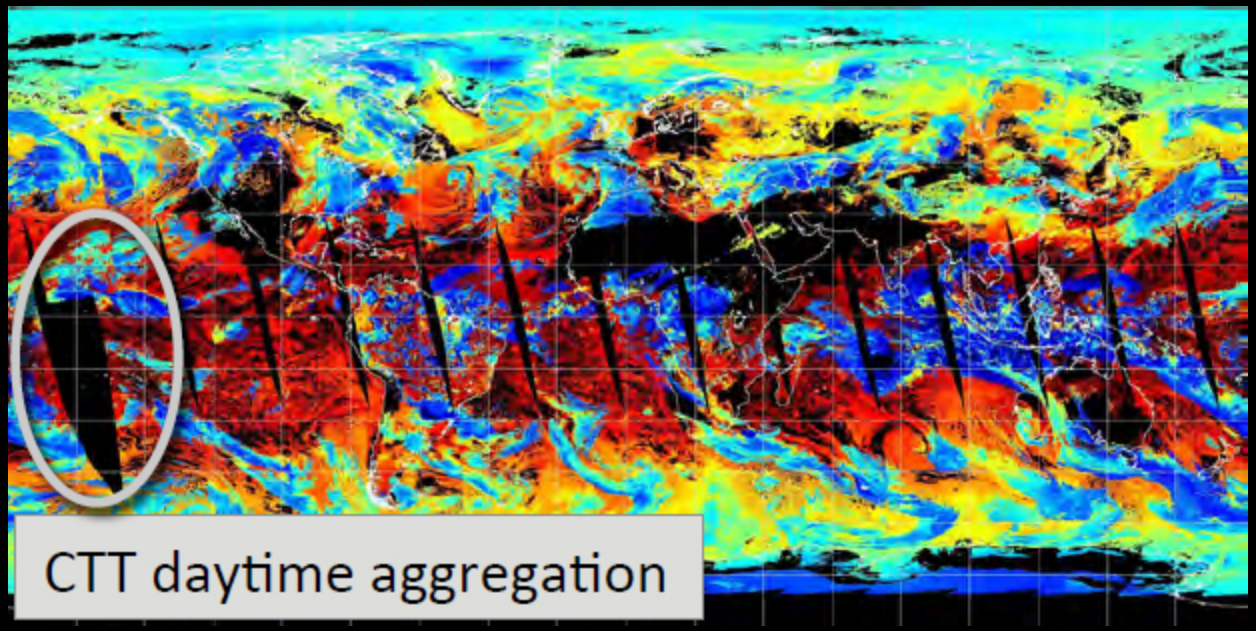


Implementation

Daytime

Problematic Collection 5 Data

Collection 5 Cloud Top Temperature Daytime

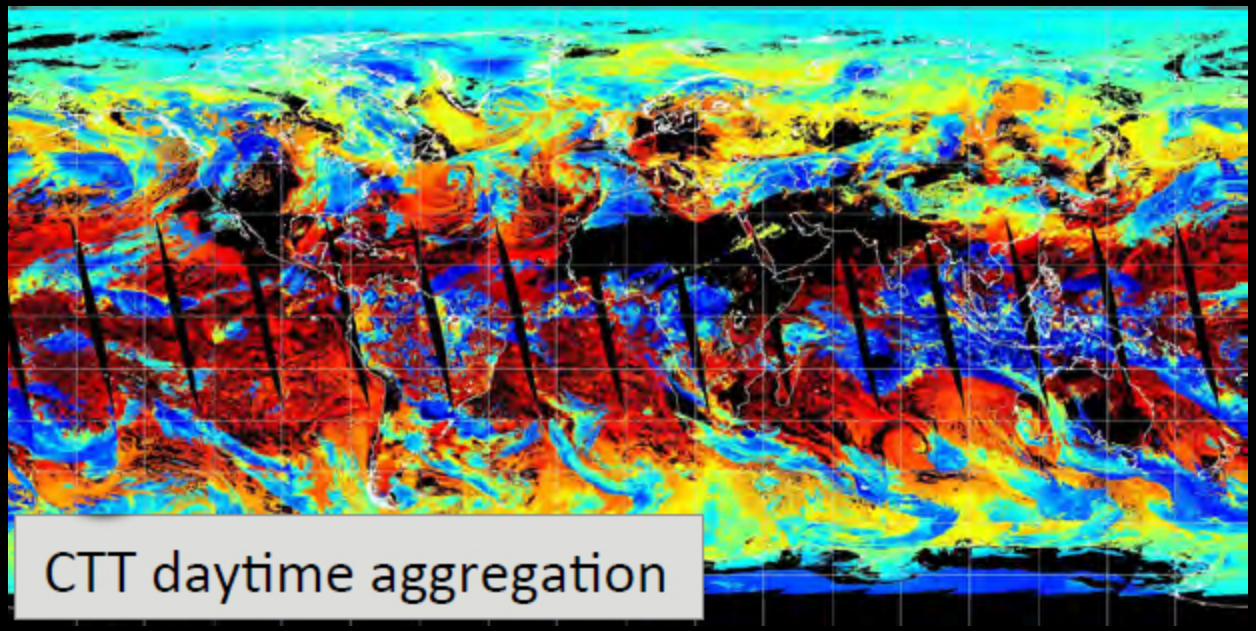


This slide shows the orbital gapping prevalent in C5.

For daytime, in C5, the “seam” in the data was ragged/choppy and extended from 90° to 180° W longitude.

Fixed Collection 6 Data

Collection 6 Cloud Top Temperature Daytime



This slide shows the fix with no orbital gapping and smooth data transitions.

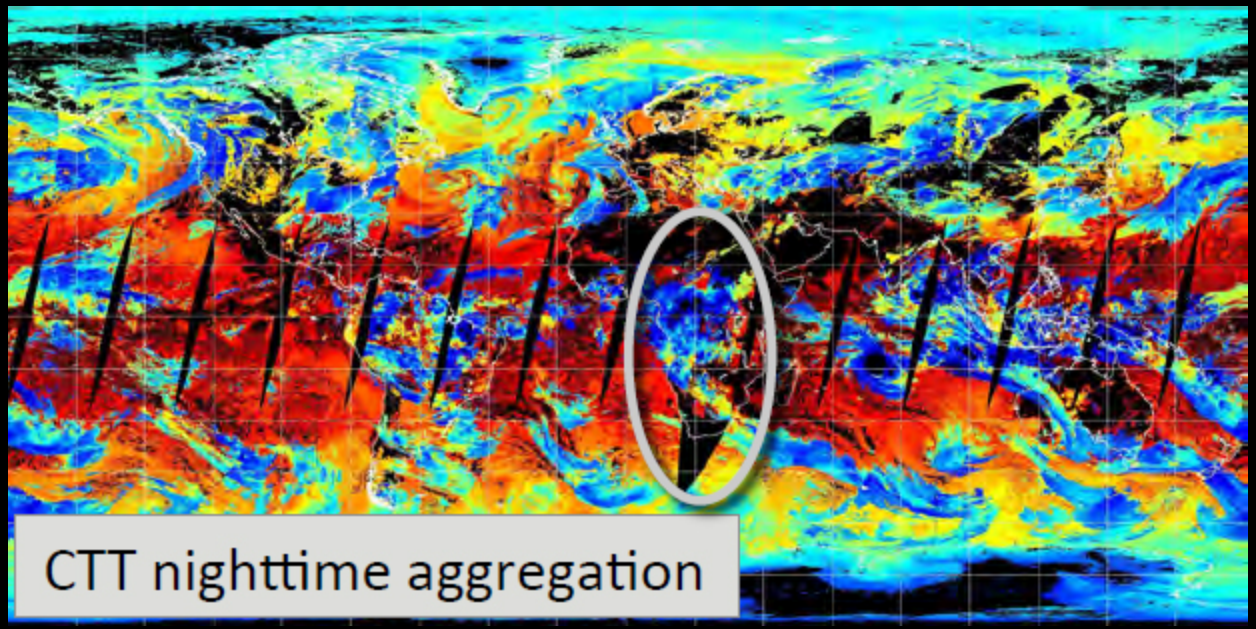
For daytime, in C6, the “seam” in the data is (technically) at 180° W longitude, along the left edge of the image.
Orbital gapping and doubling is removed.
(Note that the data discontinuity seam is formed by data taken 24 hours apart.)

Implementation

Nighttime

Problematic Collection 5 Data

Collection 5 Cloud Top Temperature Nighttime

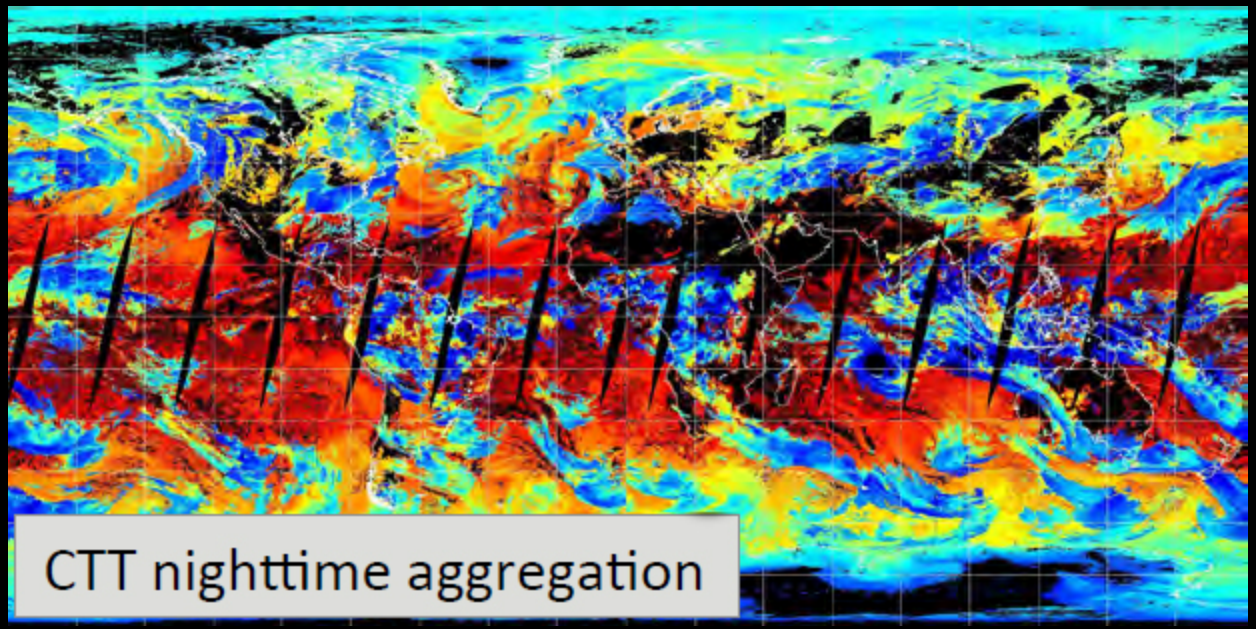


This slide shows the orbital gapping prevalent in C5.

For nighttime, in C5, the “seam” in the data was ragged/choppy and extended from 0 ° to 90° E longitude.

Fixed Collection 6 Data

Collection 6 Cloud Top Temperature Nighttime



This slide shows the fix with no orbital gapping & a single data discontinuity at 0°.

For nighttime, in C6, the "seam" in the data is at 0° longitude (Greenwich Meridian) along the center line of the image.
Orbital gapping and doubling is removed.
(Note that the data discontinuity seam is formed by data taken 24 hours apart on either side of the Greenwich Meridian)

End