MODIS Atmosphere Level 2 (ATM_L2) Joint Product

B. Wind[1,2]

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MODIS Atmosphere Group Meeting

Baltimore, MD
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MODATML2, MYDATML2

Motivations for a MODIS joint atmosphere level 2 product

1) **Small**
2) **Comprehensive and consolidated**
   - **representative of key atmosphere solutions**
3) **Enhanced usability**

The "ATM L2" product is designed so a full day of files fits on a CD

MODATML2, MYDATML2

Hard decisions add value

- Small is more externally usable
- Minimal set removes interesting but intimidating clutter how arrived at answer
- Depending on who you are, small *is* representative

How small is small?

- Any given day on a CD?
  - 288 granules per 24 hour period

    (up to)144 (summer) full-size (daytime) granules

    650Mb / (144 + (144*.5)) = 3.01Mb / gran.

- current size of a full granule ~ 180Mb / gran.

  (est. only includes MOD 04, 05, 06, 07, 35)

MODATML2, MYDATML2

Hard decisions

- What are people interested in? And, …
  …what do we want them to see?
- No quality assurance except where absolutely crucial to use/interpret answer
- Max. of 5x5km grid scale for size/consistency
  - 1km arrays necessitate reducing resolution
  - sample, not average, to retain meaning
- Exploit acceptable data representation downsize
- lat/lon 4 bytes to 2, sacrifice 1/1000th degree

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MODIS Atmosphere Level 2 (ATM_L2) Joint Product
Contents

For further details, click on 'Joint' at: http://modis-atmos.gsfc.nasa.gov

Geolocation	Water Vapor (05_L2)	Cloud (06_L2)	Profile (07_L2)	Cloud Mask (35_L2)	Aerosol (04_L2)

		5-km				10-km	
#	Kb	Name	#	Kb	Name
1.	219	Latitude	13.	54	Latitude_10km
2.	219	Longitude	14.	54	Longitude_10km
			15.	54	Solar_Zenith_10km
3.	219	Cloud_Opical_Thickness	16.	54	Viewing_Zenith_10km
4.	219	Cloud_Effective_Radius	17.	54	Relative_Azimuth_10km
5.	109	Cloud_Quality_Assurance			
6.	219	Cirrus_Reflectance			
7.	219	Cloud_Top_Pressure			
8.	219	Cloud_Top_Temperature	18.	54	Aerosol_Optical_Depth
9.	109	Cloud_Fraction	19.	54	Aerosol_Optical_Depth_Ratio_small
10.	219	Precipitable_Water_Near_Infrared_Clear	20.	27	Aerosol_Solution_Index_Ocean_Small_Average
11.	219	Precipitable_Water_Infrared_Clear	21.	27	Aerosol_Solution_Index_Ocean_Large_Average
12.	109	Cloud_Mask	22.	27	Aerosol_Quality_Assurance
	2298	Kilobytes		459	Kilobytes

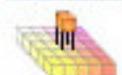Total: ~2.8 Megabytes per daytime granule

DAYTIME #1-22

NIGHTTIME #1,2,7-10,12

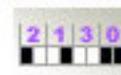REDUCED PRECISION #1,2,13,14

SAMPLED #3-6,10,12

RENAMED #4-6,10,11,13-16,18-22

BIT FLAGS #5,12,22

Two grid scales

- ~500kb (1/5) of the product is navigational data
  - Two pairs of 2-byte Latitude Longitude
    - 5_km arrays are copied same as 06_L2
    - 10_km arrays are computed same as 04_L2
  - At 10Km solar zenith angle, viewing zenith angle, and relative azimuth are also kept

MODATML2, MYDATML2

More Facts and Features

- *Production start date:*
    - *October 14, 2003 Terra and Aqua*
        - *ESDT Designation: MODATML2, MYDATML2*
        - *Program Executable (PGE) 83*
- ATM L2 compatible with most popular tools
- may generate a MODATML2 sans MODAPS from input files
- Algorithm pedigree kept as SDS attributes

MODATML2, MYDATML2

Cloud_Phase_Daytime

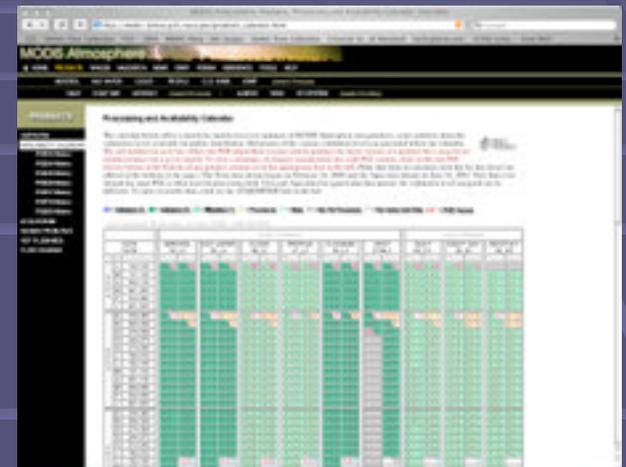source_info:
MOD06_L2.A2001222.1200.004.2002289223630.hdf
pge06v4.2.0
   Quality_Assurance_1km
   Cloud_Mask_1km

Cross-reference ATM_L2 SDS source information
with modis-atmos website production calendar.

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

MODATML2, MYDATML2

L2 Global Time Series Animation

QuickTime™ and a
Sorenson Video decompressor
are needed to see this picture.

Time-series animation
Reto Stöckli

MODATML2, MYDATML2

Virtual Reality from Day of L2's

Terra
October 28, 2003

- Height
  Cloud top pressure
- Colors
  Effective radius of water and ice clouds
- Transparency
  Optical thickness

Virtual Reality Visualization
Reto Stöckli

MODATML2, MYDATML2

QuickTime™ and a
Planar RGB decompressor
Animation decompressor
are needed to see this picture.

Water Clouds

30

23

16

9

2

Ice Clouds

50

39

28

17

6

Terra order statistics as of July 9

Statistics from http://edgrs.gsfc.nasa.gov:8000/soo/aspdb_provider/edgrs3.asp.

Distribution to Users by Instrument/Datatype Detail

GSFC

2003-10-14 -- to -- 2004-07-09
2003-287 to 1912004

DAAC	Instrument/Datatype	Discipline	MediaType	#Orders	#Requests	#Granules	#Files	#Megabytes
GSFC	MODIS /MOD04_L2.003	ATMOSPHERE	FtpPull	10	10	377	992	4,399
GSFC	MODIS /MOD04_L2.003	ATMOSPHERE	FtpPush	2	2	23	248	268
GSFC	MODIS /MOD04_L2.004	ATMOSPHERE	8MM	6	1,001	1,001	2,002	11,479
GSFC	MODIS /MOD04_L2.004	ATMOSPHERE	DLT	8	5,191	5,191	10,382	59,636
GSFC	MODIS /MOD04_L2.004	ATMOSPHERE	FtpPull	1,876	1,945	228,286	474,974	2,648,476
GSFC	MODIS /MOD04_L2.004	ATMOSPHERE	FtpPush	54	58	5,690	11,900	65,451
GSFC	MODIS /MOD05_L2.003	ATMOSPHERE	FtpPull	1	1	1	2	19
GSFC	MODIS /MOD05_L2.004	ATMOSPHERE	8MM	4	1,053	1,053	2,106	12,035
GSFC	MODIS /MOD05_L2.004	ATMOSPHERE	DLT	1	45	45	90	486
GSFC	MODIS /MOD05_L2.004	ATMOSPHERE	FtpPull	541	552	105,526	220,248	1,310,545
GSFC	MODIS /MOD05_L2.004	ATMOSPHERE	FtpPush	49	49	5,038	10,076	91,739
GSFC	MODIS /MOD06_L2.003	ATMOSPHERE	FtpPull	7	7	26	158	1,136
GSFC	MODIS /MOD06_L2.003	ATMOSPHERE	FtpPush	1	1	1	4	66
GSFC	MODIS /MOD06_L2.004	ATMOSPHERE	8MM	2	439	439	878	28,960
GSFC	MODIS /MOD06_L2.004	ATMOSPHERE	DLT	2	403	403	806	26,537
GSFC	MODIS /MOD06_L2.004	ATMOSPHERE	FtpPull	1,308	1,338	115,885	250,032	6,944,592
GSFC	MODIS /MOD06_L2.004	ATMOSPHERE	FtpPush	69	73	8,937	18,174	575,228
GSFC	MODIS /MOD07_L2.003	ATMOSPHERE	FtpPull	3	3	5	10	153
GSFC	MODIS /MOD07_L2.004	ATMOSPHERE	8MM	4	662	662	1,324	20,174
GSFC	MODIS /MOD07_L2.004	ATMOSPHERE	DLT	1	43	43	86	1,310
GSFC	MODIS /MOD07_L2.004	ATMOSPHERE	FtpPull	380	382	7,456	27,488	227,279
GSFC	MODIS /MOD35_L2.003	ATMOSPHERE	FtpPull	2	2	4	22	181
GSFC	MODIS /MOD35_L2.004	ATMOSPHERE	DLT	1	45	45	90	2,015
GSFC	MODIS /MOD35_L2.004	ATMOSPHERE	FtpPull	1,460	1,474	32,856	97,648	1,474,842
GSFC	MODIS /MOD35_L2.004	ATMOSPHERE	FtpPush	40	41	496	3,240	22,216
GSFC	MODIS /MODATML2.004	ATMOSPHERE	FtpPull	38	41	8,776	17,564	19,287
GSFC	MODIS /MODATML2.004	ATMOSPHERE	FtpPush	1	1	8	16	17

MODATML2, MYDATML2

Aqua order statistics as of July 9

Statistics from http://edgrs.gsfc.nasa.gov:8000/soo/aspdb_provider/edgrs3.asp.

Distribution to Users by Instrument/Datatype Detail

GSFC

2003-10-14 -- to -- 2004-07-09
2003-287 to 1912004

DAAC	Instrument/Datatype	Discipline	MediaType	#Orders	#Requests	#Granules	#Files	#Megabytes
GSFC	MODIS /MYD04_L2.003	ATMOSPHERE	FtpPull	200	200	9,316	24,006	107,221
GSFC	MODIS /MYD04_L2.003	ATMOSPHERE	FtpPush	13	13	103	442	1,198
GSFC	MODIS /MYD04_L2.004	ATMOSPHERE	FtpPull	163	174	14,681	37,622	171,590
GSFC	MODIS /MYD04_L2.004	ATMOSPHERE	FtpPush	5	5	921	1,842	10,754
GSFC	MODIS /MYD05_L2.003	ATMOSPHERE	DLT	1	8	8	16	154
GSFC	MODIS /MYD05_L2.003	ATMOSPHERE	FtpPull	25	25	674	1,988	7,882
GSFC	MODIS /MYD05_L2.004	ATMOSPHERE	FtpPull	30	35	7,144	17,570	89,035
GSFC	MODIS /MYD06_L2.003	ATMOSPHERE	DLT	3	296	296	592	12,939
GSFC	MODIS /MYD06_L2.003	ATMOSPHERE	FtpPull	162	163	6,149	18,494	315,225
GSFC	MODIS /MYD06_L2.003	ATMOSPHERE	FtpPush	86	86	14,567	30,374	957,045
GSFC	MODIS /MYD06_L2.004	ATMOSPHERE	FtpPull	127	133	12,208	29,616	545,511
GSFC	MODIS /MYD06_L2.004	ATMOSPHERE	FtpPush	11	11	2,343	4,814	120,462
GSFC	MODIS /MYD07_L2.003	ATMOSPHERE	DLT	1	8	8	16	244
GSFC	MODIS /MYD07_L2.003	ATMOSPHERE	FtpPull	58	59	2,663	8,772	81,155
GSFC	MODIS /MYD07_L2.004	ATMOSPHERE	DLT	1	31	31	62	945
GSFC	MODIS /MYD07_L2.004	ATMOSPHERE	FtpPull	59	60	2,462	12,646	75,037
GSFC	MODIS /MYD35_L2.003	ATMOSPHERE	8MM	1	154	154	308	6,897
GSFC	MODIS /MYD35_L2.003	ATMOSPHERE	DLT	1	8	8	16	359
GSFC	MODIS /MYD35_L2.003	ATMOSPHERE	FtpPull	195	200	6,385	24,318	286,029
GSFC	MODIS /MYD35_L2.003	ATMOSPHERE	FtpPush	9	9	39	400	1,746
GSFC	MODIS /MYD35_L2.004	ATMOSPHERE	FtpPull	284	290	9,628	29,638	432,145
GSFC	MODIS /MYD35_L2.004	ATMOSPHERE	FtpPush	11	11	177	974	7,927
GSFC	MODIS /MYDATML2.003	ATMOSPHERE	FtpPull	7	7	463	978	1,003
GSFC	MODIS /MYDATML2.004	ATMOSPHERE	FtpPull	31	32	8,284	17,516	18,683

MODATML2, MYDATML2

Future Directions

- HDF Compression
- Additional SDS's
  - Effective_Radius_Difference (1.6 and 3.7 re retrievals)
  - Collection 5 06_L2 error bars
- Suggestions?

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