NASAs Earth Sciences Data and Information Services for Air Quality and Public Health Applications

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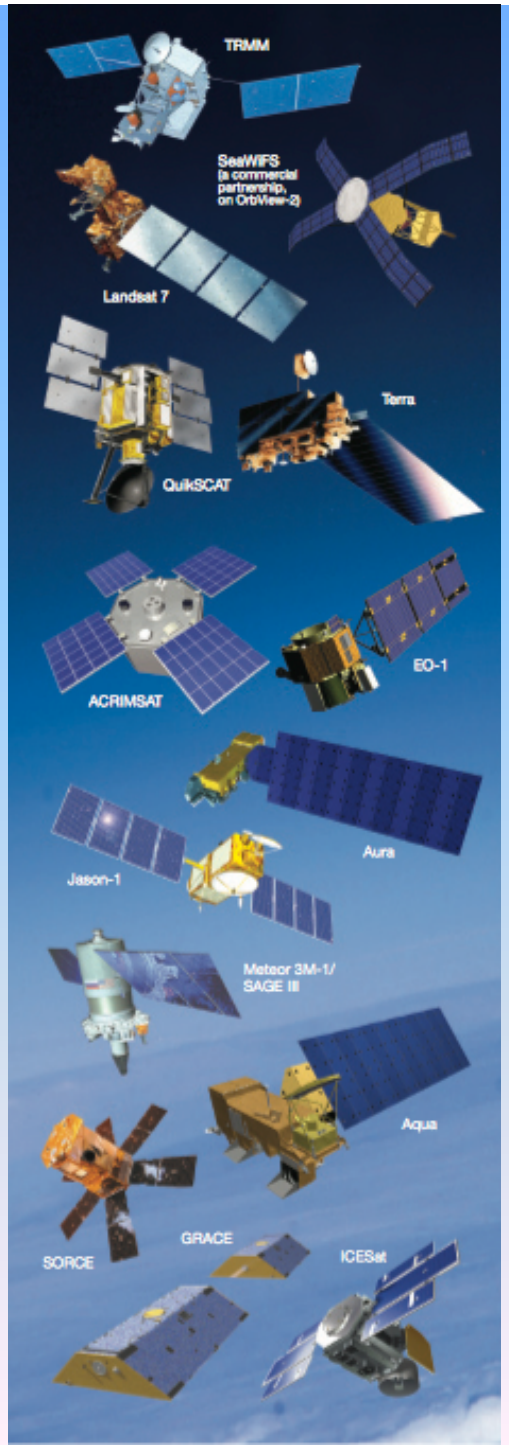
Discussion Points

- NASA Earth Science Data
- NASA Earth Science Data Systems
- NASA Earth Science Data System Tools and Services
- NASA Earth Science Data System Tools and Services: Opportunities Abound

Earth Observing System (EOS) Missions

- Provides long-term global observations
  - Land surface
  - Biosphere
  - Oceans
  - Atmosphere
  - Solid Earth



From: http://science.hq.nasa.gov/earth-sun/applications/science_for_society-brochure.pdf

Earth Observing System (EOS) Missions

Current missions and measurements specifically useful to Air Quality applications:

- Aura (comprised of the HIRDLS, MLS, OMI, TES instruments) - Atmospheric Composition
- TOMS - Ozone
- Calipso - Aerosols
- AIRS - Ozone, Carbon Traces
- MODIS - Ozone, Aerosols
- MISR - Aerosols
- MOPITT - Carbon Traces

Key Atmospheric Composition Data Sets

Missions	Nimbus 4	Nimbus 7	Nimbus 7 Meteor 3 ADEOS 1 Earth-Probe	Nimbus 7	Spacelab 3, ATLAS 1,2,3	UARS				ERS-2	Terra Aqua	Aqua	Aura			
Instruments	BUV	SBUV	TOMS	LIMS	ATMOS	CLAES	HALOE	ISAMS	MLS	GOME	MODIS	AIRS	OMI	HIRDLS	MLS	TES*
Data Period	Apr '70-May '77	Nov '78-May '93	Nov '78-Present	Oct '78-May '79	'85, '92, '93, '94	Oct '91-May '93	Oct '91-Present	Sep '91-Jul '92	Sep '91-Jul '99	April '95-Present	Mar '00-Present	Sep'02-Present	Jul'04-Present	Jul'04-Present	Jul'04-Present	Jul'04-Present
Spectral Region	255 - 380 nm	255 - 340 nm	309 - 360 312 - 380 nm	6.2 - 15 μ	2.98 - 15 μ	3.5 -12.7 μ	2.43 -10.25 μ	4.6 -16.6 μ	63, 183, 205 GHz	240 - 790 nm	0.4 -14 μ	0.4 -1.1, 3.74 -15.4 μ	270 - 500 nm	6.12 -17.76 μ	118, 190, 240, 640 GHz, 2.5 THz	3.2 -15.4 μ
Bands	13	13	6	6	16	9	8	8	3	3072	36	2382	1560	22	5	12
O_3	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
BrO										_			_		_	
$CFCl_3$					_	_								_		
CF_2Cl_2					_	_								_		
ClO									_						_	
OClO										_			_			
$ClONO_2$					_	_								_		
HOCl															_	
HCl					_		_								_	
HF					_		_									
HCHO										_			_			
CO					_			_				_			_	_
CH_4					_	_	_	_				_		_		_
CH_3CN									_							
HCN					_										_	
HNO_3				_	_	_			_					_	_	_
NO					_	_	_									
NO_2				_	_	_	_	_		_			_	_		_
N_2O					_	_		_						_	_	
N_2O_5					_	_		_						_		
OH															_	
HO_2															_	
H_2O / Humidity				_	_	_	_	_	_	_	_	_		_	_	_
SO_2	_	_	_						_	_			_		_	
Aerosols			_		_	_	_	_			_		_	_		

All data sets located at: http://disc.gsfc.nasa.gov/

Except: TES, and (not shown) MISR, CALIPSO, MOPITT located at: http://eosweb.larc.nasa.gov/

Earth Observing System (EOS) Missions

Current missions and measurements specifically useful to Public Health applications (Note: Bad air quality is a public health hazard):

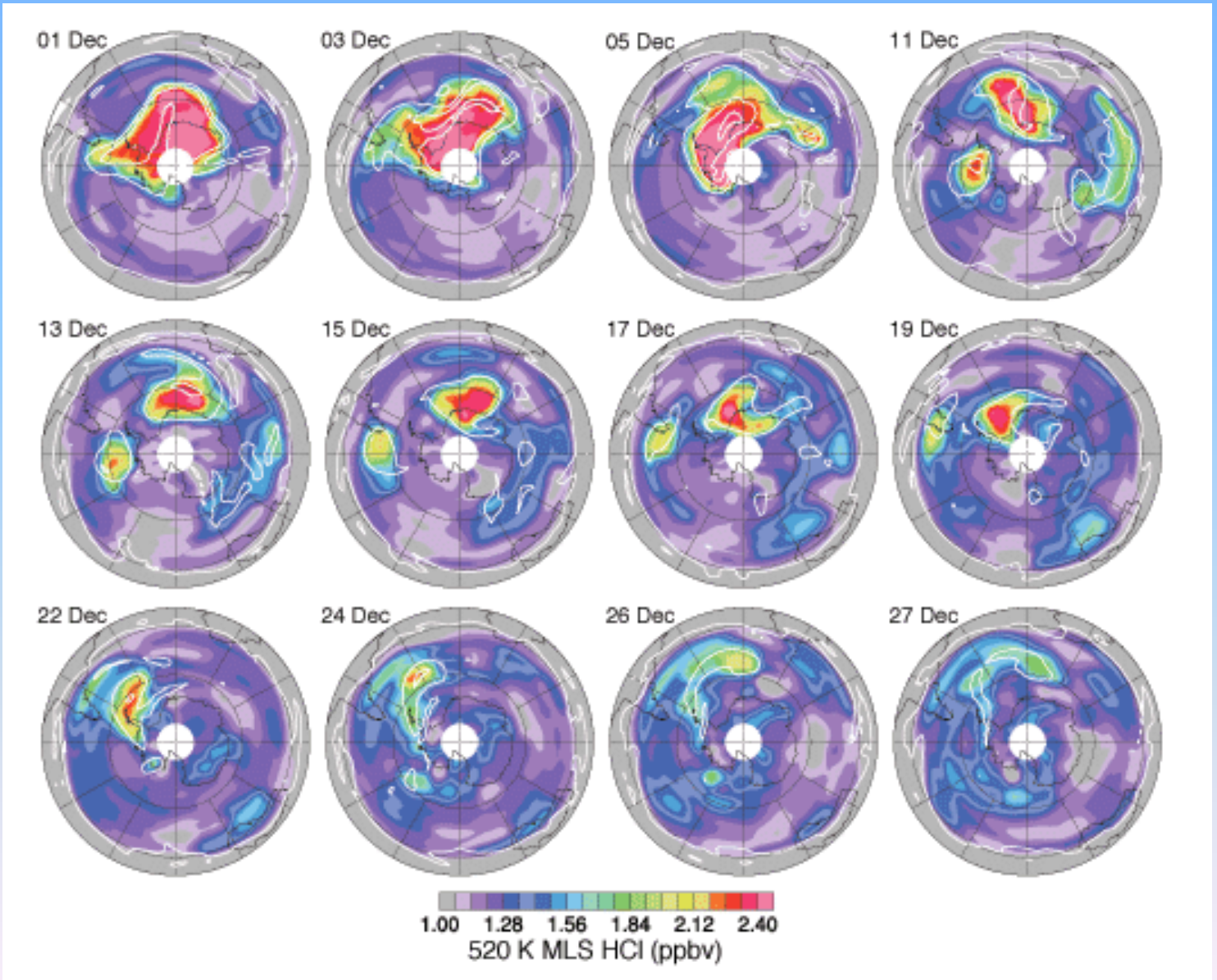
- Aura (comprised of the HIRDLS, MLS, OMI, TES instruments) - Atmospheric Composition
- TOMS - Ozone
- Calipso - Aerosols
- AIRS - Ozone, Carbon Traces, Humidity
- AMSR-E - Soil Moisture
- MODIS - Ozone, Aerosols, Temperature, Humidity, Vegetation Moisture
- MISR - Aerosols
- MOPITT - Carbon Traces
- TRMM - Precipitation
- SORCE - Solar irradiance

Earth Observing System (EOS) Models

Two active and significant models provide data useful to air quality and public health research

- Modern Era Retrospective-analysis for Research and Applications (MERRA) (http://gmao.gsfc.nasa.gov/)
  - Global reanalysis of atmospheric parameters by the GSFC Global Modeling and Assimilation Office (GMAO)
  - Uses model to assimilate satellite and in situ data
  - 1979 to present
  - Relevant products: Precipitation, Temperature. Ozone, Humidity
- North American (NLDAS) and Global (GLDAS) Land Data Assimilation System (http://ldas.gsfc.nasa.gov/)
  - Reanalysis and forecast simulations by numerical weather prediction (NWP) models
  - Relevant Products: Soil Moisture, Precipitation

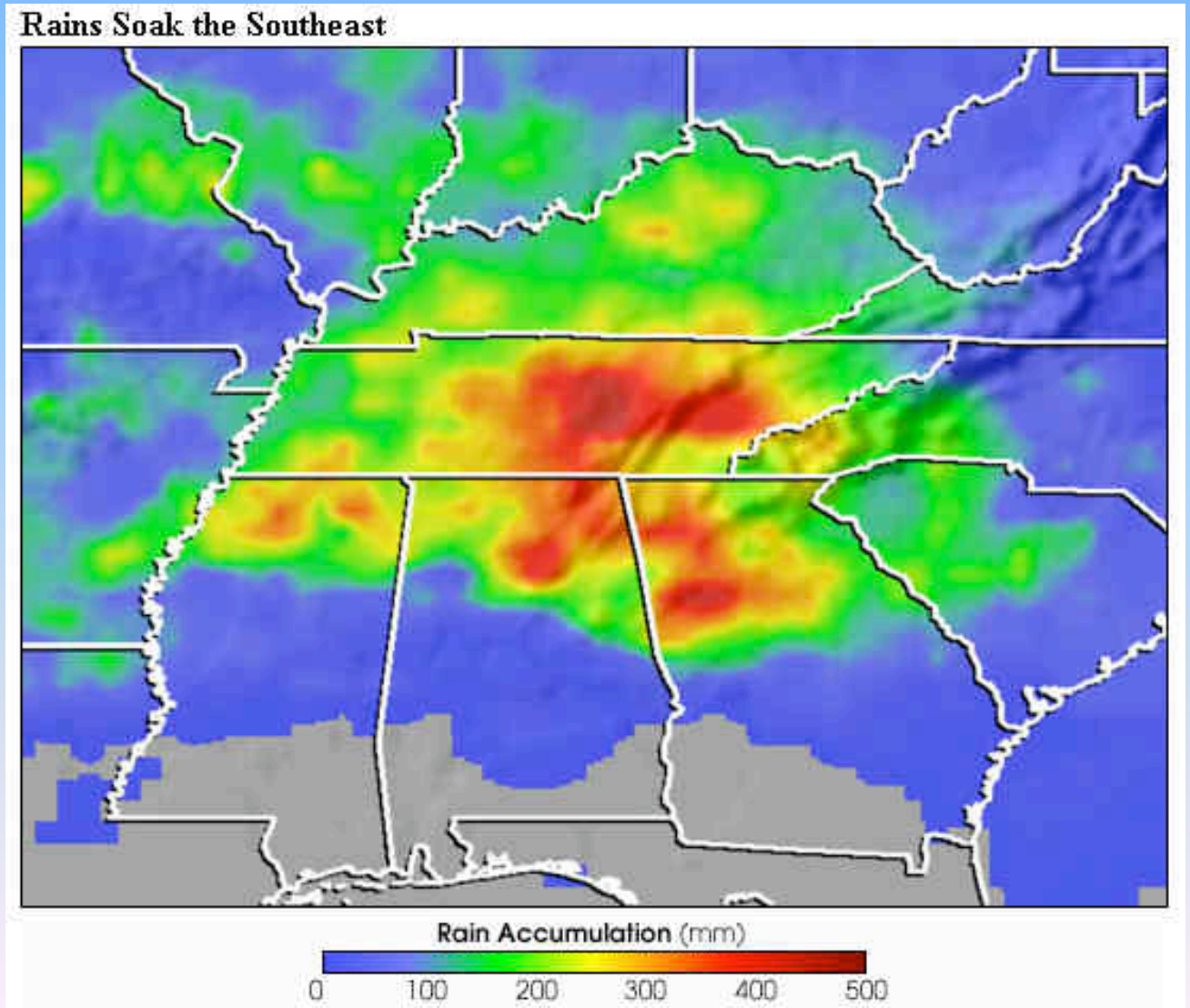
Microwave Limb Sounder (MLS) HCl Observations of Antarctic Polar Vortex Breakup



http://aura.gsfc.nasa.gov/science/

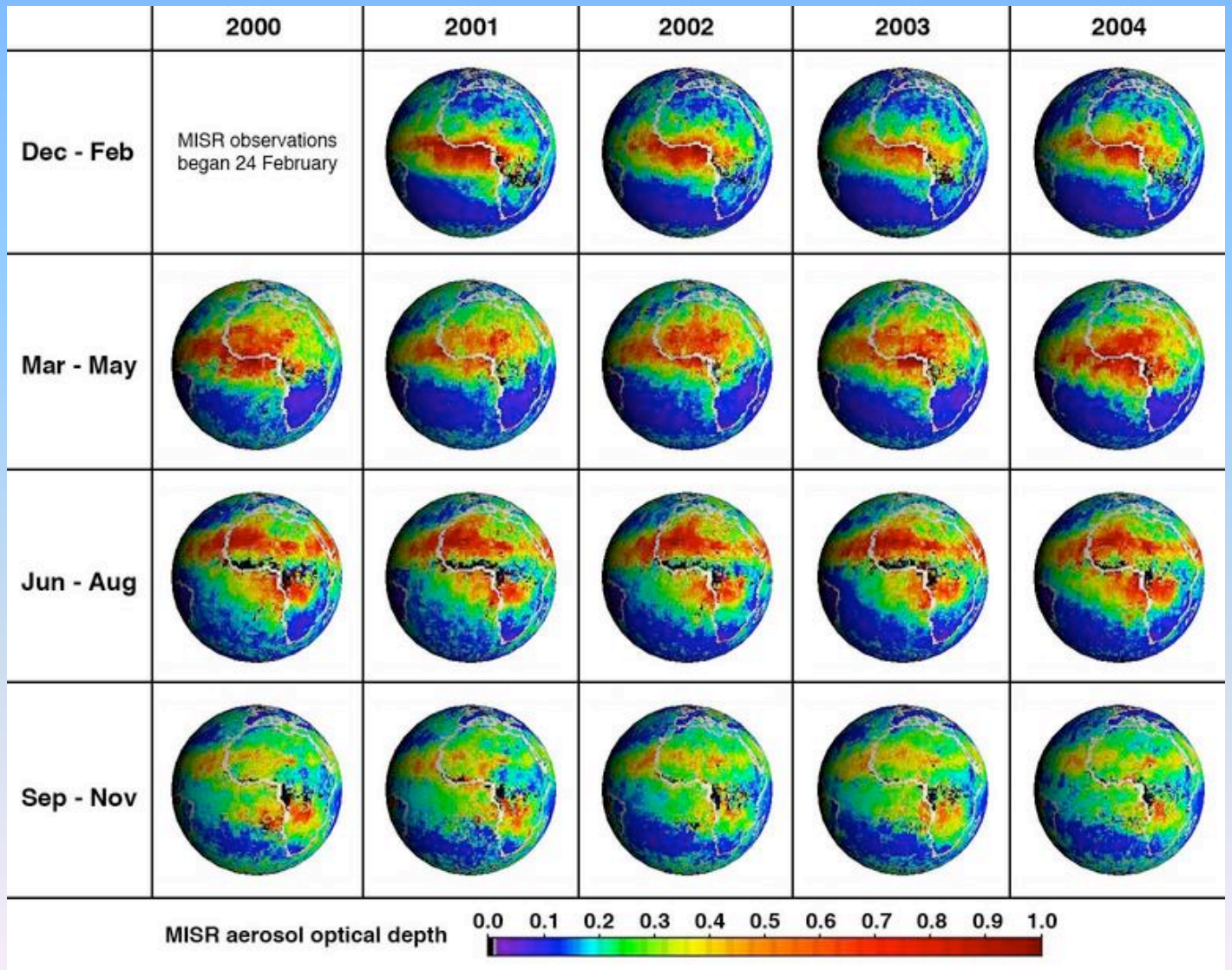
TRMM Real-time Multi-satellite Precipitation

(May 4-9, 2003)



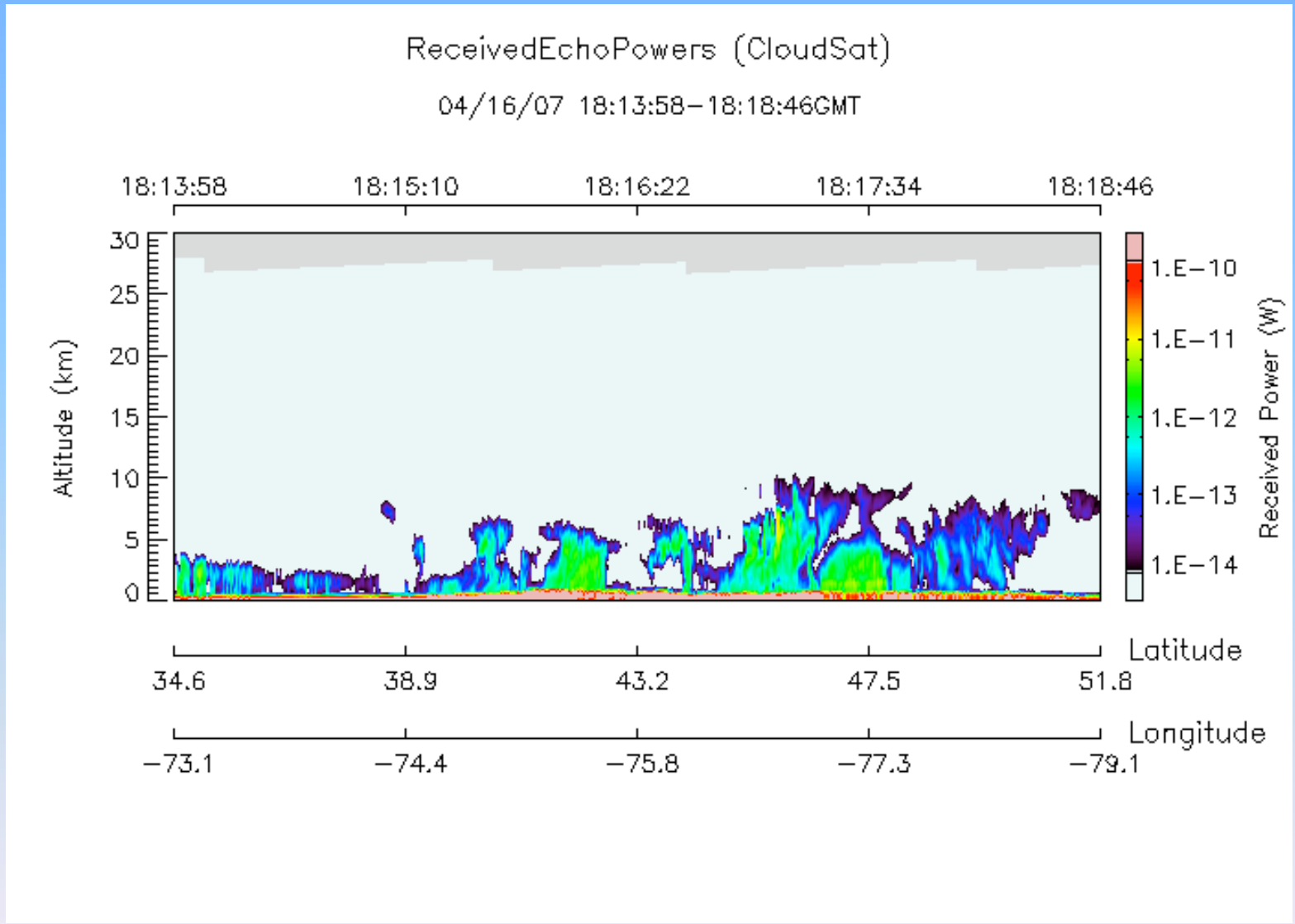
Global Aerosols from MISR

Multi-angle Imaging SpectroRadiometer



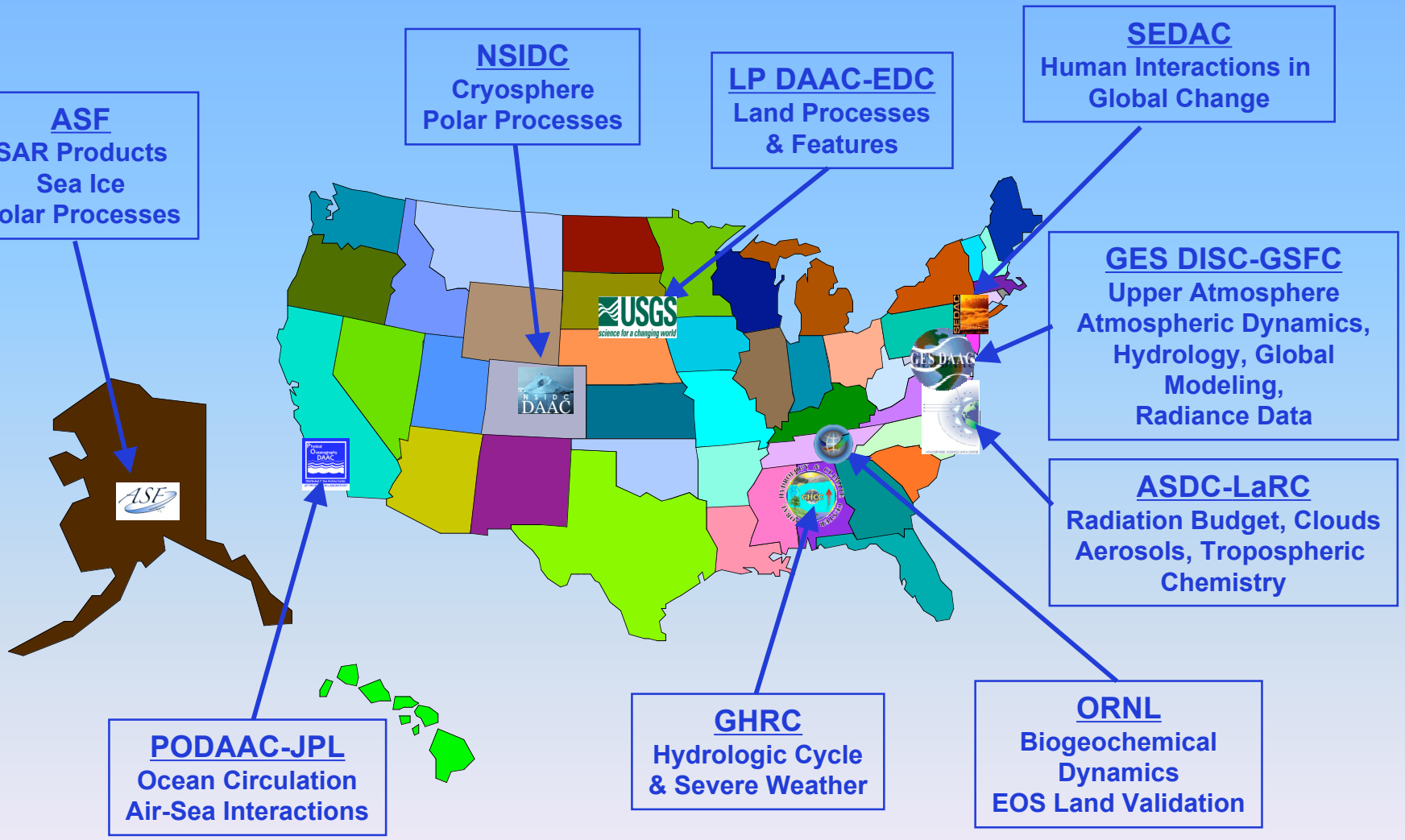
http://www-misr.jpl.nasa.gov/

Image Credit: NASA/GSFC/LaRC/JPL, MISR Team


ReceivedEchoPowers (CloudSat)
04/16/07 18:13:58–18:18:46GMT
18:13:58
18:15:10
18:16:22
18:17:34
18:18:46
Altitude (km)
30
25
20
15
10
5
0
1.E–10
1.E–11
1.E–12
1.E–13
1.E–14
Received Power (W)
Latitude
34.6
38.9
43.2
47.5
51.8
Longitude
–73.1
–74.4
–75.8
–77.3
–79.1

NASA Earth Science Data Centers

(aka Distributed Active Archive Centers)



GES DISC Mission

(and more or less the mission of all DAACs)

To maximize the investment benefit of the NASA Earth Science Enterprise by providing data and services that enable people to fully realize the scientific, educational, and application potential of global climate data.

In Short...

Our mission is to:

ENABLE EARTH SCIENCE RESEARCH

NASA Earth Science Data Systems
Basic Functions

EOS Data and Information System (EOSDIS) performs the data management functions for NASA data and information. Basic functions include:

- Produce, ingest, archive and distribute NASA data
- Operate/maintain data link servers (ancillary products)
- Produce, archive and distribute ancillary data
- Maintain systems that perform core functions
- Operate systems that perform core functions
- Provide Science data user support for core functions
- Provide POC for user problem resolution
- Provide system/sustaining engineering
- Provide data documentation
- Collect and report metrics
- Support Long Term Archive (LTA) development
- Provide data stewardship – Data archive for other data archives
- Perform to required standards

EOSDIS Evolution Approach at the GES DISC

(Evolution will be complete 12/21/07)

Current System Characteristics	Evolved System Characteristics
EOSDIS Core System (ECS)	Simple, Scalable, Script-based Science Processor for Archives (S4PA) technology
Generalized interface(s)	Discipline-specific interfaces in addition to generalized interface(s)
Tape archive - All products archived - Order data for delivery	Disk archive - Some products processed on demand (virtual products) - Download data automatically upon choosing
Search and order tools	Tools to find, explore, and analyze data
Distribute standard products	Distribute lower volume tailored products
System changes require long lead time	System changes implemented quickly according to priority within given budget cap
Steward data	Steward data

Key to EOSDIS Evolution

low-moderate volume data

migrate

Anonymous FTP

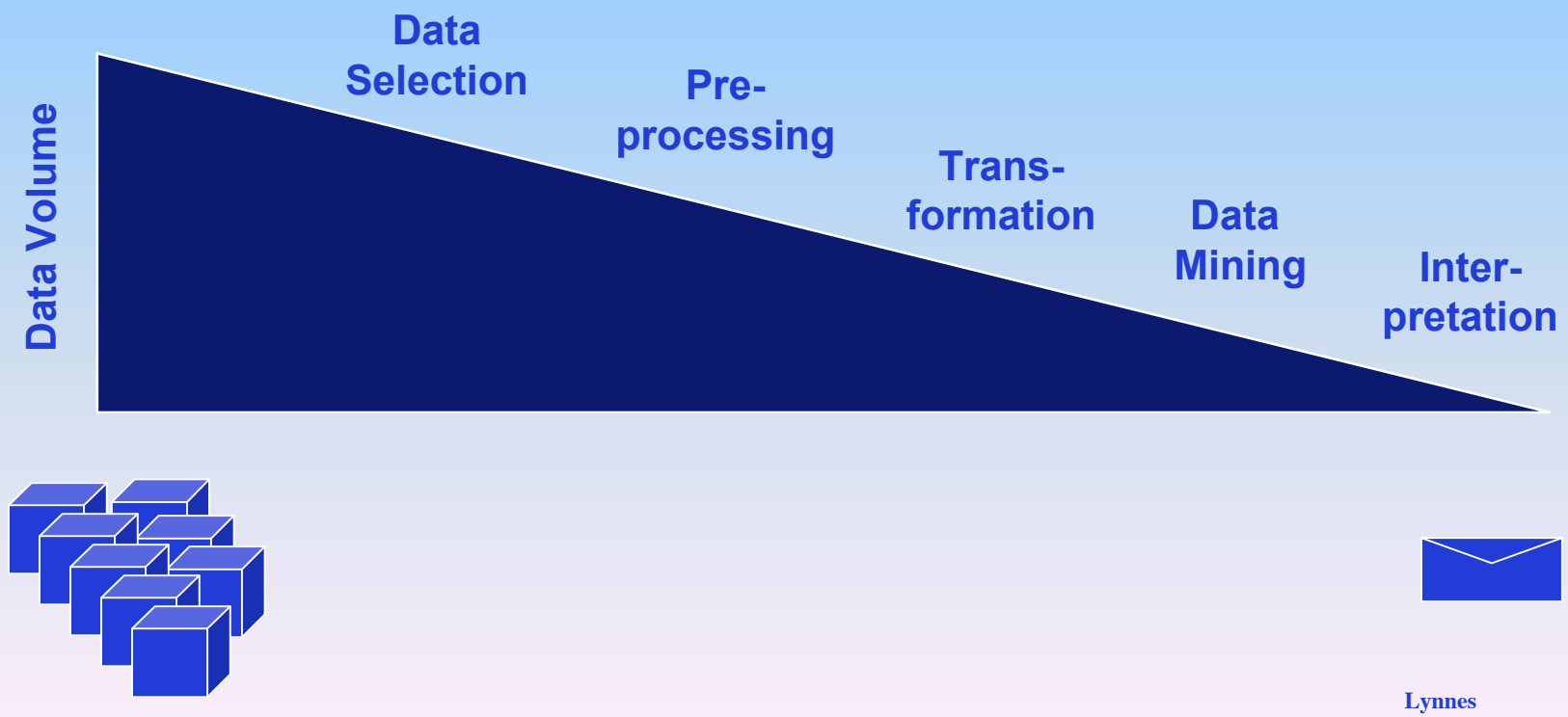
high volume data

migrate

Process on Demand

The Knowledge Discovery in Databases (KDD) Process

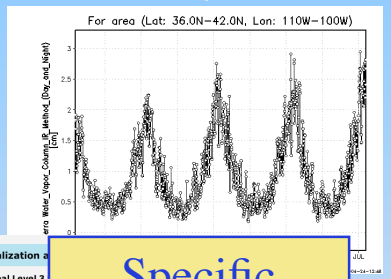
KDD: The nontrivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data (Fayyad, 1996)

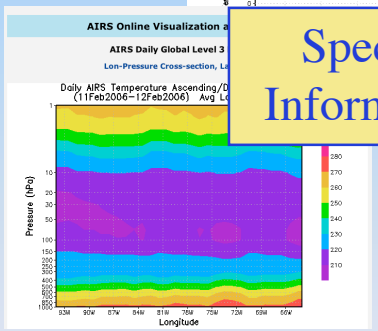


Enabling Earth Science Research

Continuous Global Data Products

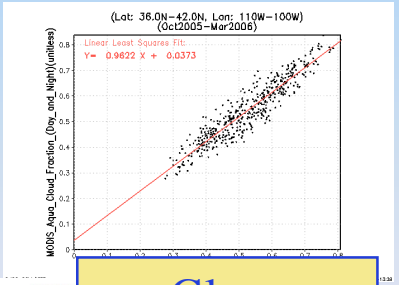
What are you looking for? *

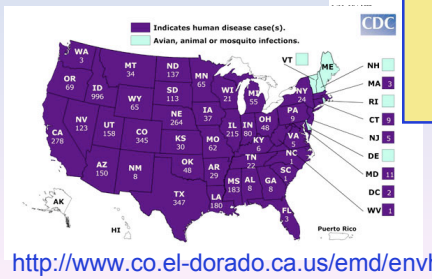




Specific Information

Information Integration **





Glean Knowledge

http://www.co.el-dorado.ca.us/emd/envhealth/wnv.html

* - Spatial & temporal resolution of data
- Region & time period of interest
- Interpretation of the data**

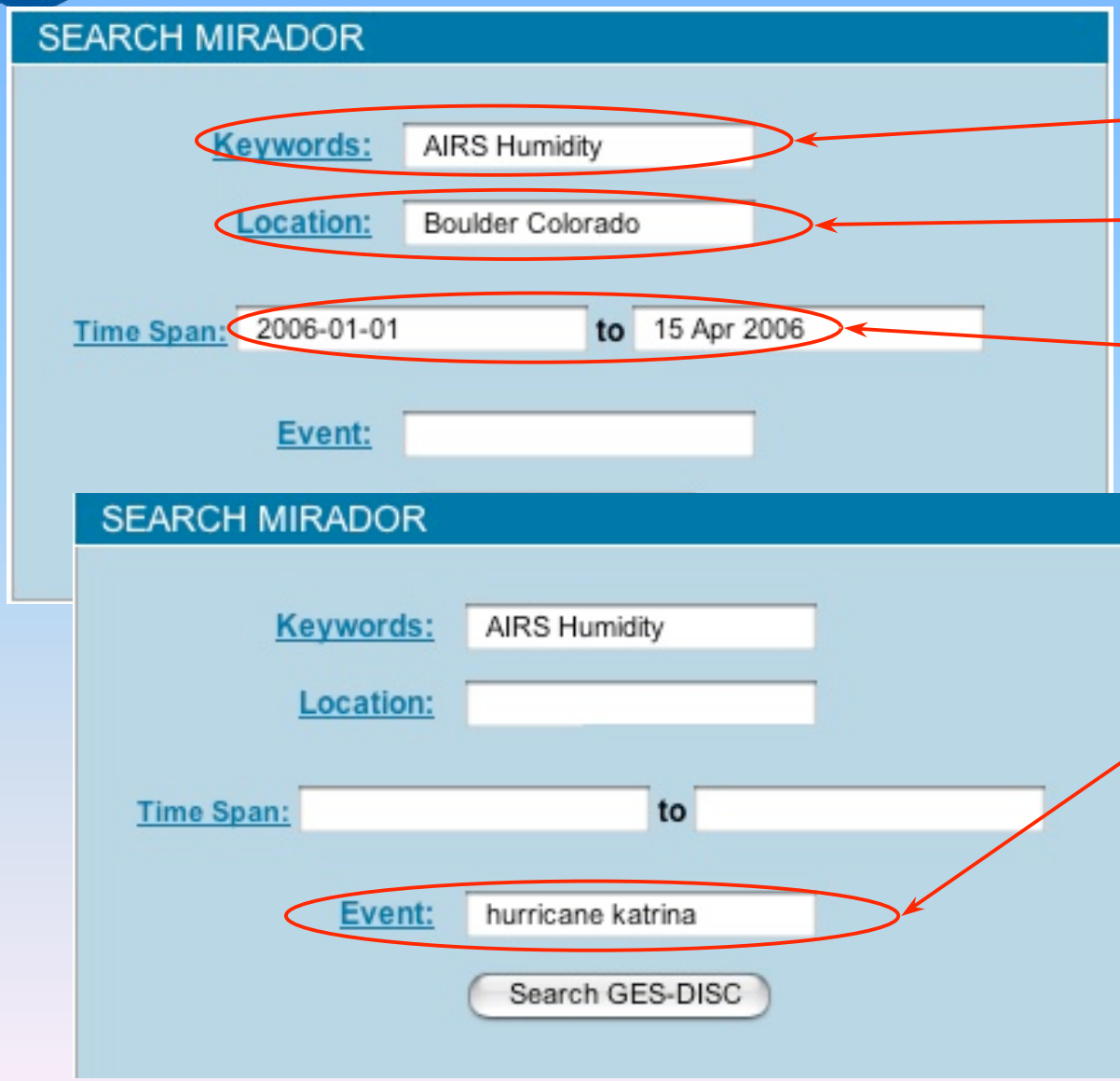
** Collaborations between remote sensing data scientists, information managers, and information recipients

GES DISC Value-Added Tools and Services

Ease of use

- Google like search and data access tool (Mirador)
- Search data by measurement (Parameter Information Page)
- Gridded data on-line visualization and analysis (Giovanni)
- On-the-fly subsetting (FTP-based)
- On-demand subsetting (S4PM-based)
- Data mining within Near-line Archive Data Mining (NADM) system
- Algorithm running within the main production system (S4PM)

Mirador Features



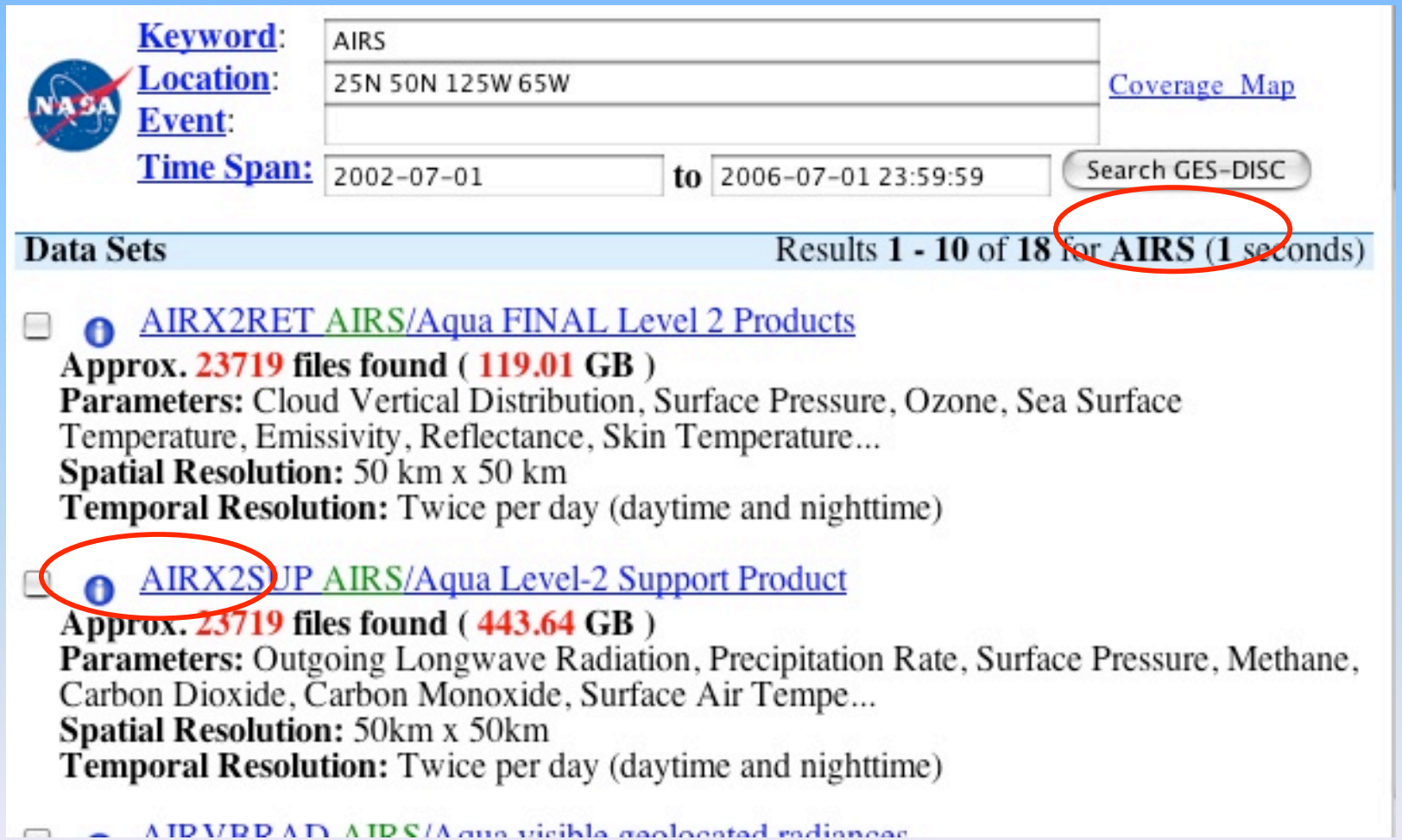
Google freetext search

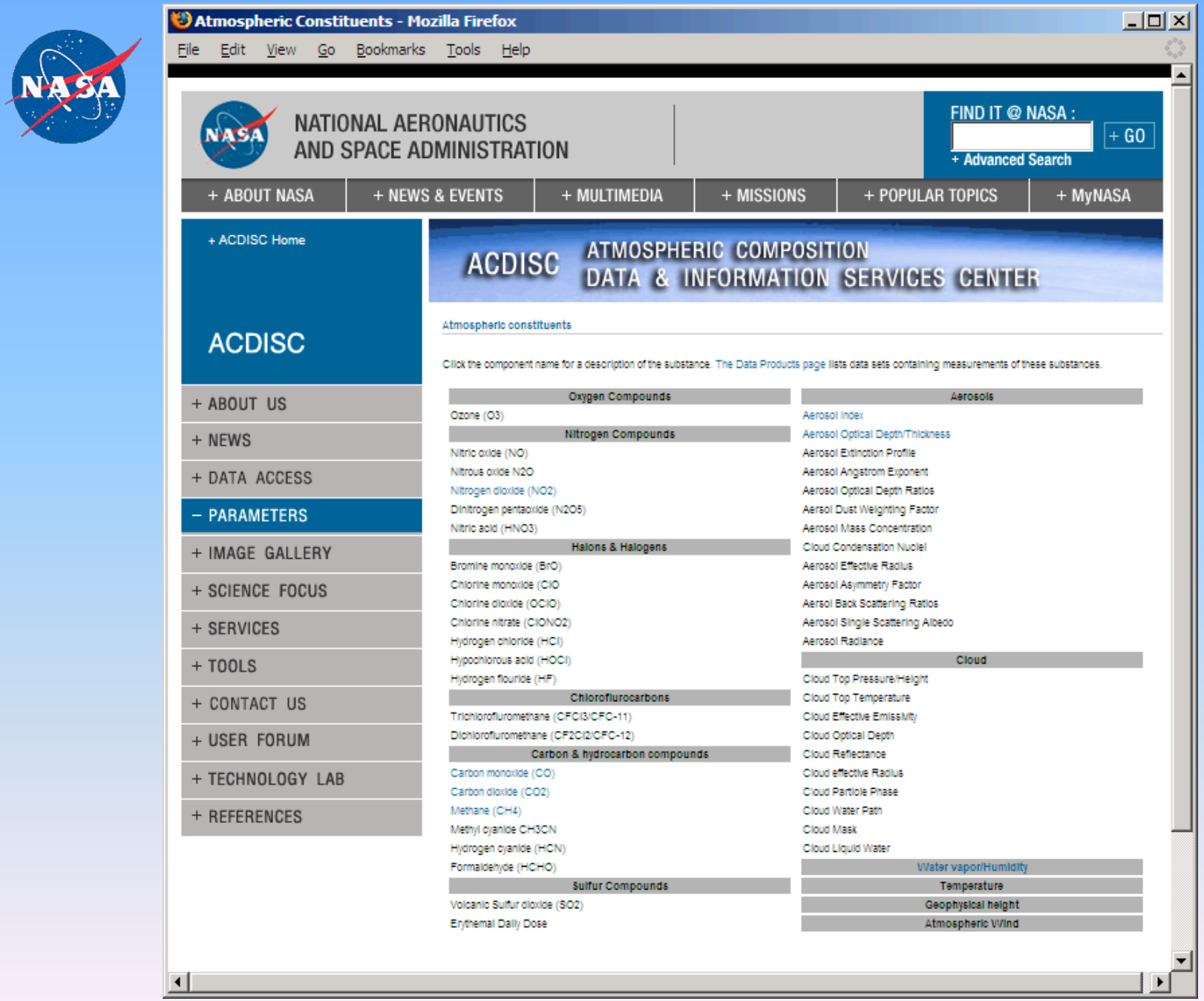
Gazetteer for spatial search

Flexible date format for time search

Event gazetteer for spatio-temporal search

Mirador Speed




Atmospheric Constituents - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FIND IT @ NASA :
+ GO
+ Advanced Search
+ ABOUT NASA
+ NEWS & EVENTS
+ MULTIMEDIA
+ MISSIONS
+ POPULAR TOPICS
+ MyNASA
+ ACDISC Home
ACDISC
ATMOSPHERIC COMPOSITION DATA & INFORMATION SERVICES CENTER
+ ABOUT US
+ NEWS
+ DATA ACCESS
– PARAMETERS
+ IMAGE GALLERY
+ SCIENCE FOCUS
+ SERVICES
+ TOOLS
+ CONTACT US
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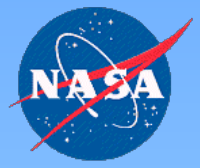
+ REFERENCES
Atmospheric constituents
Click the component name for a description of the substance. The Data Products page lists data sets containing measurements of these substances.
Oxygen Compounds
Ozone (O3)
Nitrogen Compounds
Nitric oxide (NO)
Nitrous oxide N2O
Nitrogen dioxide (NO2)
Dinitrogen pentaoxide (N2O5)
Nitric acid (HNO3)
Halons & Halogens
Bromine monoxide (BrO)
Chlorine monoxide (ClO
Chlorine dioxide (OClO)
Chlorine nitrate (ClONO2)
Hydrogen chloride (HCl)
Hypochlorous acid (HOCl)
Hydrogen flouride (HF)
Chloroflurocarbons
Trichlorofluromethane (CFCl3/CFC-11)
Dichlorofluromethane (CF2Cl2/CFC-12)
Carbon & hydrocarbon compounds
Carbon monoxide (CO)
Carbon dioxide (CO2)
Methane (CH4)
Methyl cyanide CH3CN
Hydrogen cyanide (HCN)
Formaldehyde (HCHO)
Sulfur Compounds
Volcanic Sulfur dioxide (SO2)
Erythemal Daily Dose
Aerosols
Aerosol Index
Aerosol Optical Depth/Thickness
Aerosol Extinction Profile
Aerosol Angstrom Exponent
Aerosol Optical Depth Ratios
Aersol Dust Weighting Factor
Aerosol Mass Concentration
Cloud Condensation Nuclei
Aerosol Effective Radius
Aerosol Asymmetry Factor
Aersol Back Scattering Ratios
Aerosol Single Scattering Albedo
Aerosol Radiance
Cloud
Cloud Top Pressure/Height
Cloud Top Temperature
Cloud Effective Emissivity
Cloud Optical Depth
Cloud Reflectance
Cloud effective Radius
Cloud Particle Phase
Cloud Water Path
Cloud Mask
Cloud Liquid Water
Water vapor/Humidity
Temperature
Geophysical height
Atmospheric Wind



Parameter Information Page - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

Parameter Name: Nitrogen Dioxide

Other Names

Nitrogen Peroxide, NO_2

Definition

Nitrogen dioxide (NO_2), a brownish highly reactive gas, is one of the six major regulated criteria pollutant gas that can cause acute respiratory illness. Though It is found at all levels in the atmosphere, it is dense near the surface and comes mainly from vehicle exhaust and fuel combustion sources. In the troposphere it photodissociates to give free oxygen atoms, which can produce ground level ozone (smog). It also produces corrosive Nitric Acid. In the sratosphere it takes part in the catalytic ozone reduction cycle.

Applications

(1) Air Quality
(2) Monitoring of Human Induced Pollutants
(3) Health and Environment
(4) Atmospheric Chemistry Models

GES DISC DAAC Data Access

To find all the products that contain data for the parameters listed on this page or a closely related parameter click on this link. To view and access products from just one specific sensor click on corresponding 'data access' link in the table below.

Parameter	Units	Platform/ Instrument	Data Coverage		Data Access	Data Document
			Begin Date	End Date		
NO_2 total and tropospheric verticle column and slant column densities(ground pixel resolution, 13x24 km at nadir)	molecules/ cm^2	Aura/ OMI	2004-07-15	Current	coming soon 04/15/2005	Y
NO_2 mixing ratios at different pressure levels (ground pixel resolution)	vmr	Aura/ HIRDLS	2004-07-15	Current	expected end of 2005	Y
NO_2 mixing ratios at different pressure levels (Global Gridded, at equal intervals of latitude/ or equal intervals of time	vmr	UARS/ CLAES	1991-10-25	1993-05-05	Y	Y
		UARS/ HALOE	1991-10-11	2004-04-11	Y	Y
		UARS/ ISAMS	1991-09-26	1992-07-29	Y	Y
		Nimbus-7/ LIMS	1978-10-25	1985-05-01	Y	Y

External sources for data

1. Aura/TES

What is Giovanni?

GES-DISC Interactive Online Visualization and Analysis Infrastructure, an infrastructure for a family of Web interfaces for modelers, global and regional trends researchers, teachers, students :

- No need to learn data formats
- No need to retrieve and process data
- Everything is done via a regular Web browser
- Intuitive user-friendly interfaces customized for various disciplines
- Several statistical analysis options provided

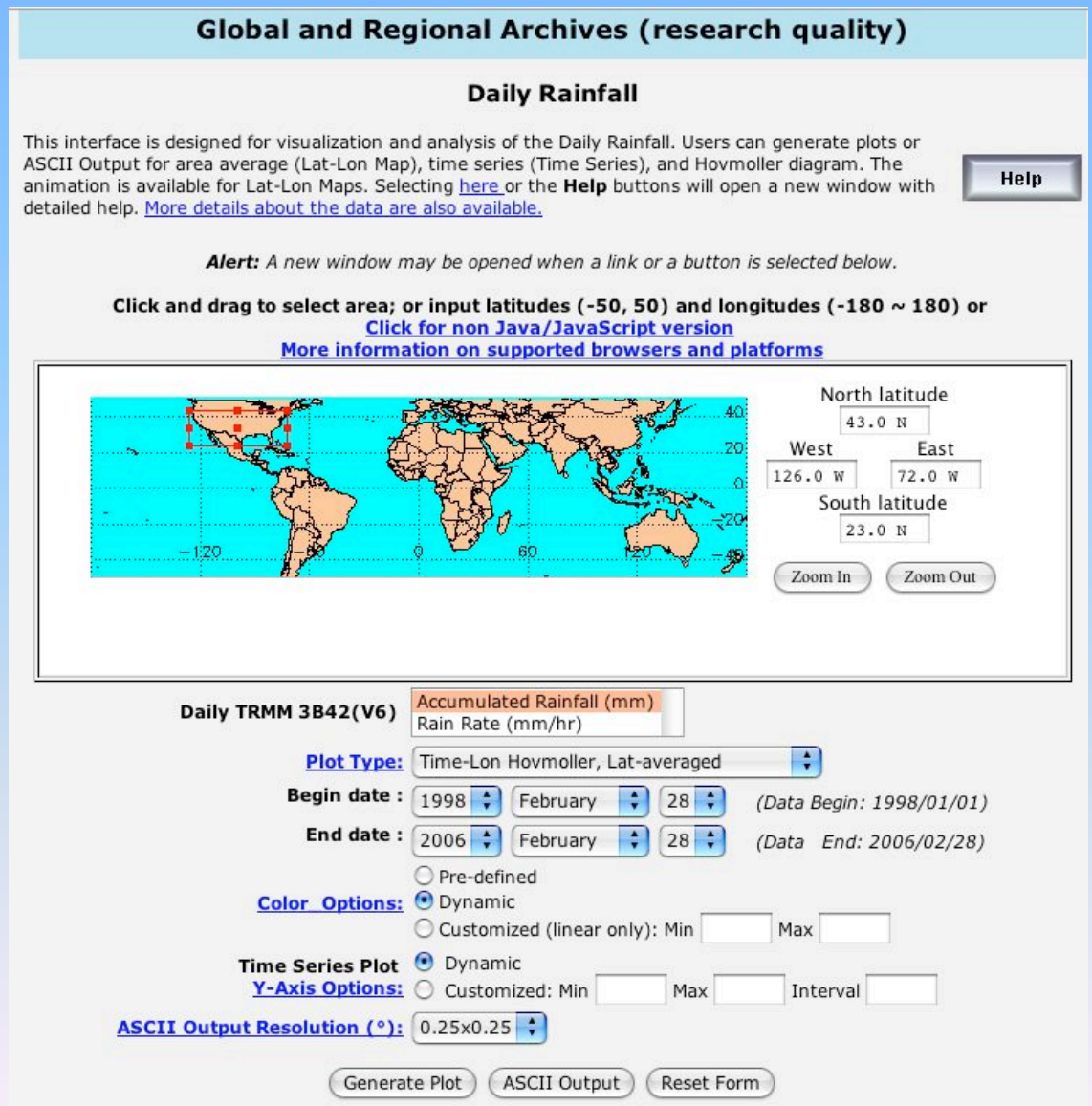
Over 15,000 Giovanni page views in April

Goals of Giovanni

- Study various phenomena interactively
- Ask what-if questions and get back answers to stimulate further investigations
- Try various combinations of parameters measured by different instruments
- Arrive at a conclusion
- Generate graphs suitable for a publication

Caution: Giovanni is an exploration tool

Giovanni



Online Analysis:

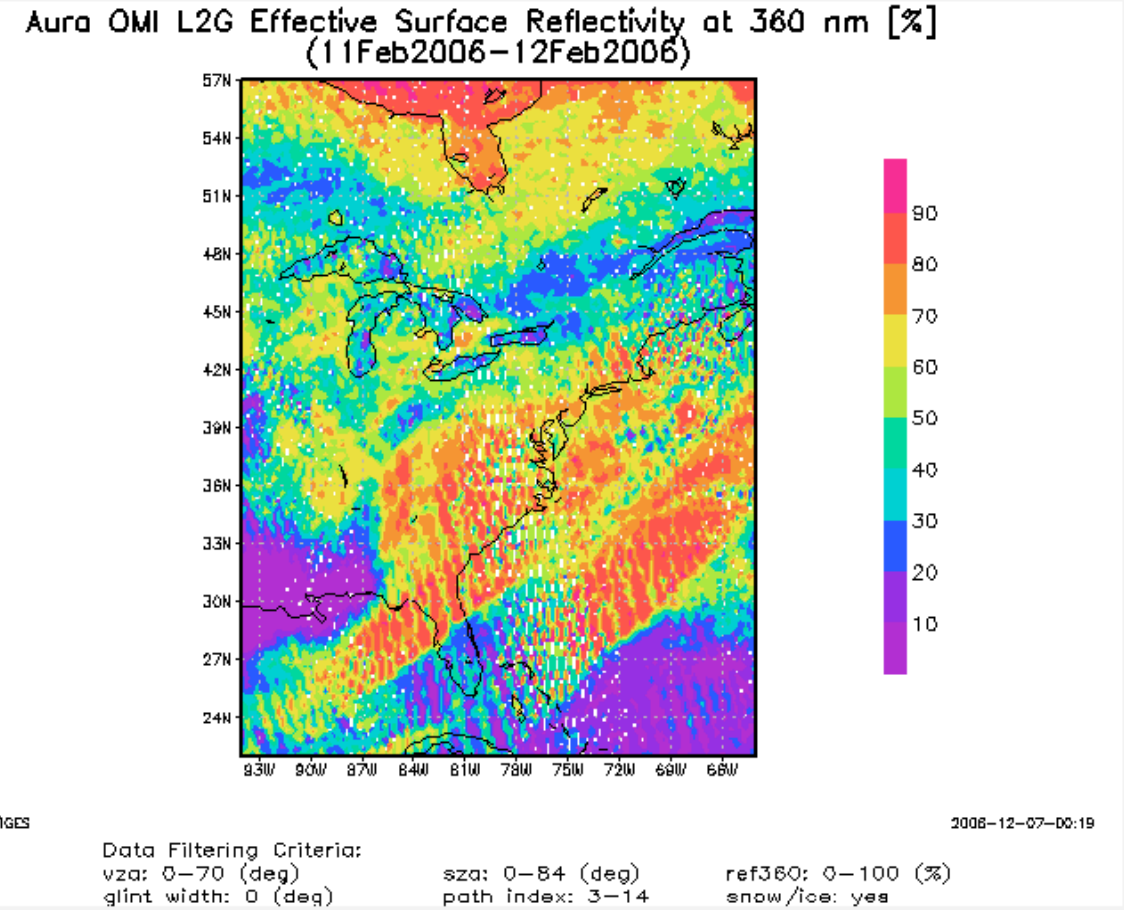
- Vertical Profiles
- Maps
- Time-Series
- Hovmoller
- Correlations
- Virtual products
- ASCII Output

Giovanni Time-Averaged Maps

OMI Online Visualization and Analysis

Aura OMI Level 2G Daily Global Products (Beta)
(for advanced users)

Lat-Lon Map, Time-averaged

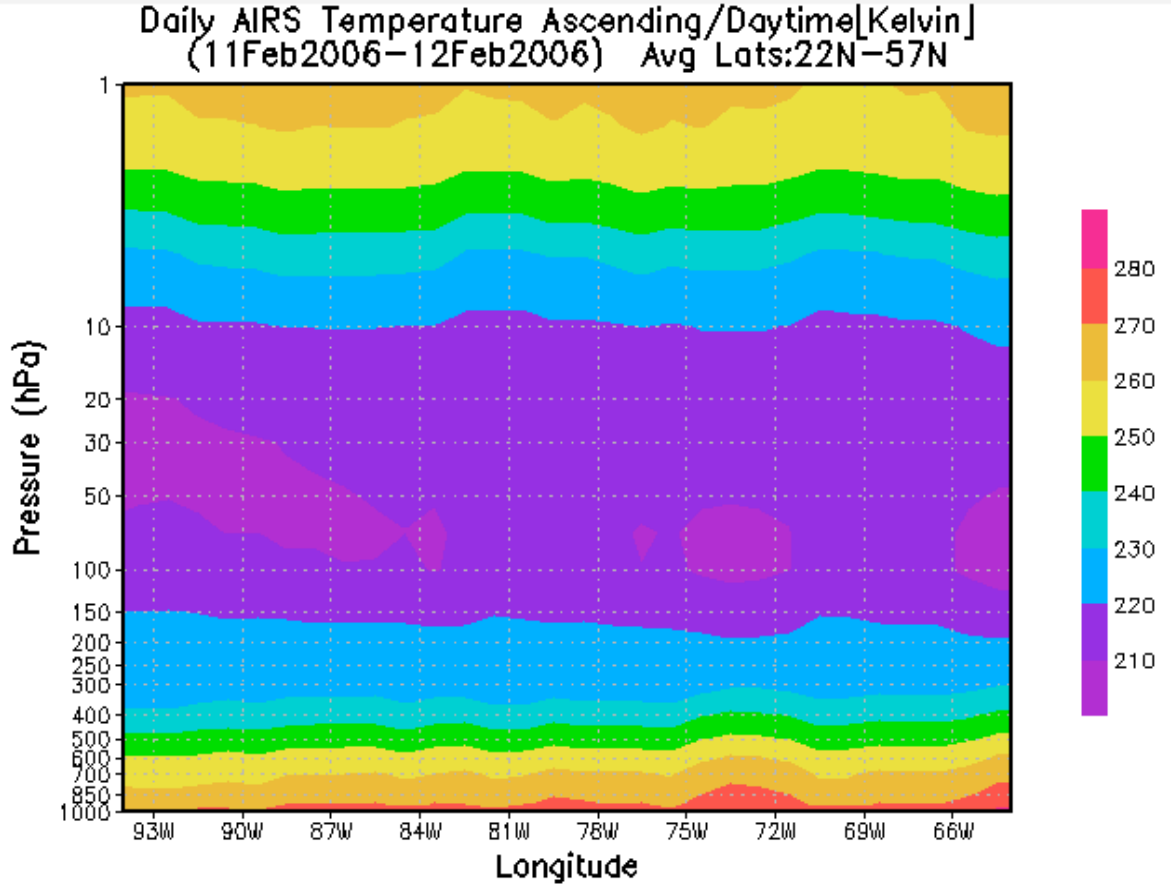


Giovanni Vertical Cross-Sections

AIRS Online Visualization and Analysis

AIRS Daily Global Level 3 Products

Lon-Pressure Cross-section, Lat-averaged

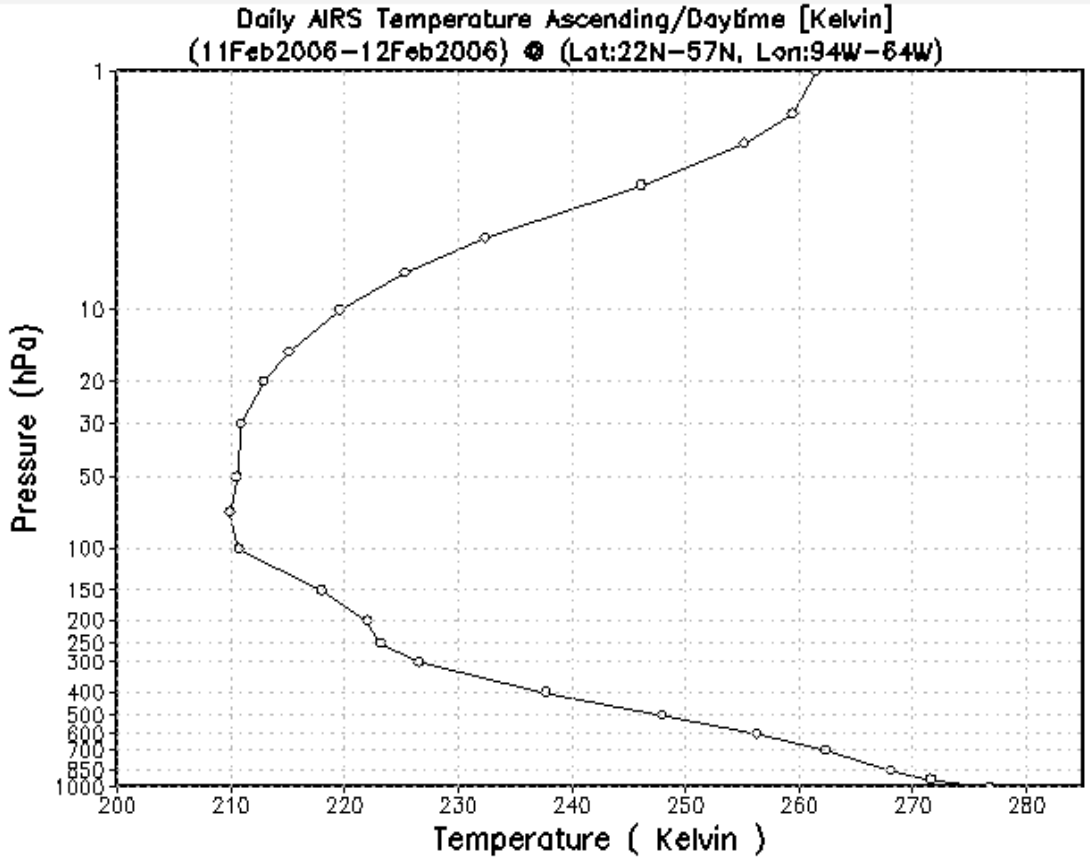


Giovanni Vertical Profiles

AIRS Online Visualization and Analysis

AIRS Daily Global Level 3 Products

Vertical Profile, Parameter vs. Pressure

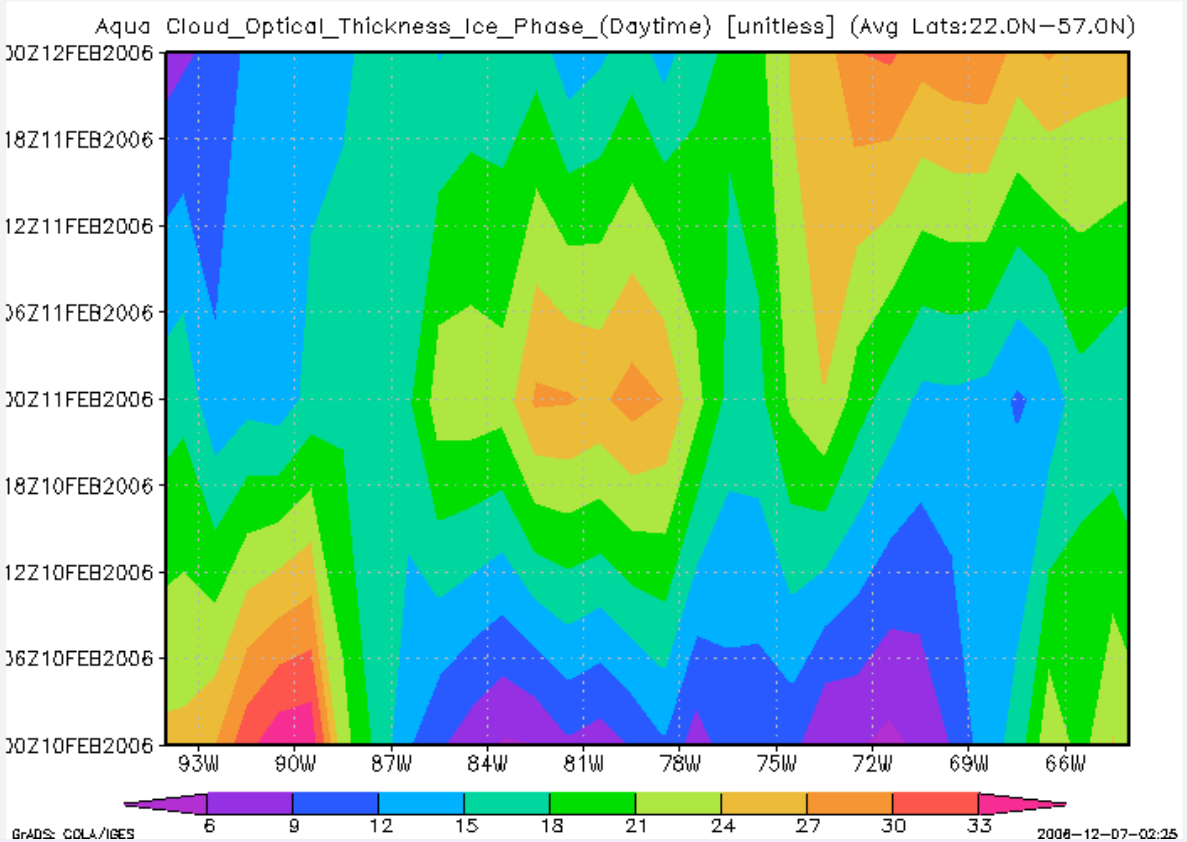


Giovanni Hovmoller

Giovanni MODIS Collection 4 Online Visualization and Analysis (MOVAS)

MODIS/Aqua Atmosphere Daily Global Product (MYD08_D3)

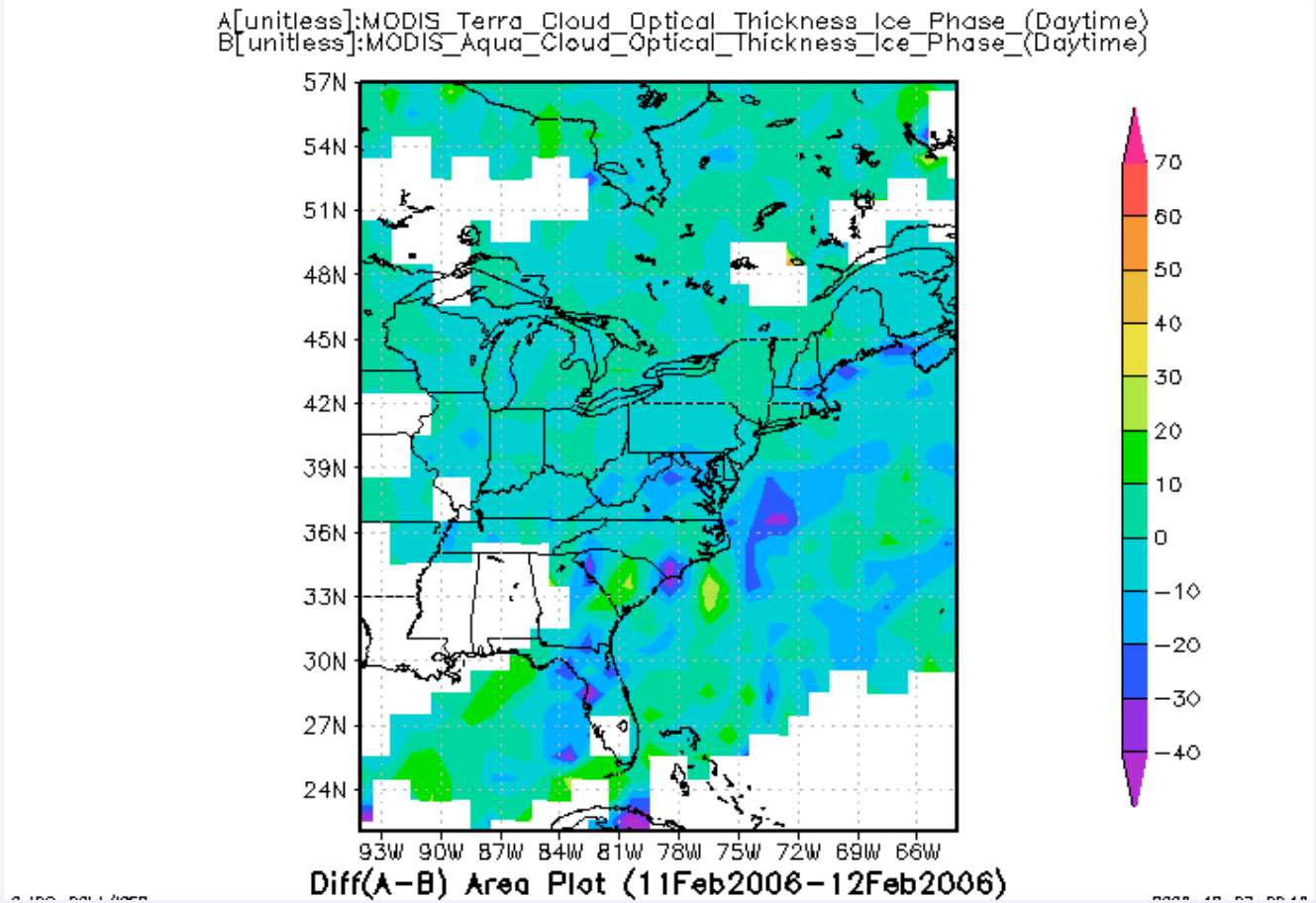
Time-Lon Hovmoller, Lat-averaged



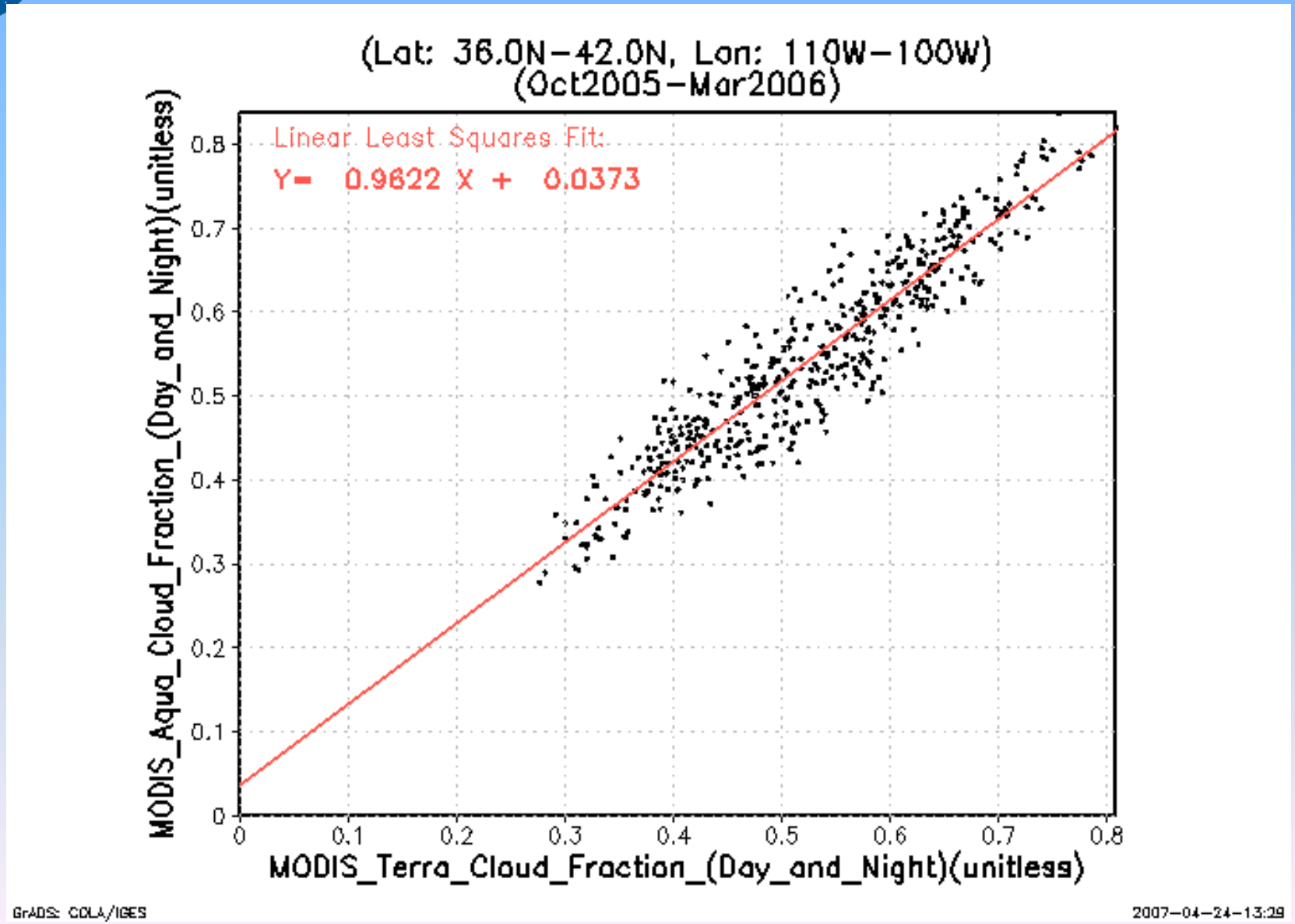
Giovanni Intercomparison Map

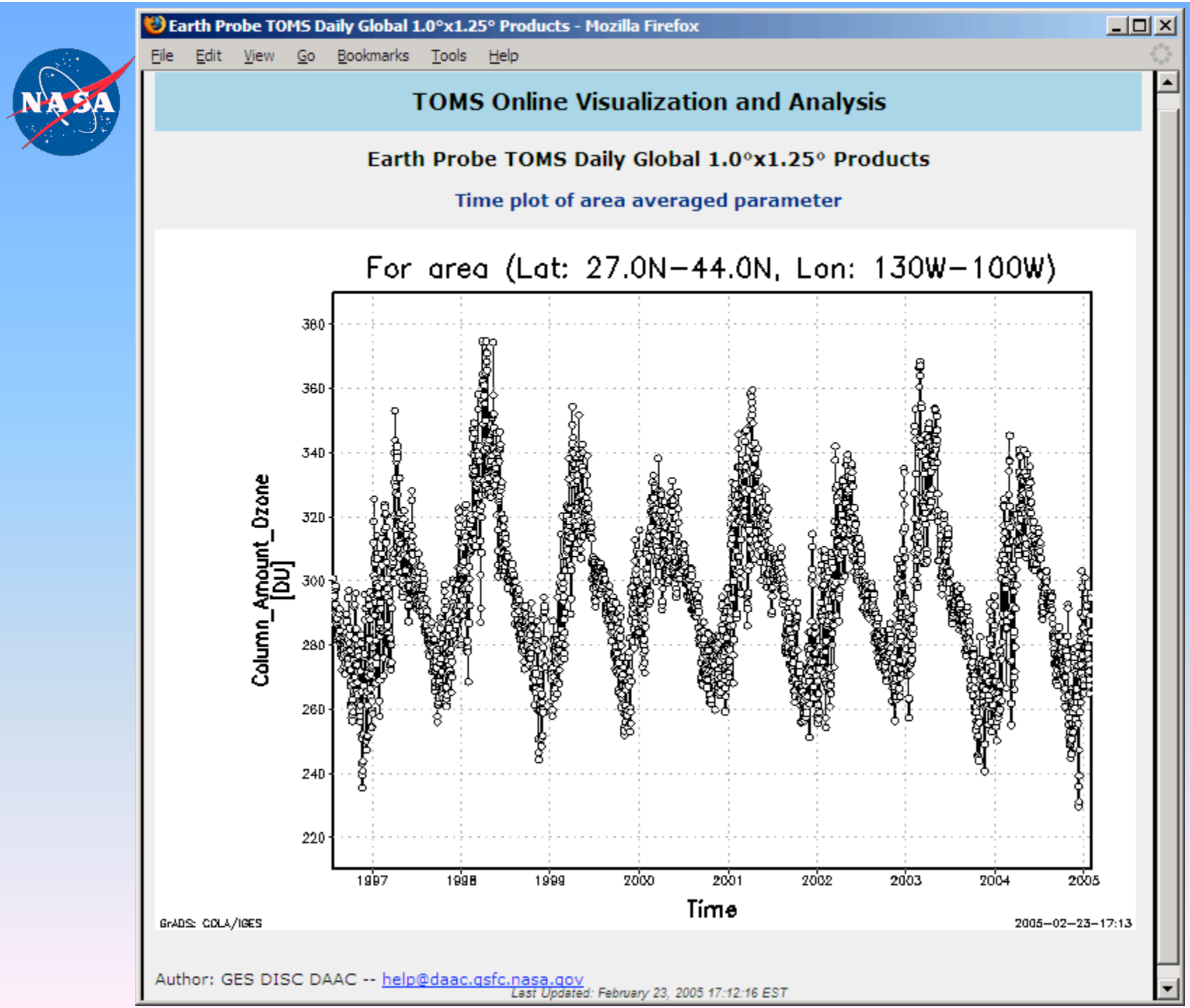
Giovanni MODIS Collection 4 Daily Multi-parameter Intercomparison System

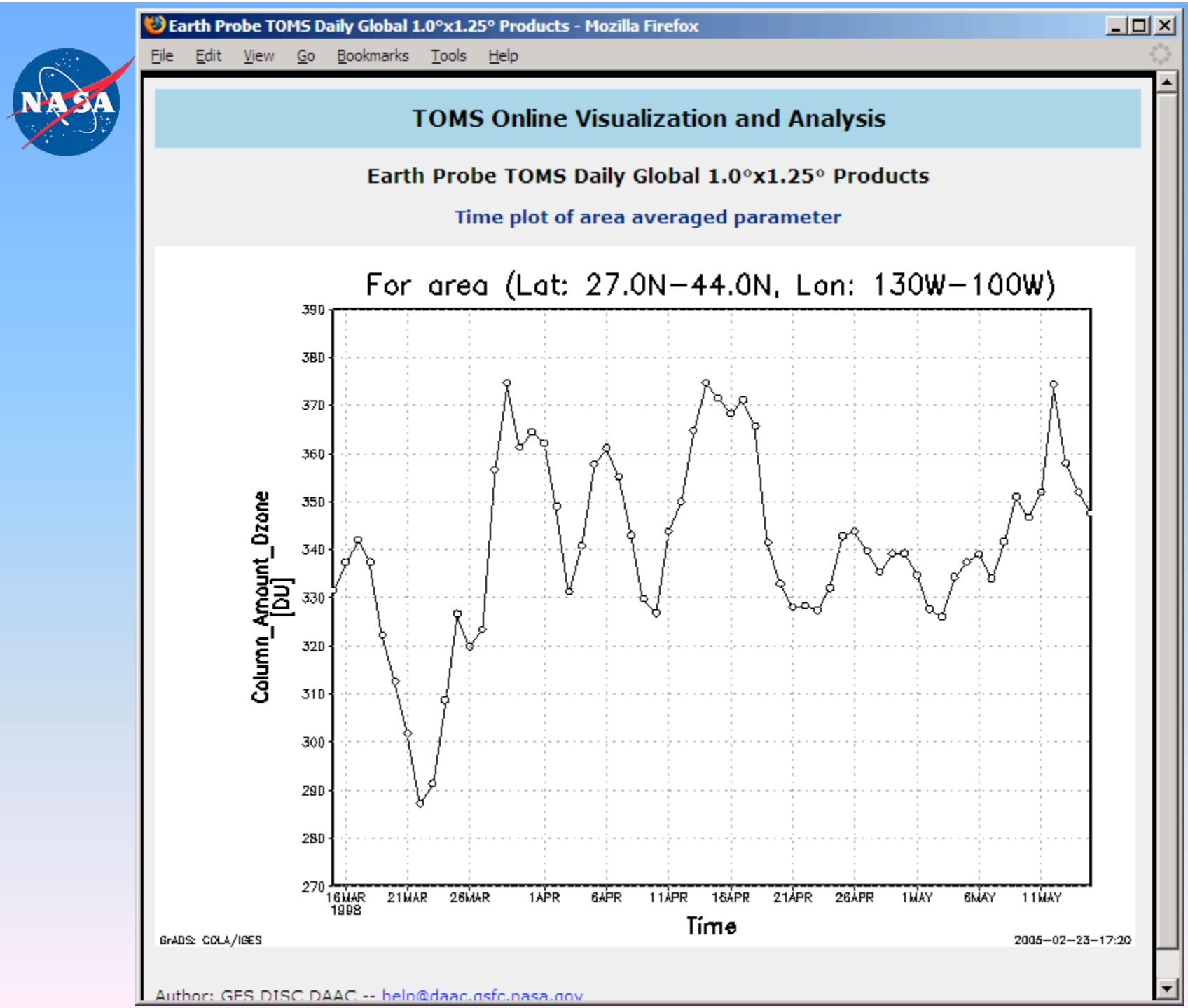
MODIS Terra/Aqua Atmosphere Daily Global Products

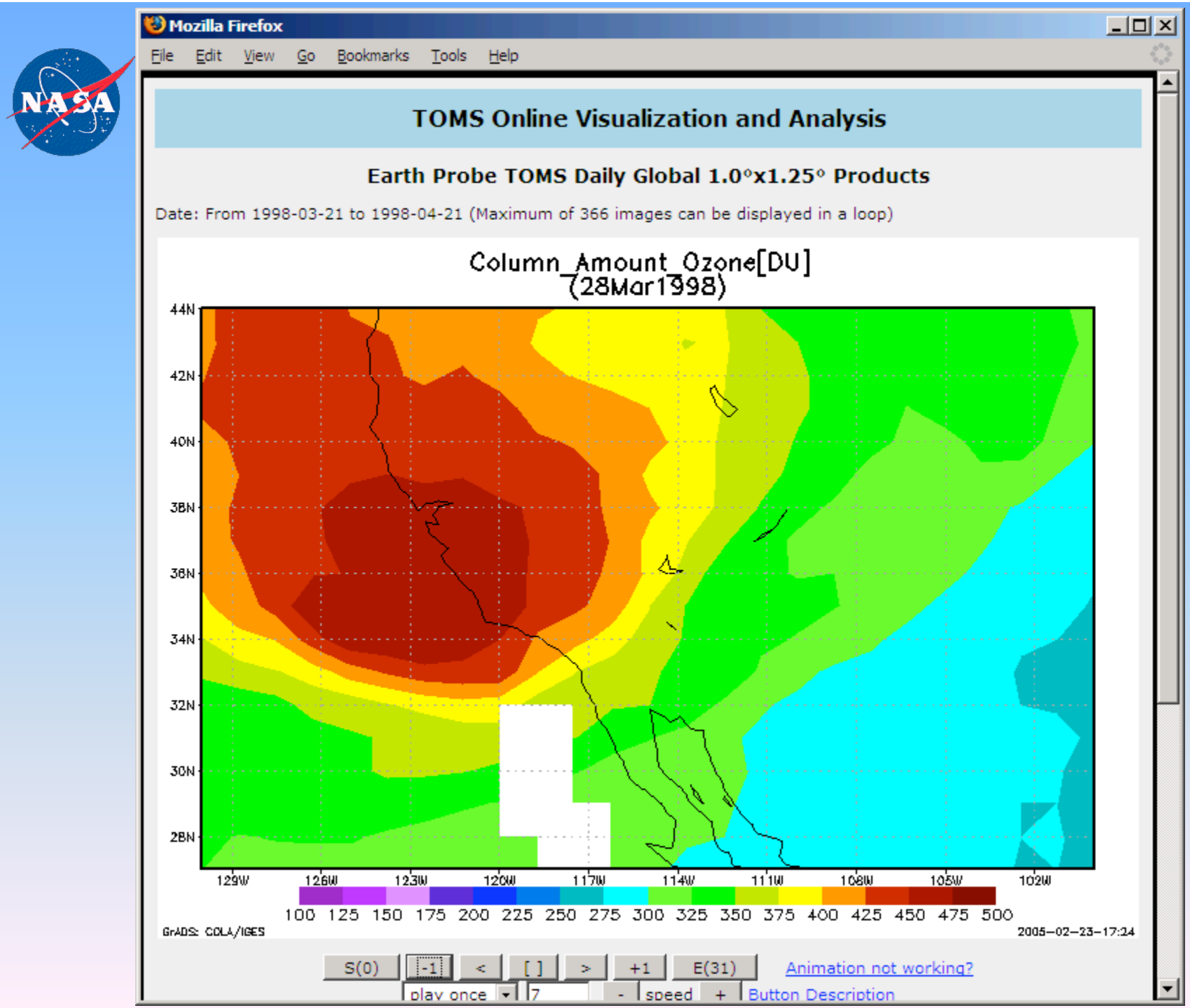


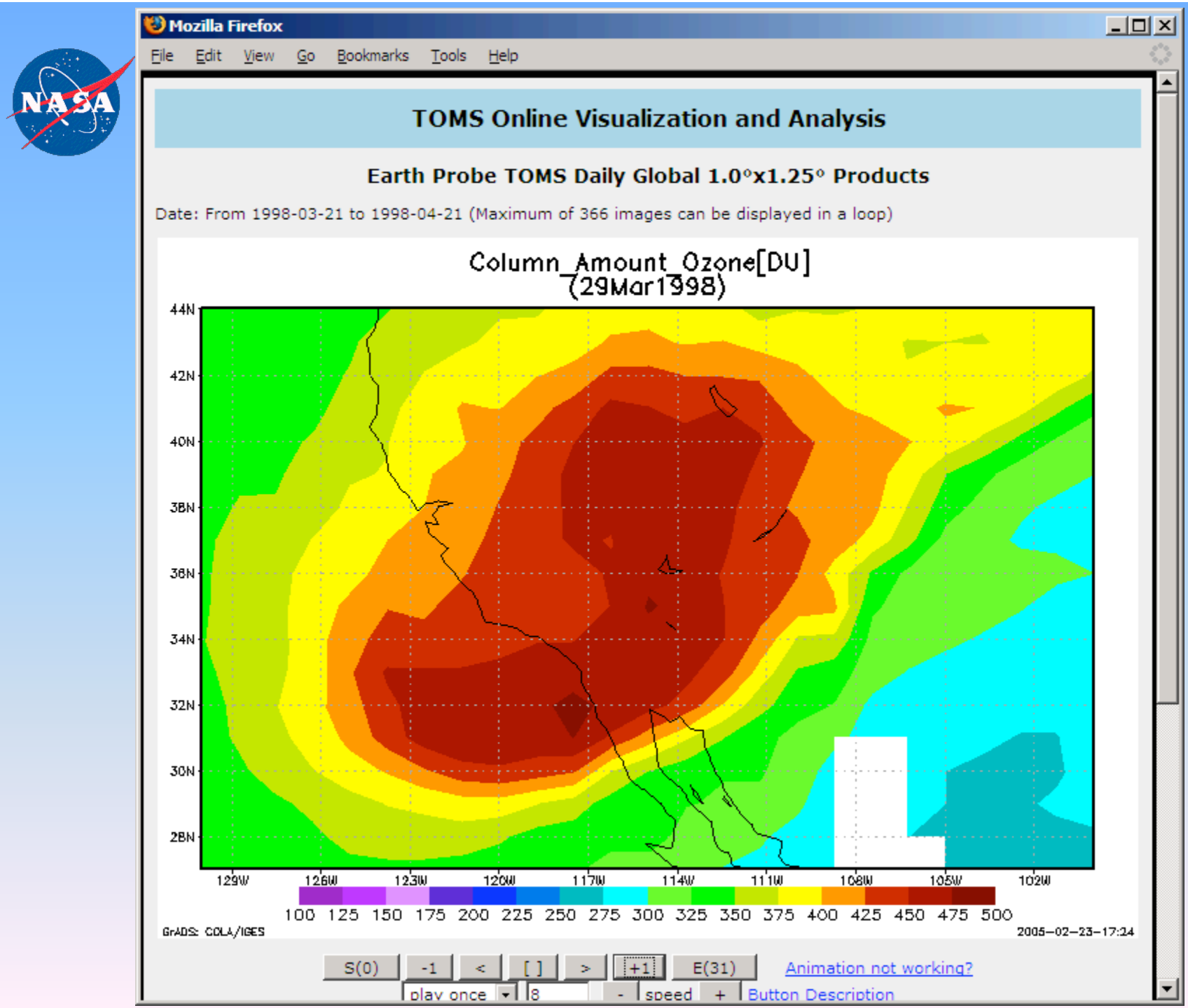
Giovanni Intercomparison Scatter Plot

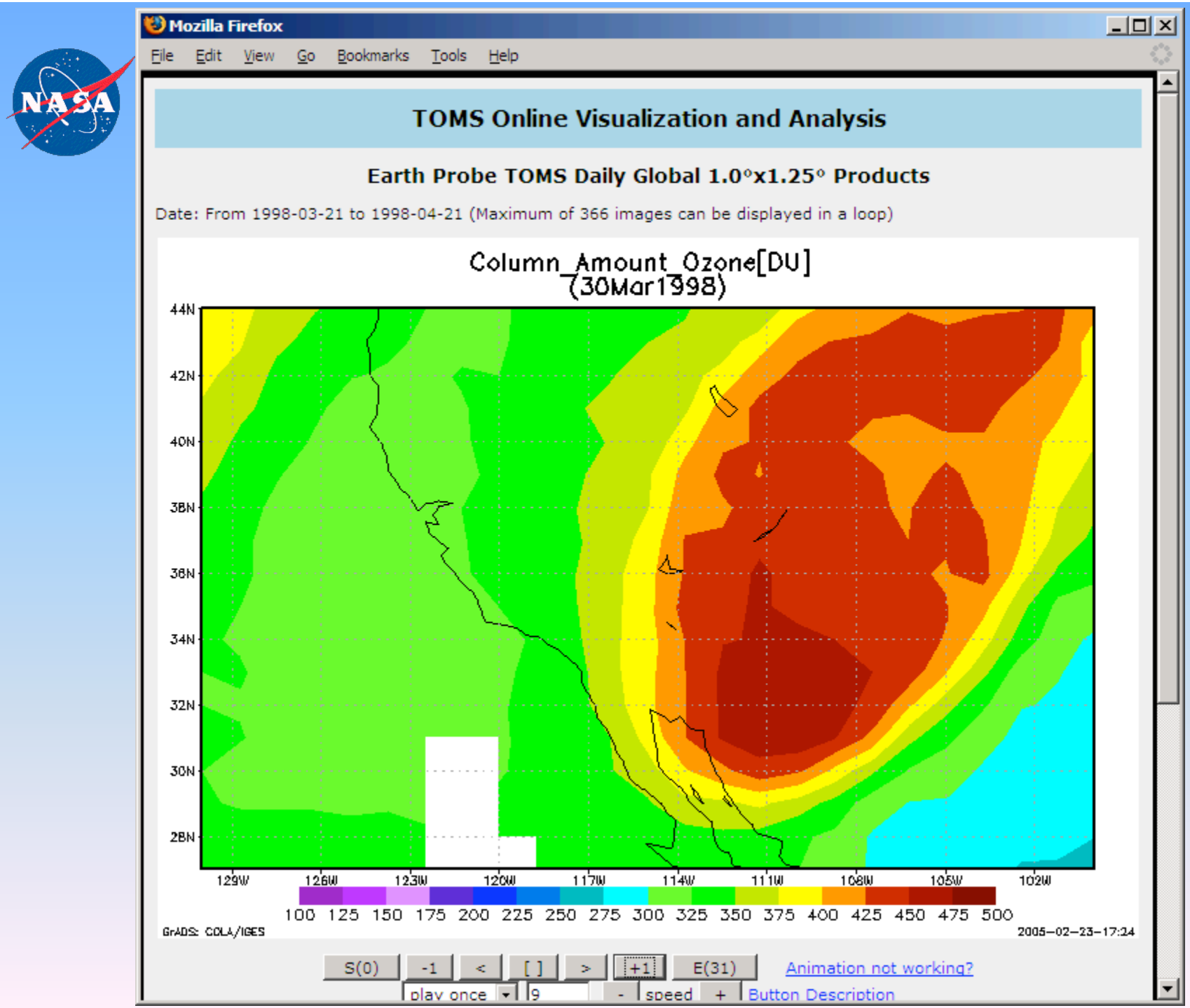


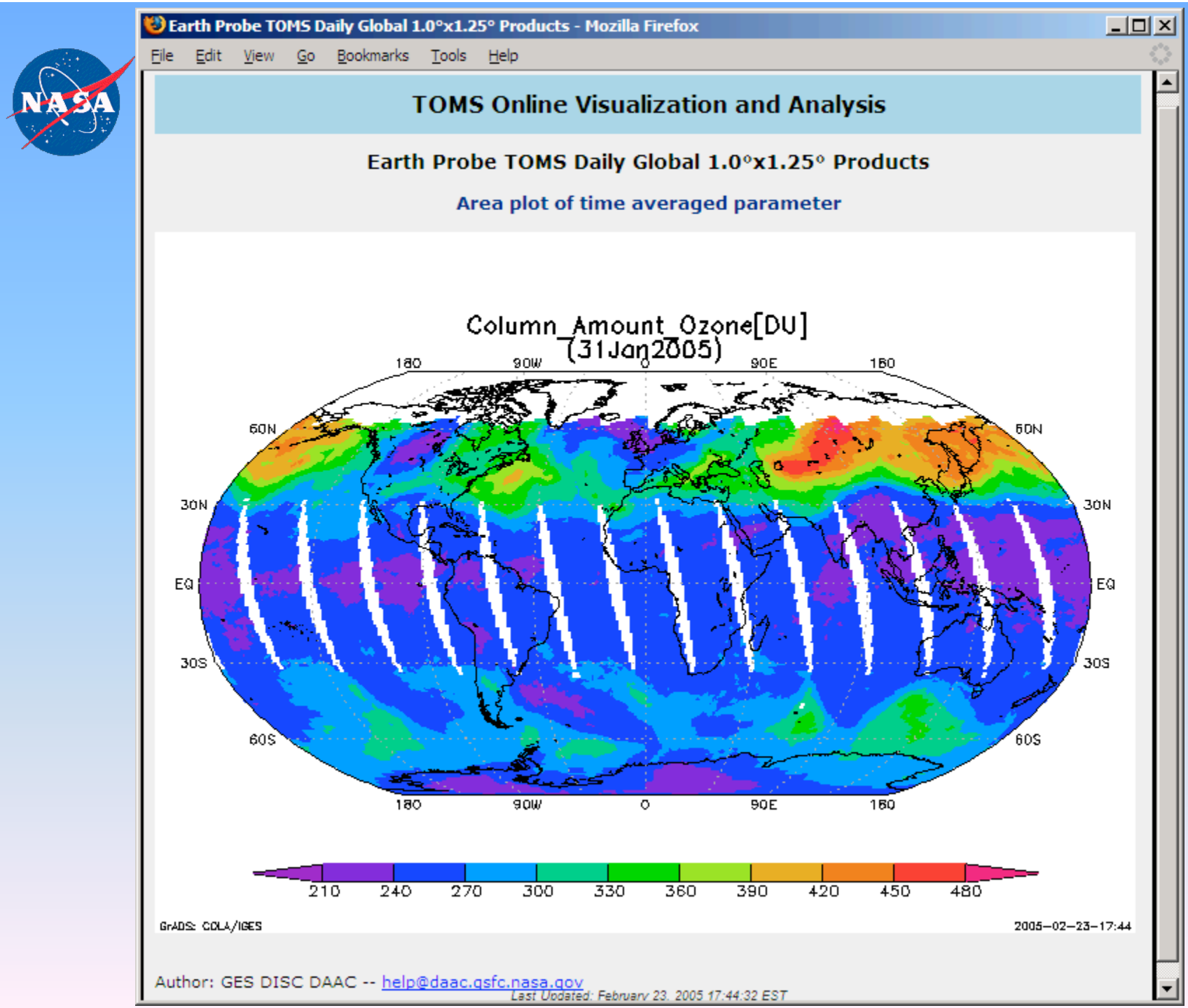

Earth Probe TOMS Daily Global 1.0°x1.25° Products - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
TOMS Online Visualization and Analysis
Earth Probe TOMS Daily Global 1.0°x1.25° Products
Time plot of area averaged parameter
For area (Lat: 27.0N-44.0N, Lon: 130W-100W)
Column_Amount_Ozone [DU]
380
360
340
320
300
280
260
240
220
1997
1998
1999
2000
2001
2002
2003
2004
2005
Time
GrADS: COLA/IGES
2005-02-23-17:13
Author: GES DISC DAAC -- help@daac.gsfc.nasa.gov
Last Updated: February 23, 2005 17:12:16 EST


Earth Probe TOMS Daily Global 1.0°x1.25° Products - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
TOMS Online Visualization and Analysis
Earth Probe TOMS Daily Global 1.0°x1.25° Products
Time plot of area averaged parameter
For area (Lat: 27.0N-44.0N, Lon: 130W-100W)
Column_Amount_Ozone [DU]
390
380
370
360
350
340
330
320
310
300
290
280
270
16MAR 1998
21MAR
26MAR
1APR
6APR
11APR
16APR
21APR
26APR
1MAY
6MAY
11MAY
Time
GrADS: COLA/IGES
2005-02-23-17:20
Author: GES DISC DAAC -- help@daac.gsfc.nasa.gov


Mozilla Firefox
File Edit View Go Bookmarks Tools Help
TOMS Online Visualization and Analysis
Earth Probe TOMS Daily Global 1.0°x1.25° Products
Date: From 1998-03-21 to 1998-04-21 (Maximum of 366 images can be displayed in a loop)
Column_Amount_Ozone[DU]
(28Mar1998)
44N
42N
40N
38N
36N
34N
32N
30N
28N
129W 126W 123W 120W 117W 114W 111W 108W 105W 102W
100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500
GrADS: COLA/IGES
2005-02-23-17:24
S(0) -1 < [ ] > +1 E(31)
Animation not working?
play once
7
- speed +
Button Description


Mozilla Firefox
File Edit View Go Bookmarks Tools Help
TOMS Online Visualization and Analysis
Earth Probe TOMS Daily Global 1.0°x1.25° Products
Date: From 1998-03-21 to 1998-04-21 (Maximum of 366 images can be displayed in a loop)
Column_Amount_Ozone[DU]
(29Mar1998)
44N
42N
40N
38N
36N
34N
32N
30N
28N
129W 126W 123W 120W 117W 114W 111W 108W 105W 102W
100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500
GrADS: COLA/IGES
2005-02-23-17:24
S(0) -1 < [ ] > +1 E(31)
Animation not working?
play once
8
- speed +
Button Description


Mozilla Firefox
File Edit View Go Bookmarks Tools Help
TOMS Online Visualization and Analysis
Earth Probe TOMS Daily Global 1.0°x1.25° Products
Date: From 1998-03-21 to 1998-04-21 (Maximum of 366 images can be displayed in a loop)
Column_Amount_Ozone[DU]
(30Mar1998)
44N
42N
40N
38N
36N
34N
32N
30N
28N
129W 126W 123W 120W 117W 114W 111W 108W 105W 102W
100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500
GrADS: COLA/IGES
2005-02-23-17:24
S(0) -1 < [ ] > +1 E(31)
Animation not working?
play once
9
- speed +
Button Description


Earth Probe TOMS Daily Global 1.0°x1.25° Products - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
TOMS Online Visualization and Analysis
Earth Probe TOMS Daily Global 1.0°x1.25° Products
Area plot of time averaged parameter
Column_Amount_Ozone[DU]
(31Jan2005)
180 90W 0 90E 180
60N
30N
EQ
30S
60S
210 240 270 300 330 360 390 420 450 480
GrADS: COLA/IGES
2005-02-23-17:44
Author: GES DISC DAAC -- help@daac.gsfc.nasa.gov
Last Updated: February 23, 2005 17:44:32 EST

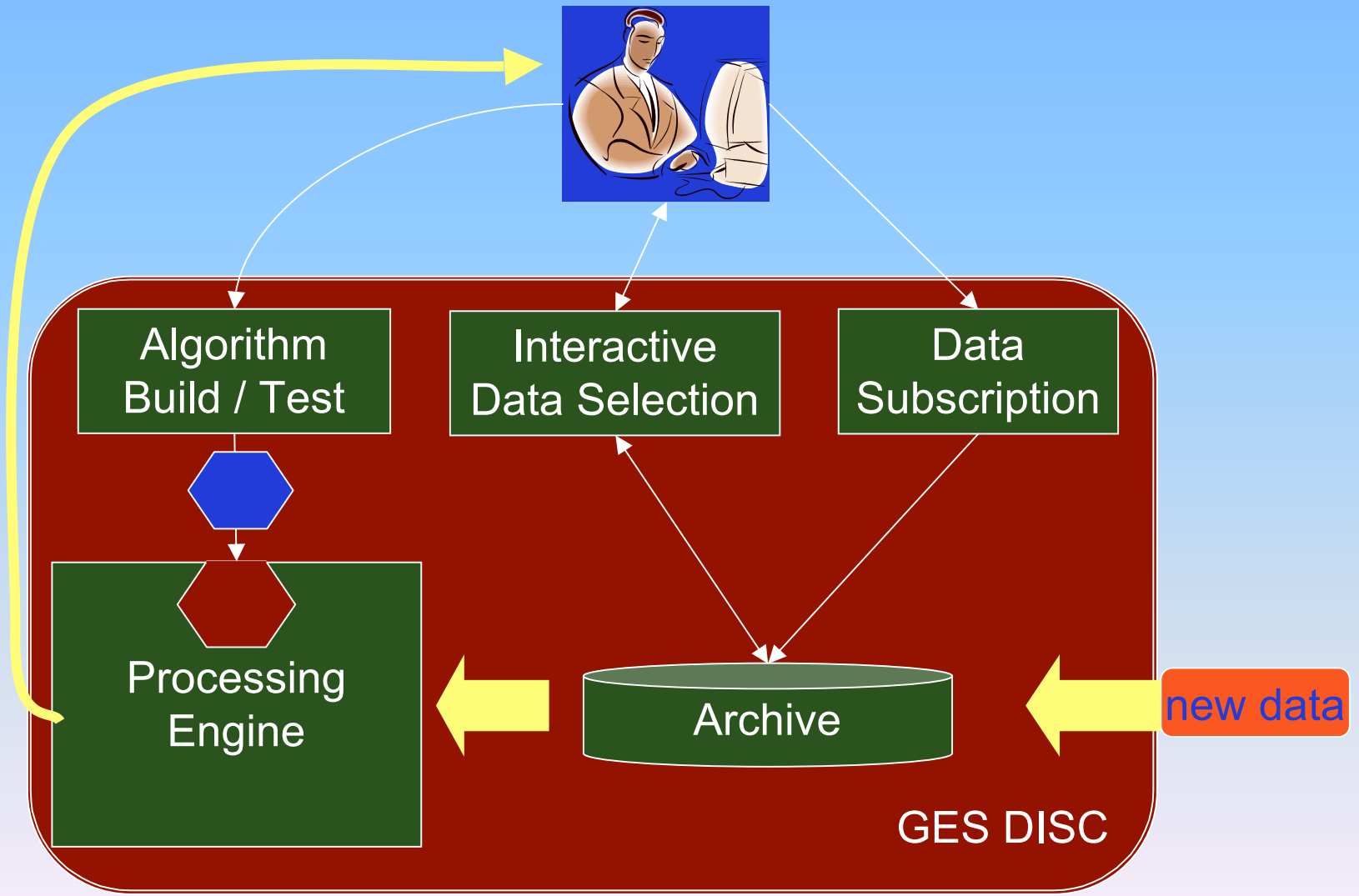
On-the-fly subsetting

- For users in need for specific channels/parameters or spatial regions
- Original data granules are in the online archive
- Users can:
  - Enter subsetting criteria through the GES DISC web interface, and:
    - Download subsets one-by-one by clicking on granules selected
    - Download an FTP script generated by the system for selected granules, and then initiate an FTP session to download all the required subsets
  - FTP directly to the online archive, and download subsets by using special extensions

On-demand subsetting

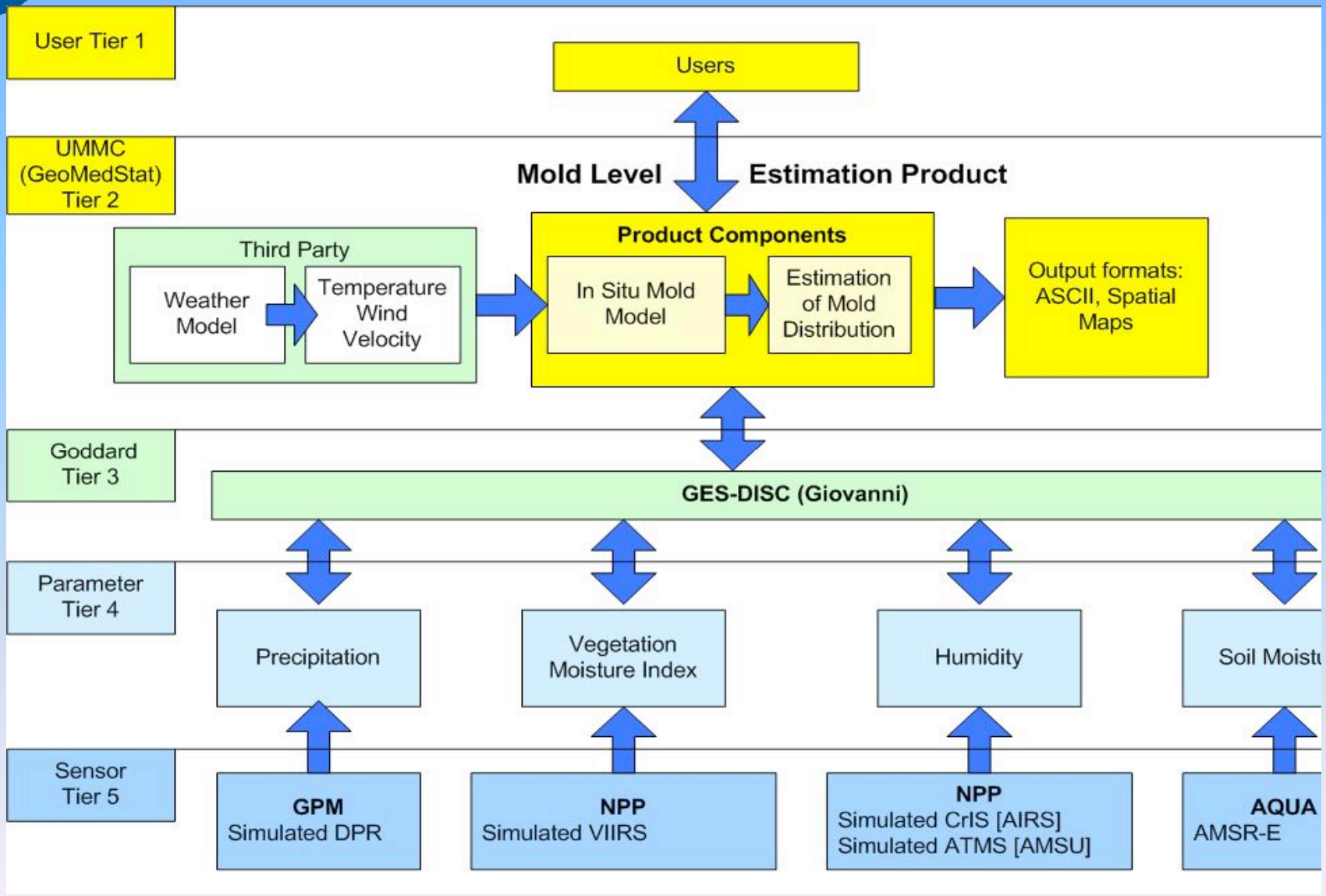
- For the same target audience as of on-the-fly subsetting
- Order is submitted to the archive system
- Selected data granules are retrieved from tapes and staged for subsetting within S4PM
- Resulting subset output delivered through standard means within 24-48 hours
- Users process output subsets themselves

Near-Archive Data Mining

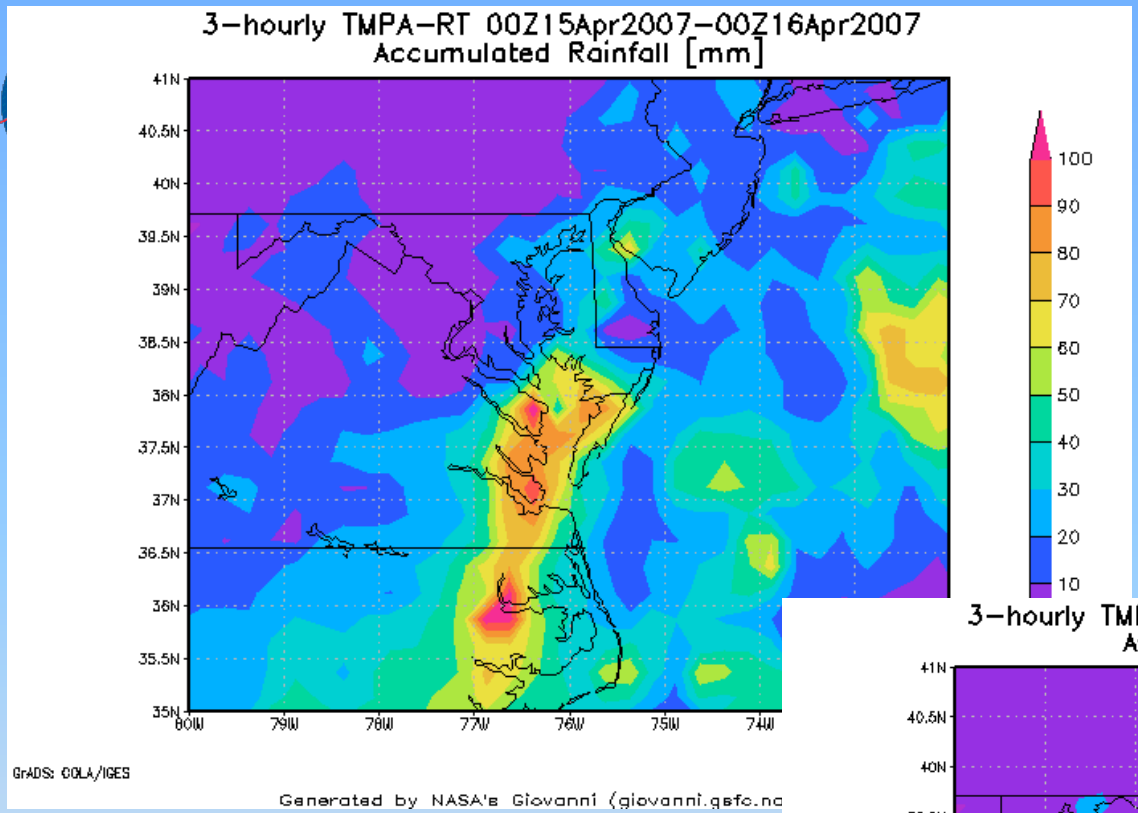


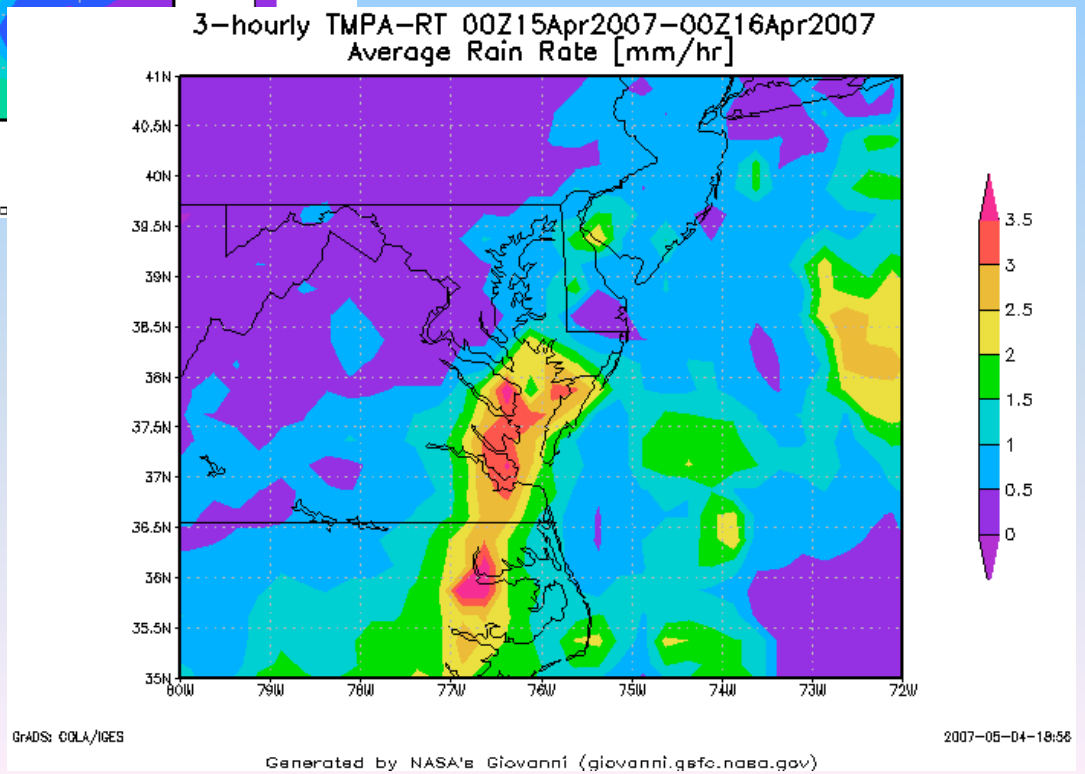
Opportunities…

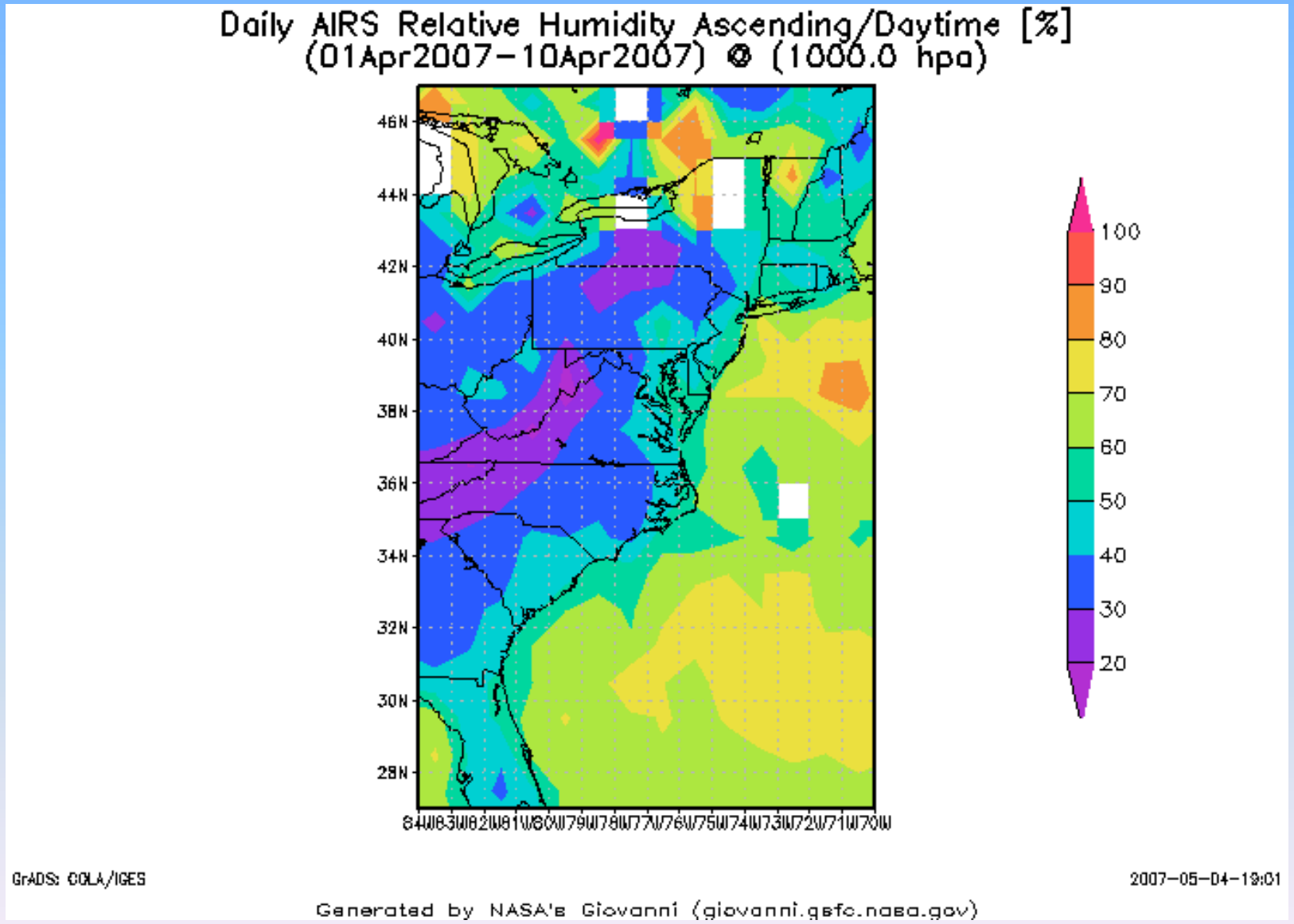
Geophysical Measurements and Mold

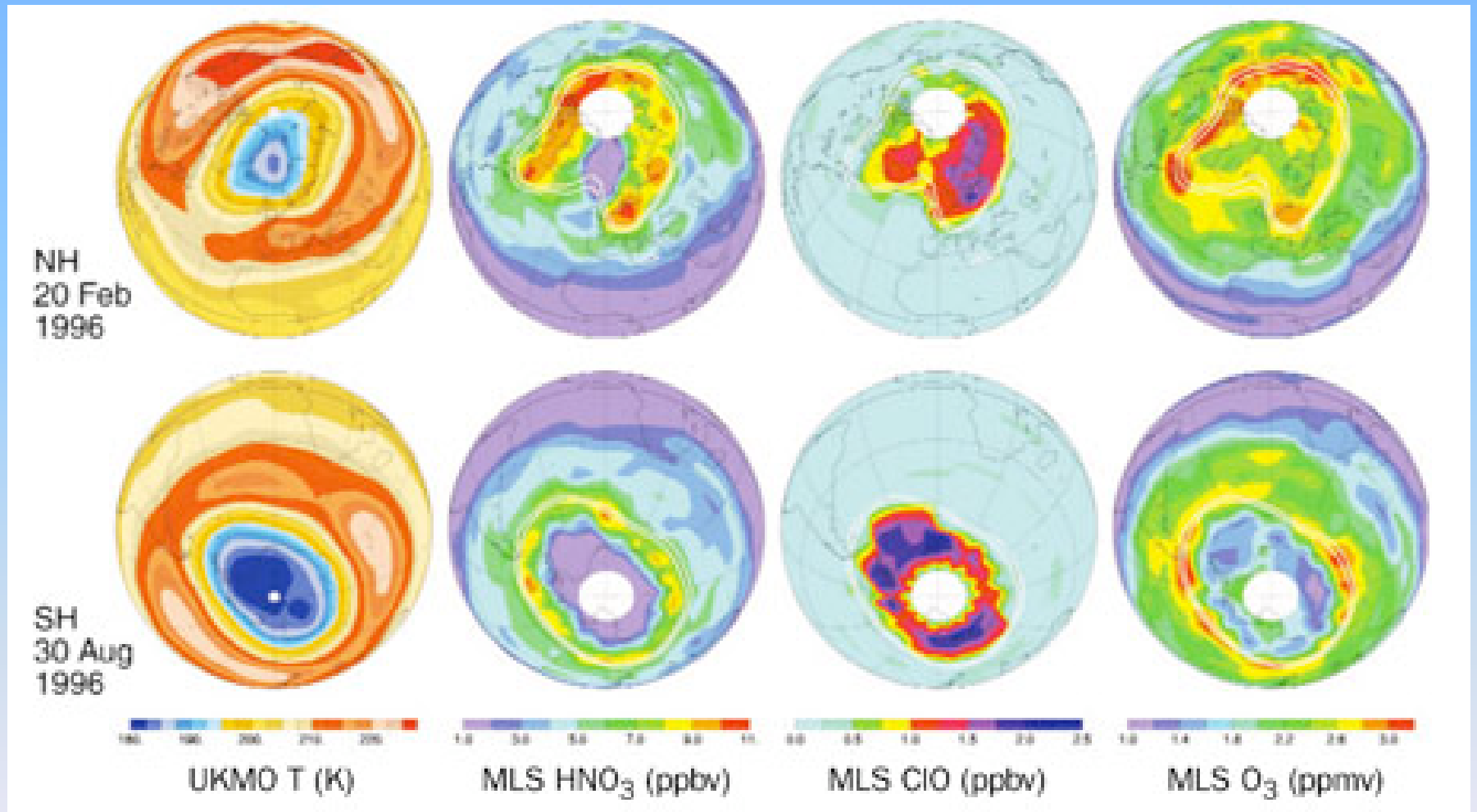


Farugue

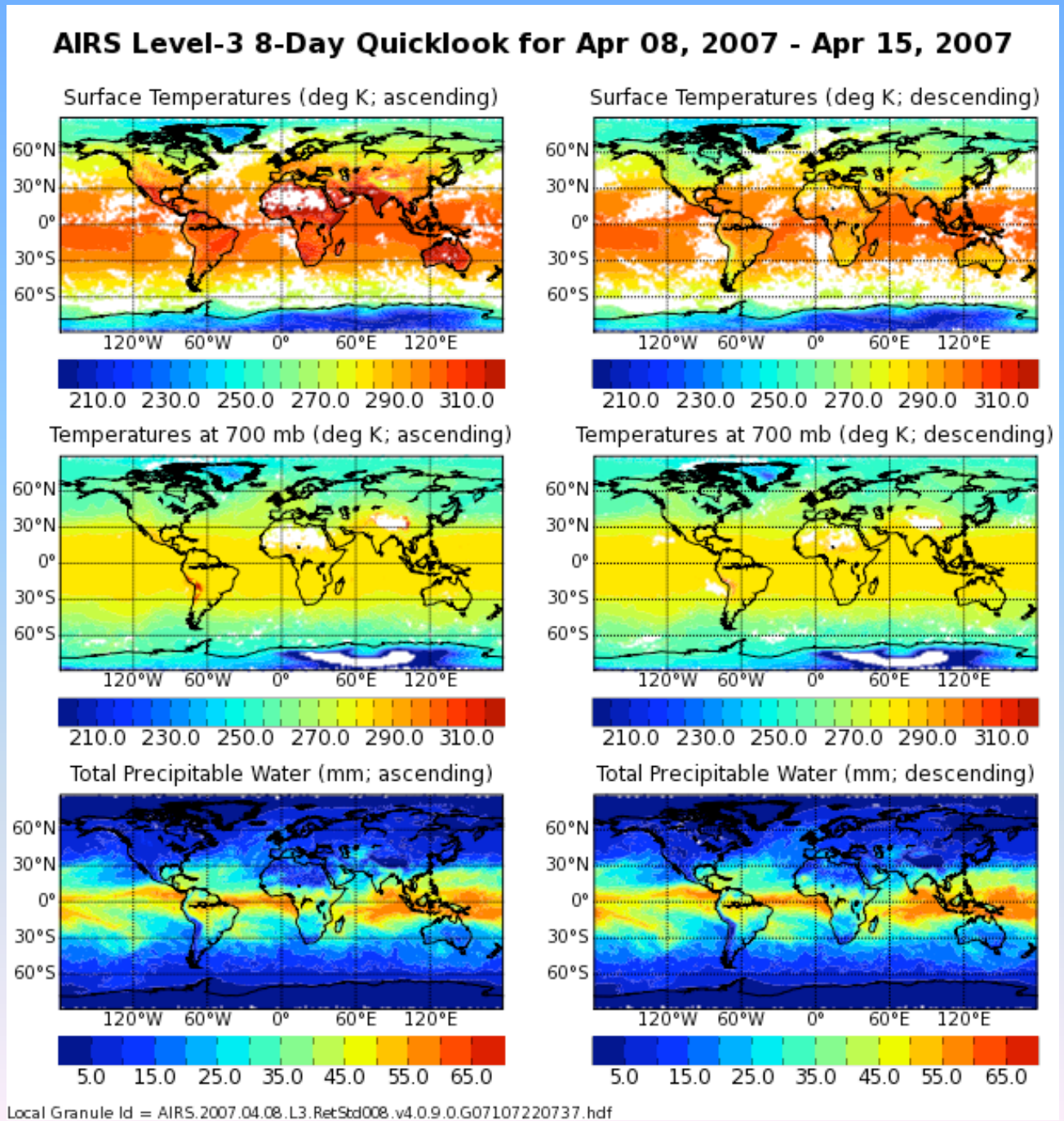

3-hourly TMPA-RT 00Z15Apr2007-00Z16Apr2007
Accumulated Rainfall [mm]
41N
40.5N
40N
39.5N
39N
38.5N
38N
37.5N
37N
36.5N
36N
35.5N
35N
80W
79W
78W
77W
76W
75W
74W
100
90
80
70
60
50
40
30
20
10
GrADS: COLA/IGES
Generated by NASA's Giovanni (giovanni.gsfc.na

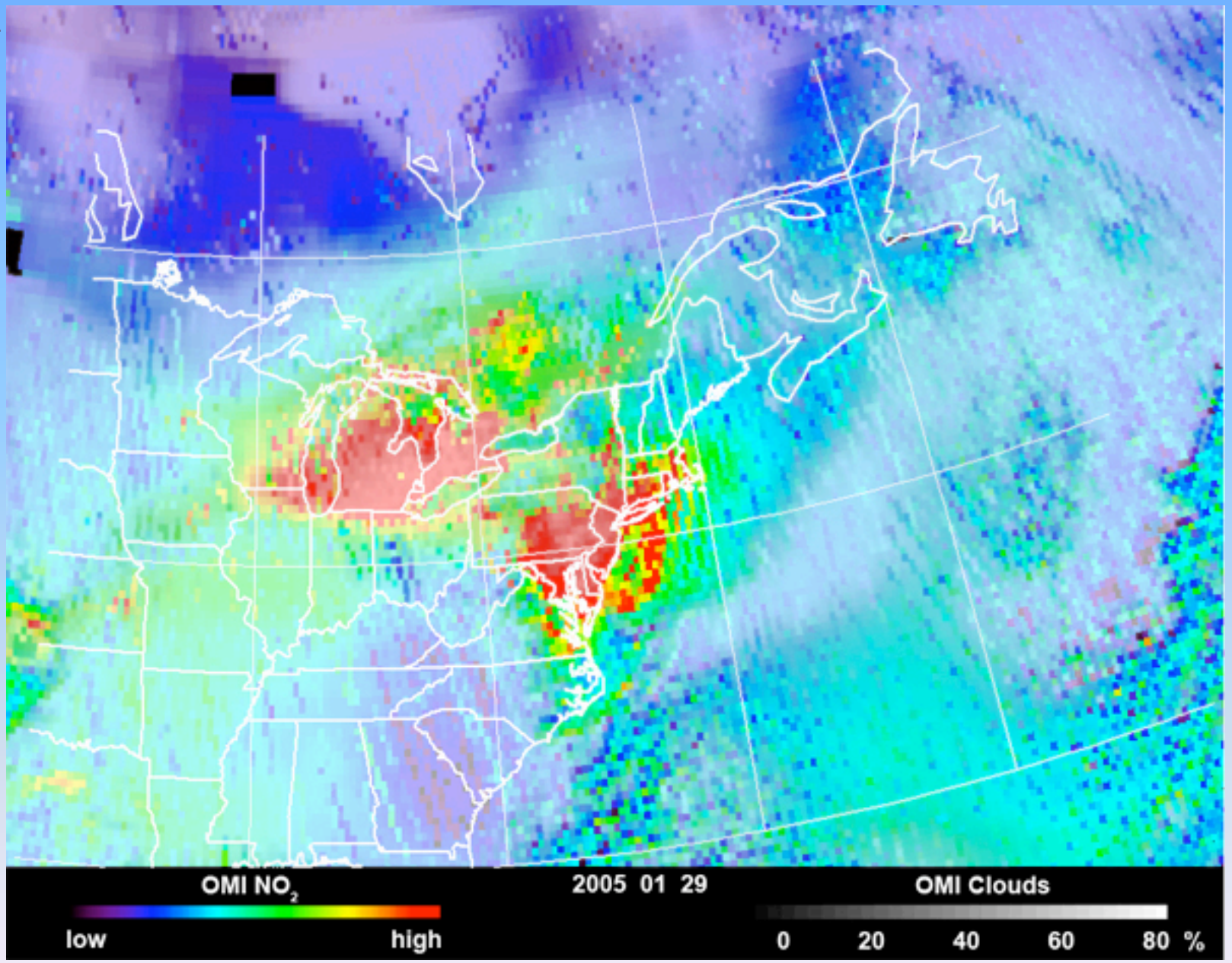

3-hourly TMPA-RT 00Z15Apr2007-00Z16Apr2007
Average Rain Rate [mm/hr]
41N
40.5N
40N
39.5N
39N
38.5N
38N
37.5N
37N
36.5N
36N
35.5N
35N
80W
79W
78W
77W
76W
75W
74W
73W
72W
3.5
3
2.5
2
1.5
1
0.5
0
GrADS: COLA/IGES
2007-05-04-18:58
Generated by NASA's Giovanni (giovanni.gsfc.nasa.gov)


Daily AIRS Relative Humidity Ascending/Daytime [%]
(01Apr2007-10Apr2007) @ (1000.0 hpa)
46N
44N
42N
40N
38N
36N
34N
32N
30N
28N
84W83W82W81W80W79W78W77W76W75W74W73W72W71W70W
100
90
80
70
60
50
40
30
20
GrADS: COLA/IGES
2007-05-04-19:01
Generated by NASA's Giovanni (giovanni.gsfc.nasa.gov)



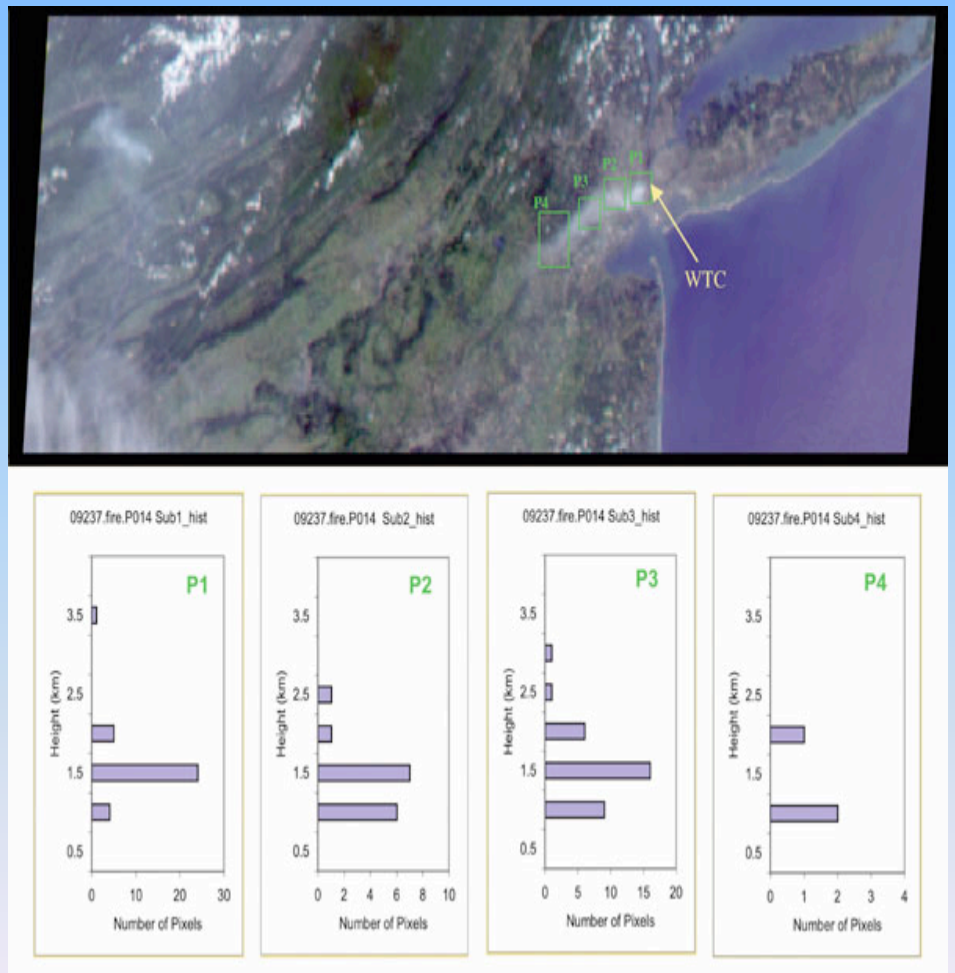
ARS MLS simultaneously mapped key chemical constituents nitric acid, chlorine monoxide, and ozone over the winter polar regions in both Northern (upper) and Southern (lower) Hemispheres where the greatest ozone loss occurs. Aura MLS maps these and other chemicals with better coverage and larger altitude range than UARS MLS. Credit: Michelle Santee


AIRS Level-3 8-Day Quicklook for Apr 08, 2007 - Apr 15, 2007
Surface Temperatures (deg K; ascending)
Surface Temperatures (deg K; descending)
Temperatures at 700 mb (deg K; ascending)
Temperatures at 700 mb (deg K; descending)
Total Precipitable Water (mm; ascending)
Total Precipitable Water (mm; descending)
60°N
30°N
0°
30°S
60°S
120°W 60°W 0° 60°E 120°E
210.0 230.0 250.0 270.0 290.0 310.0
5.0 15.0 25.0 35.0 45.0 55.0 65.0
Local Granule Id = AIRS.2007.04.08.L3.RetStd008.v4.0.9.0.G07107220737.hdf



OMI NO2 image showing the total column amount of nitrogen dioxide above the USA east coast on 29 January2005 (Jim Gleason)

MISR Smoke Plume Dispersal from the World Trade Center Disaster

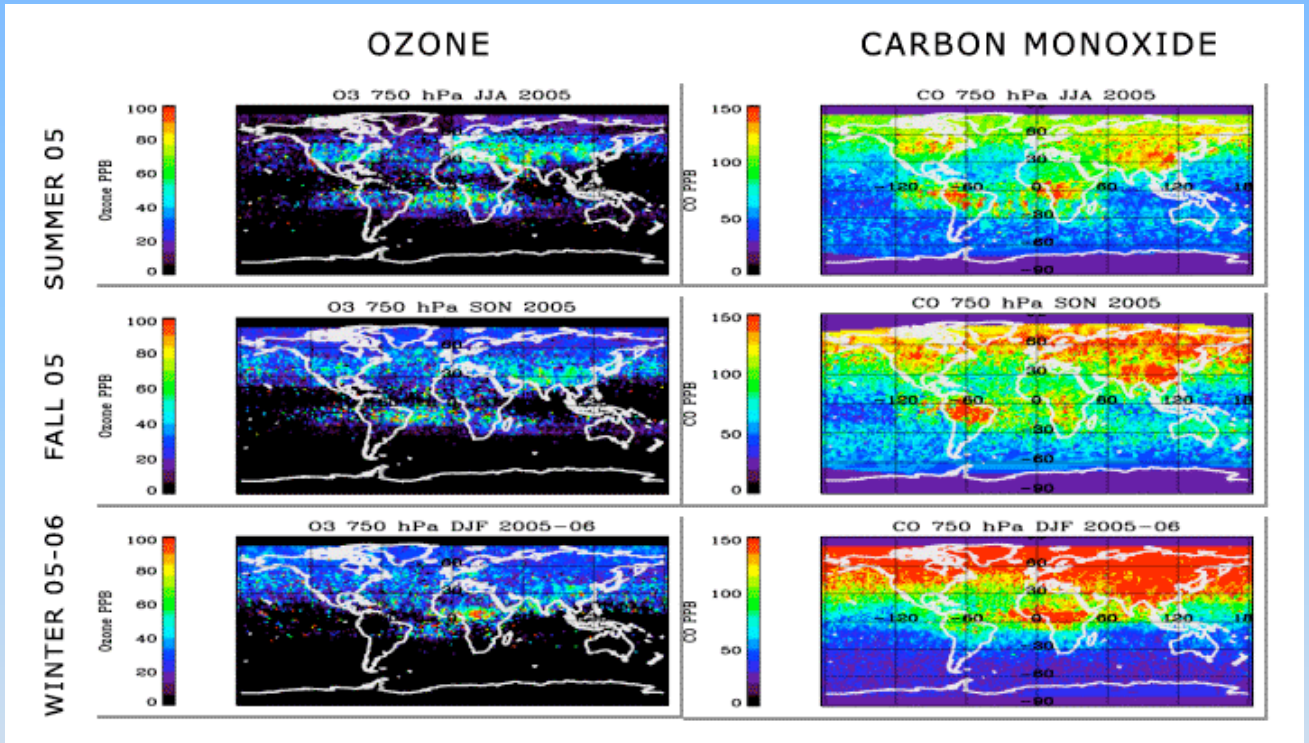


Scientists from the Environmental and Occupational Health Science Institute Robert Wood Johnson Medical School and Rutgers University, in partnership with the Environmental Protection Agency and NASA's Jet Propulsion Laboratory created a detailed numerical model showing pollutant dispersion from "Ground Zero" to the surrounding New York - New Jersey region. The researchers used models of micrometeorological atmospheric circulation and tracer transport, surface measurements, and space-based observations from the high-resolution Landsat imager and the Multi-angle Imaging SpectroRadiometer (MISR) on NASA's Terra satellite. JPL scientists used MISR stereo images combined with ground-based photographs of the plume, to determine the plume height. A natural color MISR image appears here (acquired by MISR's 70° forward-viewing camera on September 12) along with histograms of stereo-derived elevations at four points (P1, P2, P3, P4) progressing from the World Trade Center to about 70 kilometers downwind. MISR also provided information about plume evolution.

Image credit: NASA/GSFC/LaRC/JPL, MISR Team.

Stenchikov, G., N. Lahoti, D.J. Diner, R. Kahn, P. Lioy, and P. Georgopoulos (2006): Multiscale plume transport from the collapse of the World Trade Center on September 11, 2001. Environmental Fluid Mech., doi 10.1007/s10652-006-9001-8.

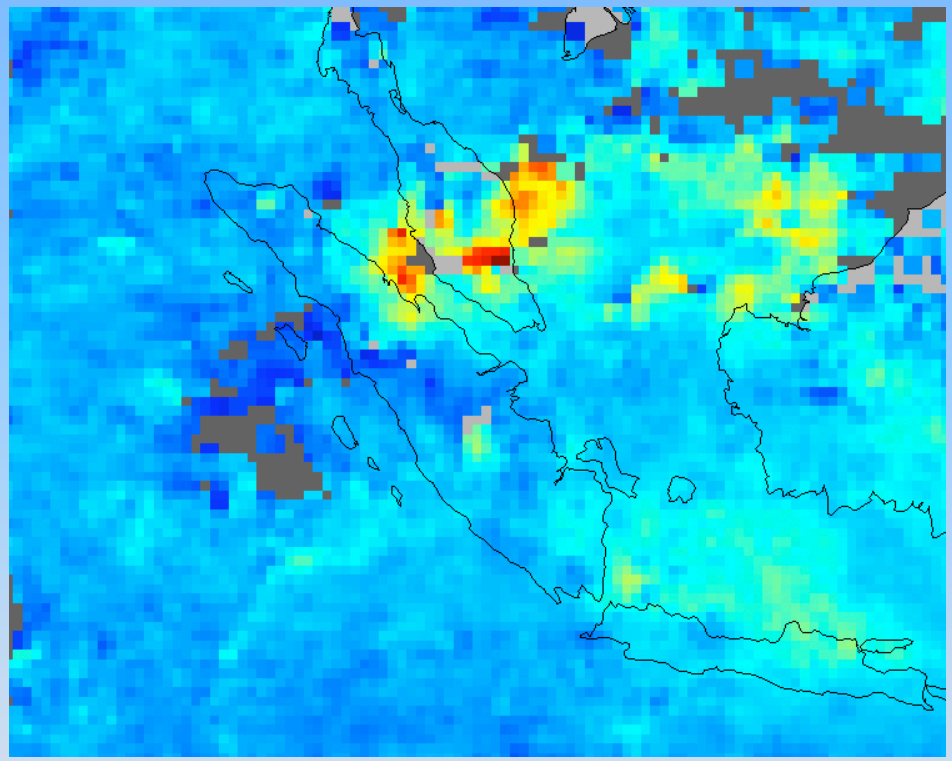
First Maps of Tropospheric Ozone & Carbon Monoxide from TES



Tropospheric Emission Spectrometer (TES) onboard the Aura satellite provides coincident measurements of tropospheric ozone and carbon monoxide critical for understanding complex tropospheric chemical and dynamical processes.

Note the high ozone (O_3) coincident with carbon monoxide (CO) in the Tropics associated with biomass burning. These maps illustrate the complexity using coincident measurements for three seasons - northern hemisphere summer (JJA, top), fall (SON, middle) and winter (DJF, bottom). During SON and DJF, areas of high tropospheric O_3 are colocated with areas of high CO. During JJA, in the tropics tropospheric O_3 is high and colocated with high CO, but in the northern hemisphere, tropospheric O_3 is high but is not colocated with high CO.

MOPITT Captures Air Quality Emergency

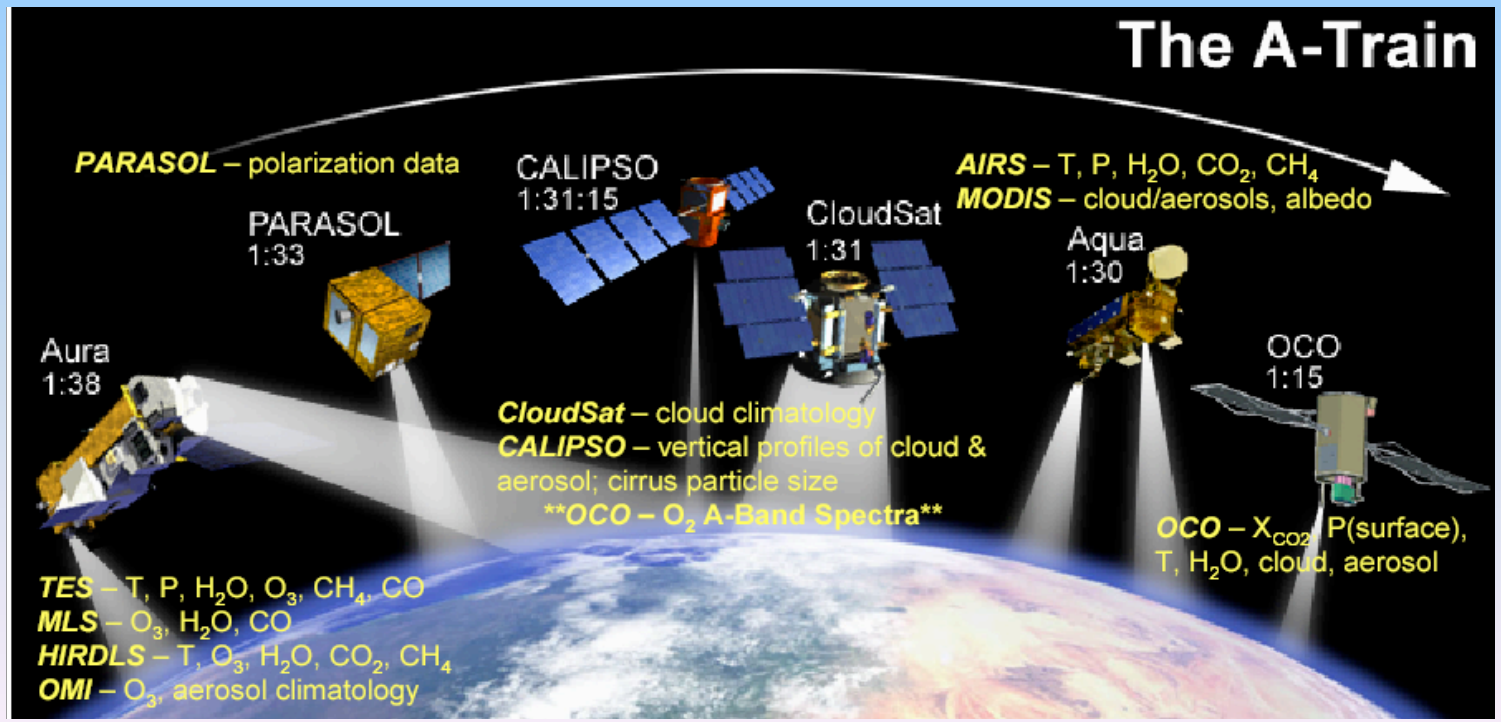


Measurements of Pollution In The Troposphere (MOPITT) onboard the Terra spacecraft detected large amounts of carbon monoxide released by fires in Malaysia. Carbon monoxide is a good tracer of pollution since it is produced as a by-product of the combustion associated with wildfires and agricultural fires.

This image shows carbon monoxide concentrations for August 1 through August 15, 2005. The highest concentrations, shown in red and yellow, are located over Malaysia where an air quality emergency was declared. In these regions, for every billion molecules in a column of the atmosphere, 240 are carbon monoxide molecules. By contrast, regions unaffected by haze have less than 120 molecules per billion. High concentrations of carbon monoxide are a threat to human health.

The A-Train

- The A-Train is a succession of six U.S. and international sun-synchronous orbit satellites: OCO, Aqua, CloudSat, CALIPSO, PARASOL, and Aura
- The A-Train formation allows for synergistic atmospheric coposition and cloud measurements where data from several different satellites can be used together to obtain comprehensive information about various key atmospheric components or processes.



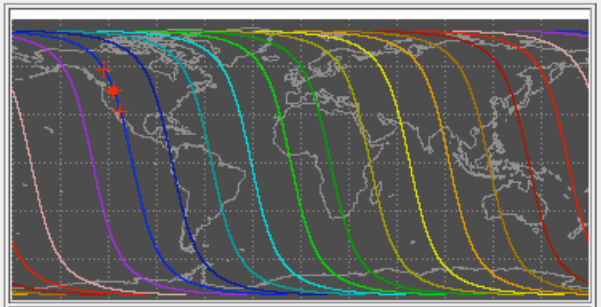
Giovanni Orbit Picker

A-Train Along CloudSat Track Beta Instance

Produces curtain plots (vertical profiles) of CloudSat atmospheric returns, and MODIS/Aqua absolute and dew point atmospheric temperatures collocated with CloudSat track.

Select Constraints:

Spatial



Map View: Ascending Orbits Range (kilometers) 3000

Parameters

Click in the group title cell (left-most column) to select all parameters associated with the group; ctrl-click to de-select

Clouds Vertical Profile ☐	☑ ReceivedEchoPowers	CloudSat.007	CloudSat	2006/06 - 2007/04
	☐ dBZ Reflectivity	CloudSat.007	CloudSat	2006/06 - 2007/04
Air Temperature Vertical Profile ☐	☑ Temperature_Profile	MAC07S0.002	MODIS	2006/06 - 2007/04
Humidity Vertical Profile ☐	☐ Dew_Point_Temperature_Profile	MAC07S0.002	MODIS	2006/06 - 2007/04

Temporal

Orbit Date **Year:** 2007 **Month:** Apr **Day:** 22 *(Range: 02 Jun 2006 - 22 Apr 2007)*

Select Visualization:

Subset Parameter vs. Pressure along Cloudsat Track

Generate Visualization Reset ***Alert:*** *A new window will be opened when"Generate Visualization" is selected.*

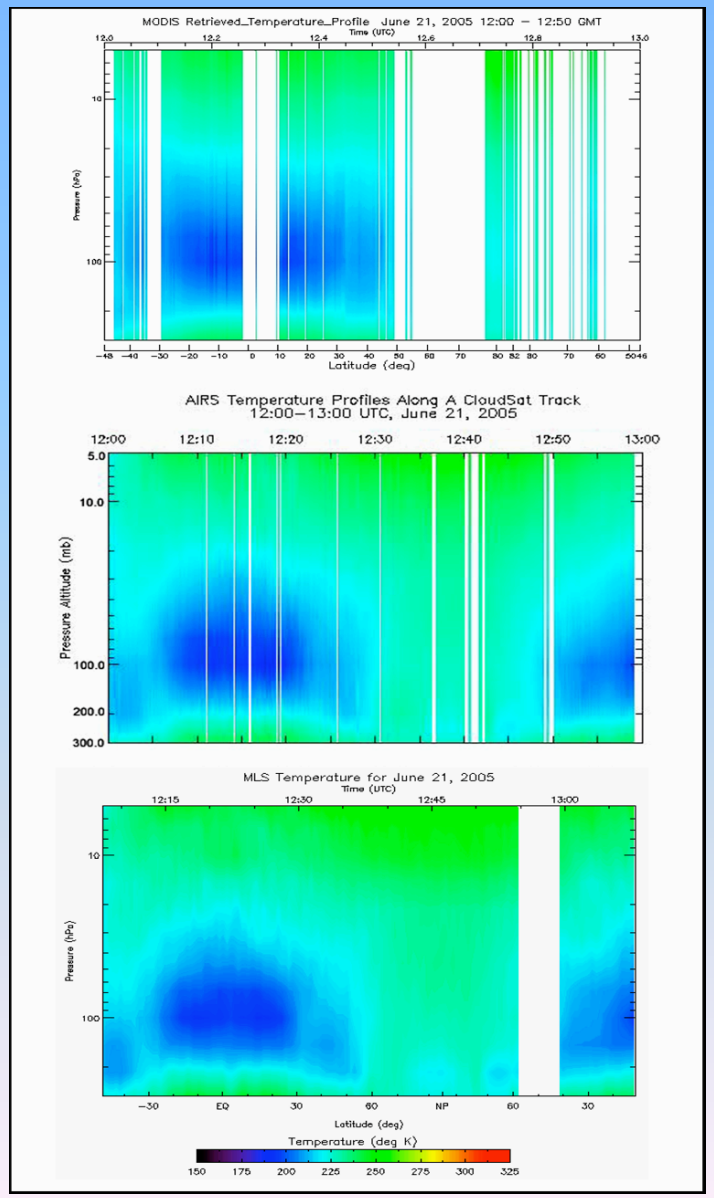
Curtain Inter-Comparison

AIRS-MODIS-MLS inter-comparison

Moderate Resolution Imaging Spectroradiometer (MODIS)

Atmospheric Infrared Sounder (AIRS)

Microwave Limb Sounder (MLS)



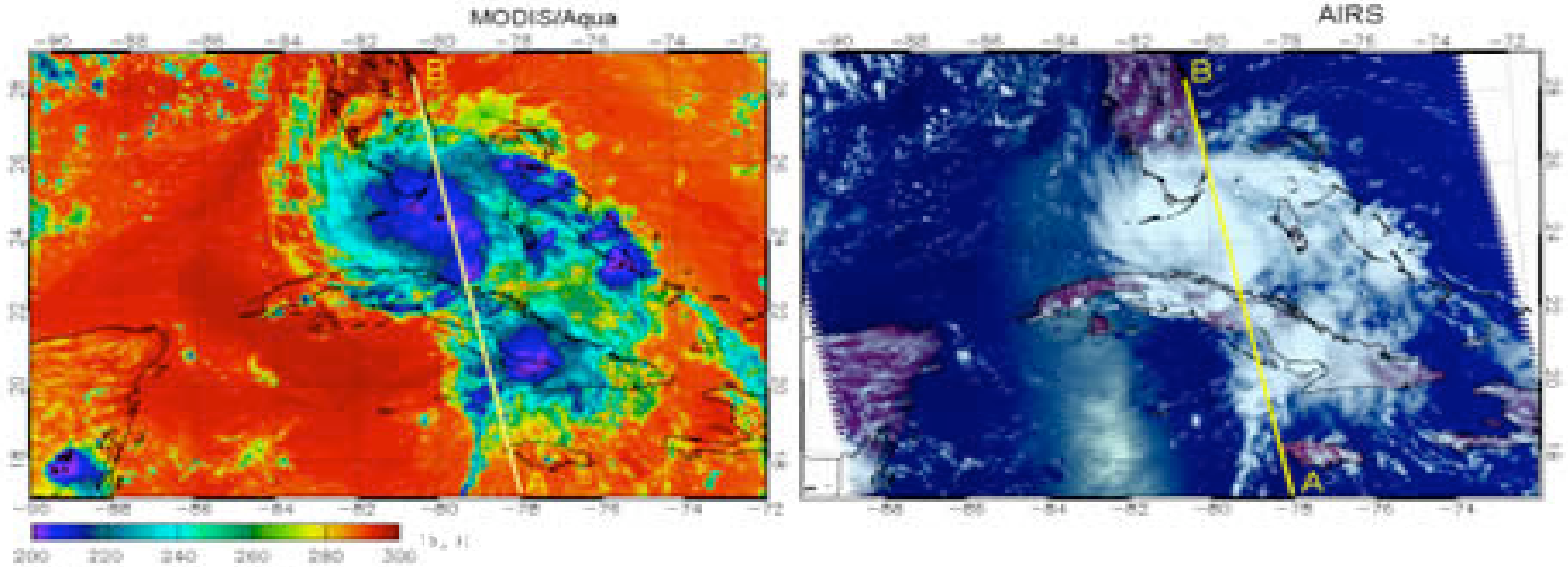
MODIS--AIRS--MLS Temperature "curtains" along the CloudSat track

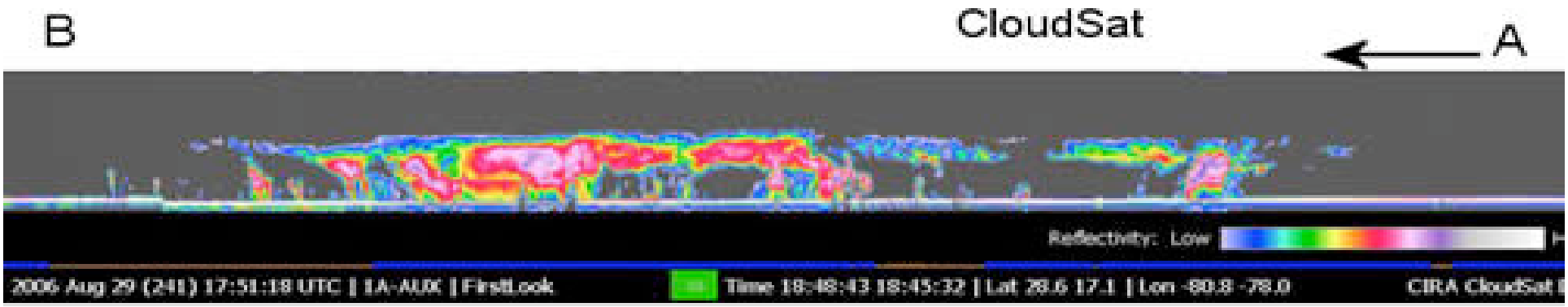
300.0-5.0 mb

06/21/05

12:00 to 12:50 GMT

August 29, 2006





Calipso

(Demonstration data, not for science)