AIRS Data Support & Services

@ NASA GES DISC

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Acknowledgement: to many colleagues who have contributed to the materials presented here…

Outline

- AIRS Web Pages @ GES DISC
- AIRS Data Access
  - Direct FTP
  - Mirador Search and Download Interface
- Data Services
  - Data subsetting
  - Data binnning/gridding (L2G)
  - Data format conversion: HDFEOS → netCDF
  - Online visualization and analysis tool: Giovanni
  - Data mining system: S4PM-DME
  - Web-based GIS services and Google-Earth

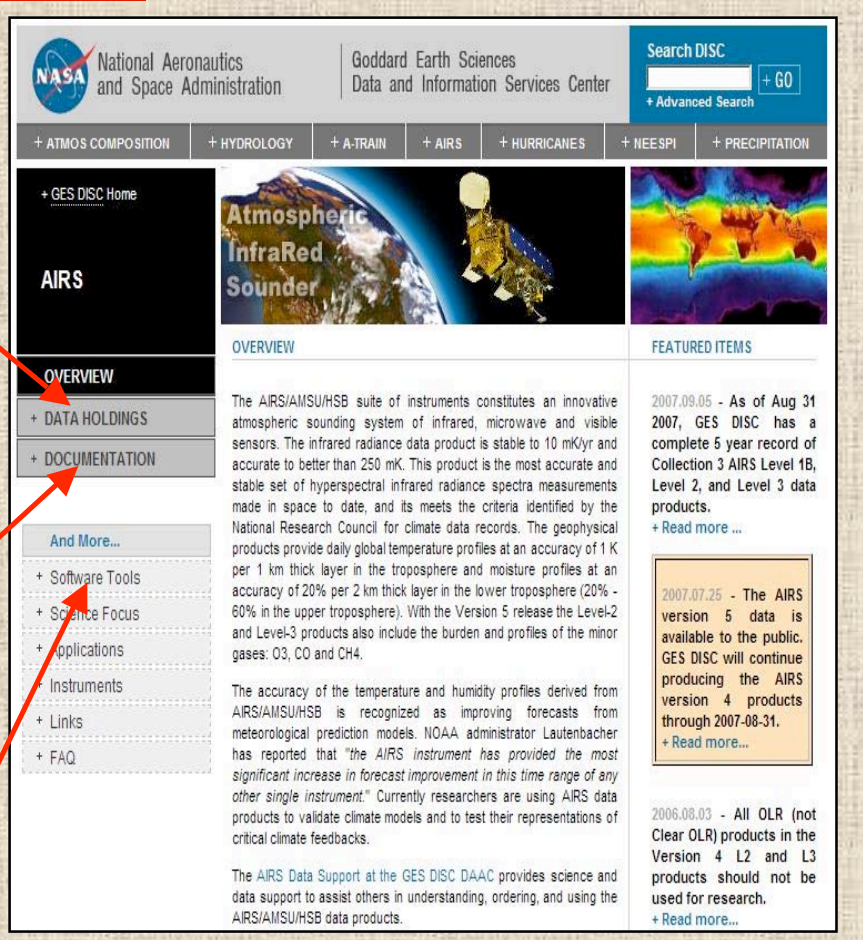
AIRS Web Pages @ GES DISC

Main AIRS Page @ GES DISC:
http://disc.sci.gsfc.nasa.gov/AIRS/

Data Holdings:
list all the publicly available products (V004 and V005) and various data access methods.

Documentation:
complete documentation package as provided by the AIRS science team, such as ATBD, guide documents, product file specifications, cal/val summary and disclaimer etc.

Software Tools:
Reader software from AIRS science team (Fortran, C, IDL and MATLAB), links to read_hdf, hdfview and Giovanni



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AIRS Data Access: Direct FTP

Product	Server Name	Top Level Directory
Level-1B (odd years) Level-1B (even years)	airscal1u.ecs.nasa.gov airscal2u.ecs.nasa.gov	/data/s4pa/Aqua_AIRS_Level1 /data/s4pa/Aqua_AIRS_Level1
Level-2	airspar1u.ecs.nasa.gov	/data/s4pa/Aqua_AIRS_Level2
Level-3	acdisc.sci.gsfc.nasa.gov	/data/s4pa/Aqua_AIRS_Level3

Pathname Pattern:

<topLevelDirectory>/<ESDT>.<collection>/<YYYY>/<dayOfYear>

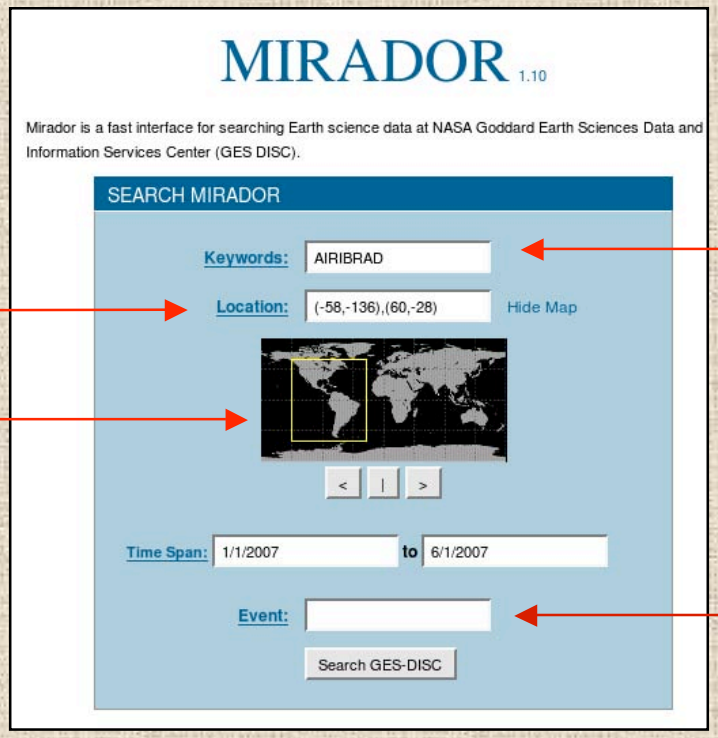
Where:

- topLevelDirectory = any one of the top level directories listed above.
- ESDT = data product code name, e.g. AIRX2RET.
- collection = data collection number (003 or 005), for V4 and V5 data respectively.
- YYYY = 4-digit year number, e.g. 2007.
- dayOfYear = day number of a year (001-366), e.g. 002 for January 2nd.

Example: /data/s4pa/Aqua_AIRS_Level2/AIRX2RET.005/2007/002

AIRS Data Access: Mirador

- Mirador is a very fast, keyword-based search interface for searching GES DISC data holdings. Uses Google Mini search appliance.
- http://mirador.gsfc.nasa.gov



Location gazetteer

Lat/Lon spatial search

Spatial Map Search

Google style keyword Search

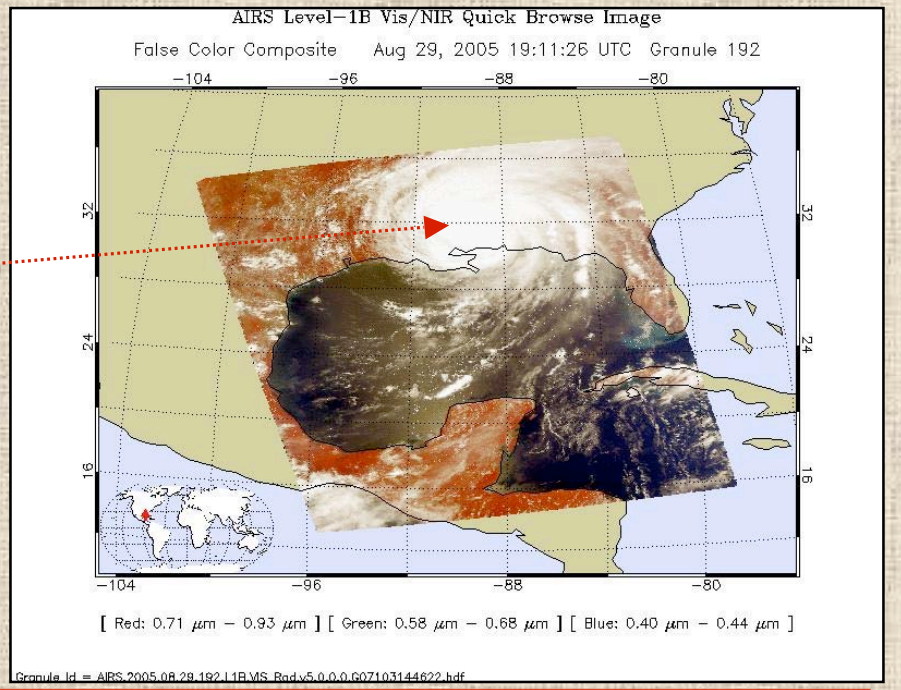
Event gazetteer (e.g. Storm)

AIRS Data Access: Mirador

- Keyword Field (mandatory):
  - Can be sensor names, parameter names or ESDT names.
  - NOT operator: AIRIBRAD **–**AIRIBQAP
  - OR operator: AIRIBRAD **OR** AIRX2RET
- Location Field:
  - Point:
    - (Lat, Lon), e.g. (39.29, -76.62)
    - Gazetteer: Baltimore
    - Multiple points: (44,-50) OR (-44,130) OR (-89,130) OR (89,0)
  - Region:
    - (minLat, minLon), (maxLat, maxLon)
    - Gazetteer: Maryland
    - Cross-Dateline (going eastward): (0,170), (10, -170)
    - Multiple regions: (0,10),(10,10) OR (0,160),(10,170)

AIRS Data Access: Mirador

- Event Field:
  - Acceptable event types:
    - ✓ Aerosols
    - ✓ Sulfur
    - ✓ Wind
    - ✓ Hail
    - ✓ Tornado
    - ✓ Storm
    - ✓ Hurricane (e.g. Katrina)
    - ✓ Depression
    - ✓ Flood
    - ✓ Waterspout
    - ✓ Disturbance
  - 300,000 event counts



AIRS Data Access: Mirador

Home | Help Center | Give Us Feedback | View Cart | Inventory | Login

Keyword: AIRVBRAD
Location: Baltimore, populated place, (Baltimore (city), Marylai Spatial Coverage Map
Event:
Time Span: 01/01/2007 to 01/01/2007 23:59:59 Search NASA GES-DISC

Enter Feedback Here ...

Click outside the textbox to send feedback
Please enter your email address if you want a response.

Data Sets Results **1** - **2** of **2** for **AIRVBRAD** (**2** seconds)

For location, did you mean ...

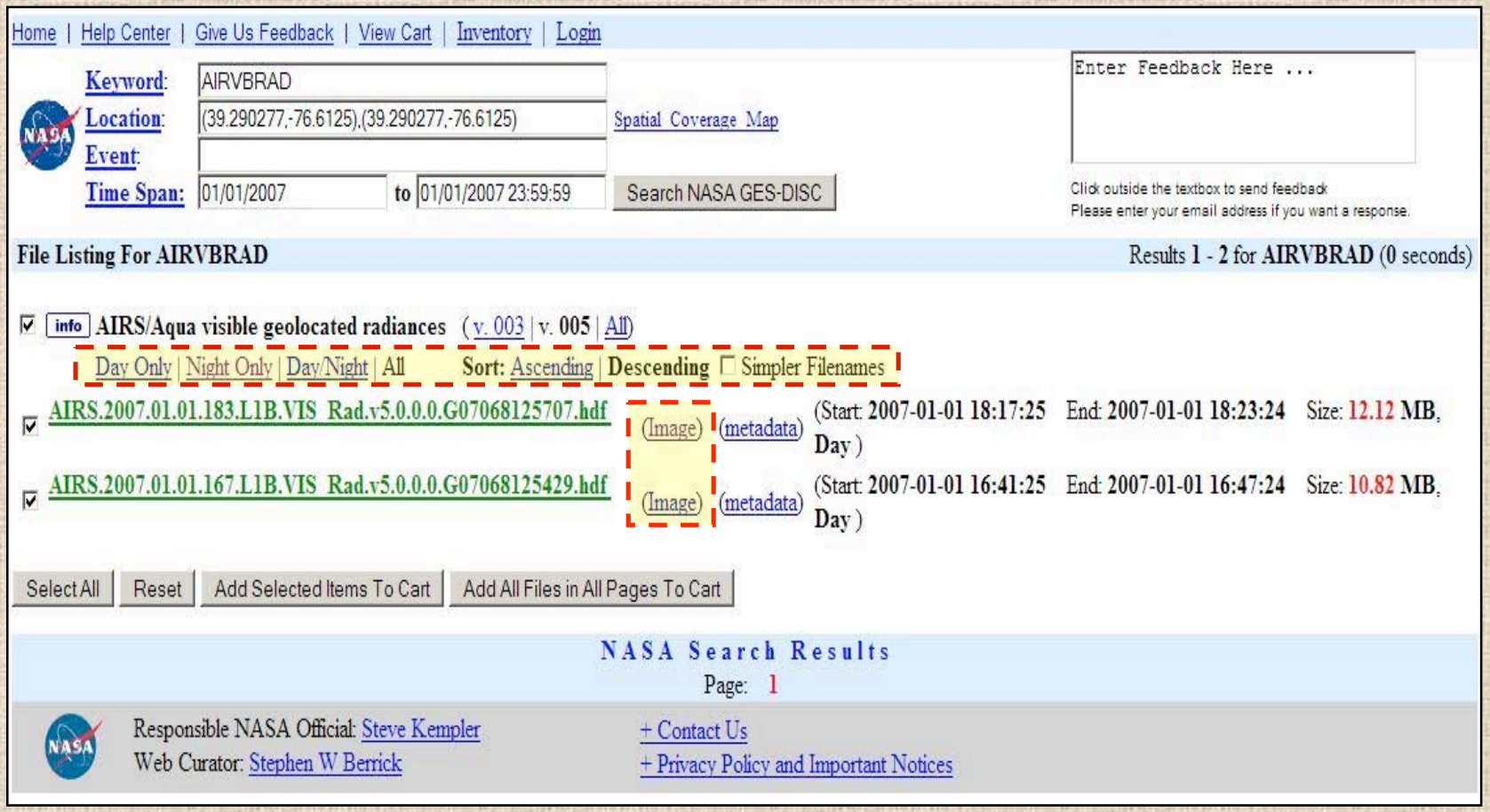
Baltimore, City of, civil, (Baltimore (city), Maryland, USA)
Baltimore County, civil, (Baltimore, Maryland, USA)
Baltimore Highlands, populated place, (Baltimore, Maryland, USA)
Baltimore Harbour, bay, (Cork Ireland)
Essex, populated place, (Baltimore, Maryland, USA)
Monkton, populated place, (Baltimore, Maryland, USA)
Baltimore Canyon, canyon, (Undersea Features)
Hart-Miller Island, island, (Baltimore, Maryland, USA)
Baltimore Bay, bay, (Cork Ireland)
Cockeysville, populated place, (Baltimore, Maryland, USA)

☐ info AIRS/Aqua visible geolocated radiances (AIRVBRAD) | v.003 only | v.005 only
Approx. 3 files found (61.03 MB)
Parameters: VISIBLE RADIANCE, INFRARED RADIANCE
Spatial Resolution: 2.3 km IFOV at nadir x 2.3 km IFOV at nadir
Temporal Resolution: 6 Minute(s)

☐ info AIRS/Aqua VIS Level-1B QA product (AIRVBQAP) | v.003 only | v.005 only
Approx. 3 files found (3.11 MB)
Parameters: INFRARED RADIANCE, VISIBLE RADIANCE
Spatial Resolution: 2.3 km IFOV at nadir x 2.3 km IFOV at nadir
Temporal Resolution: 6 Minute(s)

Select All | Reset | List Selected Files By Time | Add Selected Files To Cart

AIRS Data Access: Mirador



AIRS Data Access: Mirador

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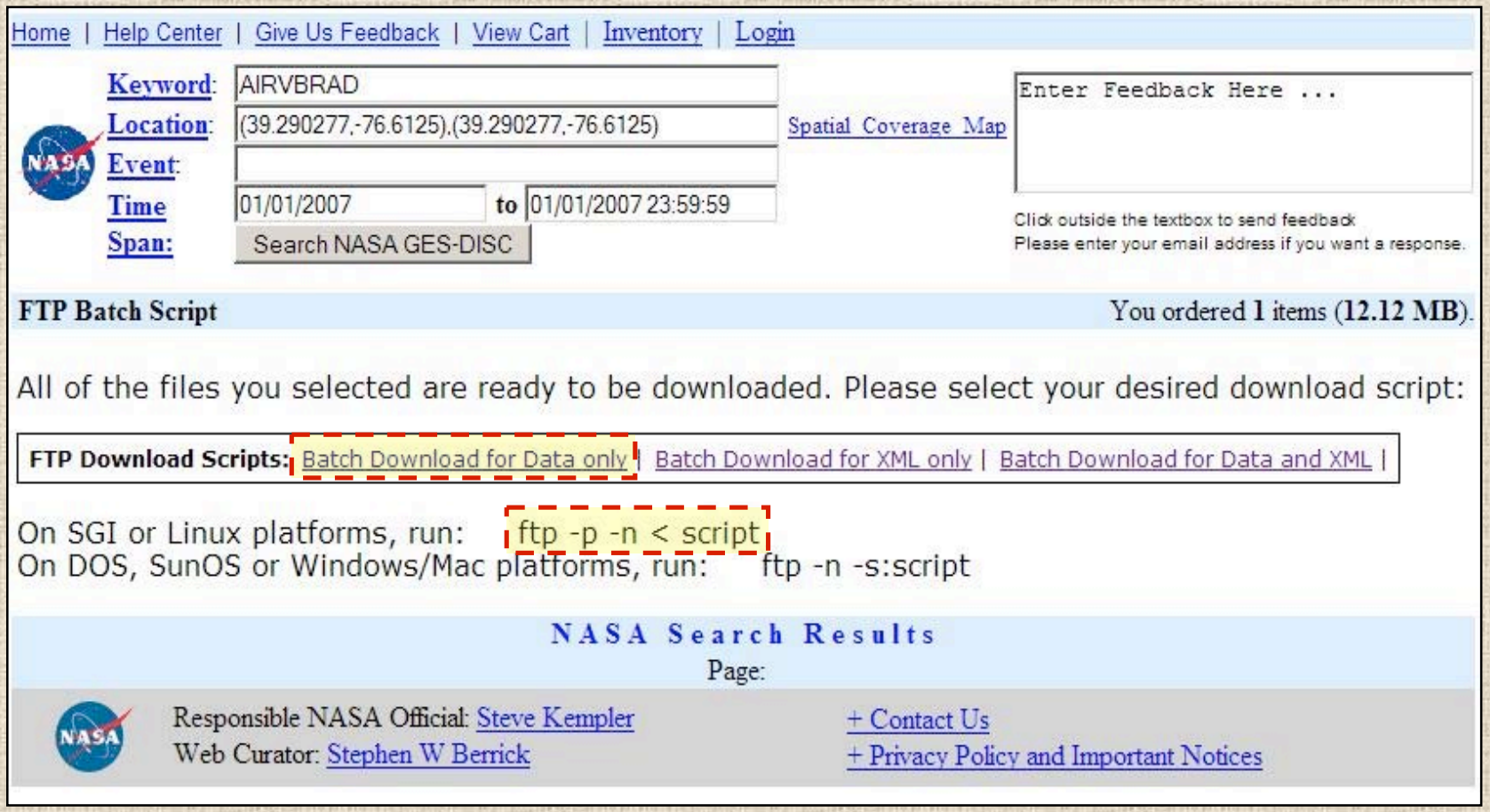

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Data Services: Subsetting

- WU-FTP based on-the-fly subsetting.
- Parameter, channel and spatial subset for AIRS L1B, L2.
- Available in both Mirador and WHOM:
  - Mirador: in the "Services" tab
  - WHOM: after "Start Granule Search".
- Future Plan:
  - HTTP-based implementation
  - Improved the User Interface
- Customized Subsetting Service

Data Services: Binning & Gridding

- Level-2 Gridded (L2G) Precipitation Estimates Product for Global Precipitation Climatology Project (GPCP).
- Science Parameters: IR precipitation estimates (includes QA and error estimates), cloud top pressure, cloud fraction, MW surface class and land fraction.
- Inputs: AIRX2RET and AIRX2SUP between 00:00:00 UTC and 23:59:59 UTC (241 granules each).
- Output onto a 3-D grid: 1440 Lon x 720 Lat x 24 Hour. Every Level-2 data point finds its unique location in the 3-D grid. One output file per day.

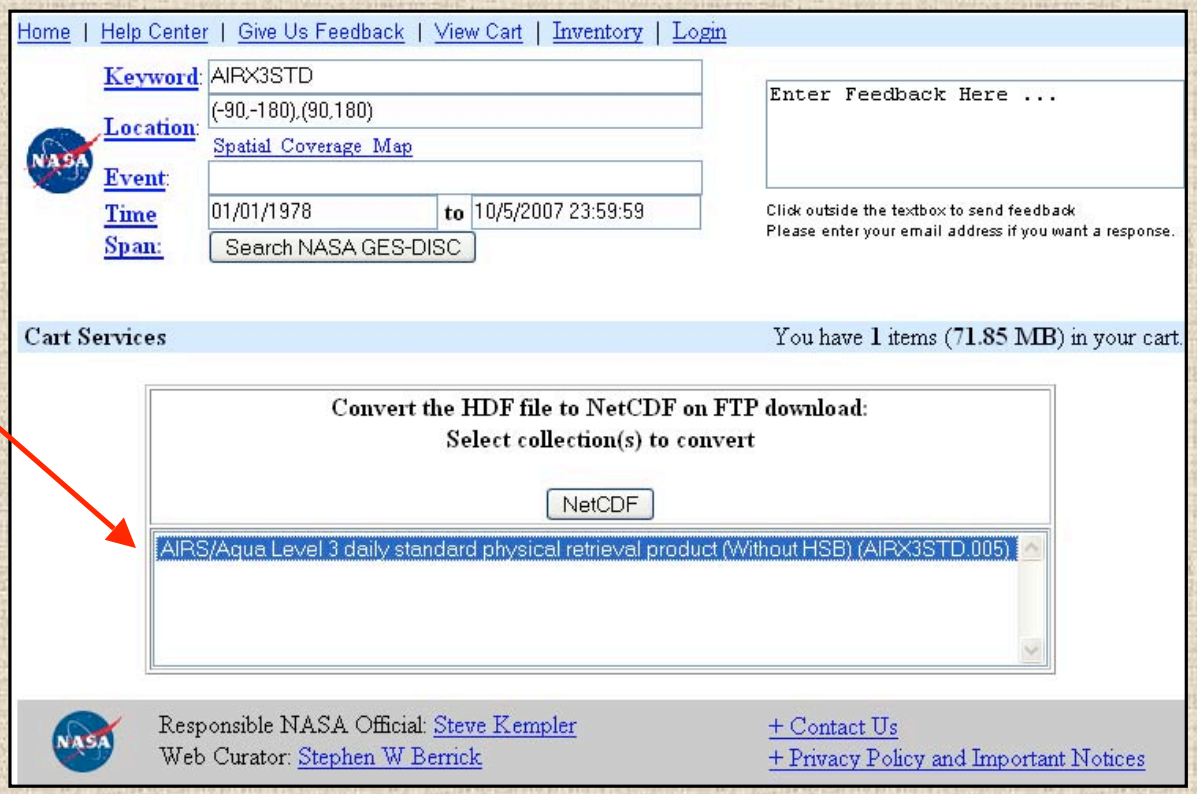
Data Services: Format Conversion

- netCDF converter in Mirador and WHOM, to convert AIRS Level-3 HDF-EOS file into netCDF format.
- netCDF files are CF-1 (Climate & Forecast) compliant. (CF-1 Convention Document: http://cf-pcmdi.llnl.gov/).
- Allows applications like IDV, Ferret/LAS, Grads or IDL to read AIRS netCDF files with ease, and understand parameter attributes (fill value, units, geospatial coordinates etc).
- Converted netCDF file size is larger than its HDF-EOS counterpart. netCDF-3 lacks compression support.

Data Services: Format Conversion

Services Tab in Mirador

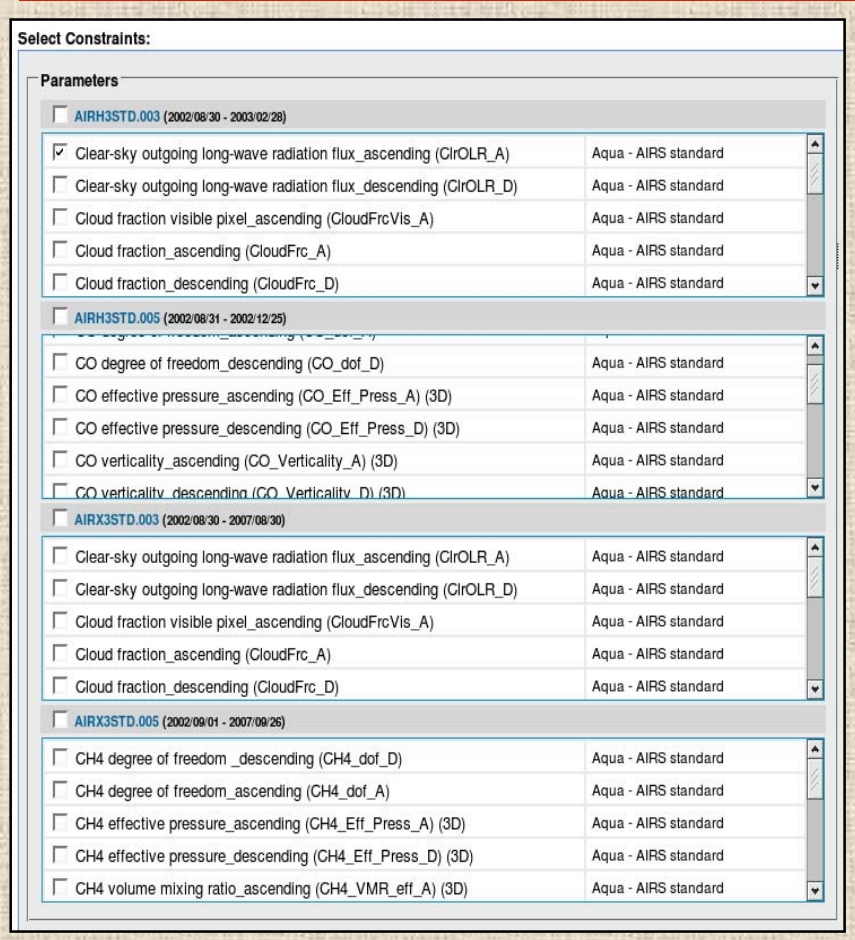
Must select this before clicking NetCDF button!

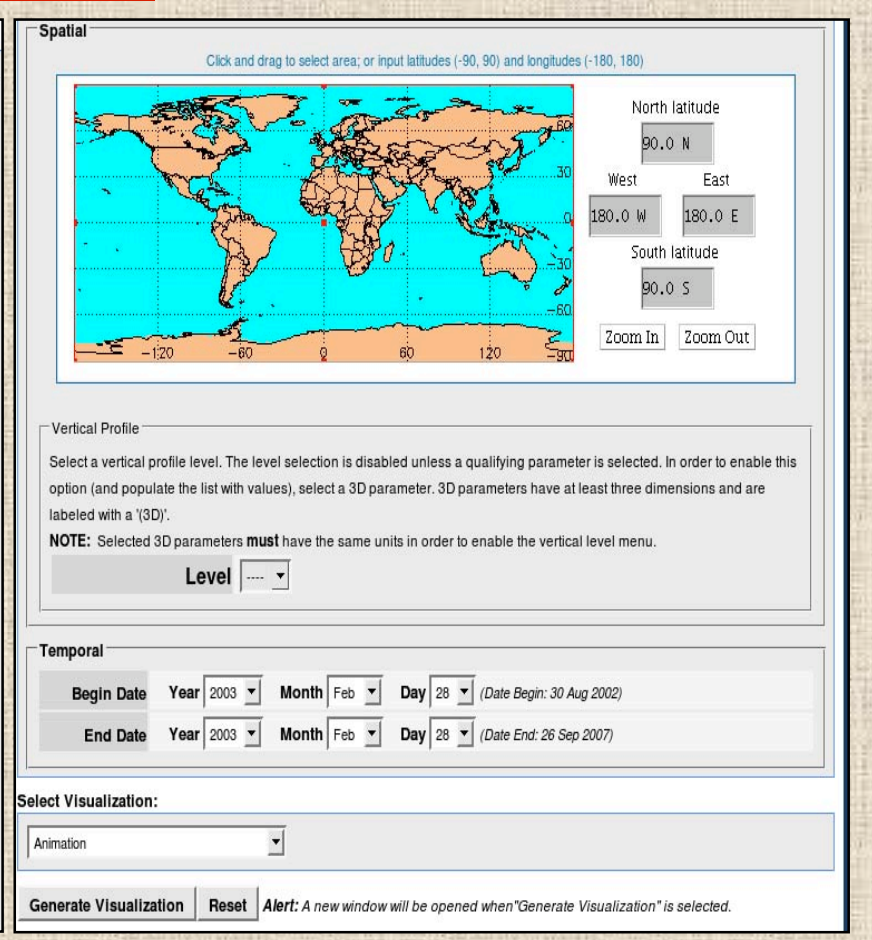


Data Services: Giovanni Overview

- Instances: AIRS L-3 Daily & Monthly // A-Train
- URLs:
  - Giovanni Main Page: http://giovanni.gsfc.nasa.gov
  - AIRS L3 Daily Instance: http://disc1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=AIRS_Level3Daily
  - AIRS L3 Monthly Instance: http://disc1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=AIRS_Level3Month
  - A-Train Data Depot instance: http://disc1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=atrain_C
- Visualization Services of AIRS Level-3 Instances:
  - Lat-Lon map
  - Animation
  - Hovmöller diagram (Lat-Time, Lon-Time)
  - Correlation (in time) map
  - Time series
  - Scatter diagram
  - *More to come …*

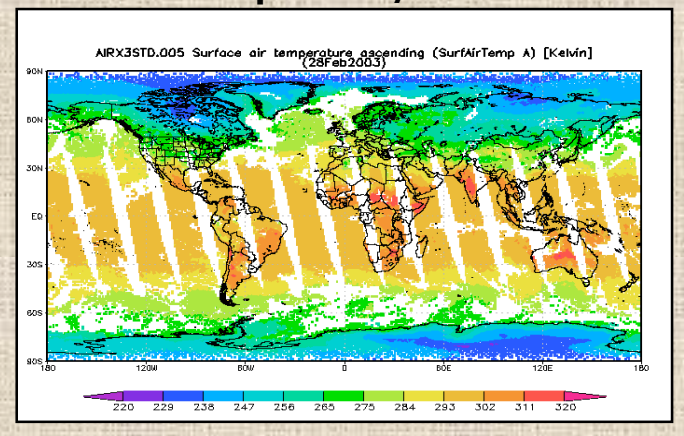
Data Services: Giovanni // L3 Daily



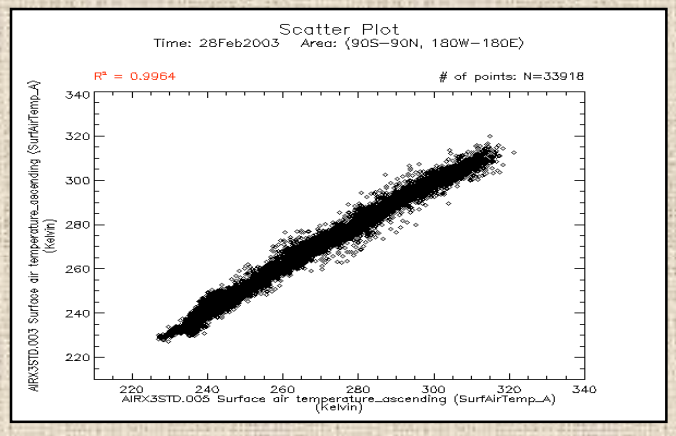


Data Services: Giovanni // L3 Daily

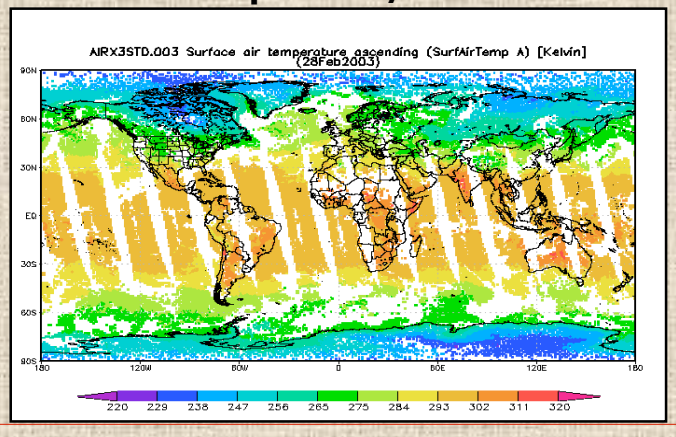
SurfAirTemp.V005 / 2003-02-28



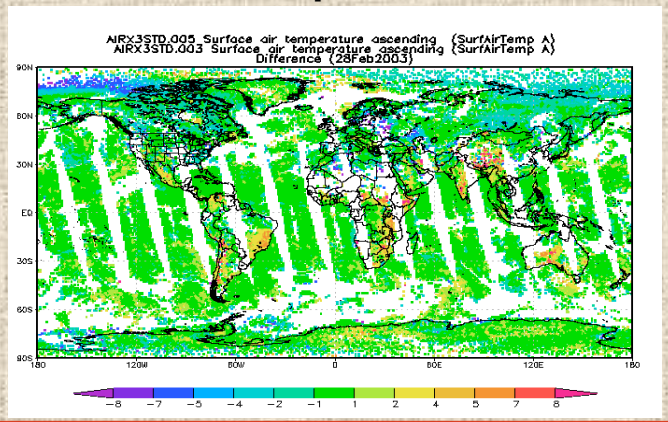
Scatter Plot: V004 vs V005



SurfAirTemp.V004 / 2003-02-28

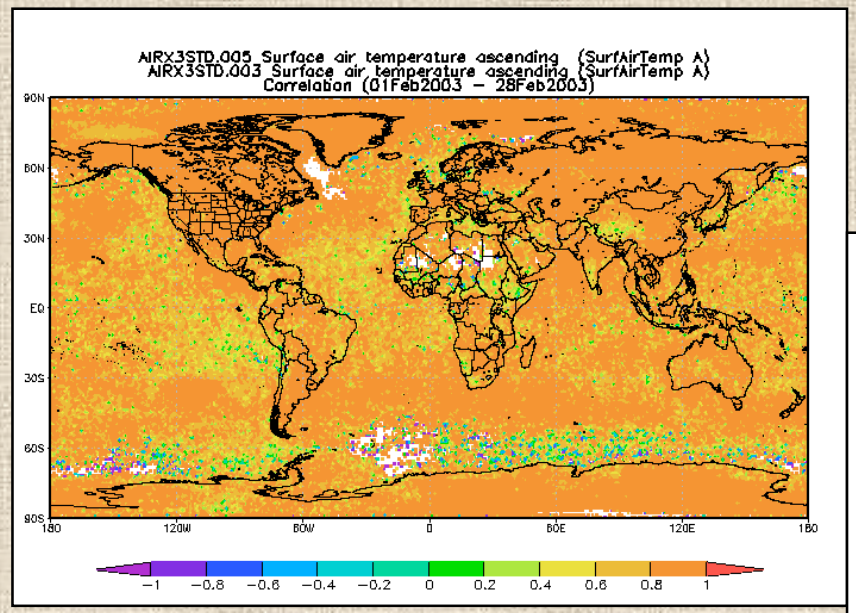


Difference Map: V004 vs V005

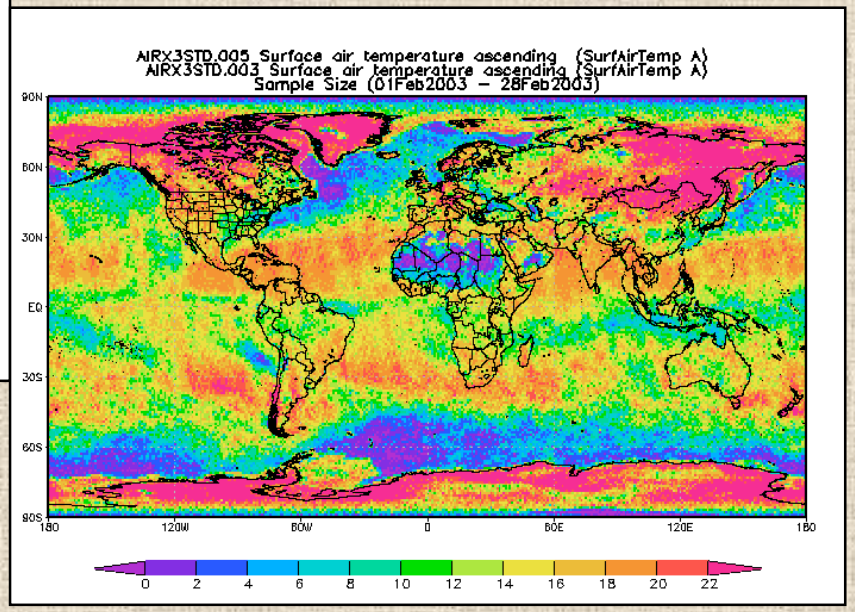


Data Services: Giovanni // L3 Daily

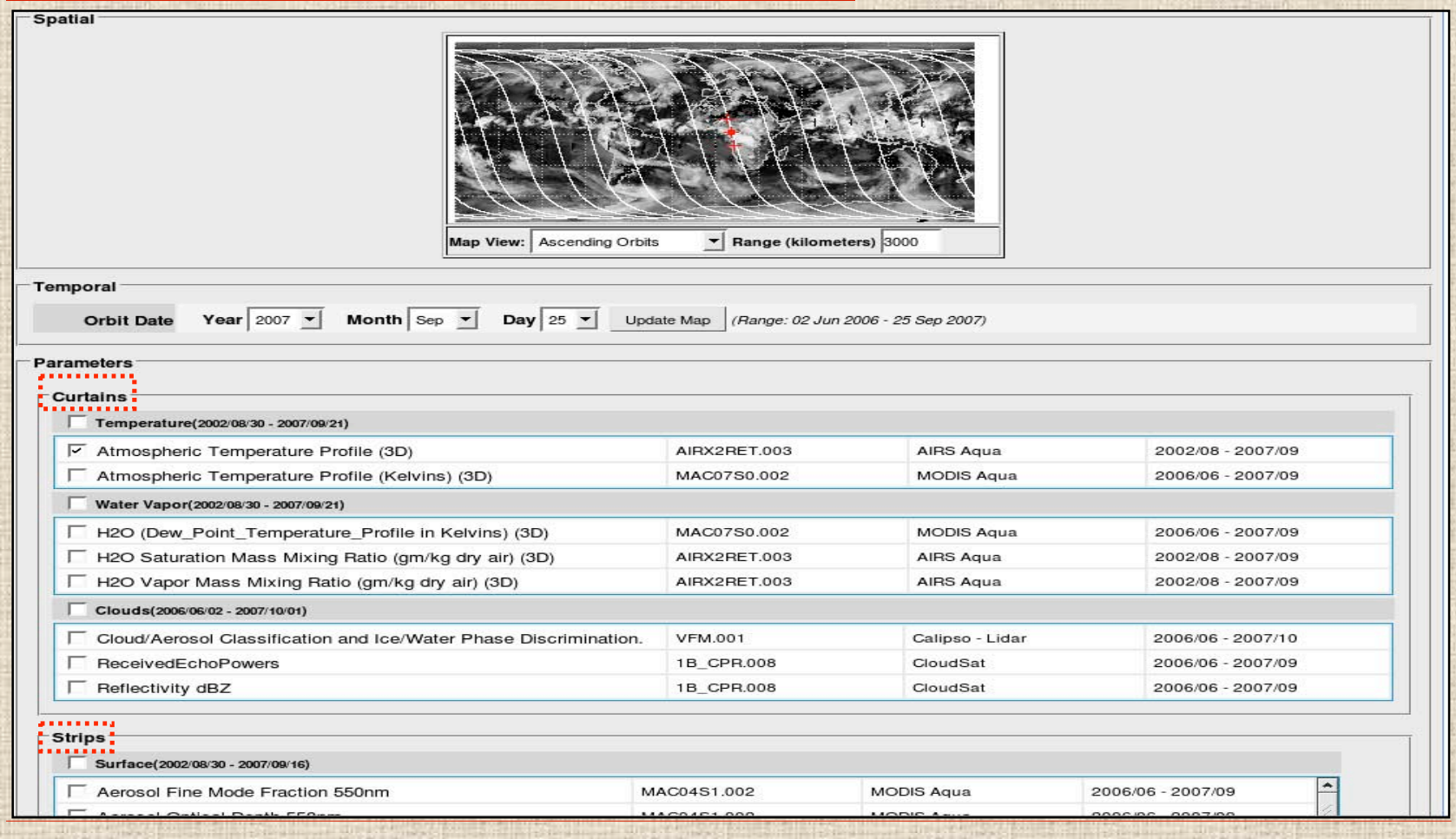
SurfAirTemp Correlation V004 vs V005
2003-02-01 to 2003-02-28



SurfAirTemp Correlation Sample Size
2003-02-01 to 2003-02-28

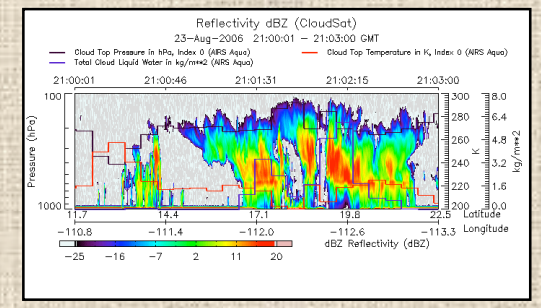


Data Services: Giovanni // A-Train

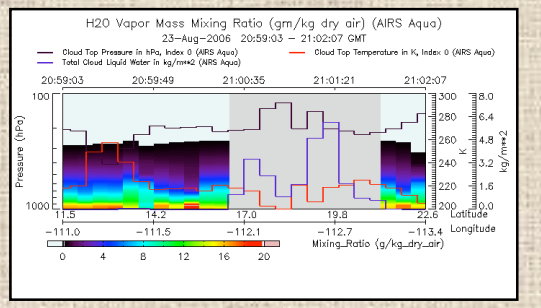


Data Services: Giovanni // A-Train

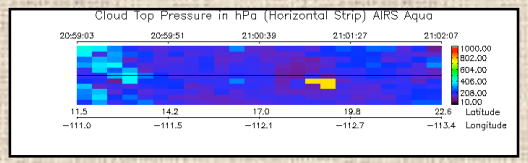
Cloudsat Reflectivity dBZ



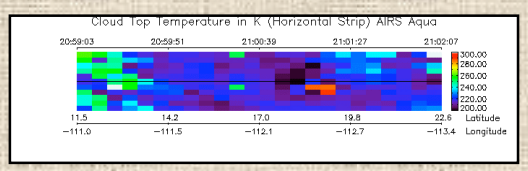
AIRS H_2O Vapor MMR Curtain



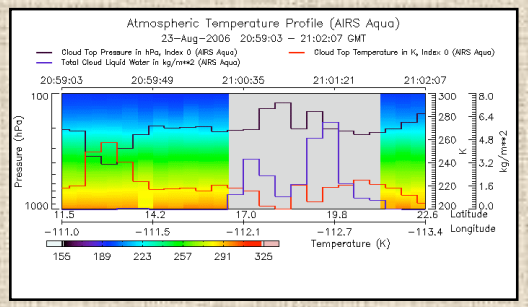
AIRS Cloud Top Pressure (2D)



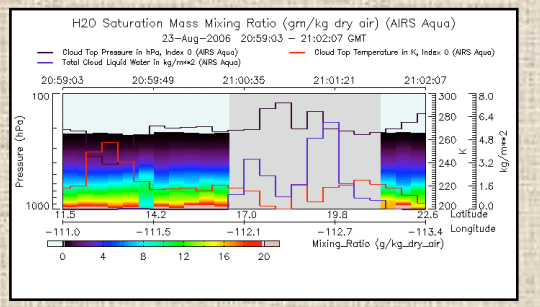
AIRS Cloud Top Temperature (2D)



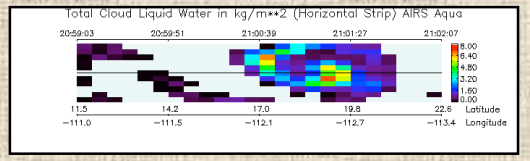
AIRS Temperature Curtain



AIRS H_2O Saturation MMR Curtain

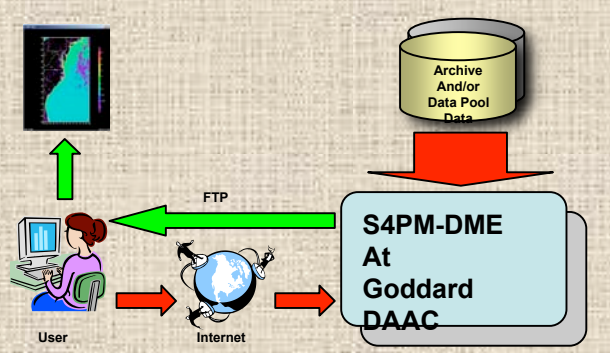


AIRS Total Cloud Liquid Water (2D)



Data Services: Data Mining

- Upload your own algorithm and mine the data on our system. Output will be placed in an FTP area for pickup.
- Easy access over the Internet to mine data using server resources (ours) rather than your own.
- Users' algorithm can be in C, FORTRAN and IDL.
- Info Page: http://disc/techlab/s4pm-dme/



S4PM-DME Data Flow

Drs. Pham, Lynnes, Eng

Data Services: GIS // WMS

- WMS = OGC Web Map Service

  http://www.opengeospatial.org/standards/wms

- WMS service produces maps of spatially referenced data dynamically from geographic information in various image formats (png, gif, jpeg). Note: map ≠ data itself!

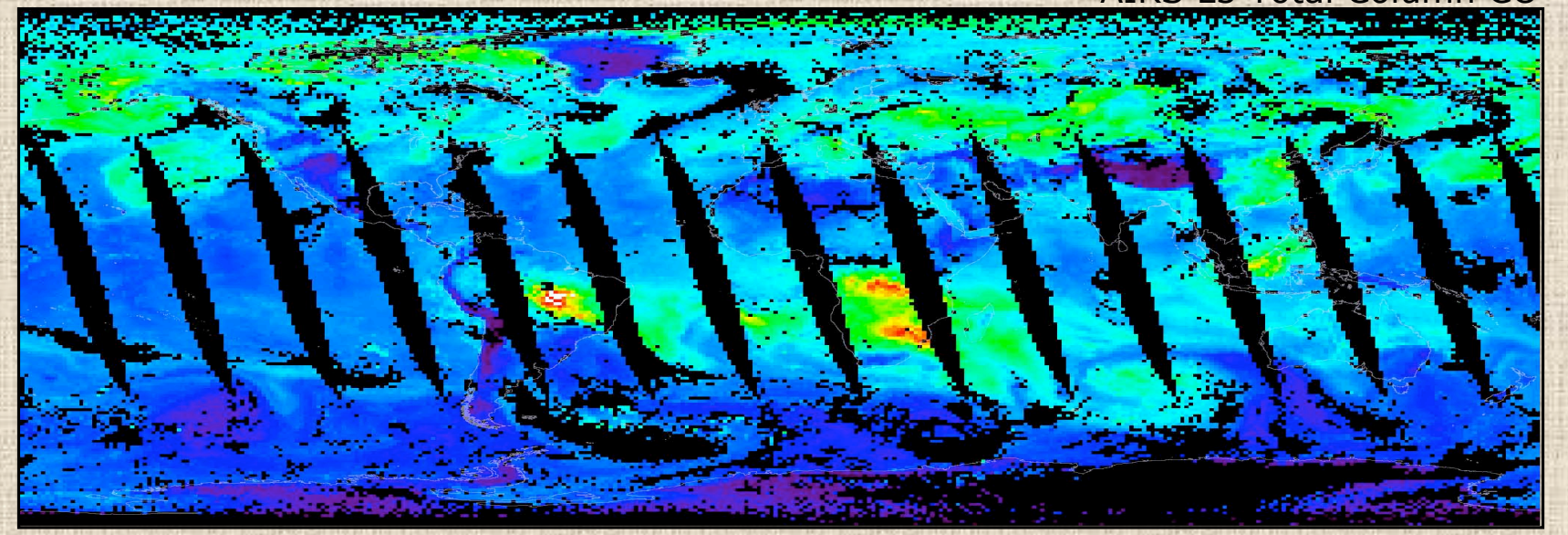
- WMS access: send requests, along with spatial, temporal constraints in the form of HTTP URLs.

- GetCapabilities: provide information about what types of maps a WMS server can deliver. A returned XML file can be imported into WMS-capable applications like Google-Earth or ArcGIS.

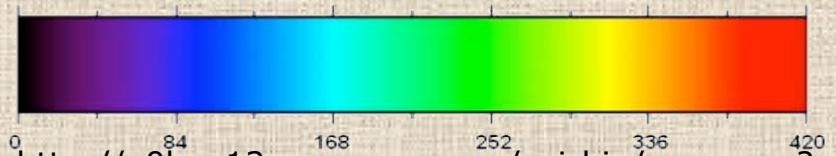
  http://g0hep12u.ecs.nasa.gov/mapserv-bin/wms_ogc?service=wms&version=1.1.1&request=getcapabilities

Data Services: GIS // WMS

AIRS L3 Total Column CO



http://g0hep12u.ecs.nasa.gov/mapserv-bin/wms_ogc?service=WMS&VERSION=1.1.1&REQUEST=GetMap&SRS=EPSG:4326&WIDTH=2048&HEIGHT=1024&LAYERS=AIRX3STD_COTOTALCOLUMN_A,coastline&time=2002-09-01&BBOX=-180,-90,180,90



AIRS Daily Retrieved Total Column CO (molecules / cm^2)

http://g0hep12u.ecs.nasa.gov/cgi-bin/wms_ogc?service=WMS&version=1.1.1&service=WMS&request=GetLegendGraphic&layer=AIRX3STD_COTOTALCOLUMN_A&format=image/png

Data Services: GIS // WCS

- WCS = OGC Web Coverage Service: http://www.opengeospatial.org/standards/wcs

- WCS is a web service for serving geospatial data. Instead of getting back an image as in WMS, you get data in HDF, HDF-EOS, netCDF data formats.

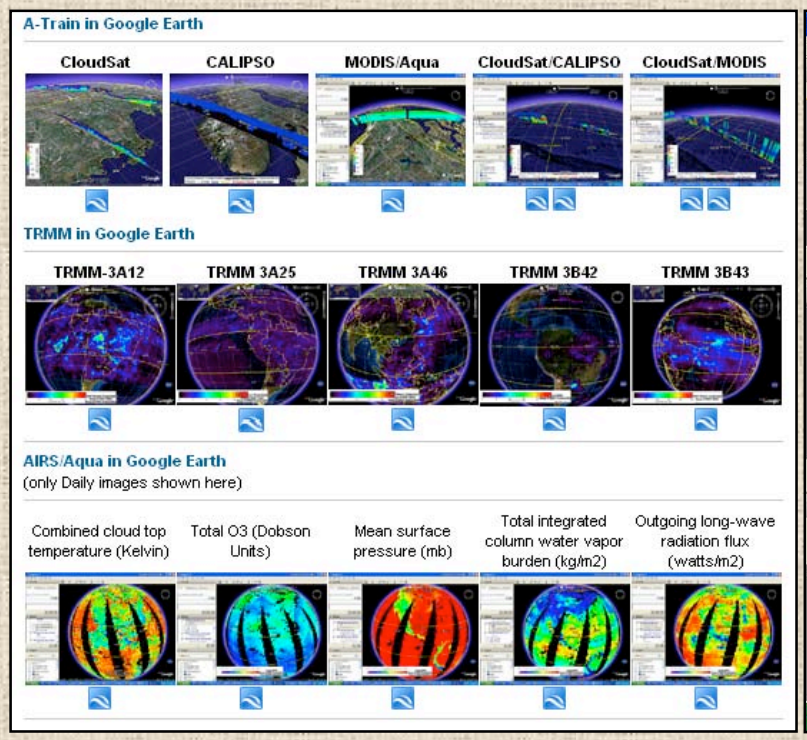
- WCS access: send requests, along with spatial, temporal constraints in the form of HTTP URLs.

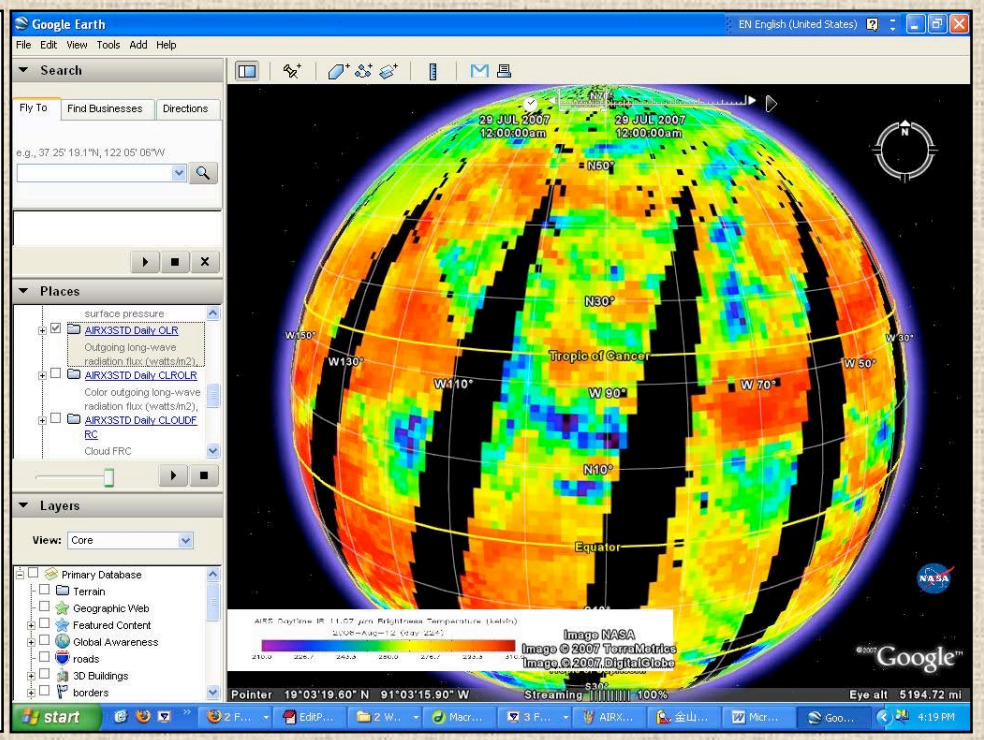
- Example: get 3D Temperature Profile in HDF-EOS format

  http://g0dup05u-ts2.ecs.nasa.gov/cgi-bin/WCS/testL3AIRS.x?service=WCS&
  version=1.0.0&request=getCoverage&coverage=/datapool/OPS/user/long_term/AIRS/
  AIRX3STD.003/2004.07.28/AIRS.2004.07.28.L3.RetStd001.v4.0.9.0.G05261164636.hdf:
  GRID:ascending:Temperature_A&CRS=WGS84&resx=1.0&resy=1.0&format=HDF-EOS&
  bbox=-180,-90,180,90&TempPrsLvls=1/24/2&interpolationMethod=Nearest%20neighbor

Data Services: Google-Earth

http://disc.sci.gsfc.nasa.gov/googleearth/





Dr. Aijun Chen, GMU

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Voice: 301-614-5224
Fax: 301-614-5268

Mailing Address:
Code 610.2
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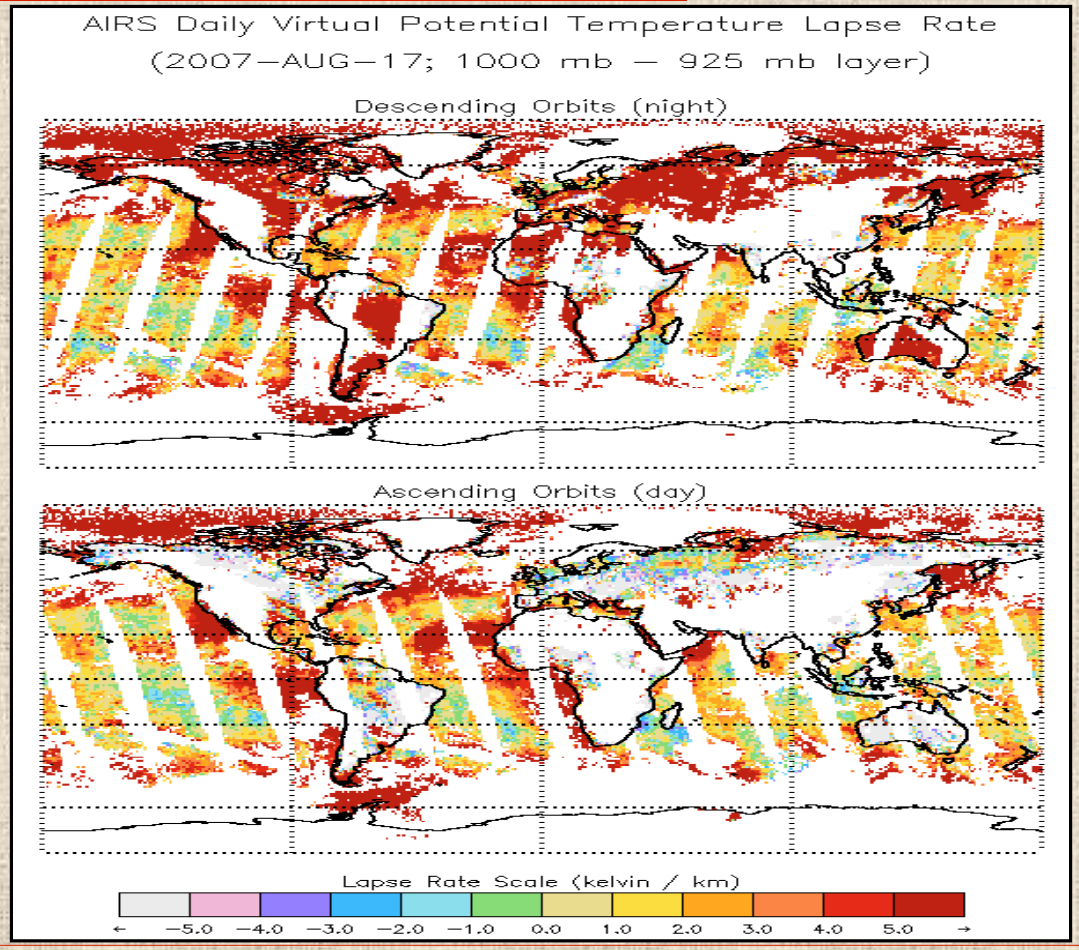
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771, U.S.A

Virtual Potential Temperature Lapse Rate for Air Quality Studies