Goddard Earth Sciences Data and Information Services Center (GES DISC)

What's NEW at the GES DISC: Evolution of data management and services for Aura mission and beyond

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Acknowledgment: Aura ST, SIPs, ESDIS EMS, GES DISC team

2016 Aura Science Team Meeting
Outline

• GES DISC world
• Aura data usage and trend
• Aura data users requests
• GES DISC update (before/after)
  – New Access method (ftp → http) with Earthdata Login System
  – New Website (DISC/Mirador → New Interface)
  – New Giovanni (Giovanni → Now Federated)
• GES DISC support beyond Aura Mission
  – Multi-sensor coincident data subsets
  – Level 2 support (Subsetter, Visualization)
  – Data List
The GES DISC ‘World’

- Advancing Technology
- Earth Science Data
- Earth Science Metadata
- Documentation
- Ingest, Process, Archive, Distribute, Steward Earth Science Data (on computers optimized for tasks)
- Data and Document Preservation
- Community Driven Data Access Capabilities
- User, Data, Science Support
- Value Added Products and Services
- Research
- Applications
- Outreach

- Document-
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Aura Distribution by Instrument

Distribution presents the amount of data successfully distributed to user community.

<table>
<thead>
<tr>
<th>Mission</th>
<th>Instrument</th>
<th># Files</th>
<th>Volume (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aura</td>
<td>HIRDLS</td>
<td>18,922</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>MLS</td>
<td>3,420,094</td>
<td>25.34</td>
</tr>
<tr>
<td></td>
<td>OMI</td>
<td>11,634,182</td>
<td>164.48</td>
</tr>
<tr>
<td></td>
<td>TES</td>
<td>244,550</td>
<td>6.80</td>
</tr>
</tbody>
</table>

User Geographical Distribution

 Aura Multi-Year Product Distribution Trend (Oct 2004 to July 2016)
Aura MLS/OMI Data Processing Level Distribution

### Users

<table>
<thead>
<tr>
<th>Product Level</th>
<th>MLS_L1</th>
<th>MLS_L2</th>
<th>OMI_L1</th>
<th>OMI_L2</th>
<th>OMI_L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>1</td>
<td>253</td>
<td>2,824</td>
<td>5,678</td>
<td>6,317</td>
</tr>
</tbody>
</table>

### Volume (GB)

<table>
<thead>
<tr>
<th>Product Level</th>
<th>MLS_L1</th>
<th>MLS_L2</th>
<th>OMI_L1</th>
<th>OMI_L2</th>
<th>OMI_L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>4</td>
<td>11,260</td>
<td>19,238</td>
<td>70,805</td>
<td>99,097</td>
</tr>
</tbody>
</table>

### Files

<table>
<thead>
<tr>
<th>Product Level</th>
<th>MLS_L1</th>
<th>MLS_L2</th>
<th>OMI_L1</th>
<th>OMI_L2</th>
<th>OMI_L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Files</td>
<td>8</td>
<td>17,942</td>
<td>38</td>
<td>10,842</td>
<td>400,806</td>
</tr>
</tbody>
</table>
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Help Desk Request from Users

- **Find/Access/Download Data**
  - I do not know how to download...
  - Enhance tools/services/data
    - recipe for better data search, data access, data download

- **Data Subsetting**
  - Improve ability and performance of data subsetting tool

- **Data Reading**
  - Keep data reader code updated, more data reading recipes

- **Documentation and Science Question**
  - Parameter unit, vertical layers ...
  - Can we use OMI data for ...? Are OMI data better than ...?
  - Enhance metadata and online resources

- **Users help us**
  - Users find error in our website and code not working -> we make correction.

### Instrument Statistics

<table>
<thead>
<tr>
<th>Instrument</th>
<th># User Request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aura</td>
<td>9</td>
</tr>
<tr>
<td>HIRDLS</td>
<td>7</td>
</tr>
<tr>
<td>MLS</td>
<td>53</td>
</tr>
<tr>
<td>OMI</td>
<td>283</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>352</strong></td>
</tr>
</tbody>
</table>

2007 May to 2016 Aug
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GES DISC will replace anonymous FTP with HTTP download on October 3rd, 2016

We have provided detail in alert message, banner, emails…

Problems/Questions to GES DISC Help Desk (gsfc-help-disc@lists.nasa.gov)
### GES DISC New Web Interface

**Data Collections**

**Related Documentation**

**Refine By**

- **SubjectSort**
  - Aerosols (16)
  - Air Quality (1)
  - Altitude (5)
  - Atmospheric Chemistry (80)
  - Atmospheric Radiation (14)

- **MeasurementSort**
  - Aerosol Extinction (12)
  - Aerosol Optical Depth/Thickness (11)
  - Altitude Characteristics (2)
  - Bromine Monoxide (6)
  - Carbon Monoxide (5)

- **SourceSort**

**Showing all (143) datasets associated with Aura for date range 1920-01-01 to 2016-08-24 within -180, -90, 180, 90...**

<table>
<thead>
<tr>
<th>Image</th>
<th>Dataset</th>
<th>Source</th>
<th>Temporal Resolution</th>
<th>Spatial Resolution</th>
<th>Process Level</th>
<th>Begin Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Sample Image</td>
<td>OMI/Aura Ozone (O3) Total Column Daily L2 Global Gridded 0.25 degree x 0.25 degree V3 (OMTO3G.003) - Atmospheric Chemistry, Atmospheric Radiation, Aerosols</td>
<td>Aura OMI</td>
<td>1 day</td>
<td>0.25° x 0.25°</td>
<td>2</td>
<td>2004-10-01</td>
<td>present</td>
</tr>
<tr>
<td>No Sample Image</td>
<td>GOZCARDS Merged Water Vapor 1 month L3 10 degree Zonal Means on a Vertical Pressure Grid V1 (GozMmipH2O.1) - Atmospheric Water Vapor</td>
<td>UARS HALOE, Aura MLS</td>
<td>1 month</td>
<td>3</td>
<td>1991-09-01</td>
<td>2013-01-01</td>
<td></td>
</tr>
</tbody>
</table>
Giovanni: More Data, More Plots, Faster Results

Old Giovanni:
- 40 individual Portals

New Giovanni:
- Omnibus Portal (future)
- Point data (future)

Giovanni (V4):
- Flexible infrastructure
- One Instance & Modular
- Fully interoperable
- URL-based
- Data types:
  - L3 gridded
  - L2 swath/profiles (future)
  - Point data (future)

Giovanni (V3):
- Harmonized data & inventory
- Separate instances
- Configurator

Giovanni (prototype, V1/V2):
- Independent instances
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  - New Website (Mirador → Unified User Interface)
  - Giovanni (G3 → Giovanni, open source)

- GES DISC support beyond Aura Mission
  - A Train Data Depot (Multi-sensor coincident data subsets)
  - Level 2 support (Subsetter, Visualization)
  - Data List
A-Train Data Depot (ATDD) was supported by NASA ACCESS (Advancing Collaborative Connections in Earth System Science) program and now is on sustaining mode.

Started with CloudSat mission support with MODIS-CloudSat collocated subsets. Building upon the expertise, OMI, POLDER, and AIRS subsets were subsequently added in production, and distributed by ATDD.

The collocated subsets include MODIS/Aqua L1B and L2 atmospheric products, OMI/Aura L2 products, and Polder/Parasol L2 products (Table shows detail)

**Archived On-line A-Train Subsets**
- **New Web** http://disc.sci.gsfc.nasa.gov/uui/datasets?keywords=a-train
- **http** : http://atrain.gesdisc.eosdis.nasa.gov/data/

**MODIS/Aqua, Level 1B, radiances**
- MAC021S*: 1-km radiances
- MAC02QS*: 250-m radiances

**MODIS/Aqua, Level 2, atmospheric products**
- MAC04S*: Aerosol Optical Depth Land and Ocean, Aerosol Type over Land, Angstrom Exponent, Mass Concentration, Fine Mode Fraction
- MAC05S*: Water Vapor IR and near IR retrievals
- MAC06S*: Cloud Top Parameters: Pressure, Temperature, Effective Emissivity, Spectral Forcing, Cloud Phase; Cloud Optical Parameters: Cloud Optical Thickness, Effective Particle Radius; Cirrus Detection: Cirrus Reflectance.
- MAC07S*: Temperature and Moisture (dew point temperature) profiles.
- MAC35S*: Cloud Mask: IR, NIR, and CO2 tests; Visible test at 250-m.

**OMI/Aura, Level 2, Cloud Pressure, Ozone, and UV index**
- OMCLOD02_CPR: Cloud effective pressure based on O2-O2 absorption
- OMCLODRR_CPR: Cloud effective pressure based on Raman scattering
- OMT03_CPR: Column amount O3, UV Aerosol Index, UV reflectivity.
- OMAERUV_CPR: UV Aerosol Index, Aerosol Absorption Optical Depth, Surface Albedo, UV Reflectivity.

**POLDER/Parasol, Level 2, Radiation Budget processing**
- PARASOLRB_CPR: Column Water Vapor, Cloud Pressure from O2 lines, Cloud Optical Thickness, Cloud Phase, Cloud Albedo, Clear Albedo.

*Available in 200- and 10-km swath widths, The rest are available (+/-100 km) only.
Multi-Sensor Intercomparison

<table>
<thead>
<tr>
<th>Spectrometer</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-grating spectrometers with CCD detectors</td>
<td>Double monochromator with pre-disperser prism and four holographic gratings</td>
<td>4 grating spectrometers with their own optics and 2-D detectors</td>
<td></td>
</tr>
<tr>
<td>Sample interval (nm)</td>
<td>0.41</td>
<td>Band 1: 0.24-0.29, Band 2: 0.26-0.28</td>
<td>Band 1 &amp; 2: 0.065, Band 3: 0.20</td>
</tr>
<tr>
<td>Swath</td>
<td>Push broom 110°</td>
<td>Across track scanning</td>
<td>Push broom 2600km</td>
</tr>
<tr>
<td>Spatial Resolution</td>
<td>NM: 50km × 50km, NP: 250km × 250km</td>
<td>METOP-A: 40km × 80km &amp; 40km × 40km (after July 2013), METOP-B: 40km × 80km</td>
<td>Band 1: 28x7km, Band 2 &amp; 3: 7km × 7km</td>
</tr>
<tr>
<td>L1B Data Format</td>
<td>HDF5</td>
<td>EPS-native format</td>
<td>netCDF-4</td>
</tr>
</tbody>
</table>

Source: http://www.tropomi.eu/
Data Quality Level 2 Visualizer

NASA L2 Data Quality Visualization

MAP LAYERS

MODIS
- Terra Corrected Reflectance (True Color)
- Aqua Corrected Reflectance (True Color)

OMAERUV
- Absorption AOD 388nm (no QA)
- Absorption AOD 388nm (QA)
- Absorption AOD 500nm (no QA)
- Absorption AOD 500nm (QA)
- AOD 388nm (no QA)
- AOD 388nm (QA)
- AOD 500nm (no QA)
- AOD 500nm (QA)

OMAERO
- OMSO2
- OMTQ3
- OMDQA03
- World Background
Summary

GES DISC is user driven data service center

- Maintain active archive of datasets and enhance information services by developing tools and services for users
  - Applications Support: Earthdata Login, New Website, Subsetting, Giovanni, Data Recipe/Cookbook, OPeNDAP, …
  - Dataset documentation support (User Guides, Readme, FileSpec, DIF, …)
- Engage the user community in their data access, data usability and information/services needs.
  - Conference & Science Team participation, outreach.
  - Help Desk/User Support.
  - Develop and test recipes, and support tools for working with GES DISC data.
- Web content support, Social Media, User Forum, news articles, version release information, and data services updates, FAQ.
- Support for legacy missions & document preservation
Operational Services/Tools

- **Giovanni** – Data Discovery, Visualization and Exploration
- **Mirador** – Data Search and access
- **Simple Subset Wizard** – GES DISC led, cross DAAC effort to provide subsetting capabilities
- **Data Recipes**
- **OpenDAP**
- **GrADS Data Server**
- **Open Geospatial Consortium (OGC) Web Map Service (WMS)**
- **Data provided in various formats** (HDF, netCDF, ASCII, kmz, others)
- **MAPSS** – Provides multi-sensor aerosol analysis centered around AERONET sites
- **Data Quality Screening** – Allows users to filter data on Quality
- **NEESPI (Northern Eurasia), MAIRS (Monsoon Asia), and A-Train Data Depot (along the A-Train track)** – Provides multi-instrument heterogeneous data access for a given region
- **Data Stewardship**