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

Jennifer Wei¹,²

¹ NASA GES DISC
² Adnet Systems Inc.

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
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
### 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>

#### Aura Multi-Year Product Distribution Trend (Oct 2004 to July 2016)

#### User Geographical Distribution

[Maps showing geographical distribution for HIRDLS, MLS, OMI]
Aura MLS/OMI Data Processing Level Distribution

Product Level

<table>
<thead>
<tr>
<th>Users</th>
<th>Volume (GB)</th>
<th>Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS_L1</td>
<td>MLS_L2</td>
<td>OMI_L1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>253</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>599</td>
</tr>
</tbody>
</table>

Year:
- OMI_L3: 2016
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
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.

### Instrumental User Request

<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
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
Transition to Earthdata Login

**IMPORTANT MESSAGE Jun 28, 2016**  Access to GES DISC data will require all users to be registered with the Earthdata Login system

Starting August 1st, 2016, access to GES DISC data will require all users to be registered with the Earthdata Login system. Data will continue to be free of charge and accessible via HTTP. Access to data via FTP will no longer be available after October 3rd, 2016. Detailed instructions on how to register and receive authorization to access GES DISC data are provided [here](https://example.com).

GES DISC Users who deploy scripting methods to list and download data in bulk via anonymous FTP are advised to review the [How to Download Data Files from HTTP Service with wget](https://example.com) recipe that provides examples of GNU wget commands for listing and downloading data via HTTP.

- 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

**Refine By**

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

- **Measurement**
  - Aerosol Extinction (12)
  - Aerosol Optical Depth/Thickness (11)
  - Attitude
  - Bromine Monoxide (6)
  - Carbon Monoxide (5)

- **Source**

#### Related Documentation

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 Grid 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 (GozMmlpH2O.1) - Atmospheric Water Vapor</td>
<td>UARS HALOE, Aura MLS</td>
<td>1 month</td>
<td></td>
<td>3</td>
<td>1991-09-01</td>
<td>2013-01-01</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 (V3)
- Harmonized data & inventory
- Separate instances
- Configurator

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

• GES DISC world
• Aura data usage and trend
• Aura data users requests
• GES DISC update (before/after)
  – New Access method (ftp → http) with User Registration System
  – 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).
Multi-Sensor Intercomparison

### Footprints of S5P TROPOMI, S-NPP OMPS, METOP-B, GOME-2, Aura OMI, and Envisat Schiemachy

<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></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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP: 250-310</td>
<td></td>
<td>Band 1: 240-315</td>
<td>Band 1: 270-300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spectral resolution (nm)</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td></td>
<td>Band 1: 0.24-0.29</td>
<td>Band 1: 0.065</td>
</tr>
<tr>
<td></td>
<td>Band 2: 0.26-0.28</td>
<td>Band 2 &amp; 3: 0.065</td>
<td>Band 3: 0.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample interval (nm)</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.41</td>
<td></td>
<td>Band 1: 0.12</td>
<td>Band 1 &amp; 2: 0.12</td>
</tr>
<tr>
<td></td>
<td>Band 2: 0.12</td>
<td>Band 2: 0.12</td>
<td>Band 3: 0.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Swath</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push broom 110°</td>
<td>Across track scanning</td>
<td>Push broom 2600km</td>
<td></td>
</tr>
<tr>
<td></td>
<td>METOP-A: 1920km &amp; 900nm (after July 2013)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>METOP-B: 1920km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spatial Resolution</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NM: 50km x 50km</td>
<td></td>
<td>METOP-A: 40km x 80km &amp; 40km x 40km (after July 2013)</td>
<td>Band 1: 28x7km</td>
</tr>
<tr>
<td>NP: 250km x 250km</td>
<td>METOP-B: 40km x 80km</td>
<td>Band 2 &amp; 3: 7km x 7km</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L1B Data Format</th>
<th>OMPS</th>
<th>GOME-2</th>
<th>TROPOMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDF5</td>
<td>EPS-native format</td>
<td>netCDF-4</td>
<td></td>
</tr>
</tbody>
</table>

Source: [http://www.tropomi.eu/](http://www.tropomi.eu/)
Data Quality Level 2 Visualizer
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**