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

Exploring synergistic tools from NASA satellite data for Air Quality

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Outline

- Air Quality vs Earth Observatory AQ data

- **Data Challenge**:
  - **Demand** (community needs) vs. **Supply** (available data) often do not meet
  - Tools & Tips in **Data Discovery**
  - Tools & Tips in **Data Exploration**

- Examples on how you can exploit data through **Worldview** and **Giovanni**

Air Quality Indicators vs. NASA Data

Demand

- Ground level ozone
- **Carbon monoxide (CO)**
- **Sulfur dioxide (SO_2)**
- **Nitrogen dioxide (NO_2)**
- Airborne particles (PM10, PM2.5) or **aerosols (AOD)**
- Precursors:
  Formaldehyde(HCHO)
  Ammonia (NH_3)

Supply

In-Situ

- ❑ AERONET
- ❑ Field Campaigns

Space-borne

- ❑ **AIRS, SNPP/CrIS,** MOPITT
- ❑ **OMI, OMPS, S5P/TROPOMI**
- ❑ SeaWiFS, MODIS, MISR, VIIRS
- ❑ Other Missions (GOES-R, Himawari, TEMPO, MAIA…)

Model

- ❑ **MERRA-2**
- ❑ MAIAC (MCD19A2)

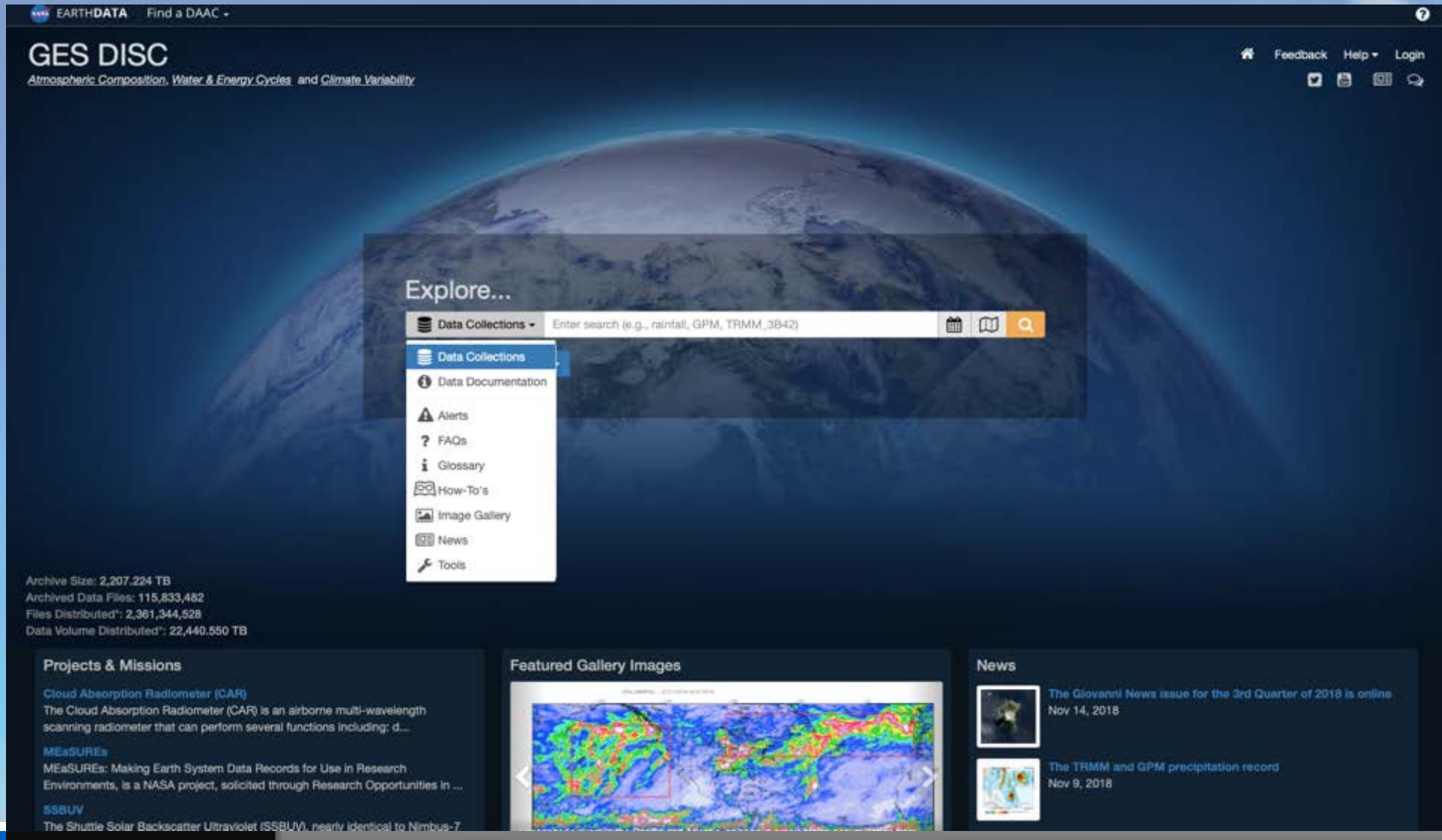
Data Challenges in Air Quality

- **Demand (purpose for using data) varies**
  - Monitoring - temporal/spatial, data latency
  - Decision-making - simple, visualization
  - Research - detail and ancillary information

- **Data Type varies**
  - Instrument
    - Platform
    - Data Access
  - Implementation (e.g., algorithm)
  - Data formats
  - Quality (e.g., Real Time, Near-Real-Time, Production)

Tools & Tips: Discover NASA Air Quality data

- **Tools to discover NASA AQ data:**

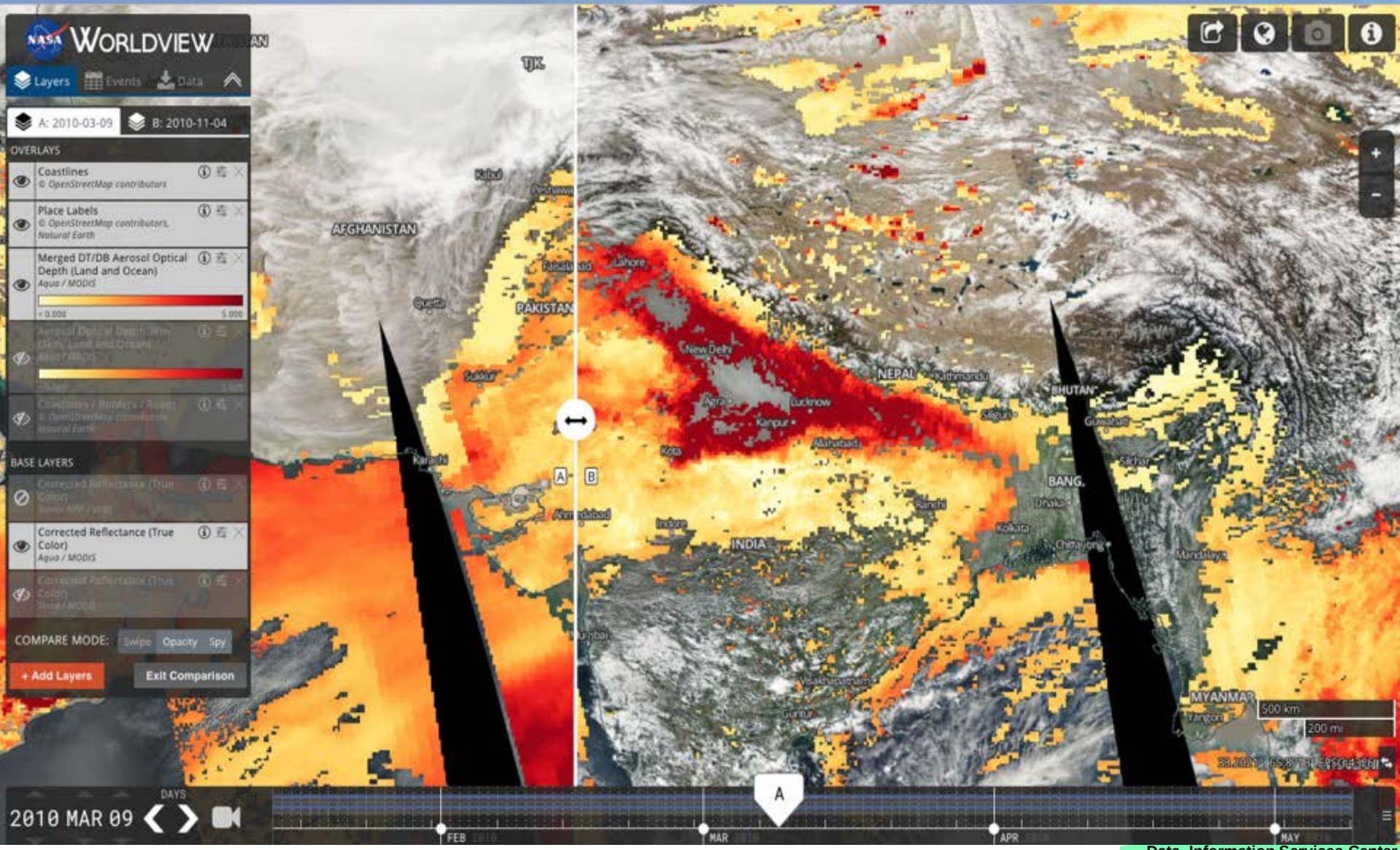


Tools & Tips: Exploit NASA Air Quality data

- **NASA AQ Exploring Tools**
  - Worldview: https://worldview.earthdata.nasa.gov
  - Giovanni: https://giovanni.gsfc.nasa.gov/giovanni/
  - Multi-sensor Aerosol Products Sampling System:
    - MAPSS: https://giovanni.gsfc.nasa.gov/mapss/
    - MAPSS Explorer: https://giovanni.gsfc.nasa.gov/mapss_explorer/
- **NASA Applied Sciences AQ Resources:**
  - NASA Health and Air Quality (AQ)
  - GSFC Air Quality
  - NASA Applied Remote SEnsing Training (ARSET)
  - NASA Health and Air Quality Applied Sciences Team (HAQAST)
  - NASA Earth Observatory: https://earthobservatory.nasa.gov
- **Tips:**
  - Use Quick Tour for the tool
  - Data Recipe or Data HowTo's
  - Webinars
  - News articles from NASA EO and GES DISC

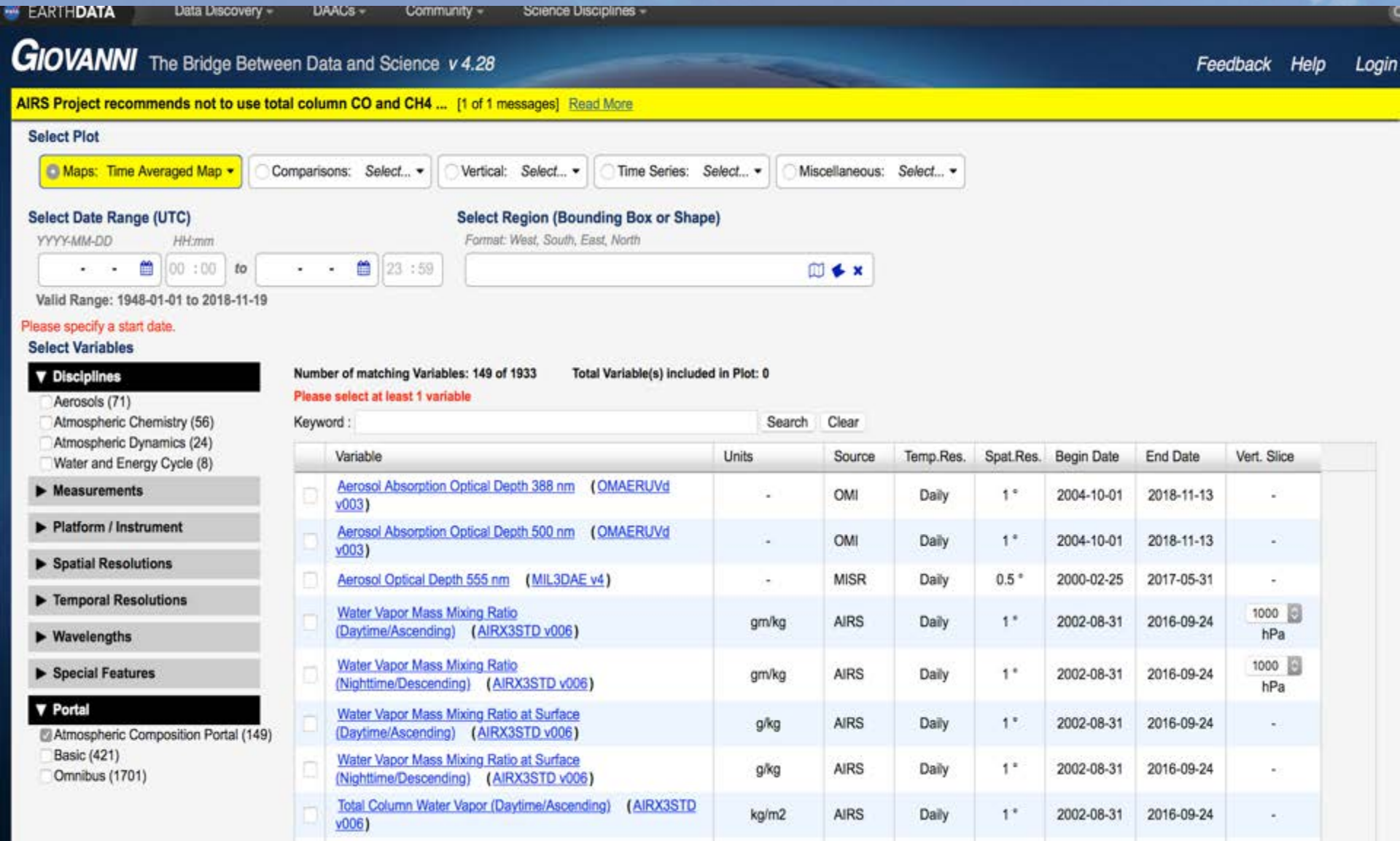
NASA Worldview

https://worldview.earthdata.nasa.gov



NASA GES DISC Giovanni

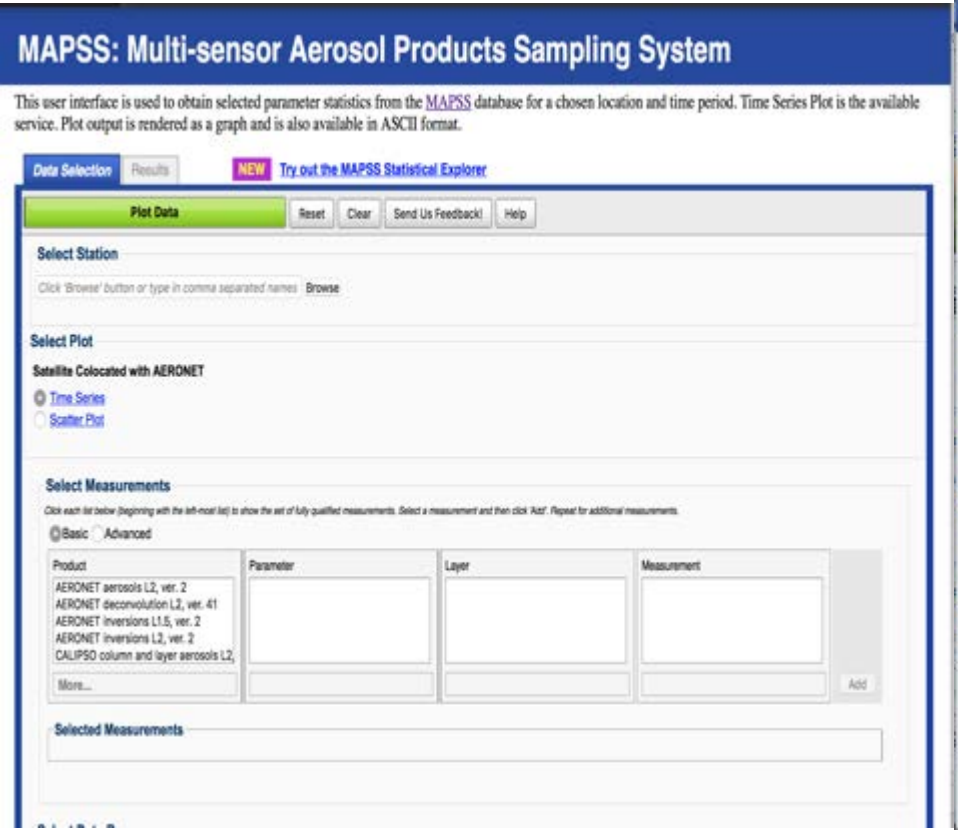
https://giovanni.gsfc.nasa.gov/



Multi-Sensors Multi-Measurements Statistical Tools

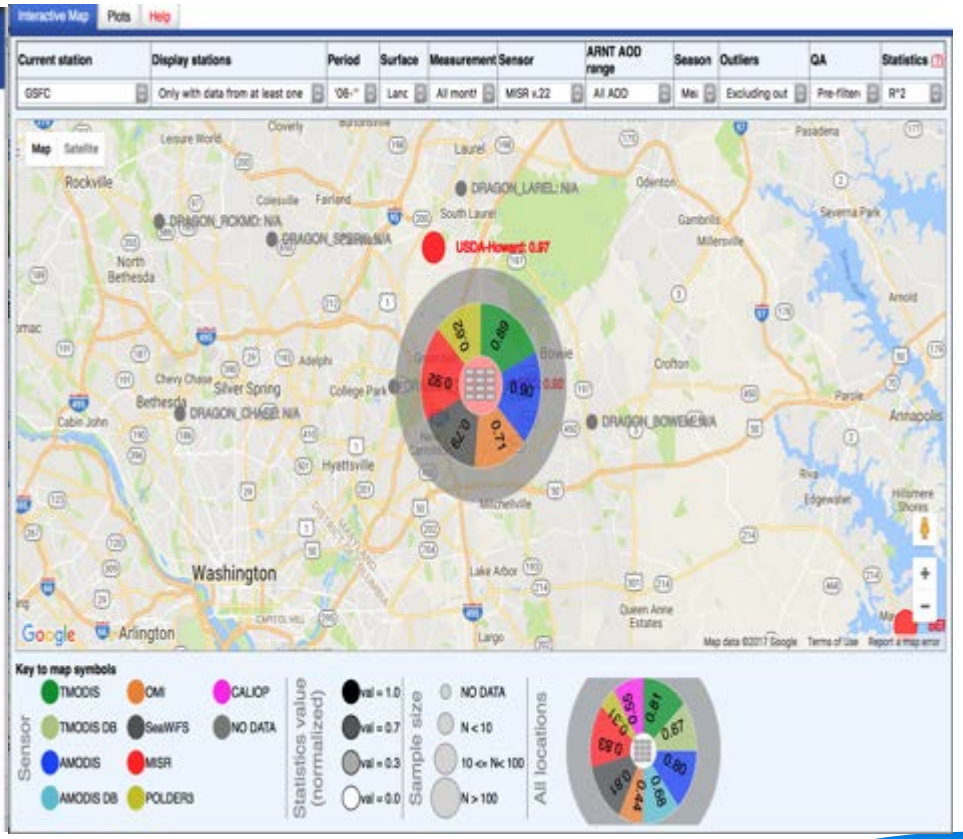
The Multi-sensor Aerosol Products Sampling System (MAPSS) has been established as a consensus data framework for multi-sensor aerosol validation, intercomparison, and joint analysis. MAPSS provides statistics of spatial and temporal subsets of Level-2 aerosol scientific data sets (SDS) from a range of sensors that currently includes AERONET, MODIS, MISR, OMI, SWDB, VIIRS, POLDER, and CALIOP.

MAPSS



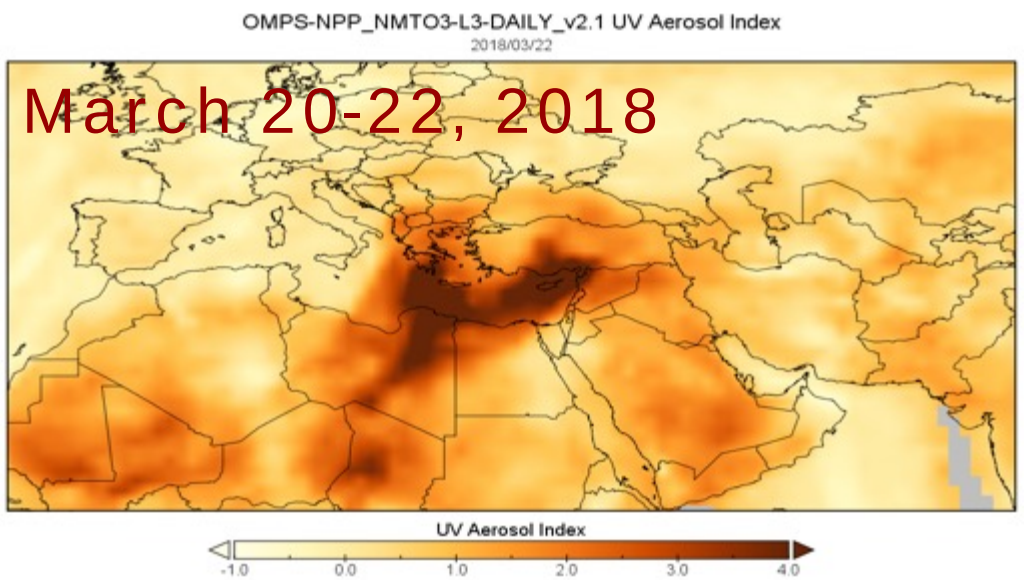
https://giovanni.gsfc.nasa.gov/mapss/

MAPSS Explorer

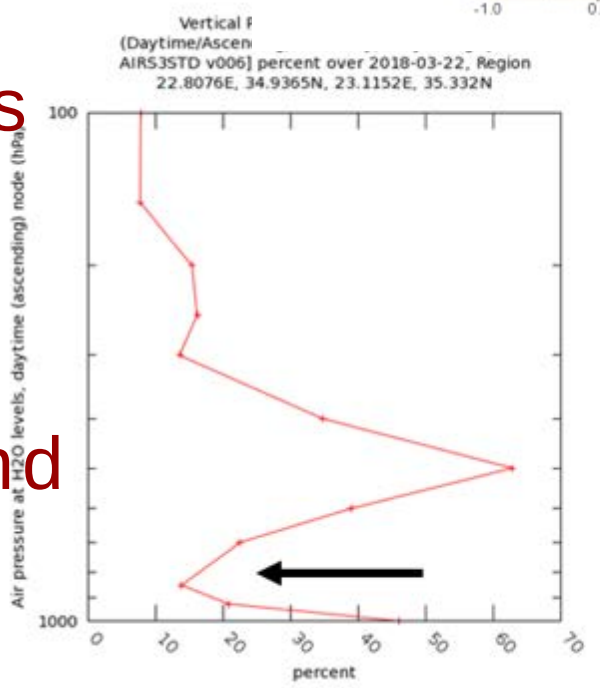


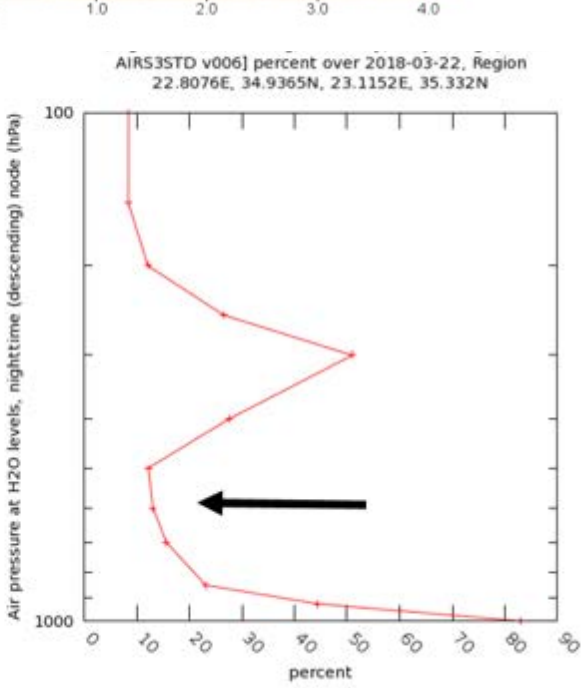
https://giovanni.gsfc.nasa.gov/mapss_explorer/

Episodic Event - Orange Snow?

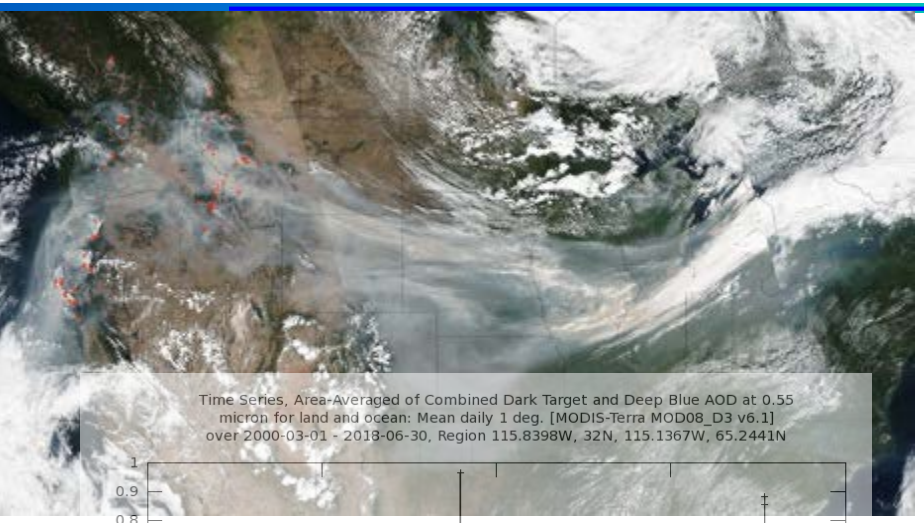


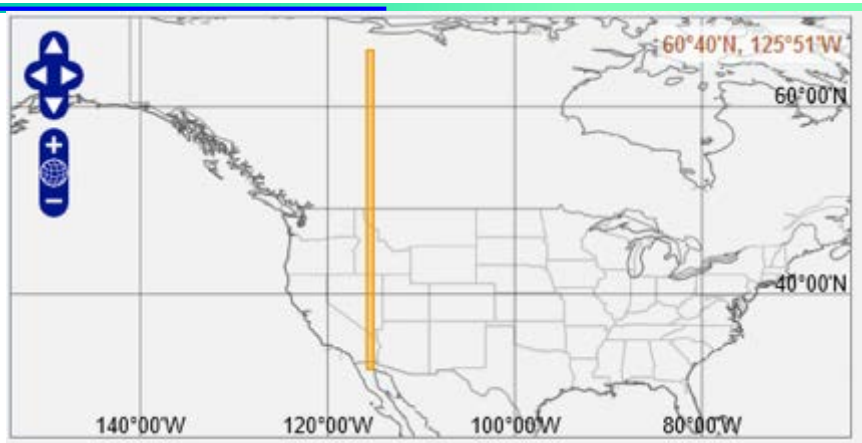
Giovanni allows rapid data analysis over user-specified time periods and region

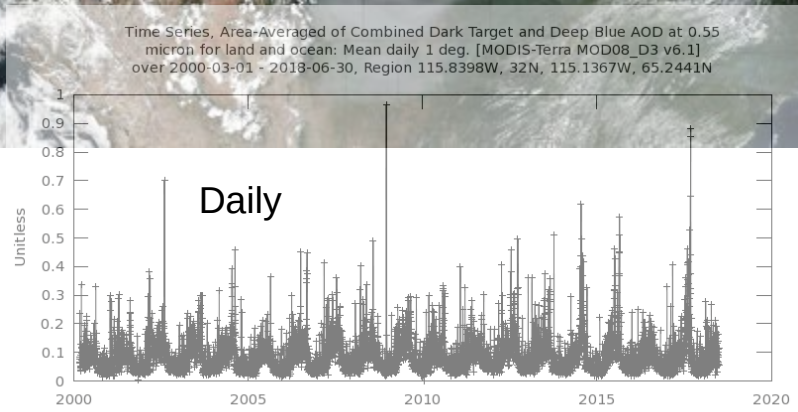


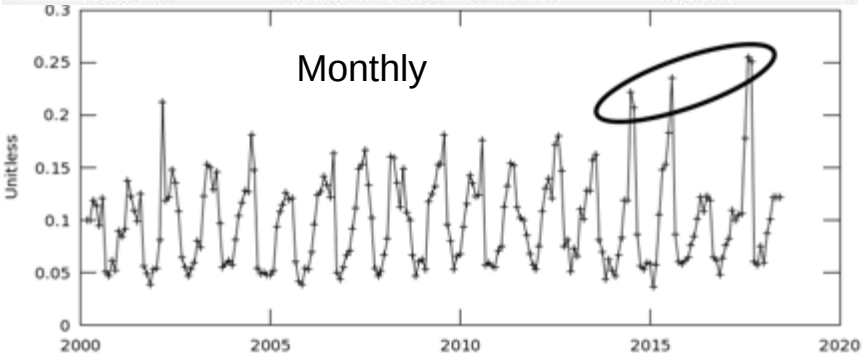


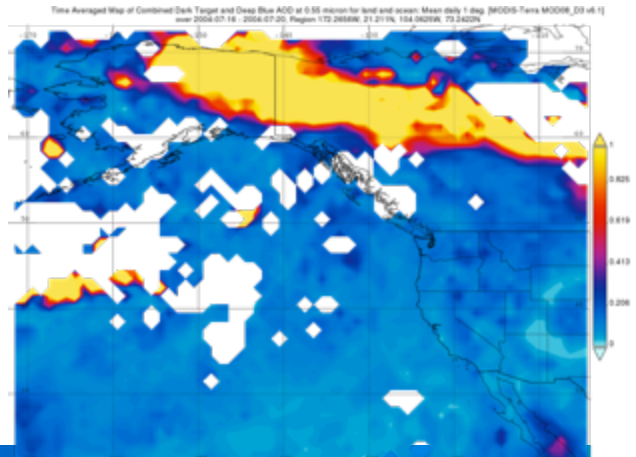
Identify Events: Aerosol Optical Depth Across North America - What Can a Giovanni Time Series Indicate?











Links for Additional Information

► Wildfire Smoke Crosses the U.S. on the Jet Stream

► A Season of Smoke

► Impact of California Fires on Local and Regional Air Quality: The Role of a Low-Cost Sensor Network and Satellite Observations (Gupta et al., GeoHealth, May 2018)

Related Data Sets for Wildfire Research

AOD and related data products in Giovanni

Carbon Monoxide (CO) in Giovanni

Nitrogen Dioxide (NO_2) in Giovanni

AIRS Carbon Monoxide (all listed AIRS data products include the CO variable)

Nitrogen Dioxide

Summary

NASA **EOSDIS Data Search** https://search.earthdata.nasa.gov

NASA **GES DISC Data Search** https://disc.gsfc.nasa.gov/

Worldview: https://worldview.earthdata.nasa.gov/

Giovanni: https://giovanni.gsfc.nasa.gov/giovanni/

GES DISC's **HowTos** https://disc.gsfc.nasa.gov/information/howto

Questions?

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