



IN51A-03

Streamlining Access to Satellite Level 2 Data

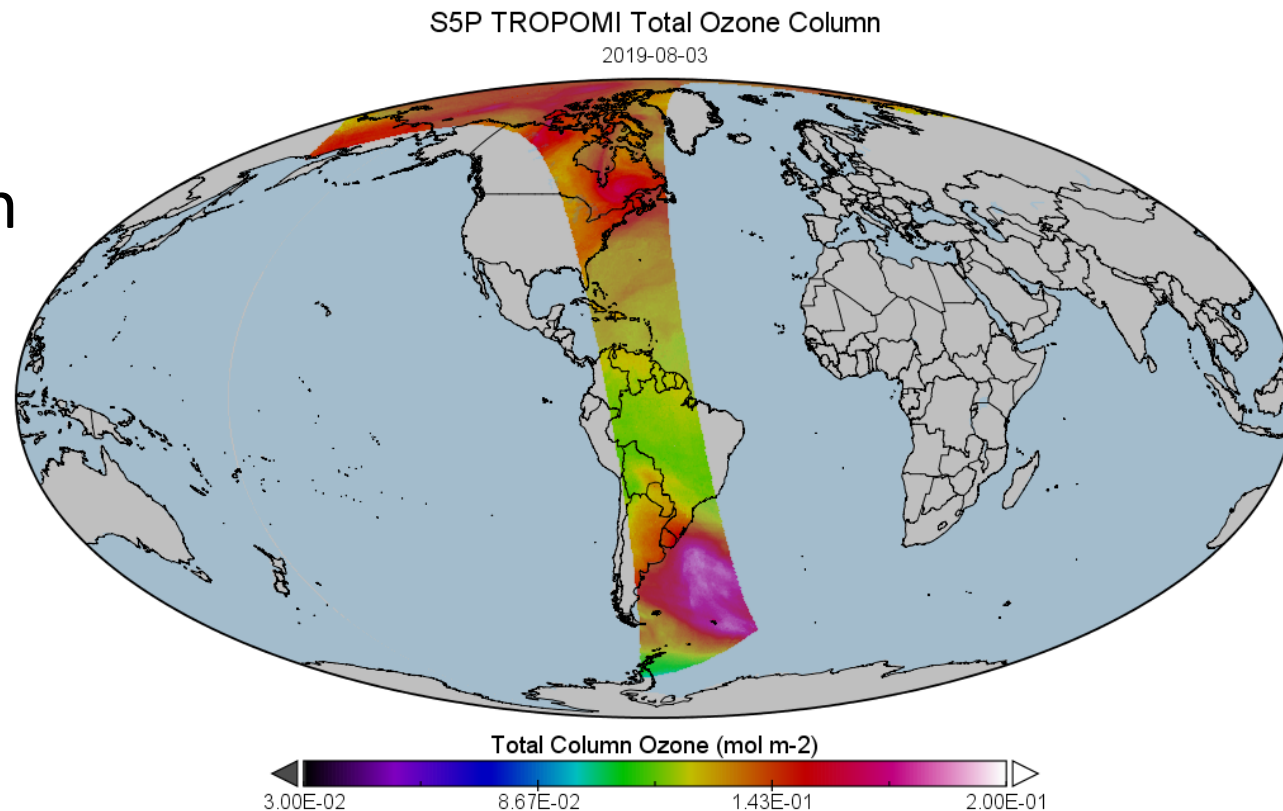
Paul Huwe^{1,2}, David Silberstein^{1,2}, Jerome Alfred^{1,2}, Jennifer Adams^{1,2},
Dana Ostrenga^{1,2}

¹NASA Goddard Space Flight Center, ²ADNET Systems Inc.

Contact: paul.huwe@nasa.gov

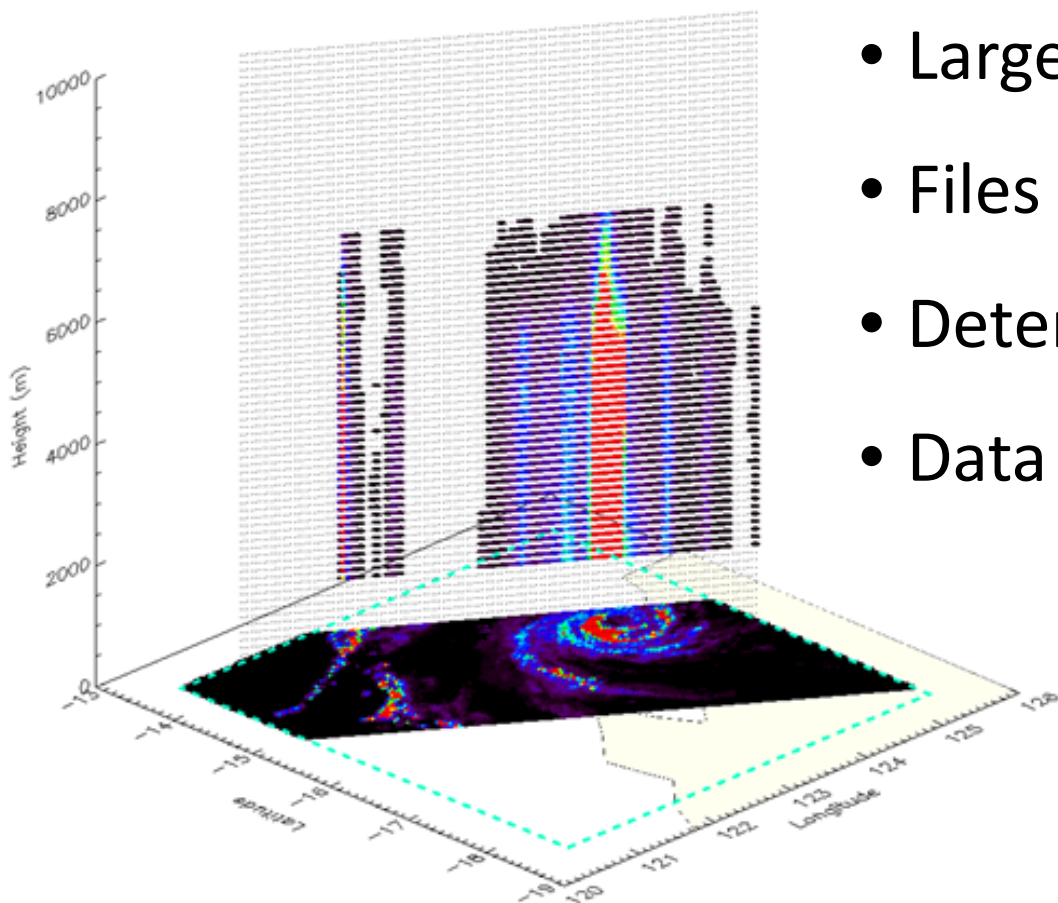
Level 2 Satellite Data

- Derived geophysical variables at the same resolution and location as the instrument source data
- Satellite observation geometry
- Products are geospatially and temporally referenced by variables (no grid dimensions)



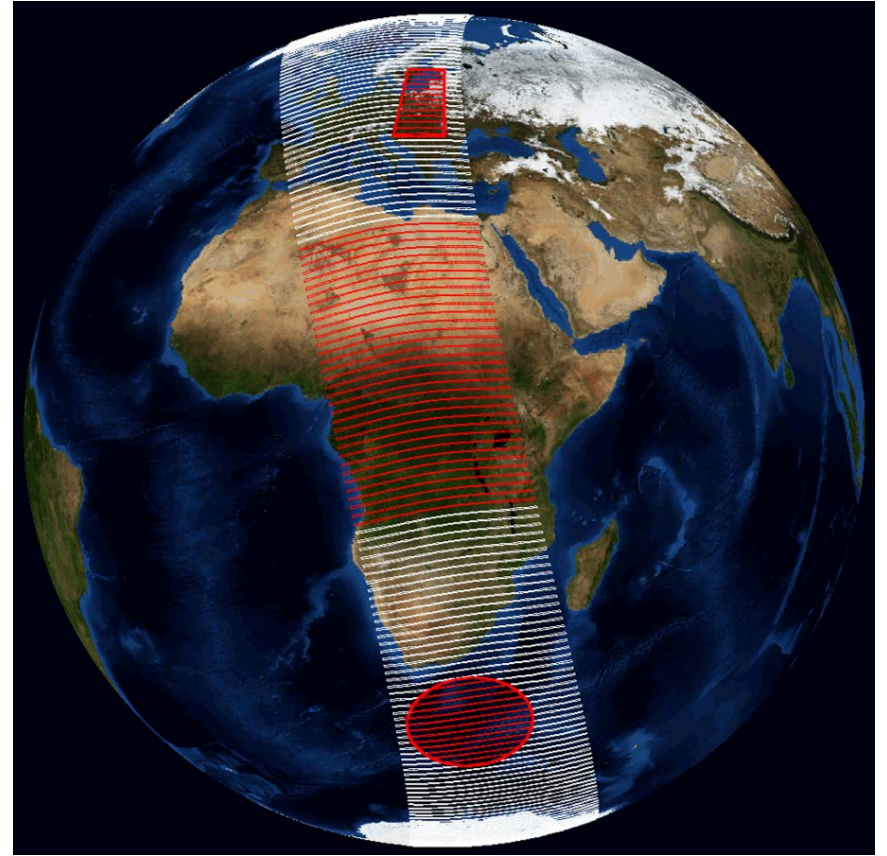
Level 2 Data Access Challenges

- Large File Sizes (>100MB)
- Files contain multiple swaths / instruments / orbits
- Determining required variables
- Data extraction within region of interest



GES DISC Level 2 Subsetting Service

- Allows users to select desired variables, spatial domains, time slices, and dimensions
- Streamlines file layout and contents
- Eliminates need to download entire file
- Reduces file size
- Saves storage and bandwidth resources





Level 2 Subsetter Interface

EARTHDATA

Find a DAAC -

?

GES DISC

Atmospheric Composition, Water

Data Collecti

Refine By

Subject Sort ▾
☐ Atmospheric Chemistry (3)

Measurement Sort ▾
☐ Sulfur Dioxide (1)

Source Sort ▾
☐ Aura OMI (3)

Processing Level Sort ▾
☐ 2 (2)
☐ 3 (1)

Project Sort ▾
☐ ATDD (1)
☐ Aura (2)

Get OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 data

Estimated size of results
5,543 days, 80,928 links, 2.9 TB

Refine Search ?

Refine Date Range:

2004-10-01 00:00:00 to 2019-12-04 23:59:59

Reset

Subset Options ?

Spatial Subset:

-180, -90, 180, 90

Reset

Variables:

Get all variables

Reset

Dimensions:

Get all dimensions

Reset

Time of Day:

None

Reset

Data Presentation:

CROP

Reset

Output format ?

File Format:

HDF-EOS5

Reset

Reset All

Get Data

Feedback

Help ▾

Login

Twitter

YouTube

Facebook

LinkedIn

Begin Date ▾

End Date ▾

2004-10-01

2019-12-04

2004-10-01

2019-12-04

OMI/Aura Formaldehyde

Aura OMI

003

1 day

0.1 ° x 0.1 °

3

2004-10-01

2019-12-05



File Search

▼ **Refine Date Range:** 2004-10-01 00:00:00 to 2019-12-05 23:59:59

From:

2004-10-01 00:00:00

To:

2019-12-05 23:59:59

Available Range: 2004-10-01 00:00:00 to 2019-12-05 23:59:59

< October 2004 >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	29	30	01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	01	02	03	04	05	06

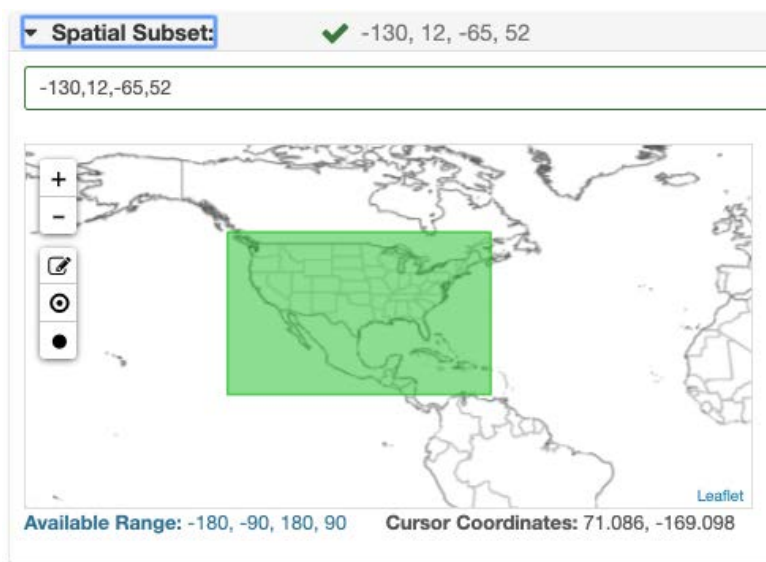
< December 2019 >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	01	02	03	04
05	06	07	08	09	10	11

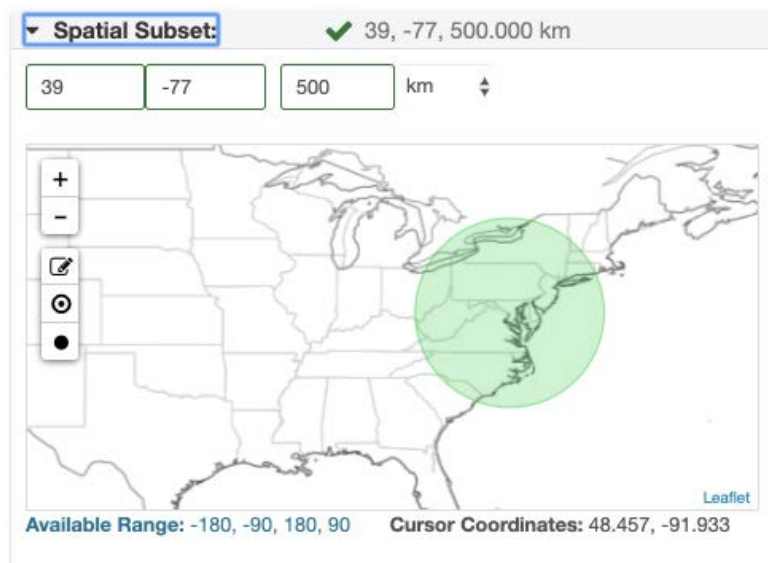
- Select any temporal range over the mission duration
- Subset links are generated for each granule containing data within the subset parameters

Spatial Subsetting

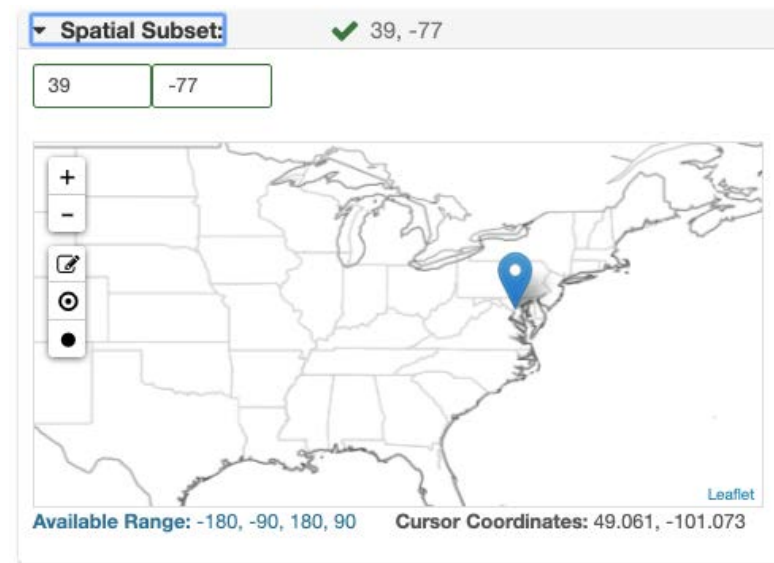
Lat/Lon Box



Radial



Point





Temporal Subsetting

Date ranges may be narrowed down by:

▼ **Refine Date Range:** 2019-08-06 00:00:00 to 2019-11-30 23:59:59 Reset

From: **To:**

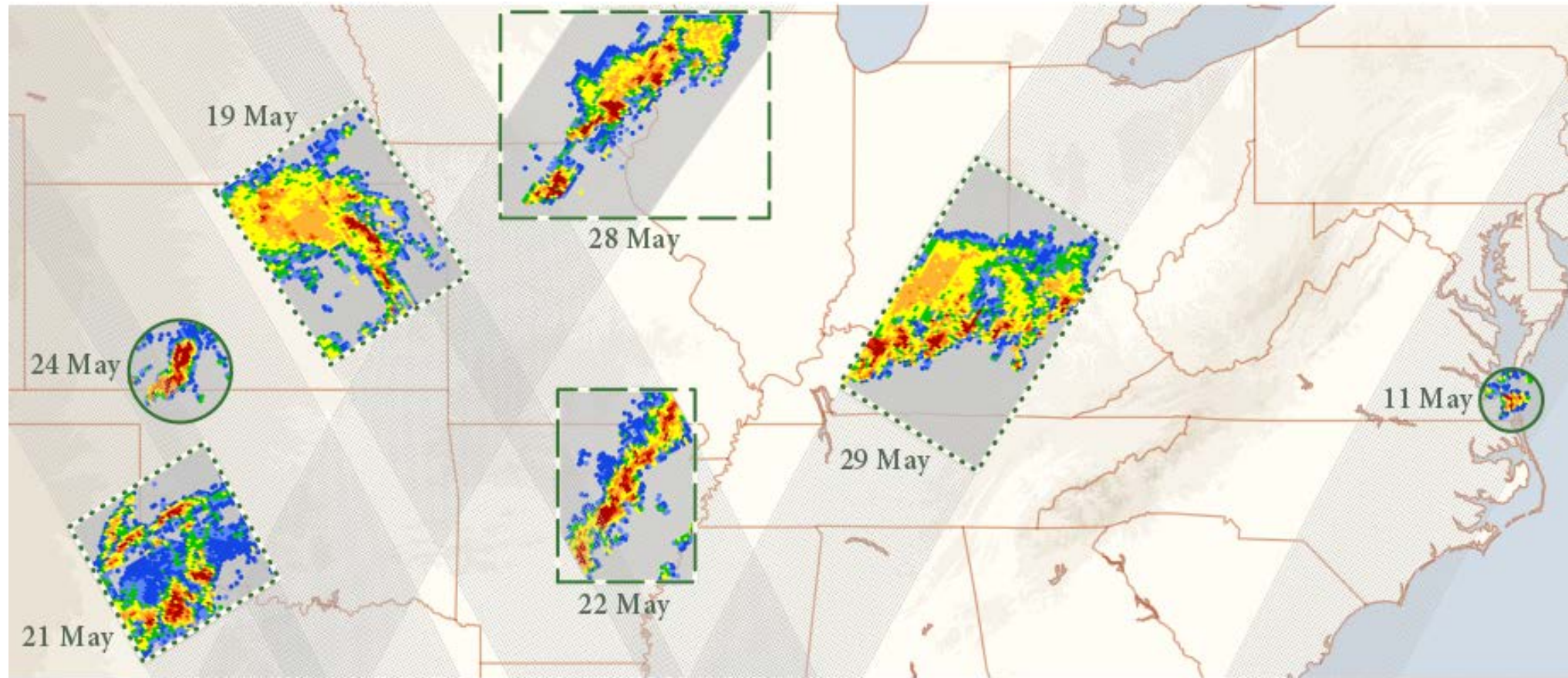
Diurnal (Time of Day) subsets are also supported:

▼ **Time of Day:** ✓ 16:00:00 to 18:30:00 Reset

☉ **From:** ☉ **To:**

18 : **30** : **00**

Radial, Box, & Temporal Subsetting



GPM Dual-Frequency Precipitation Radar (DPR) observations during tornado outbreaks in May 2019.



Variable Selection

- Any number of variables
- Select groups
- Display variable name and description
- File structure view
- Required variables automatically selected and included by the service
 - Geospatial
 - Temporal
 - Etc.

▼ Variables: Get all variables Reset

NOTE: By default, **ALL** variables are sent in the subset request.

Collapse Tree

- ☐ HDFEOS
 - ☐ SWATHS
 - ☐ OMI Total Column Amount SO2
 - ☒ Data Fields
 - ☒ Geolocation Fields
 - ☐ GroundPixelQualityFlags (Ground Pixel Quality Flags)
 - ☐ RelativeAzimuthAngle (Relative Azimuth Angle (sun + 180 - view))
 - ☐ SecondsInDay (Seconds after UTC midnight)
 - ☐ SolarAzimuthAngle (Solar Azimuth Angle)
 - ☐ SolarZenithAngle (Solar Zenith Angle)
 - ☐ SpacecraftAltitude (Spacecraft Altitude)
 - ☐ SpacecraftLatitude (Spacecraft Latitude)
 - ☐ SpacecraftLongitude (Spacecraft Longitude)
 - ☐ TerrainHeight (Terrain Height)
 - ☐ ViewingAzimuthAngle (Viewing Azimuth Angle)
 - ☐ ViewingZenithAngle (Viewing Zenith Angle)



- ▼ Dimensions:

Get all dimensions

Reset

NOTE: By default, **ALL** dimensions are sent in the subset request.

Collapse Tree

HDFEOS

SWATHS

OMI Total Column Amount SO2

nLayers

nWavel

1 (308.7nm)

2 (310.8nm)

3 (311.85nm)

4 (312.61nm)

5 (313.2nm)

6 (314.4nm)

7 (317.62nm)

8 (322.42nm)

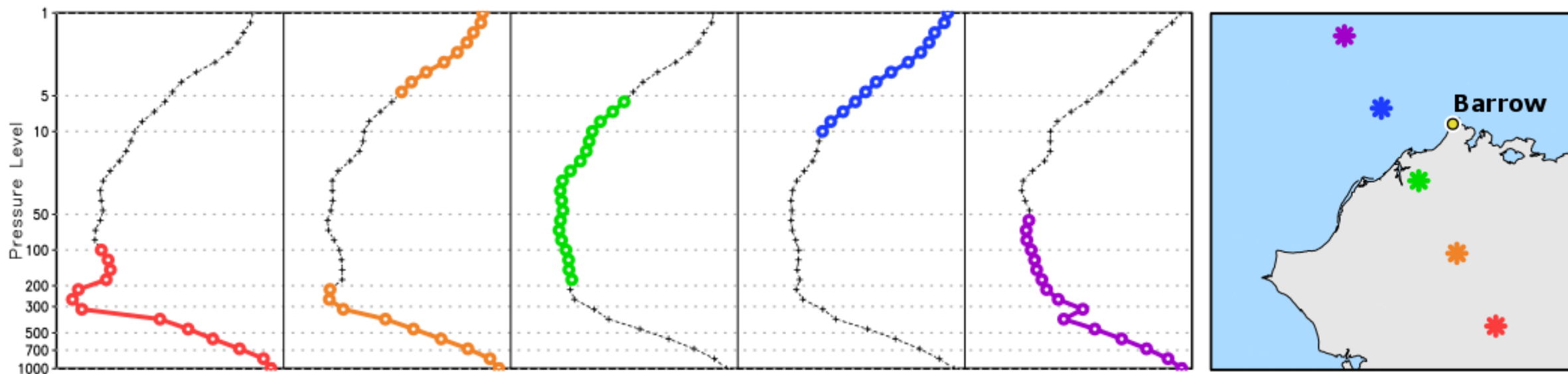
9 (331.34nm)

10 (345.4nm)

11 (360.15nm)

12 (372.8nm)

Dimensional Subsetting



Pressure Level subsets of Temperature observations from five MLS soundings



Refactoring the Data Presentation

Three different ways
to get subset results:

▼ Data Presentation:

CROP

☐ VECTOR: Spatial dimensions will be reduced to a single data stream dimension.

☒ CROP: Spatial dimensions will be trimmed to data. (Default)

☐ FULL: Spatial dimensions will remain at original lengths.

Crop (Default)

- File is trimmed to region of interest

Full

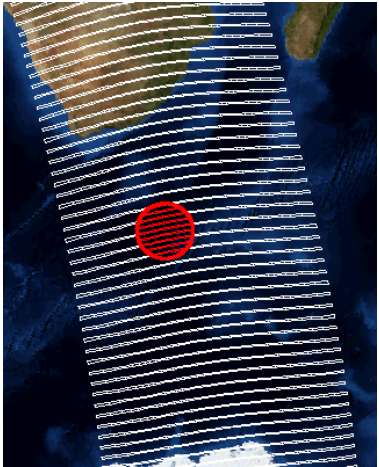
- File is not trimmed and data outside subset region are set to “missing”

Vector

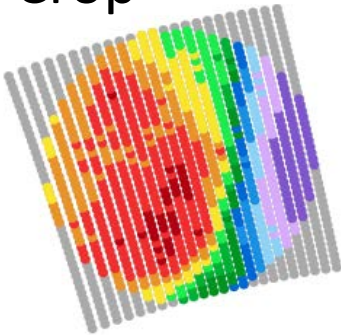
- Most Compact: Spatial dimensions collapsed into time-ordered 1D array

Refactoring a Radial Subset Result

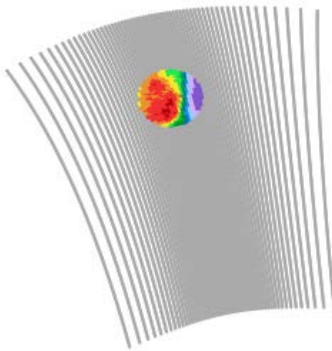
Radial Subset



Crop

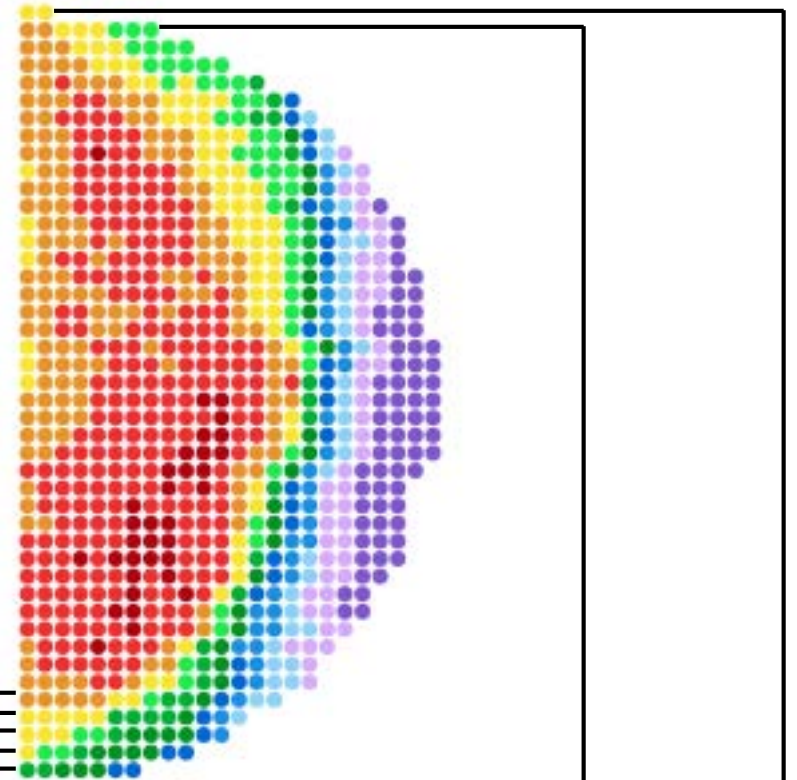


Full



Vector

Missing values trimmed



Data rows repositioned
into 1-dimensional array





Upcoming Features

Output conversion of all products to netCDF4

- For all supported missions
- With CF-compliant metadata

▼ File Format:

HDF-EOS5

Reset

☒ HDF-EOS5 (Default)

☐ netCDF

Addition of UTC time to all output products

- Users will not have to deal with complicated native time types



Supported Missions

- **OMI** (Aura Ozone Monitoring Instrument) – Original, Zoom, and L2G
- **MLS** (EOS Aura Microwave Limb Sounder)
- **OCO-2** (Orbiting Carbon Observatory) – Lite
- **ACOS** (Atmospheric CO₂ Observations from Space) – Lite
- **GPM** (Global Precipitation Measurement)
- **Sentinel-5P TROPOMI** (TROPOspheric Monitoring Instrument) – Original and HiRes
- (Coming Soon) **AIRS** (Atmospheric Infrared Sounder)
- (Coming Soon) **OCO-3** (Orbiting Carbon Observatory)

Application Program Interface

- No , , , , etc.
- Script-based access to Search and Subset services
- Works in Windows, Mac, and UNIX environments
- Supports asynchronous requests
- Documentation and code samples in “How-To” articles



Thank You

Contact:

paul.huwe@nasa.gov

<https://disc.gsfc.nasa.gov>