Giovanni-4:

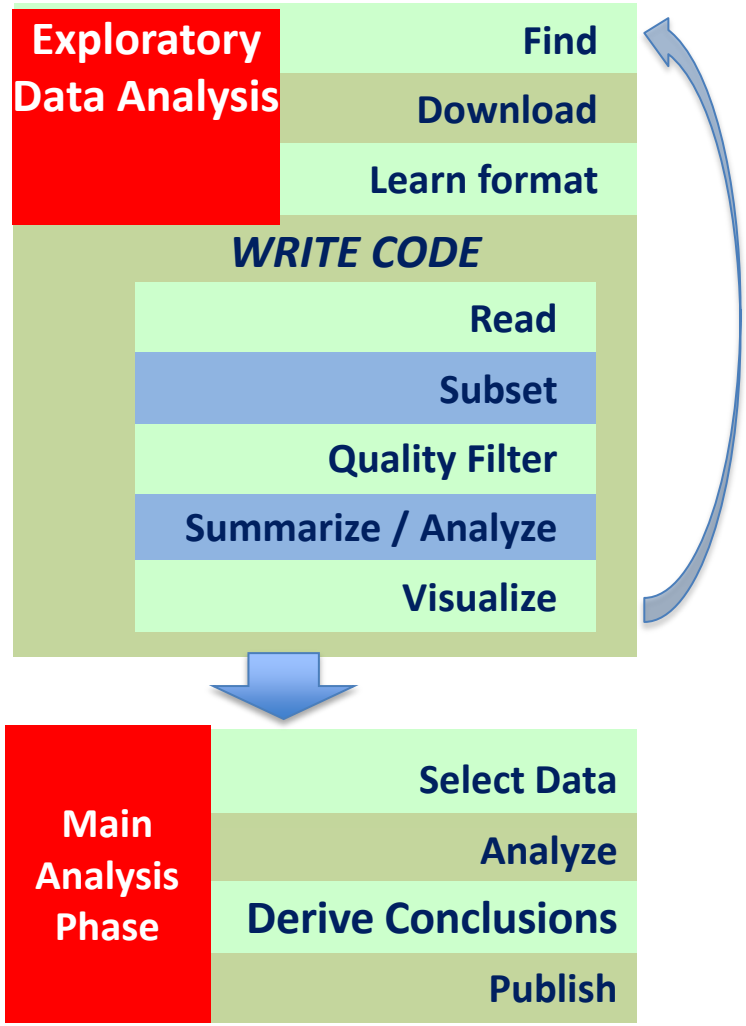
The Next Generation

C Lynnes, M Hegde, C Smit, D DaSilva, K Bryant, P. Zhao, Z. Liu, S. Shen, A. Savtchenko, W. Teng, J. Wei, J. Acker

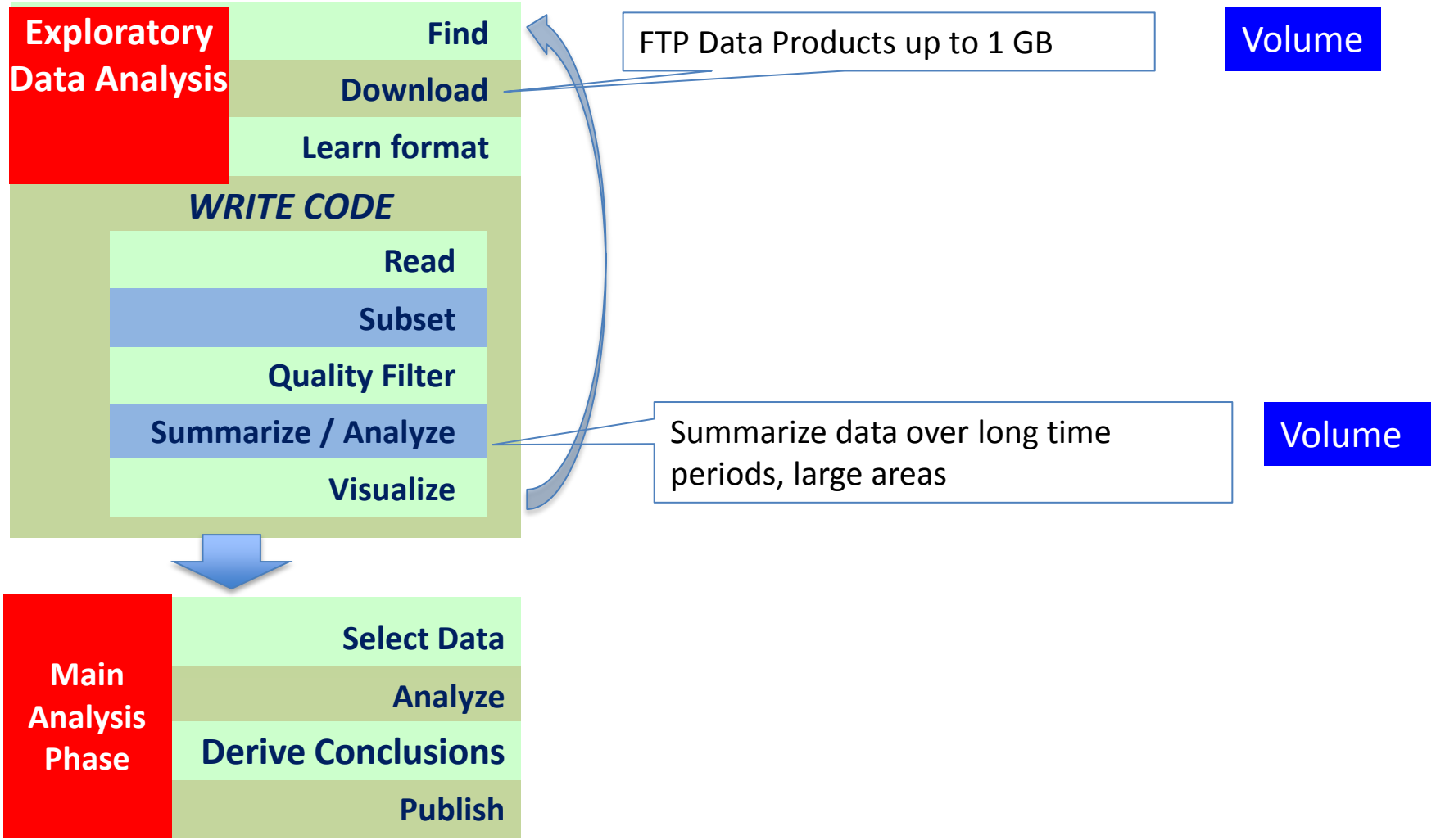
Outline

- Overview of Giovanni
- New and Notable Features
- Discussion?

Giovanni and “Big Data”



Why So Difficult?



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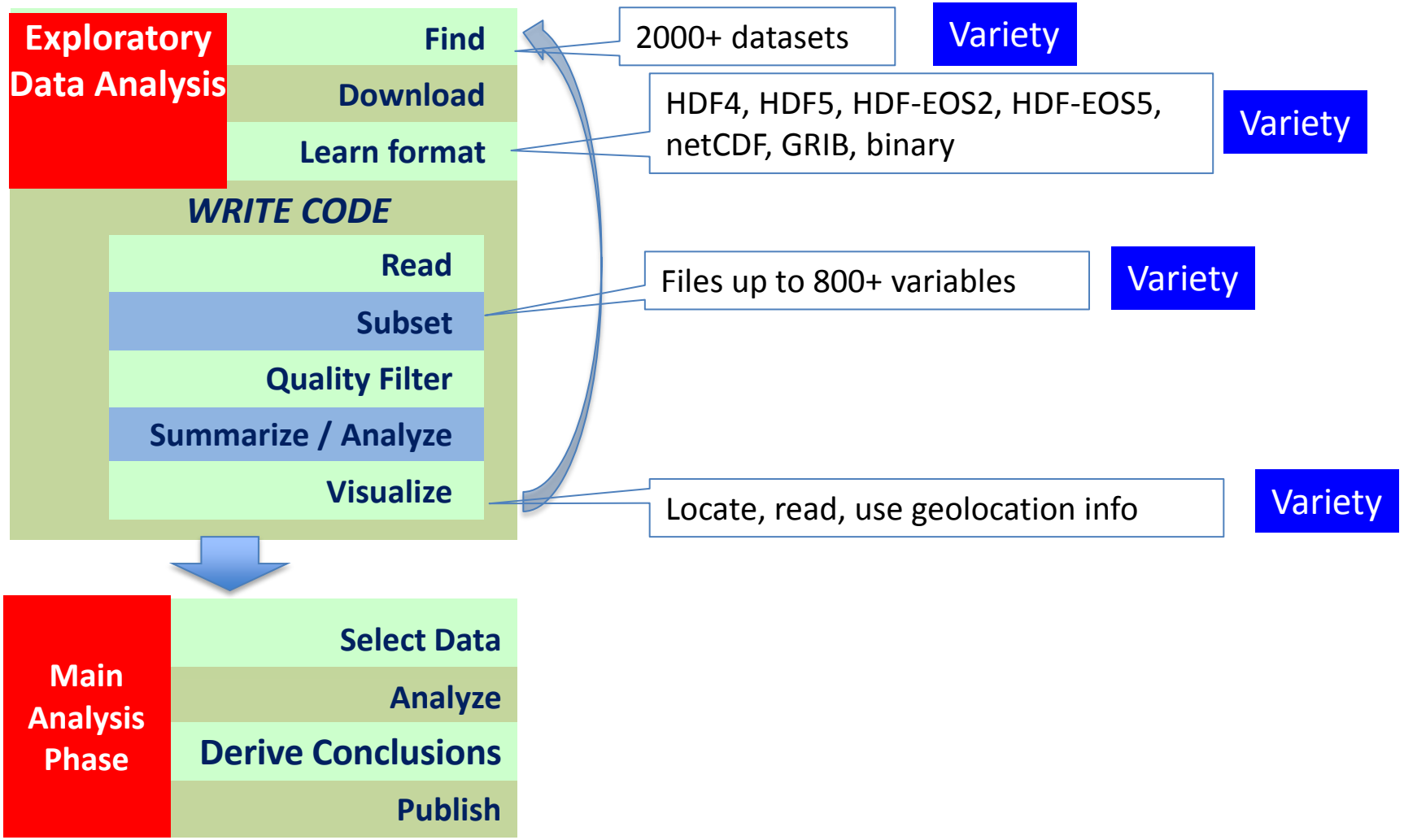
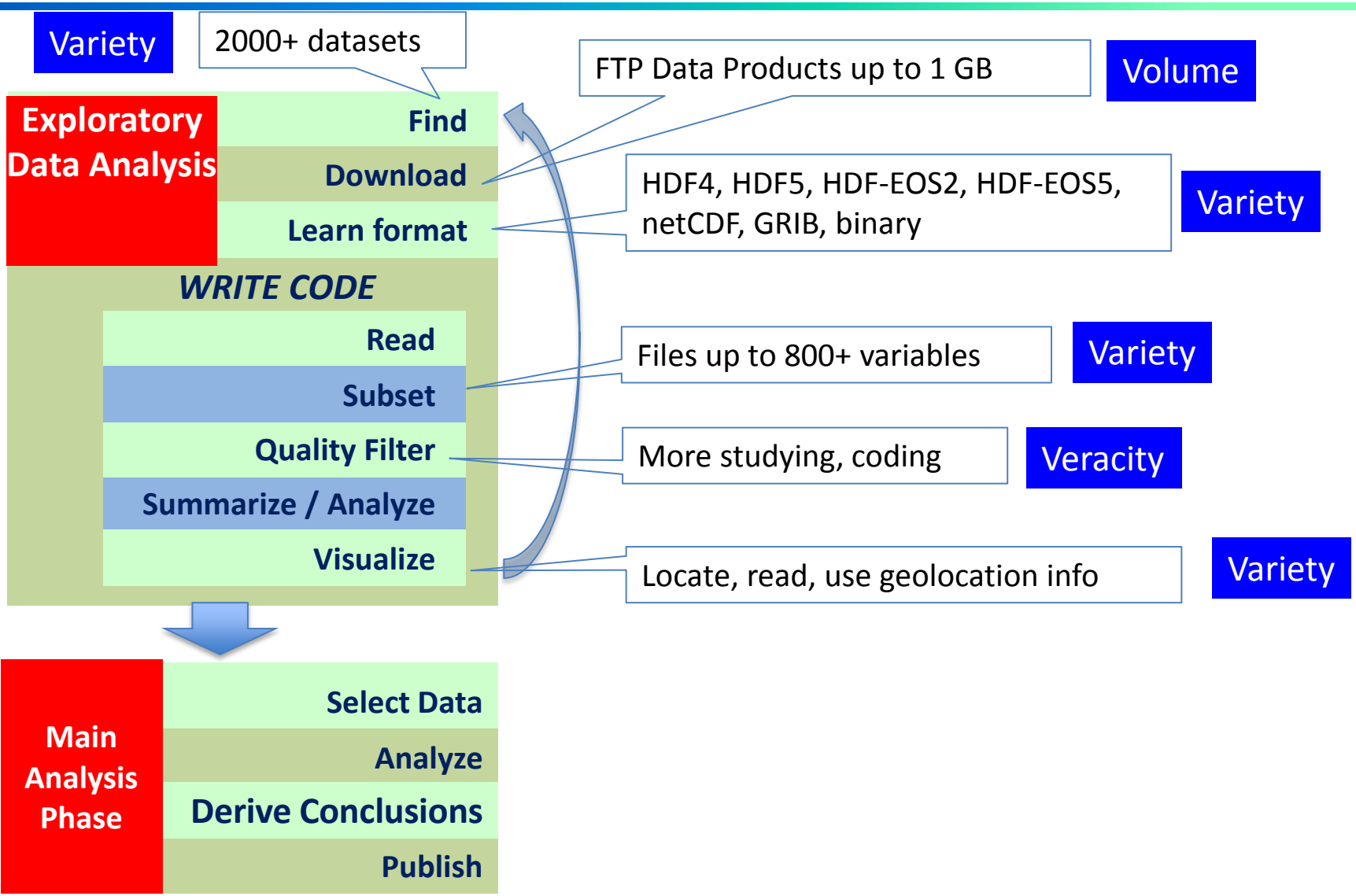


Remote Sensing Science: Why So Difficult?



Giovanni provides (relatively) rapid exploration of datasets

Exploratory Data Analysis

- Find
- Download
- Learn format

WRITE CODE

- Read
- Subset
- Quality Filter
- Summarize / Analyze
- Visualize

Main Analysis Phase

- Select Data
- Analyze
- Derive Conclusions
- Publish

Giovanni provides *Server-Side, Quick-Start Exploratory Data Analysis:*

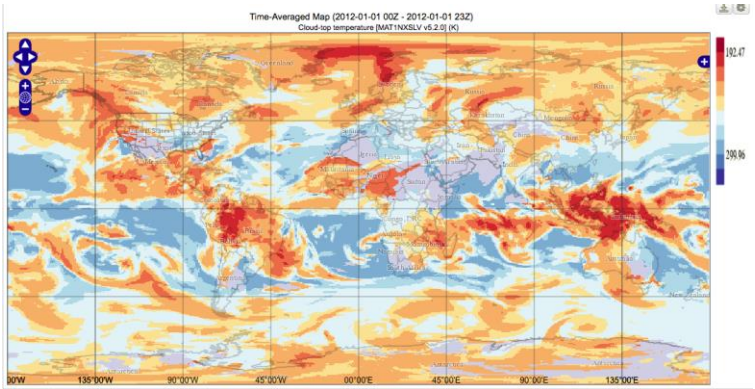
no coding necessary

no downloads necessary

Web-based Services

Giovanni

- Find
- Fetch
- Reformat
- Filter
- Regrid
- Summarize
- Visualize



What's New?

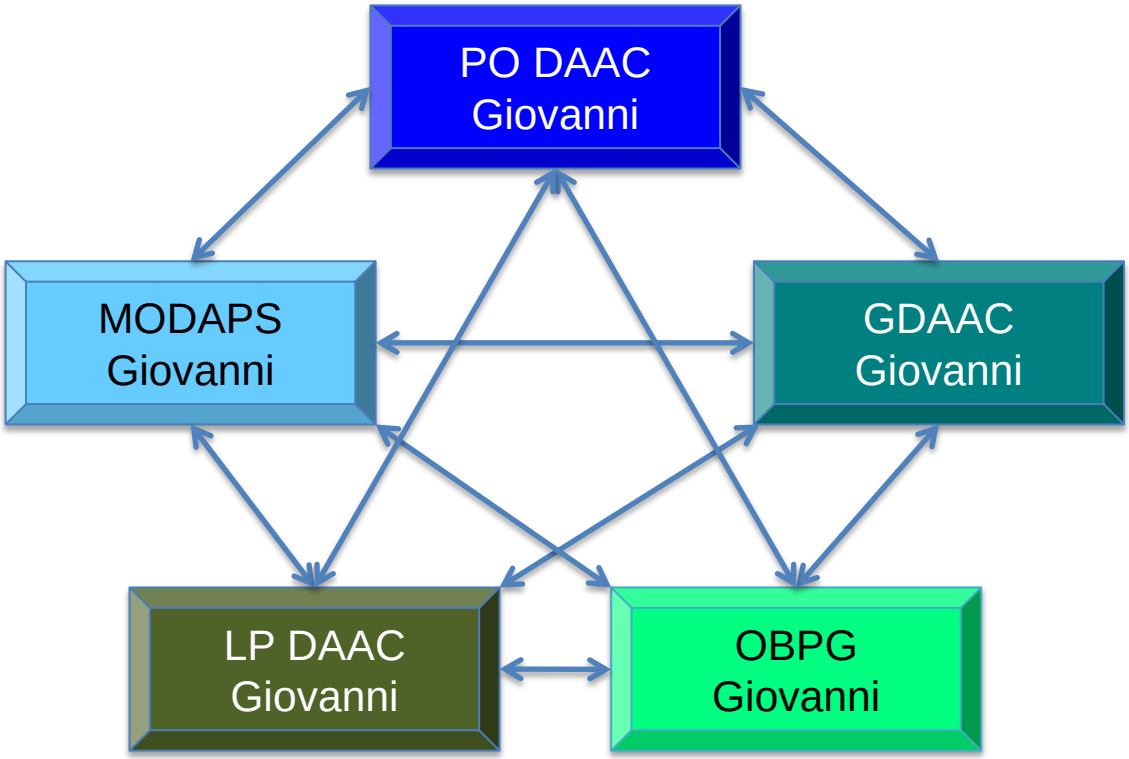
- Giovanni-4, relative to Giovanni-3
  - Omnibus Giovanni Portal
  - Federated Giovanni
  - Variable selection interface
  - Sharable/reproducible URLs
- New in Giovanni-4
  - More comparison functions
  - Vector Plots
  - Seasonal Analysis
  - Shapefile-based Area Averages

Omnibus Portal

- All variables in one portal
  - Compare across instruments and disciplines
  - Caveat: Multi-temporal comparisons not yet supported
- However: Requires more navigational aids

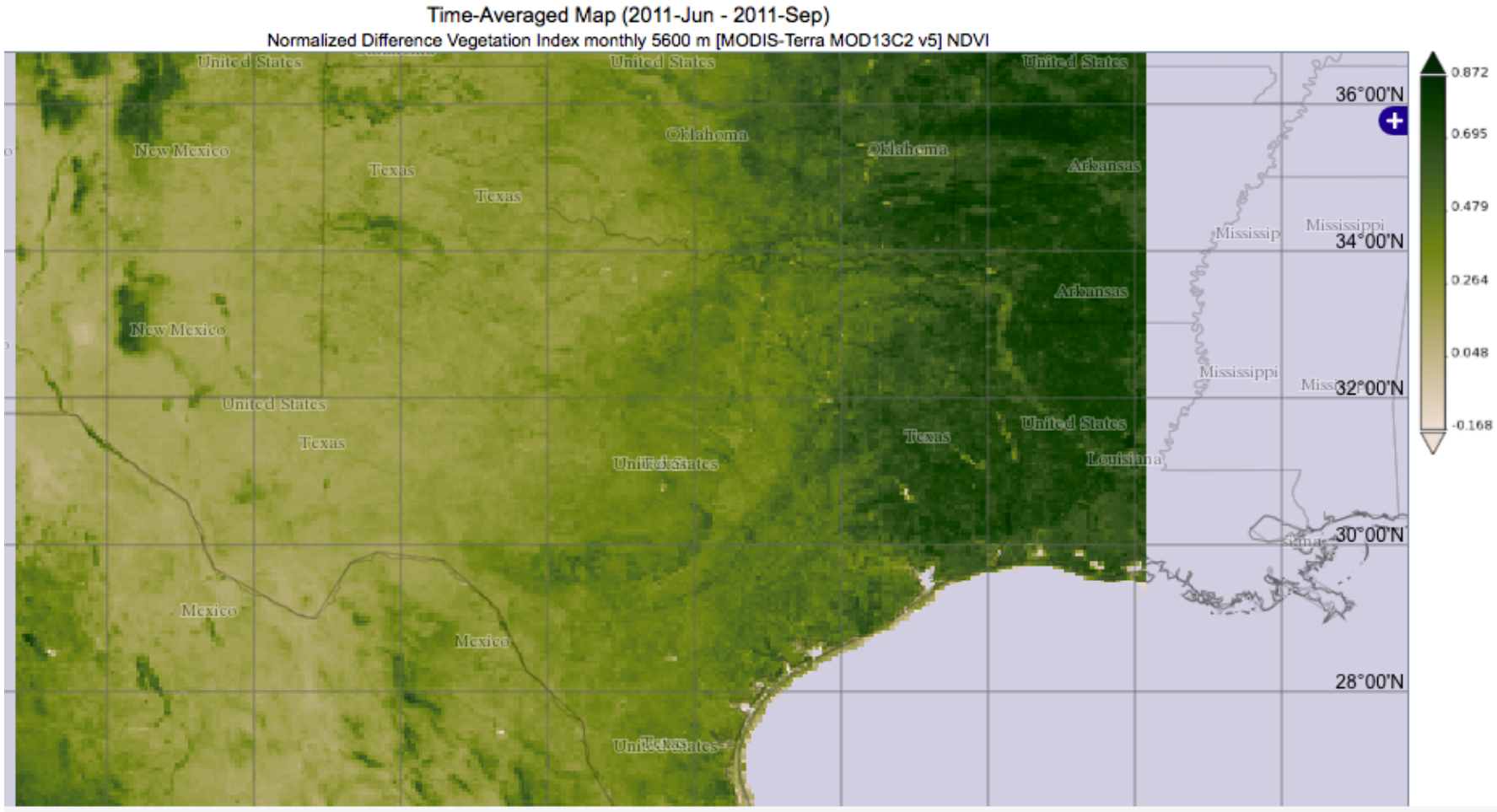
Federated Giovanni will further increase the availability of data in Giovanni

- Ongoing now: Funded by NASA-ACCESS: 2014-2016

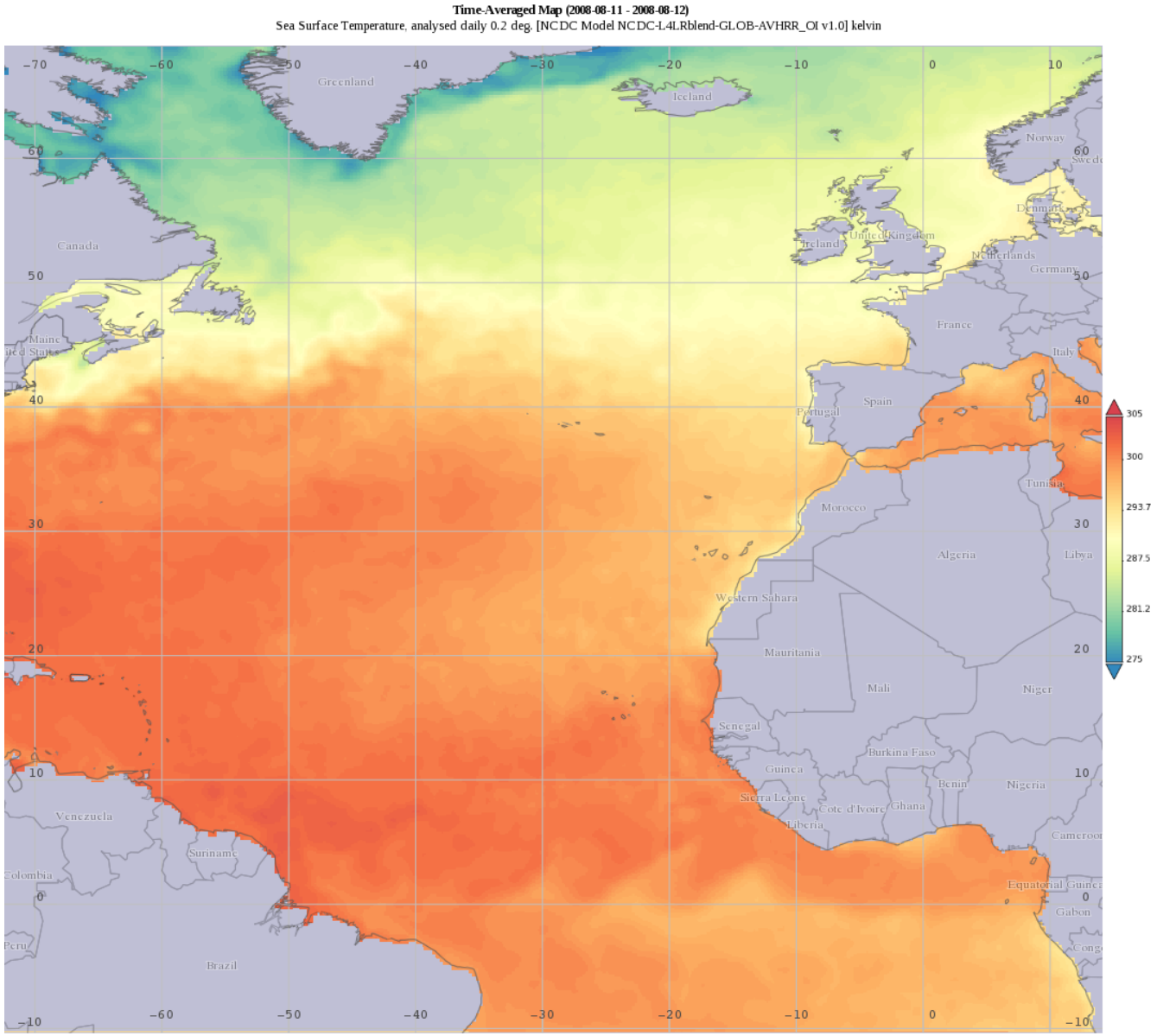


- Eventual release of source and Virtual Machine to the community

MODIS NDVI from LP DAAC

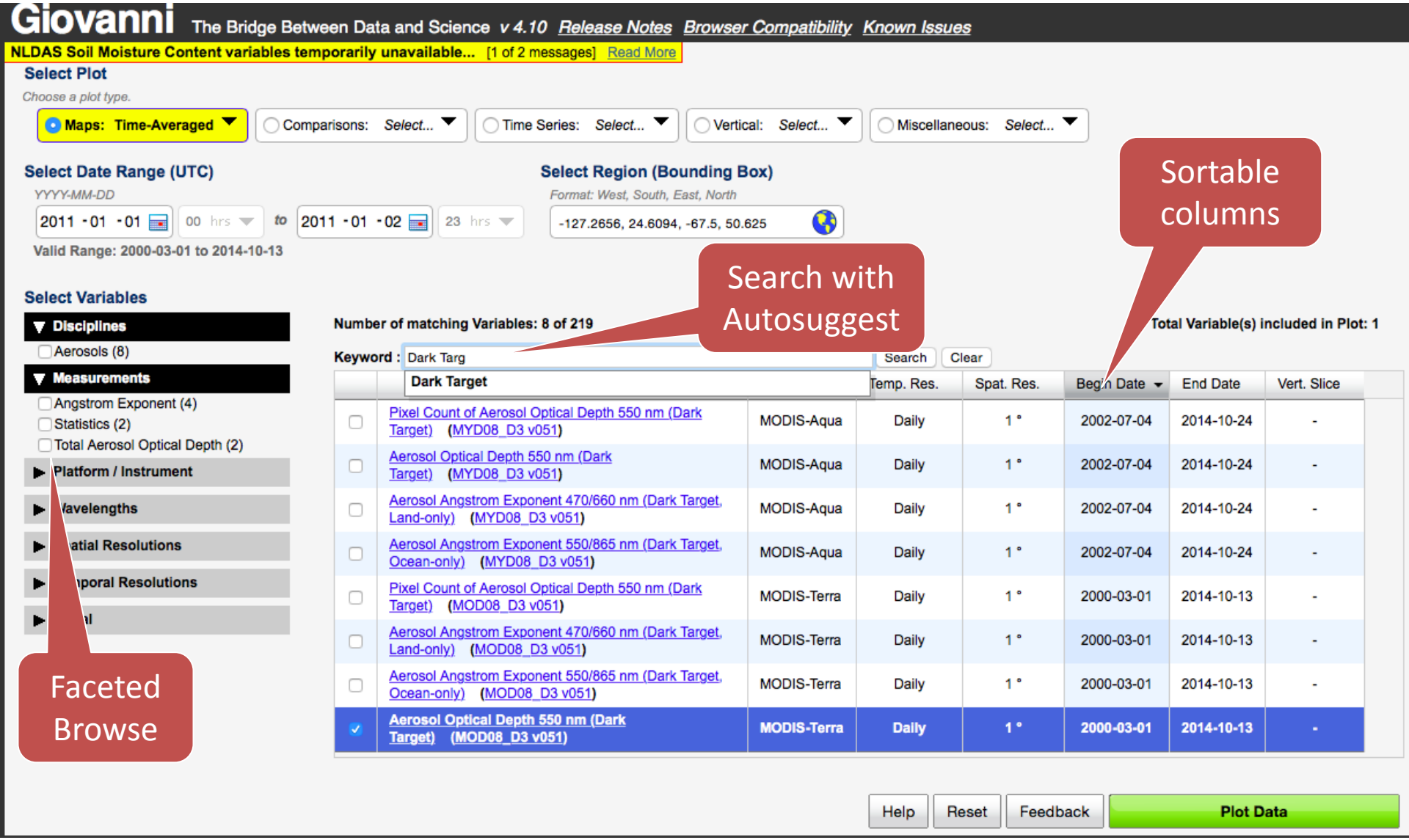


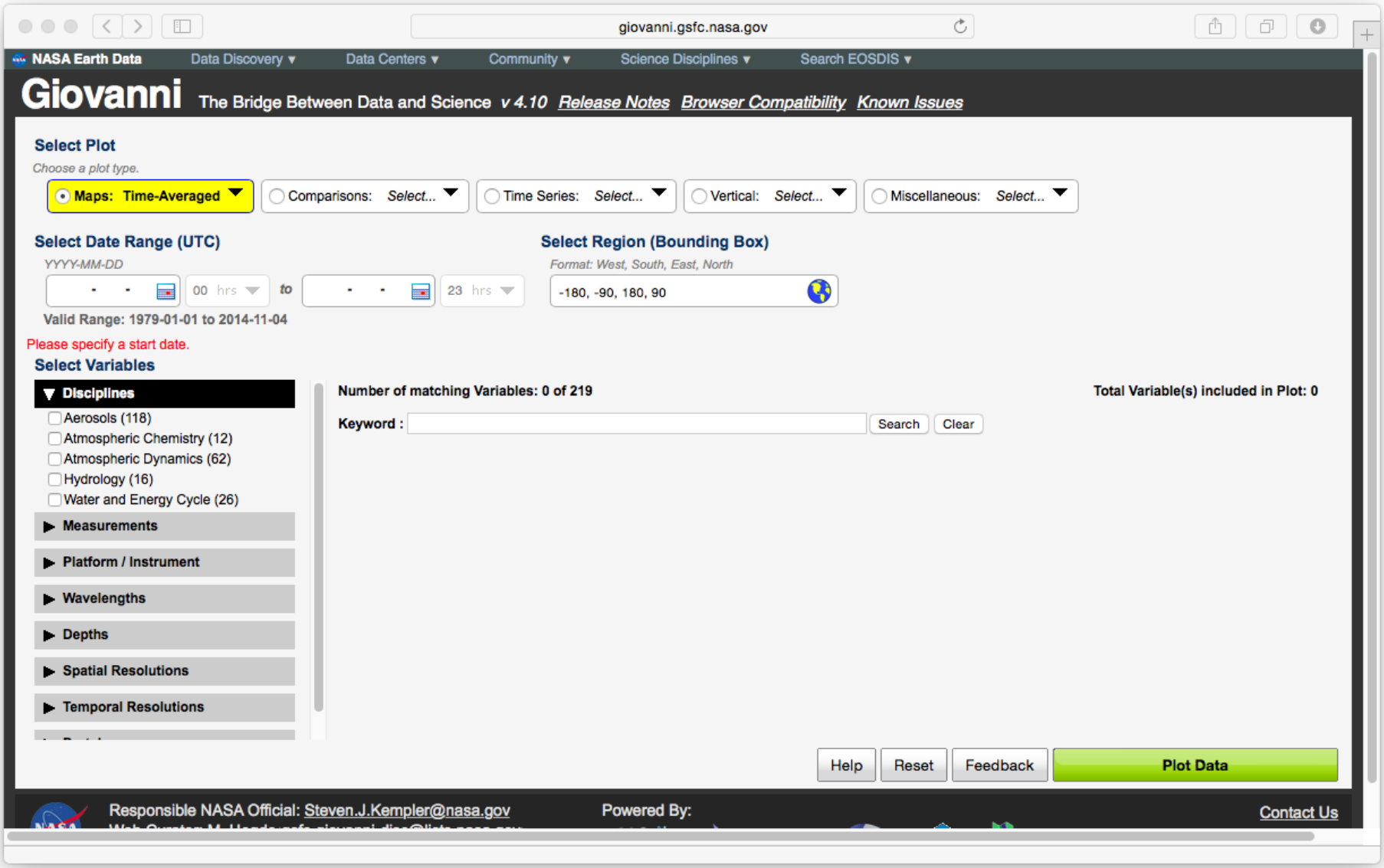
SST from PO.DAAC



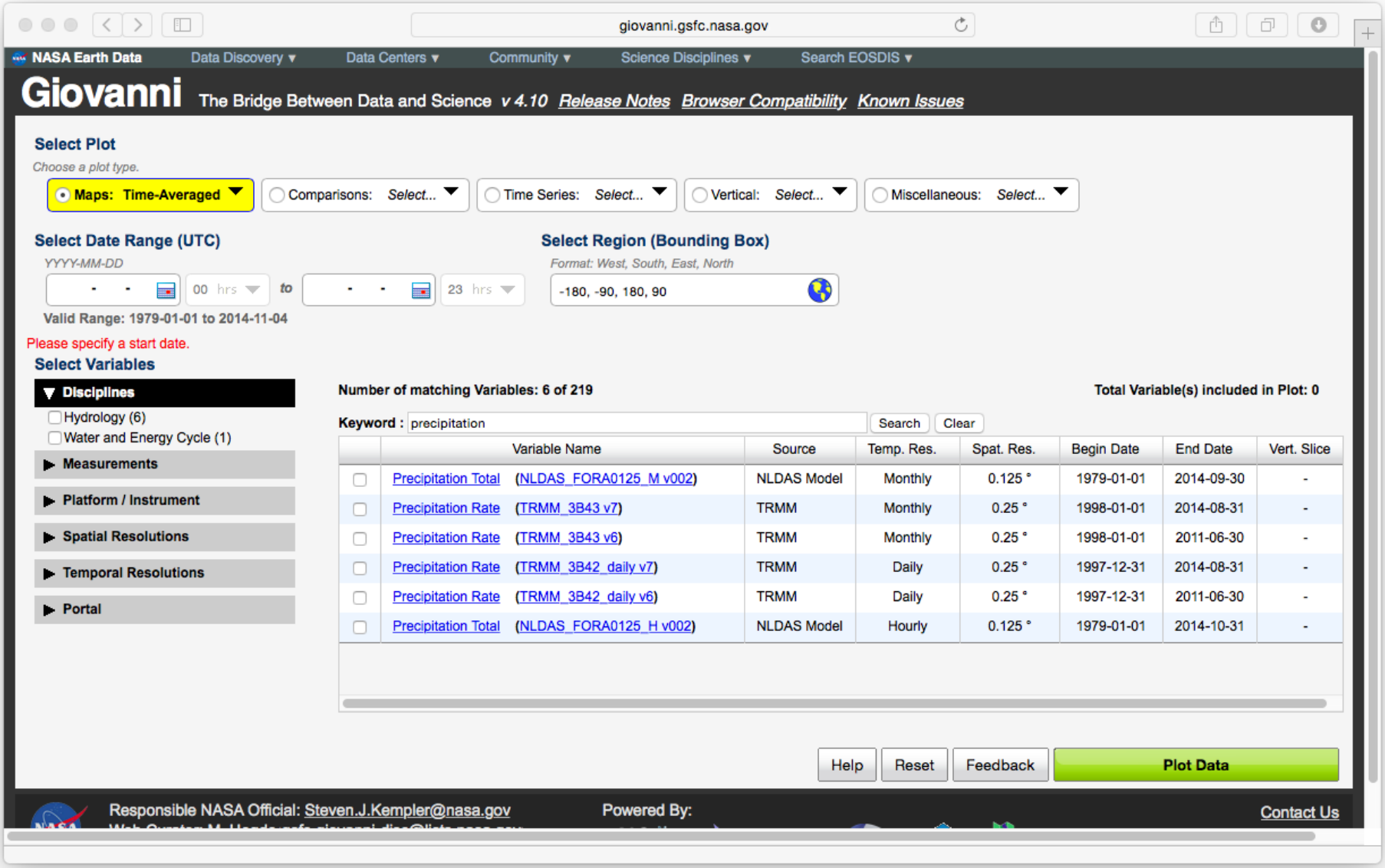
- Selected date range was 2008-08-12 - 2008-08-12. Title reflects the date range of the granules that went into making this result.

Giovanni-4 User Interface

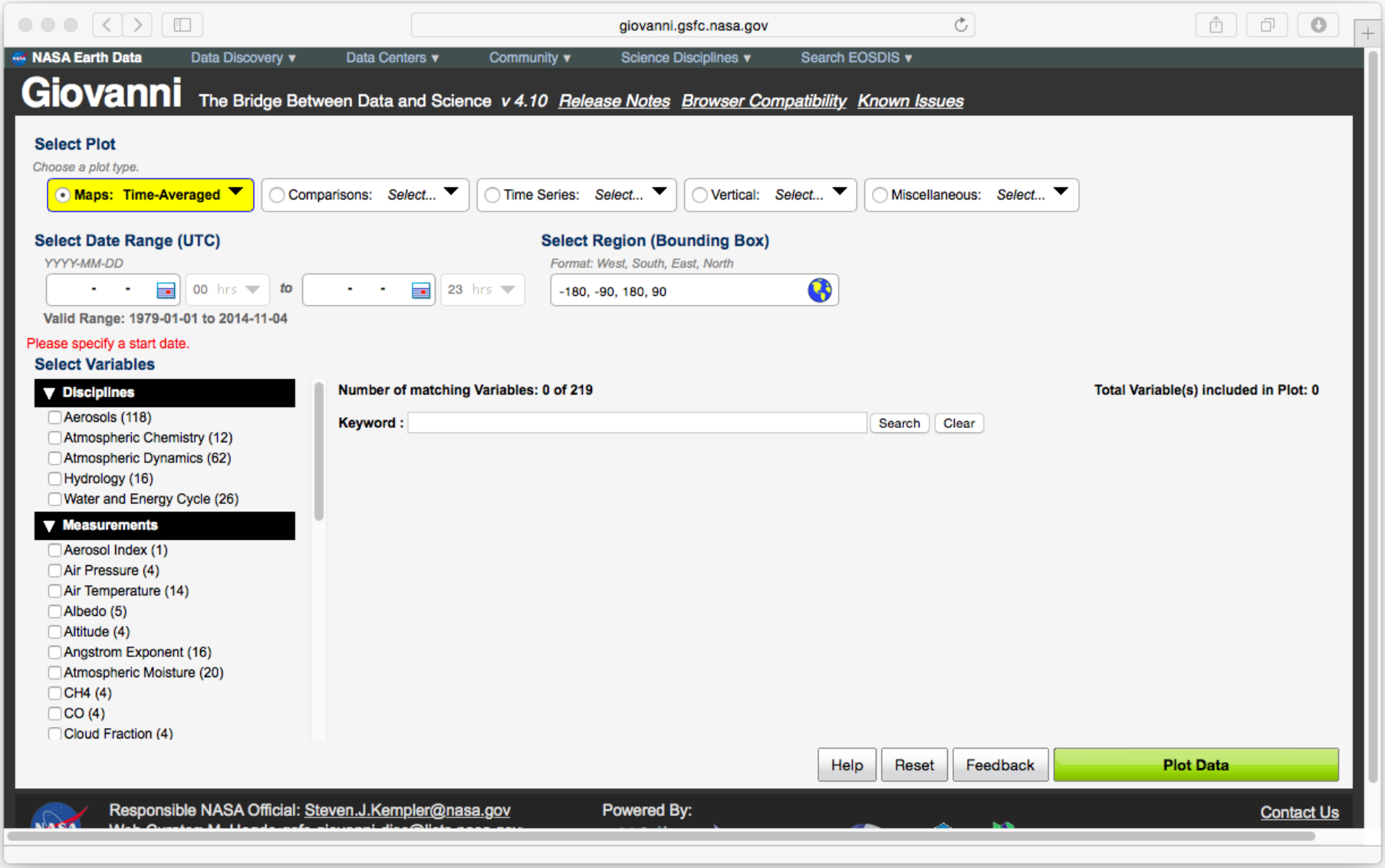



giovanni.gsfc.nasa.gov
NASA Earth Data
Data Discovery
Data Centers
Community
Science Disciplines
Search EOSDIS
Giovanni
The Bridge Between Data and Science v 4.10 Release Notes Browser Compatibility Known Issues
Select Plot
Choose a plot type.
Maps: Time-Averaged
Comparisons: Select...
Time Series: Select...
Vertical: Select...
Miscellaneous: Select...
Select Date Range (UTC)
YYYY-MM-DD
00 hrs
to
23 hrs
Valid Range: 1979-01-01 to 2014-11-04
Please specify a start date.
Select Region (Bounding Box)
Format: West, South, East, North
-180, -90, 180, 90
Select Variables
Disciplines
Aerosols (118)
Atmospheric Chemistry (12)
Atmospheric Dynamics (62)
Hydrology (16)
Water and Energy Cycle (26)
Measurements
Platform / Instrument
Wavelengths
Depths
Spatial Resolutions
Temporal Resolutions
Number of matching Variables: 0 of 219
Total Variable(s) included in Plot: 0
Keyword :
Search
Clear
Help
Reset
Feedback
Plot Data
Responsible NASA Official: Steven.J.Kempler@nasa.gov
Powered By:
Contact Us

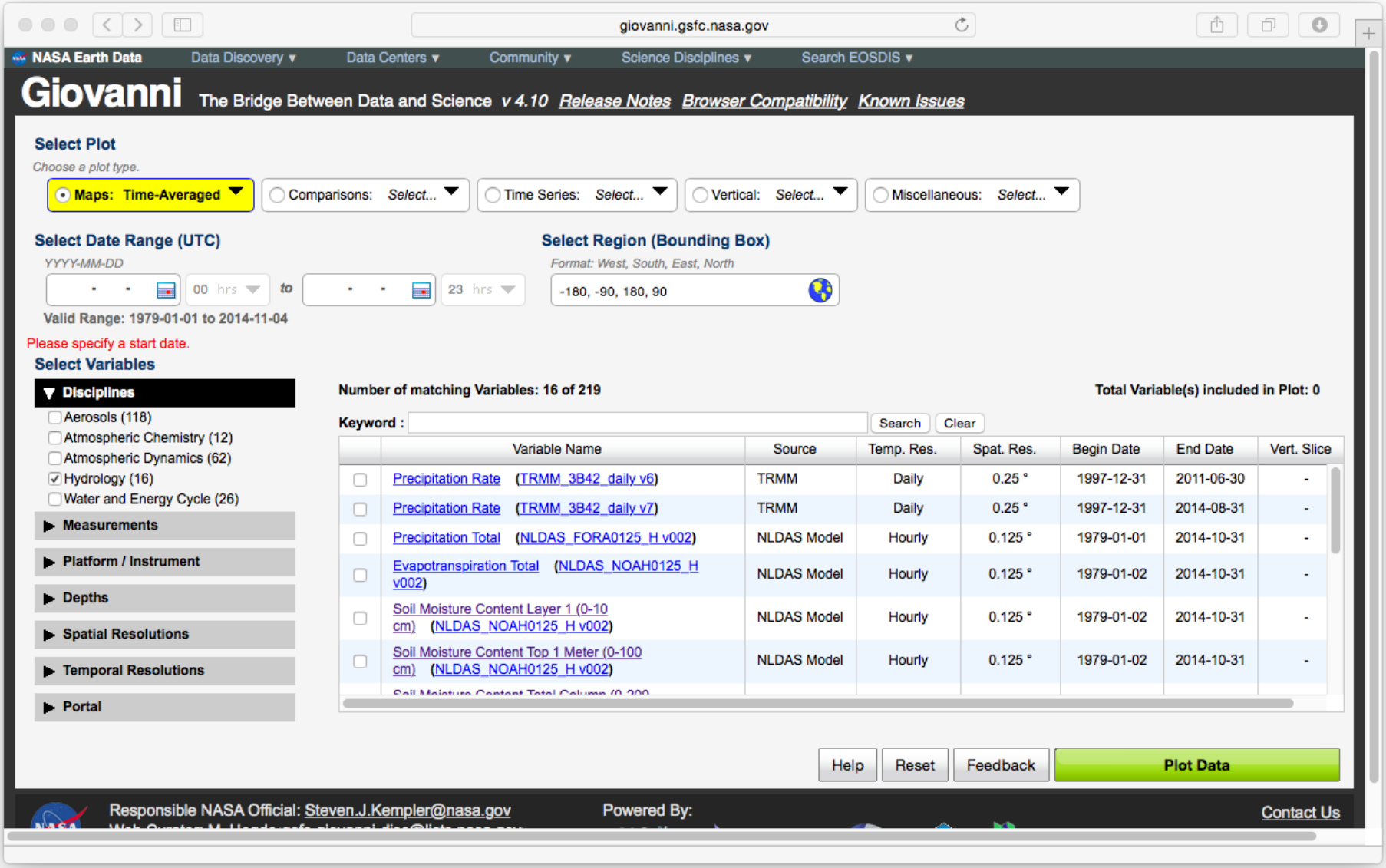
Keyword search on precipitation



Reset with button or by clearing search



Selecting a Discipline “Facet”



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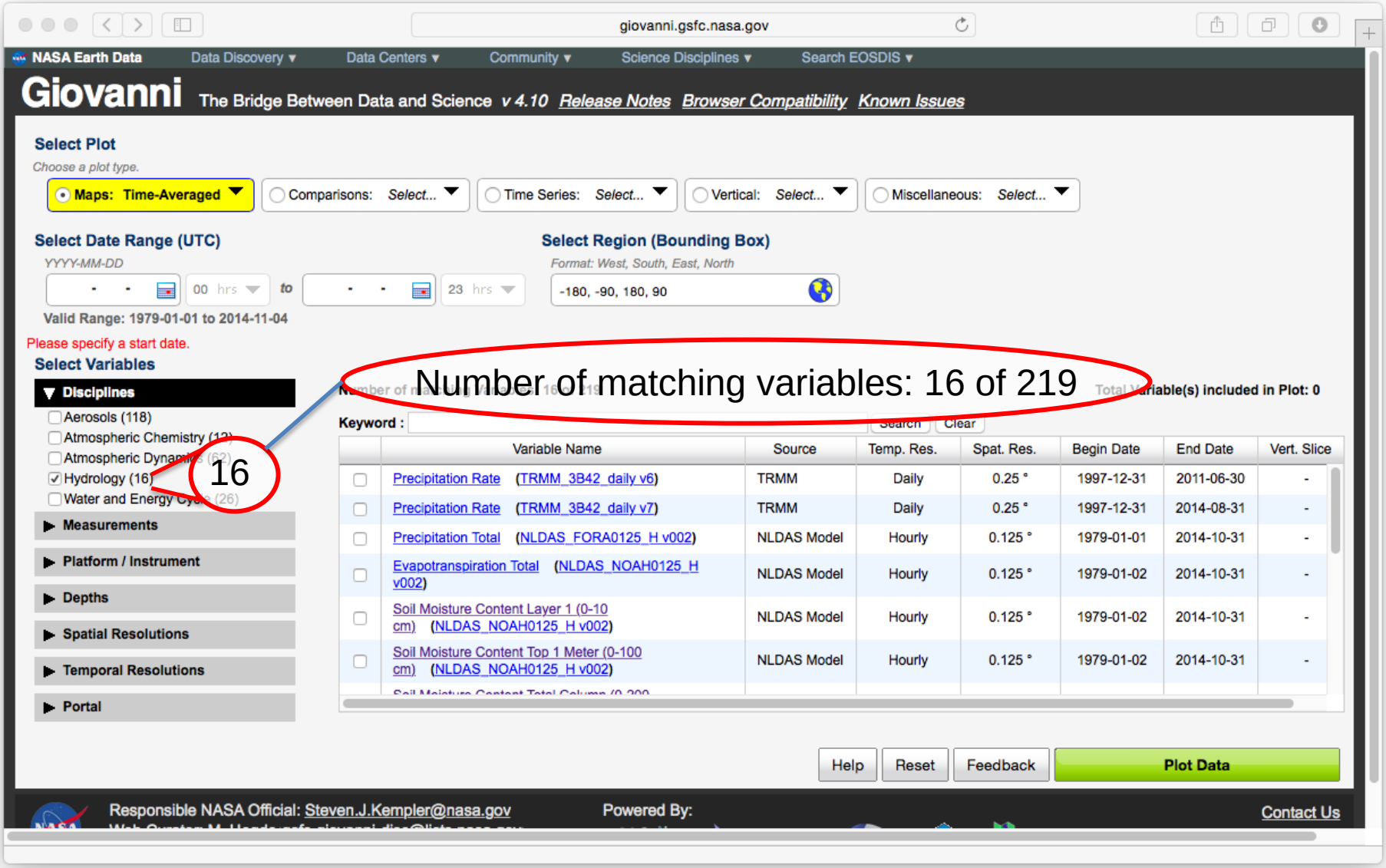
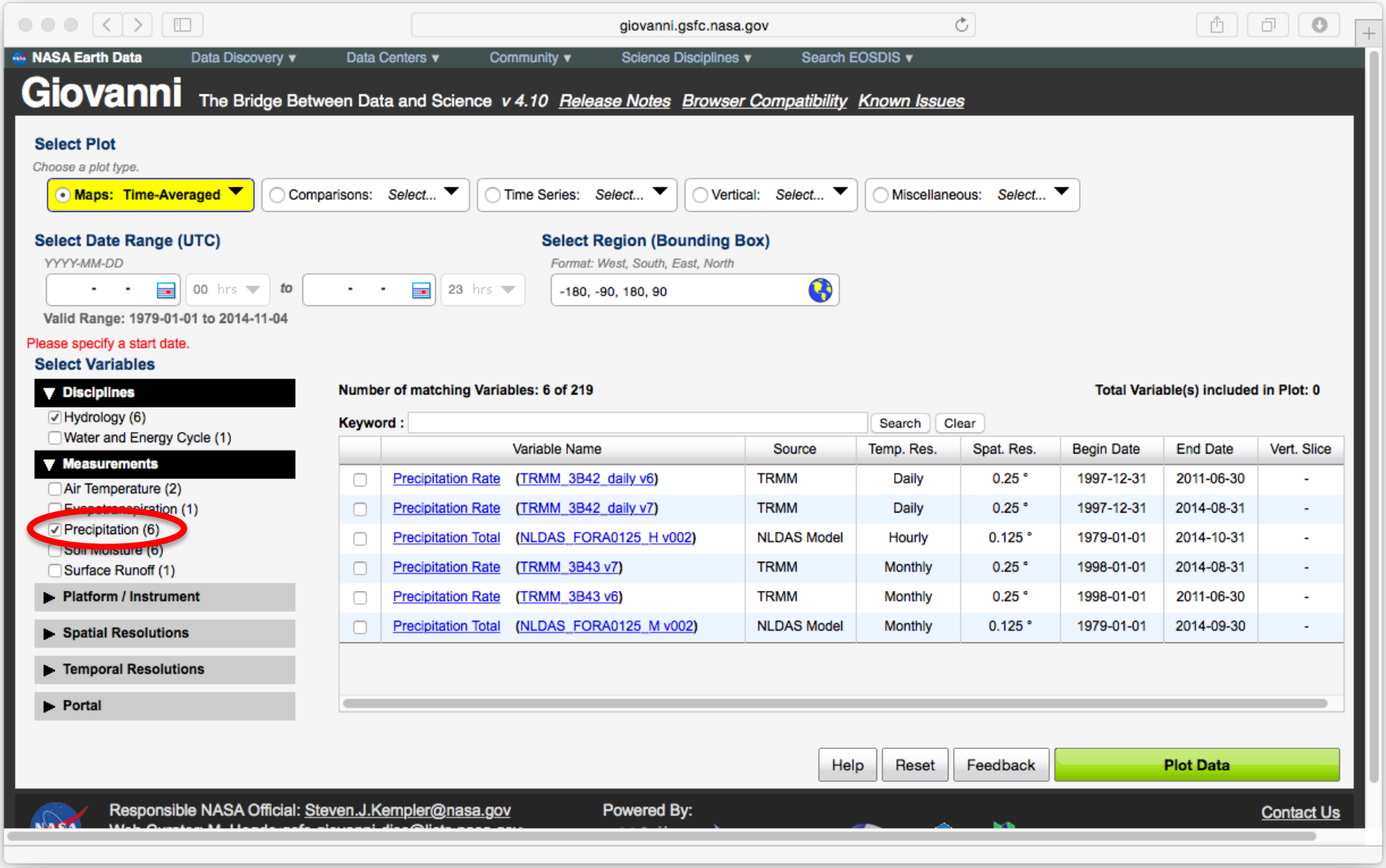
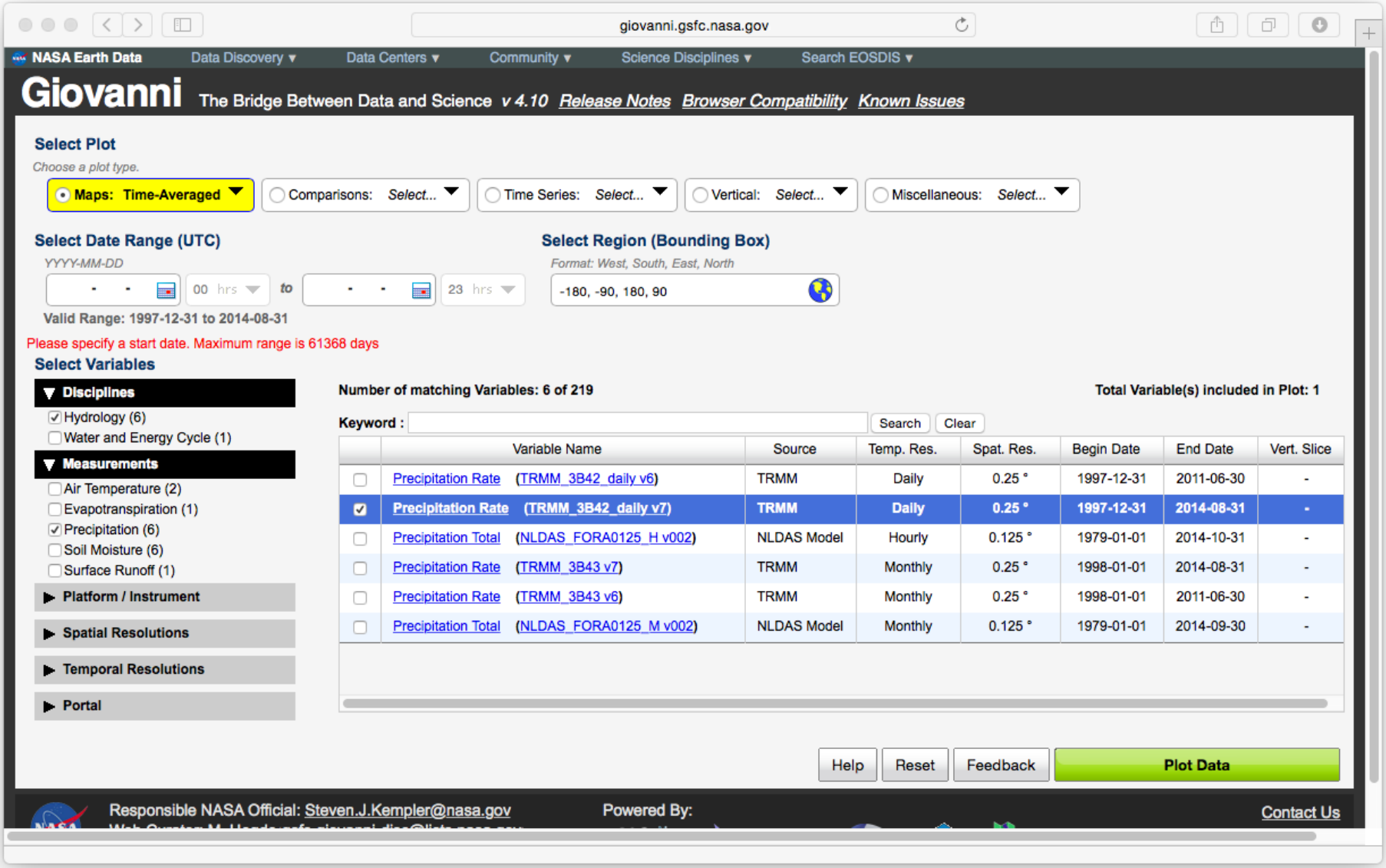


Narrow by selecting more facets



Selecting variables leads to hints on date range



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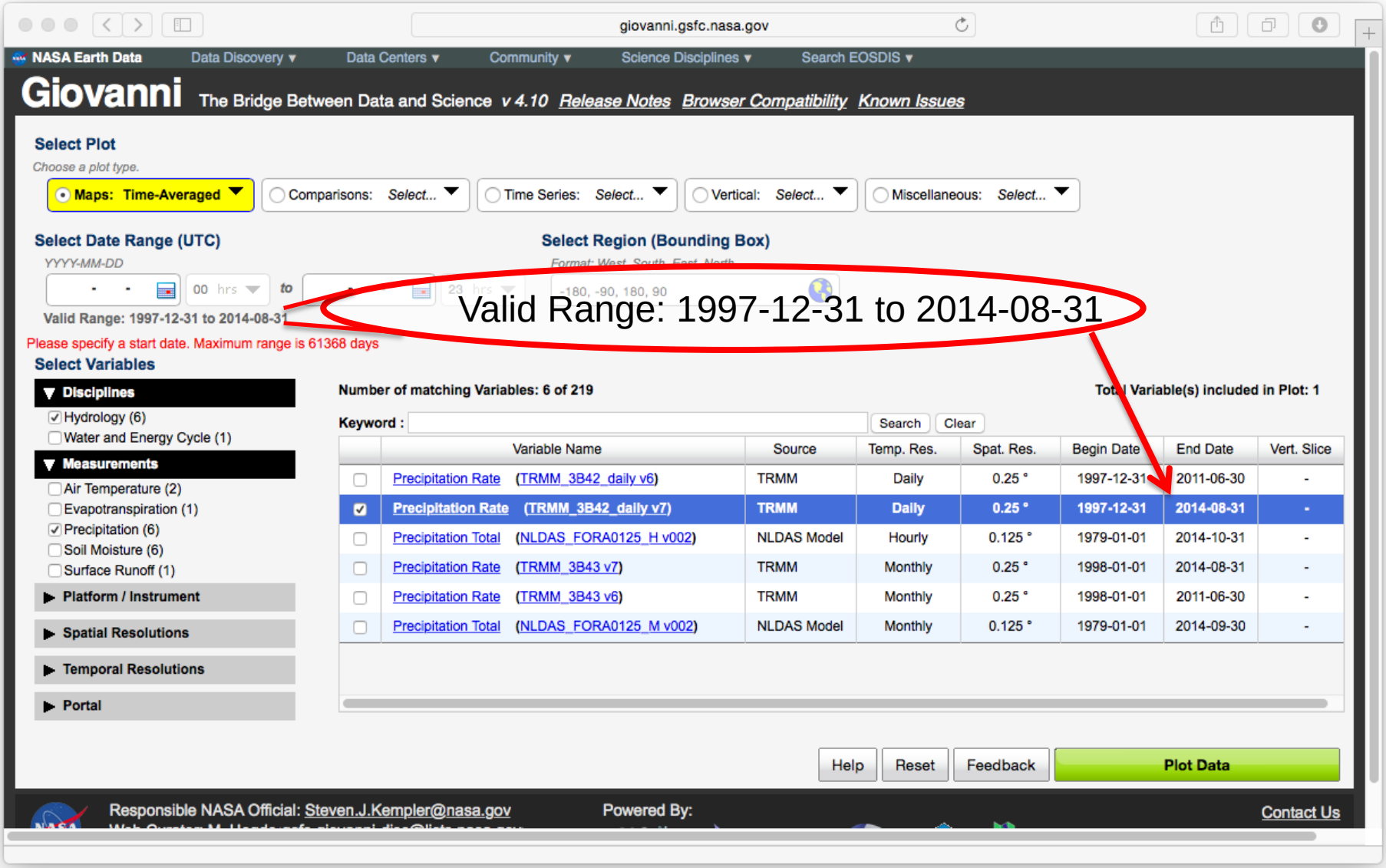
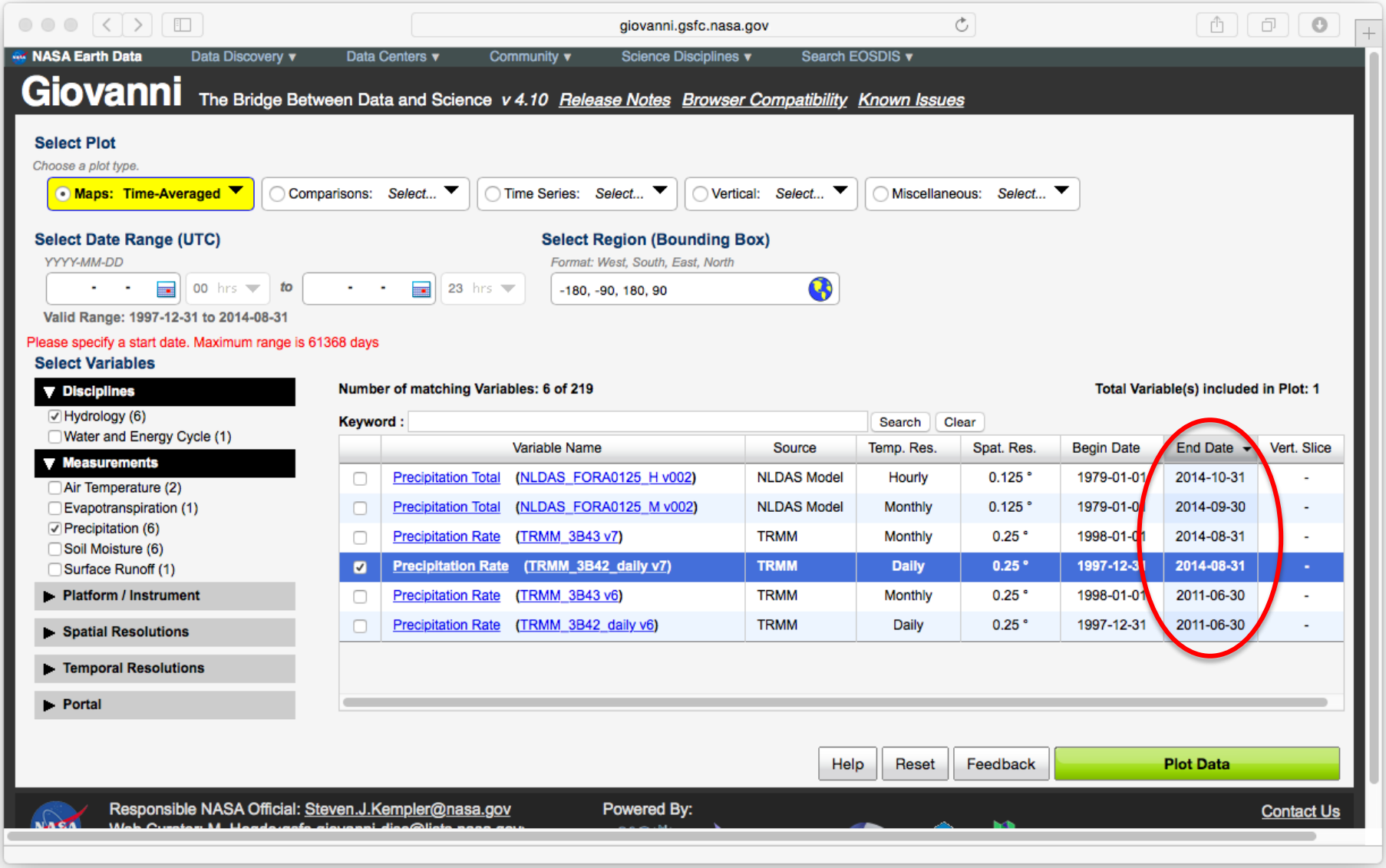
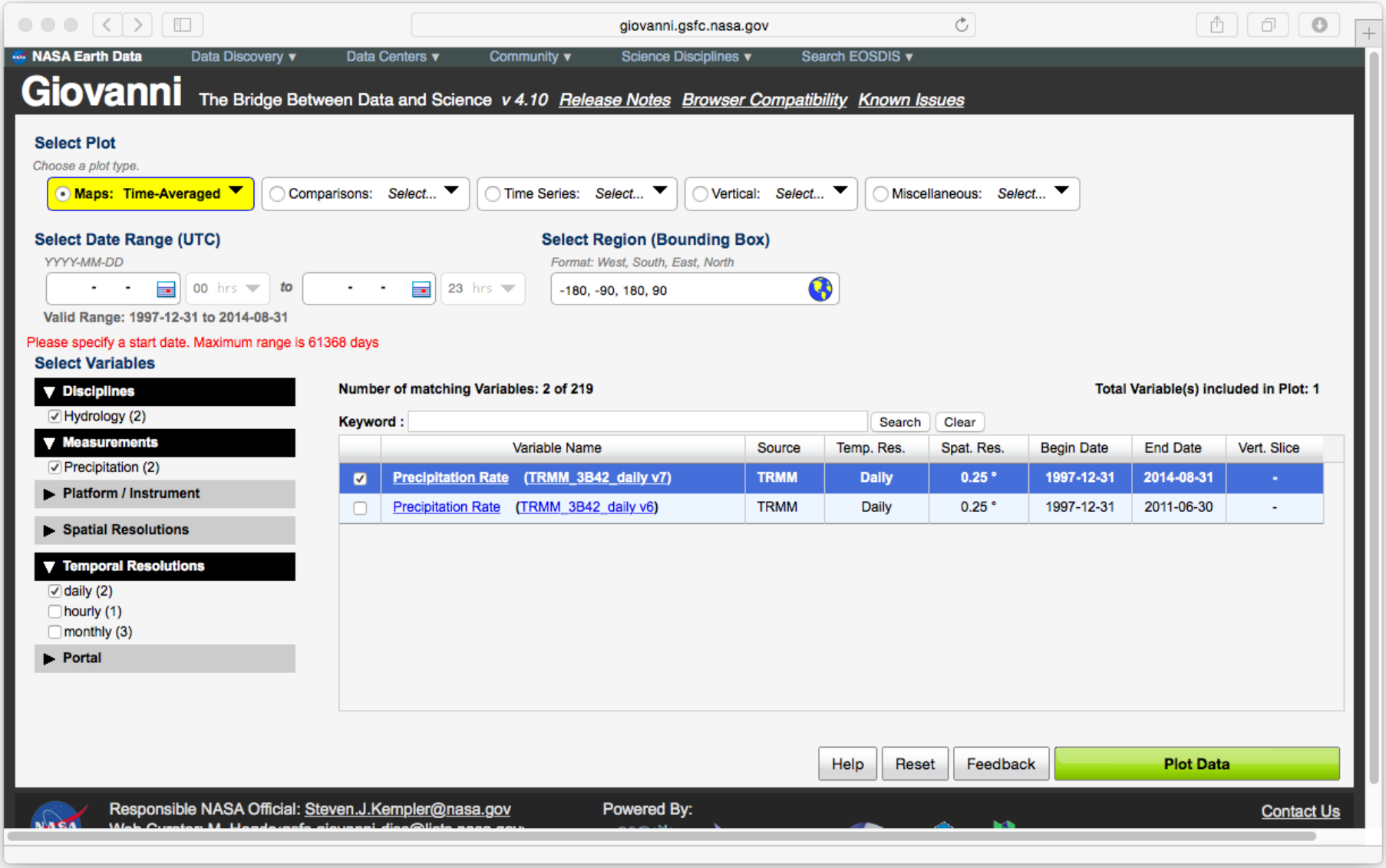


You can also sort on columns



Spatial and temporal resolution facets are also available



Giovanni-4 selections are encoded in the URL Making them Sharable and Reproducible

http://giovanni.gsfc.nasa.gov/giovanni/#

service=INTERACTIVE_MAP&

starttime=2001-01-01T00:00:00Z&

endtime=2001-01-31T23:59:59Z&

bbox=-124.4531,24.2578,-68.2031,52.3828&

data=MOD08_D3_051_Optical_Depth_Land_And_Ocean_Mean&

variableFacets=dataFieldDiscipline%3AAerosols%3B

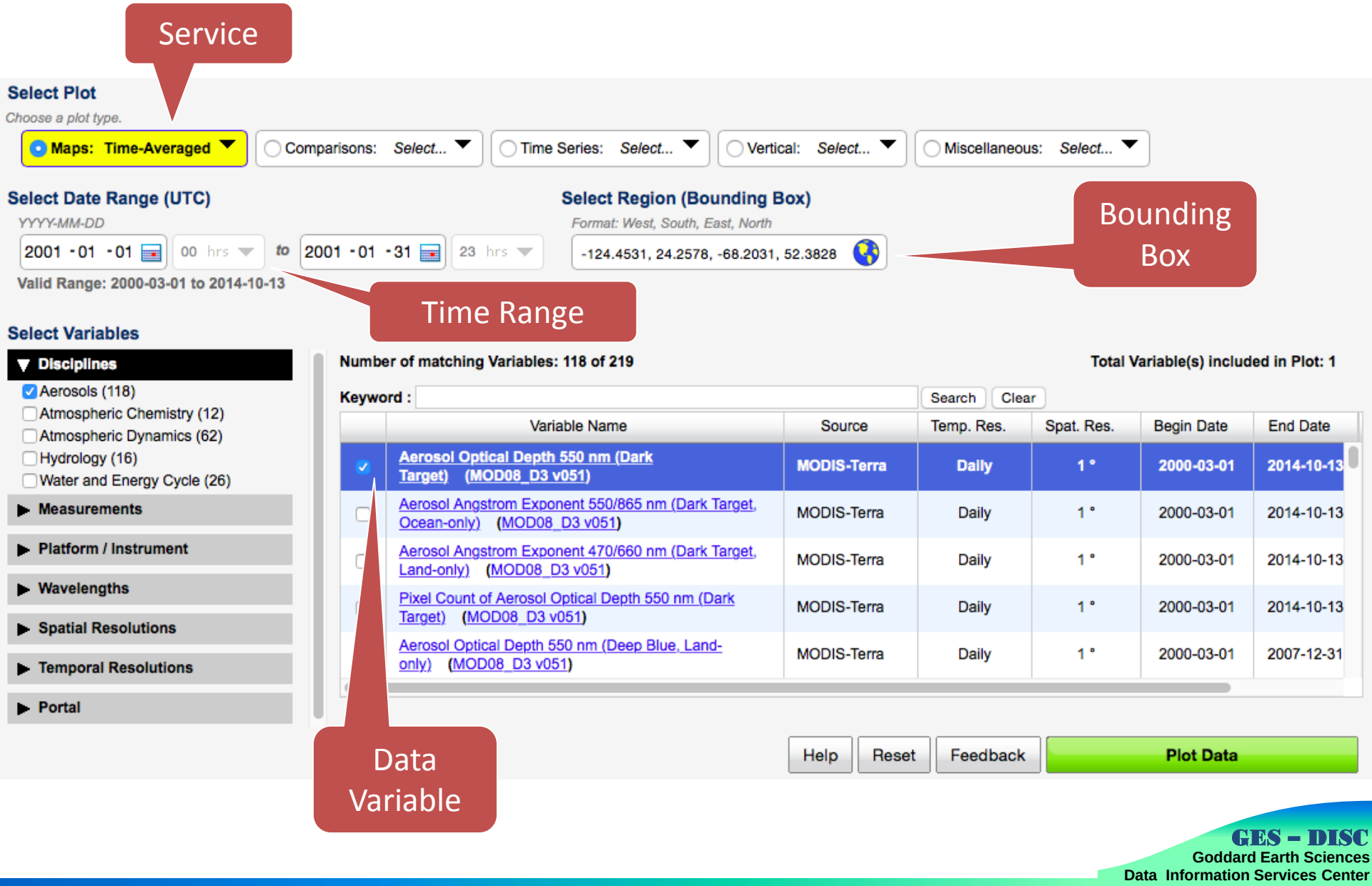
Service

Time Range

Bounding Box

Data Variable

Giovanni-4 URLs are Sharable and Reproducible

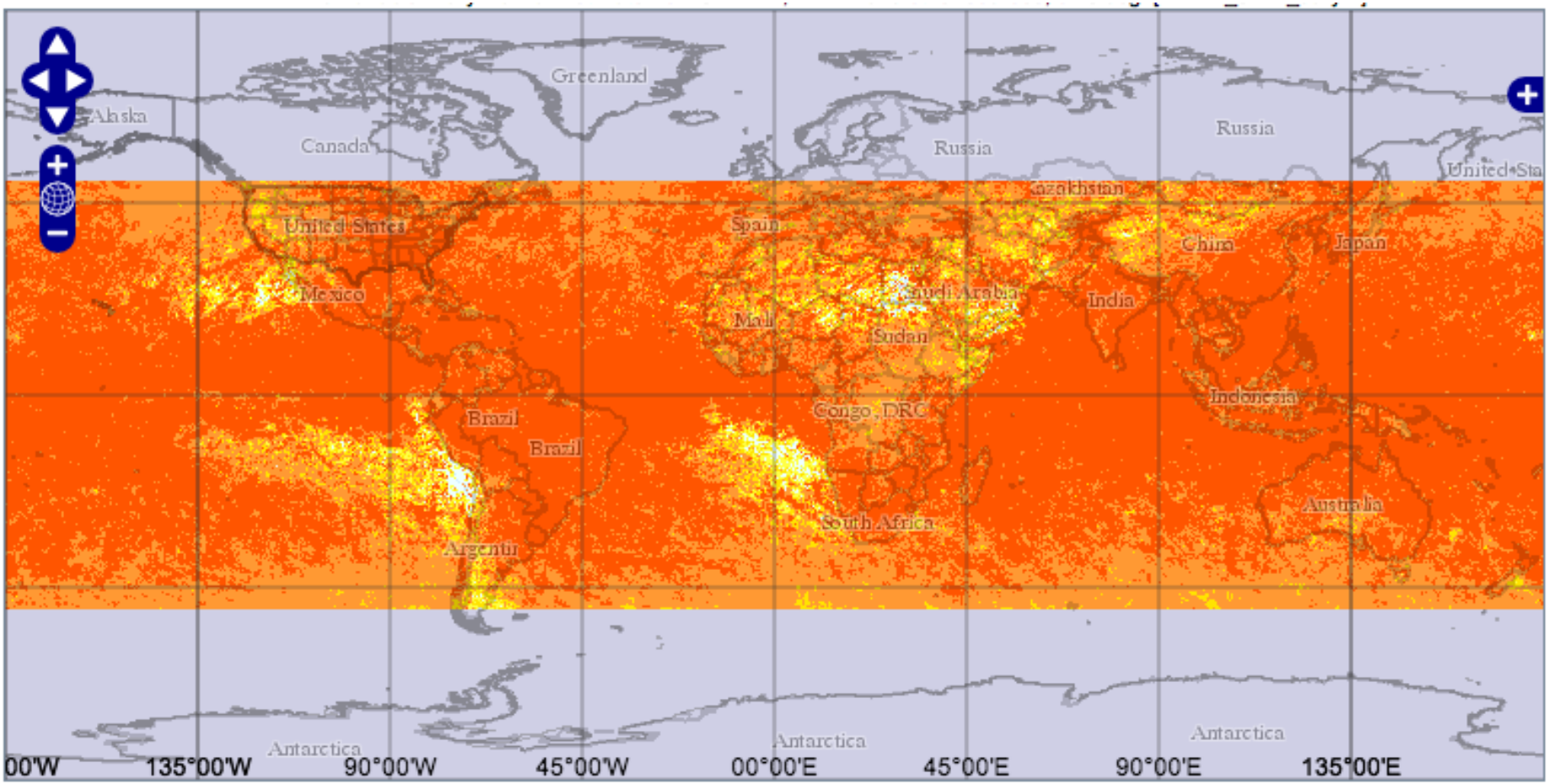


Data comparison services to compare similar datasets

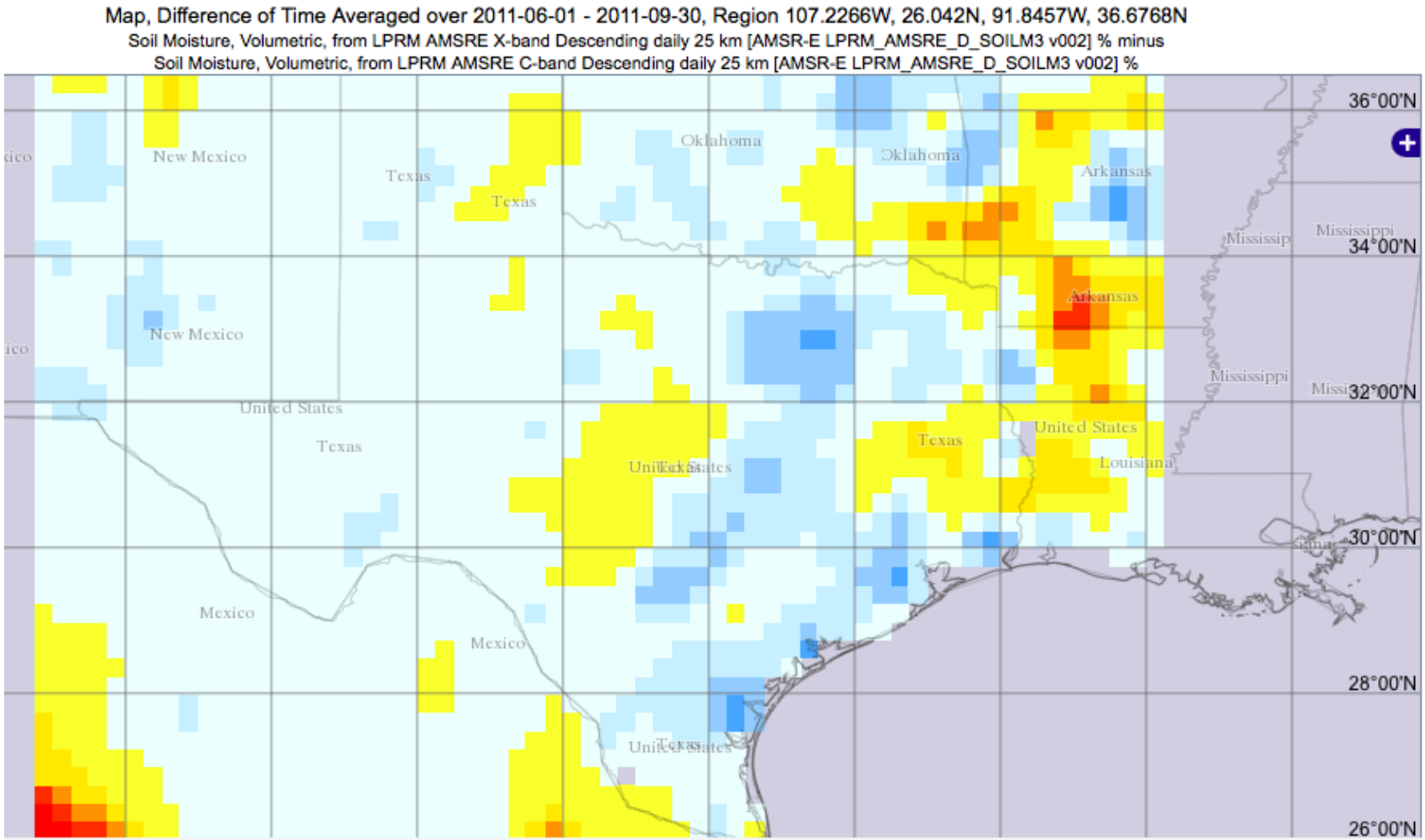
- Correlation Map
- Difference of Time-Averaged Maps
- Time Averaged Scatterplot
- Area Averaged Scatterplot
- Time Series of Differences of Area Averages

Correlation Map: TRMM Rainfall Versions 6 vs. 7

2010-2011

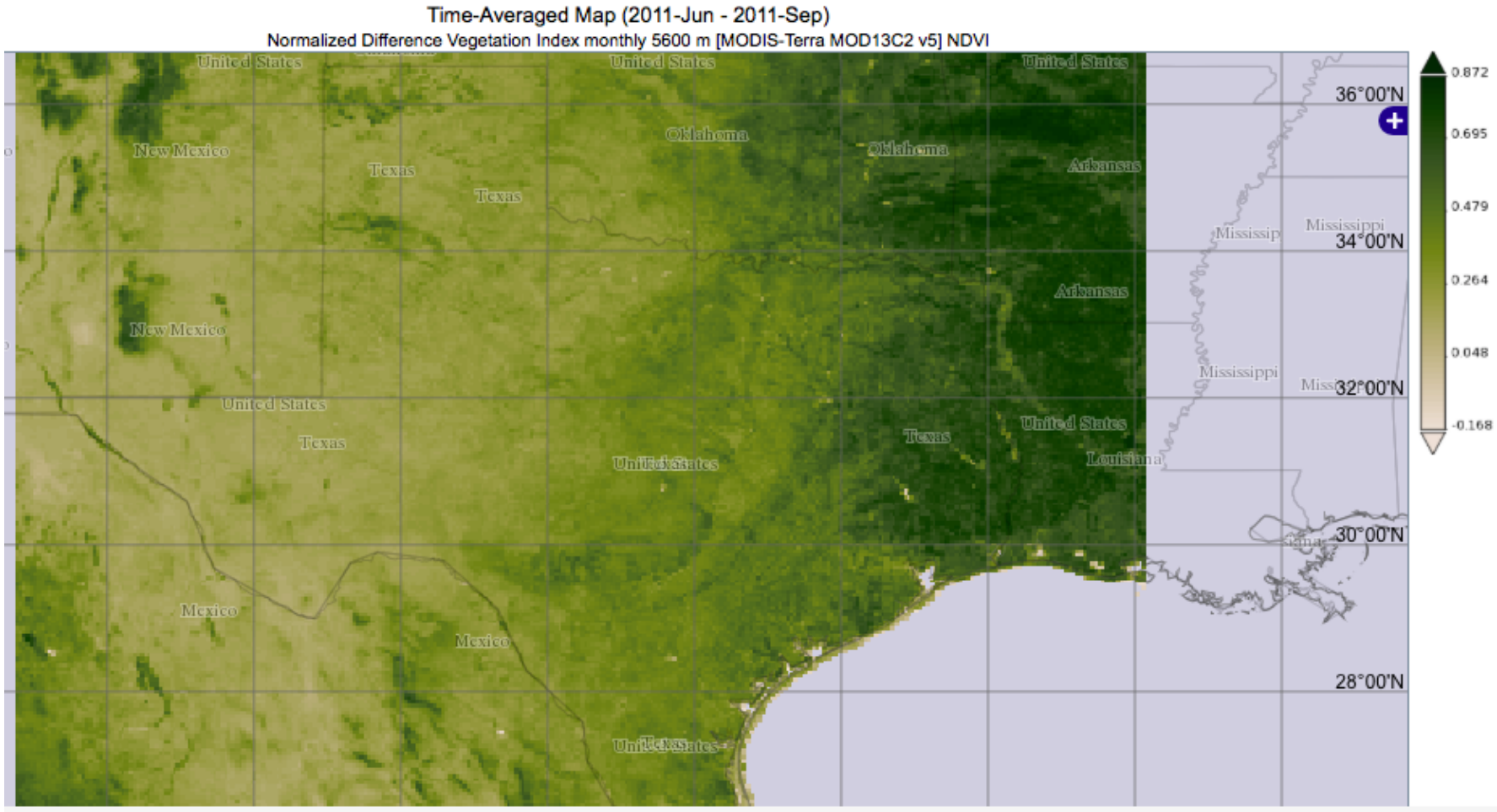


Difference of Time-Averaged Maps



- LPRM from X-band is more affected by vegetation than by C. This difference map shows that C and X don't differ that much when the surface is bare to sparsely vegetated, but do differ when the surface is more densely vegetated and soil moisture retrieval becomes problematic. (Courtesy Bill Teng)

MODIS NDVI from LP DAAC



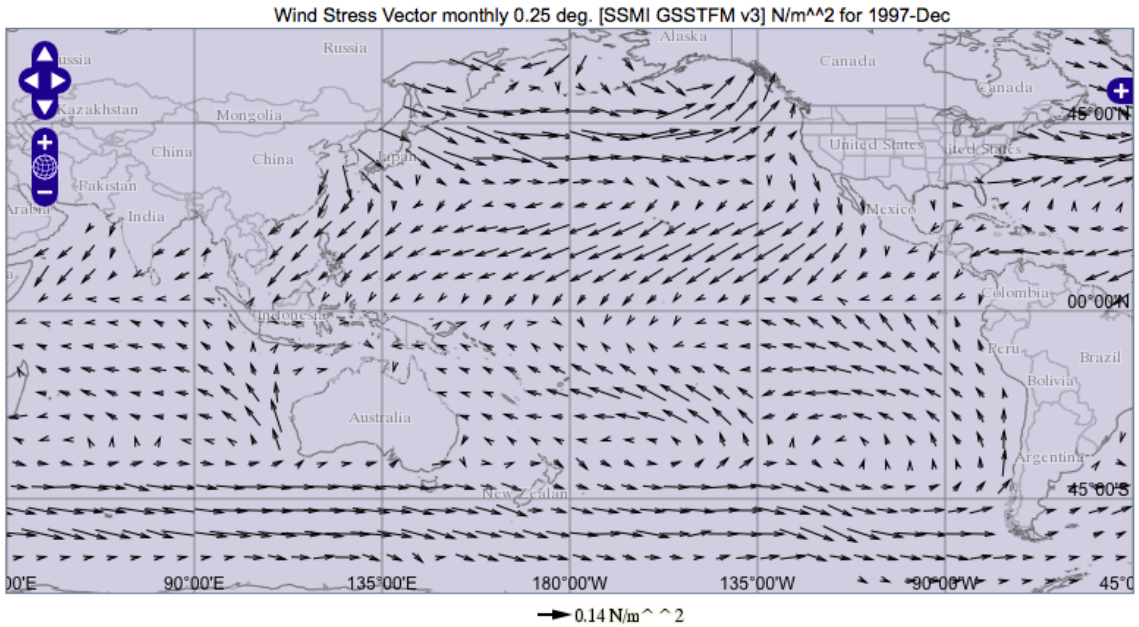
New Services

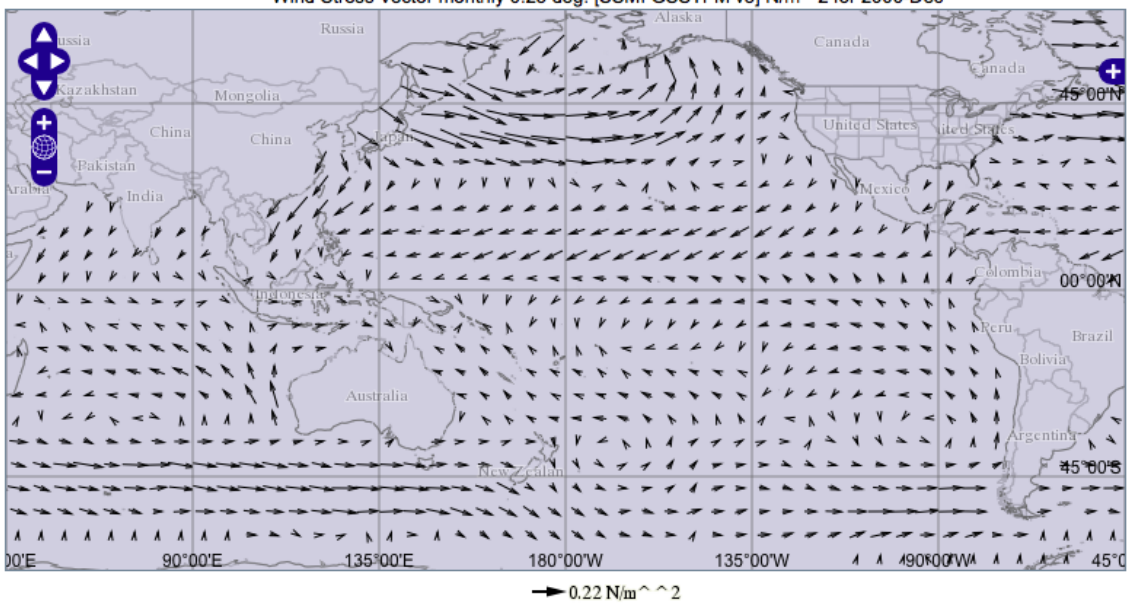
- Vector Plots
- Seasonal Analysis
  - User-defined Climatology
  - Interannual Time Series
- Shapefile-based Area Average Time Series

Vector Plots

- Available for some wind-related variables
  - More coming soon…
- Time Averaged Map service only
- Computes averages of U and V, then vector magnitude + direction

Vector Plots (Time-Averaged Map)





Wind Stress

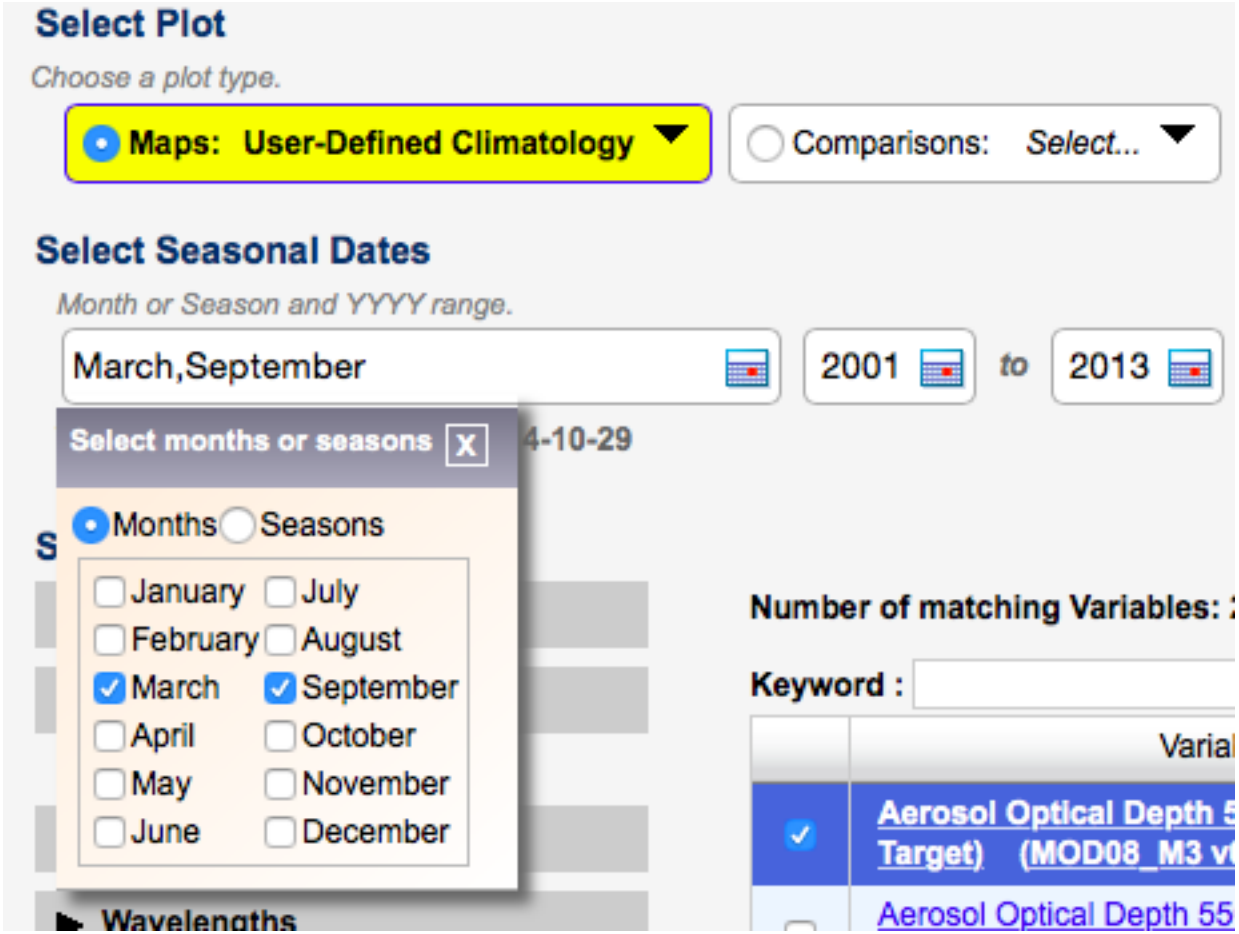
Dec 1997 (El Nino)

Dec 2000 (La Nina)

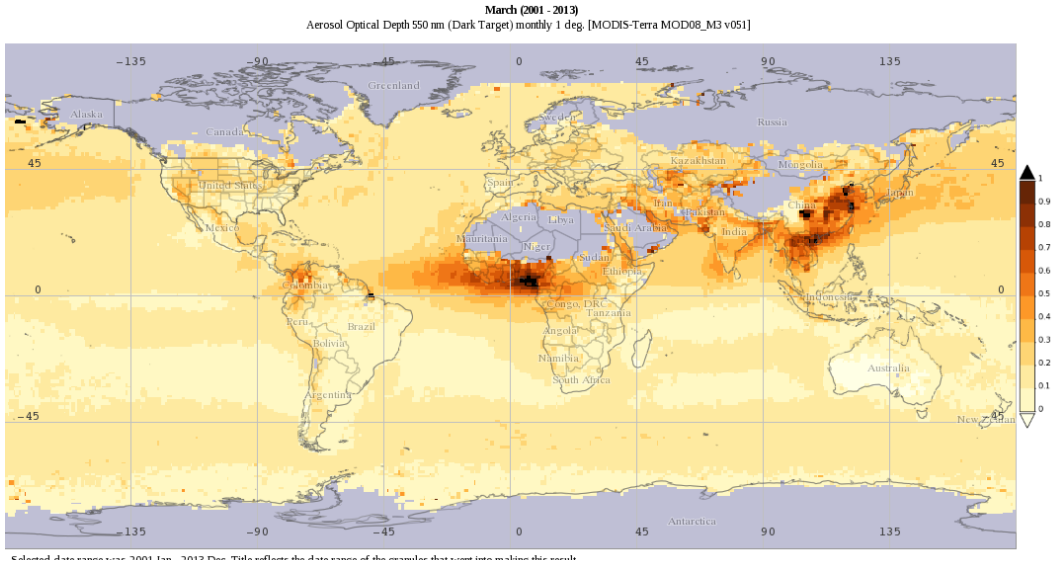
Courtesy Chung-Lin Shie

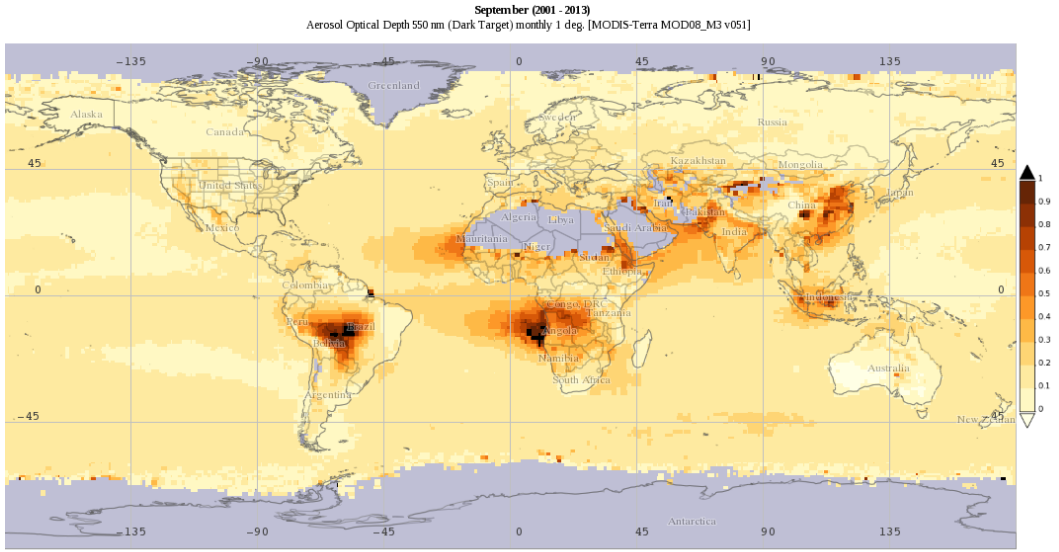
User-Defined Climatology

Available for Monthly data
Aggregate by Month or Meteorological Season (DJF, MAM, JJA, SON)



User-Defined Climatology





- Selected date range was 2001-Jan - 2013-Dec. Title reflects the date range of the granules that went into making this result.

Comparison of aerosol regimes in March vs. Sept. over 2001-2013. (Courtesy Suhung Shen)

MODIS Monthly AOD

March, 2001-2013

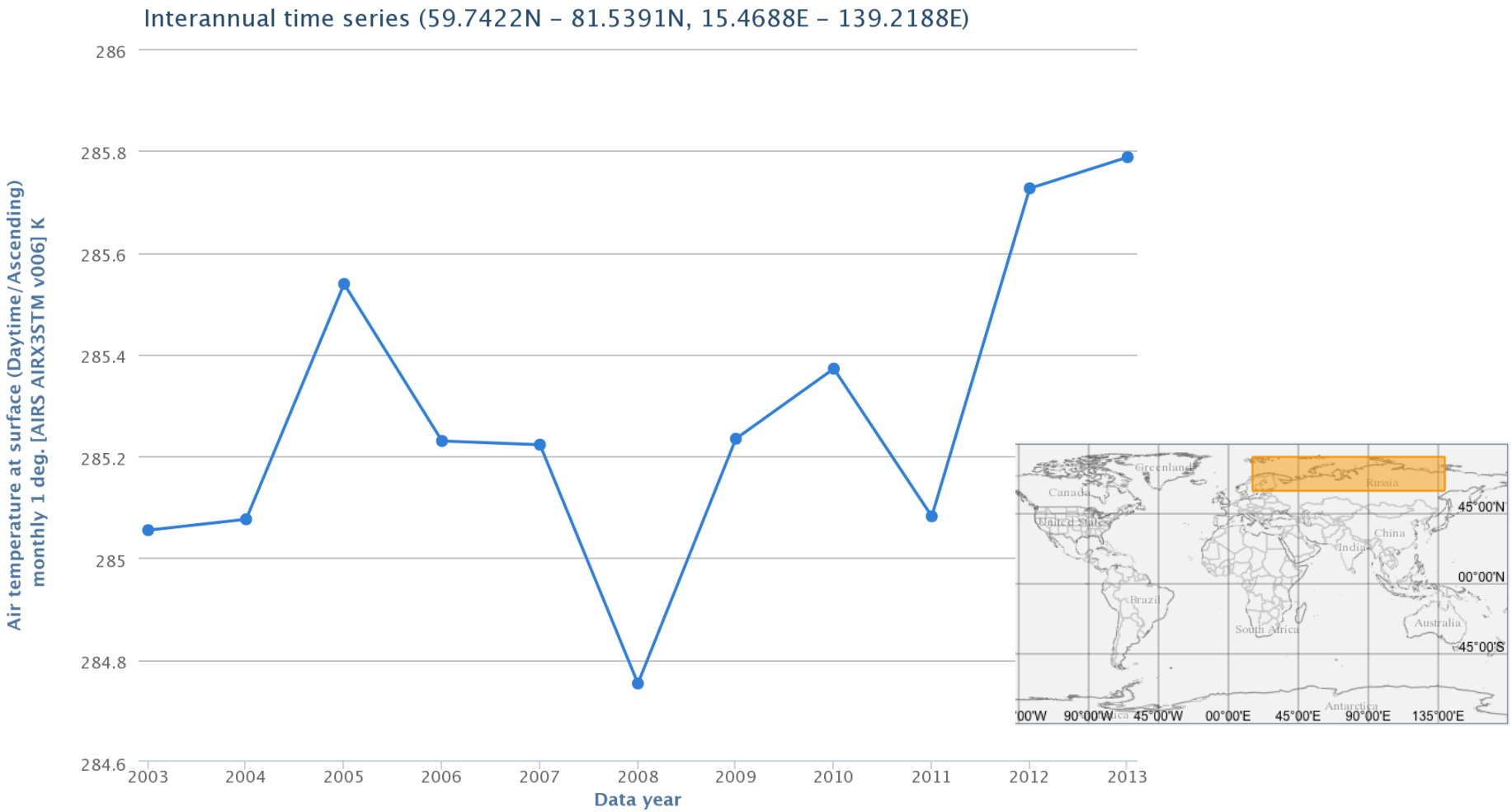
September, 2001-2013

Click Here to Repeat

Seasonal Analysis: Interannual Time Series

- Available for Monthly data
- Plot the area average for <month> for the years <start> to <end>

Interannual Time Series Example

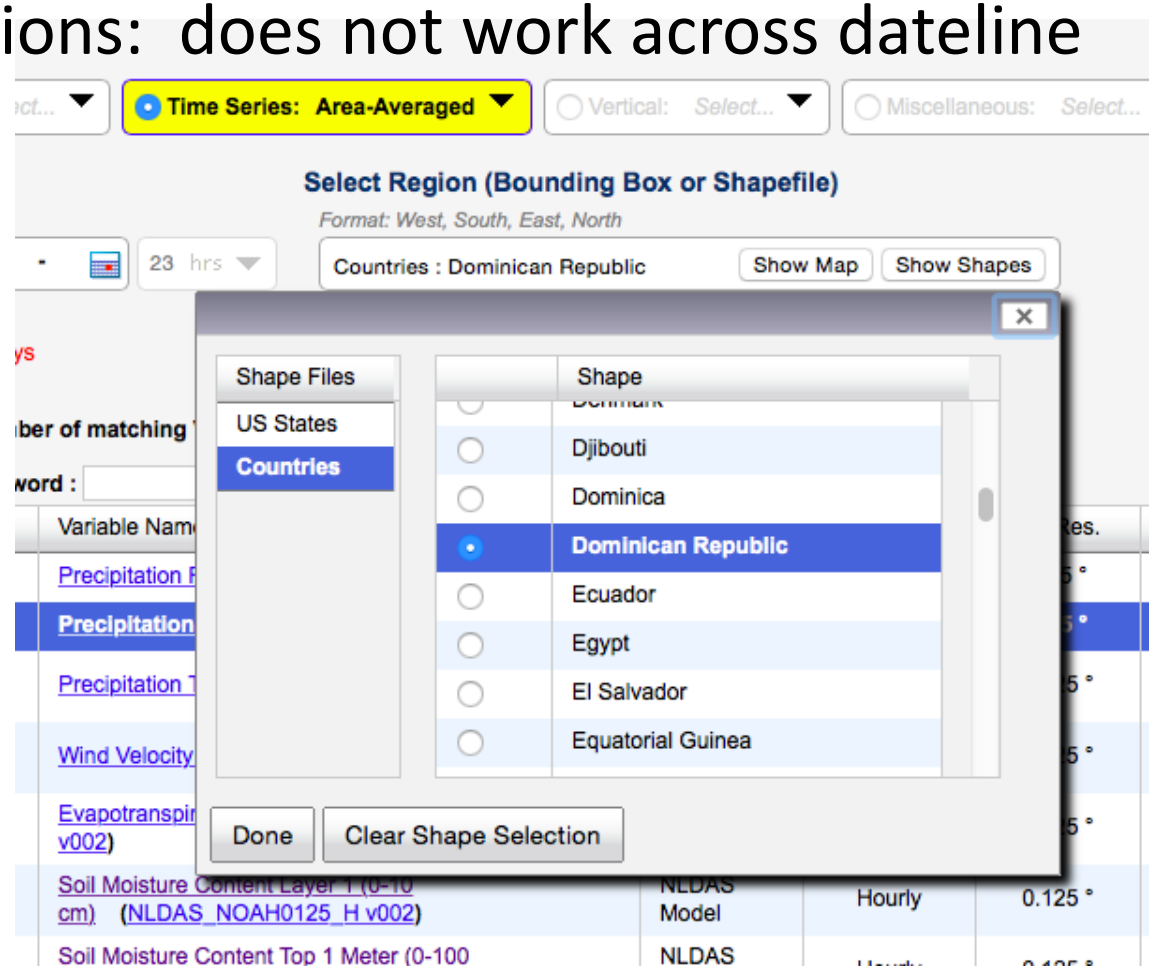


Strong summer (July) warming, on the order of 0.5K/dec during the past decade, is observed by AIRS over the permafrost of the Tundra region. (Courtesy Andrey Savtchenko)

Click here to repeat

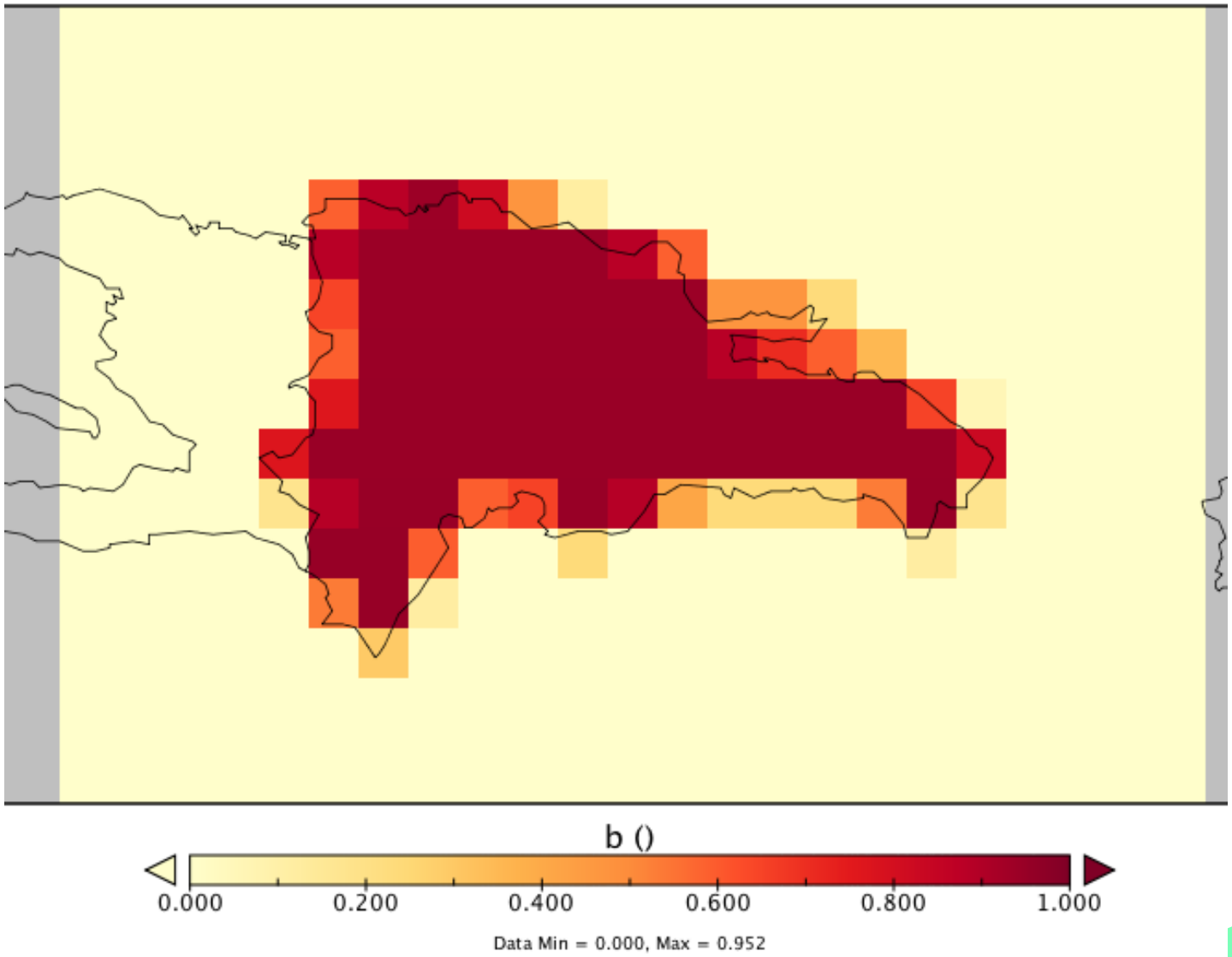
Shapefile Support

- Area-Averaged Time Series
- Coming soon…time-averaged map, histogram
- Limitations: does not work across dateline

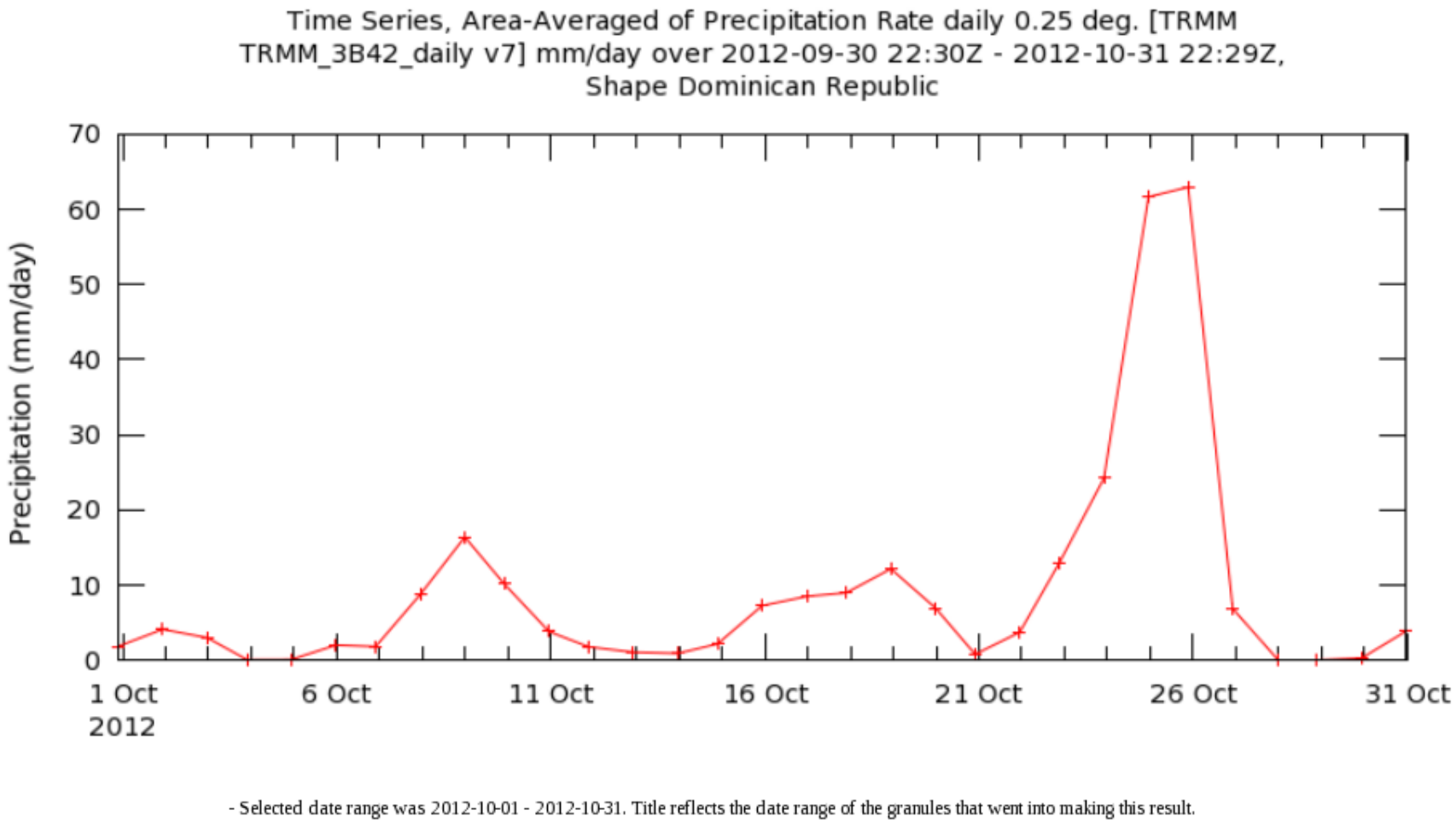


Shapefile-based Area Averaged Time Series

Compute average over area, weighted by % coverage by shape and cos(lat)

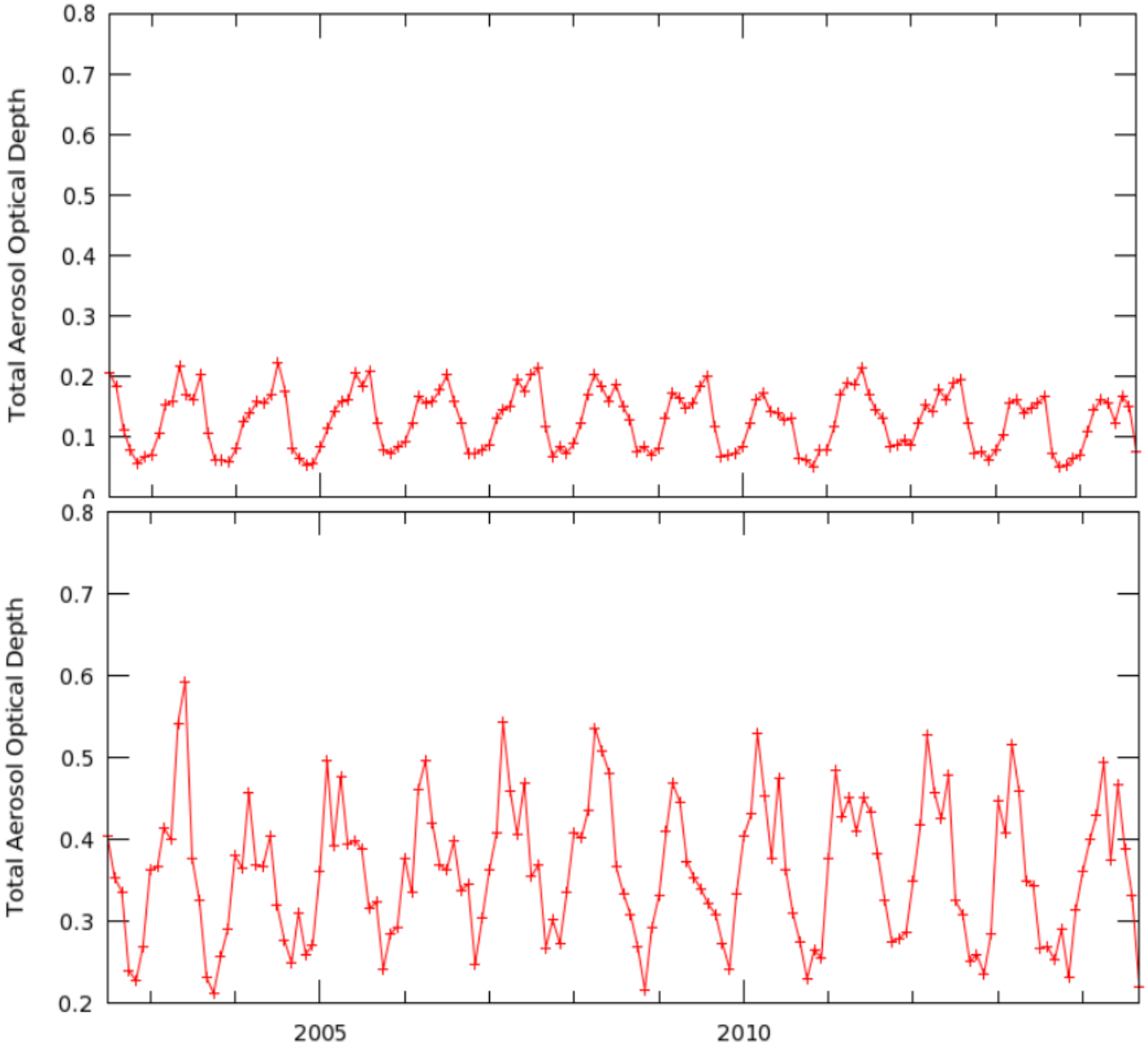


Shapefile-based Area Averaged Time Series



TRMM Rainfall for Oct. 2012, showing Hurricane Sandy landfall.
(Courtesy Zhong Liu)

Shapefile based Computation of MODIS-Terra Monthly AOD

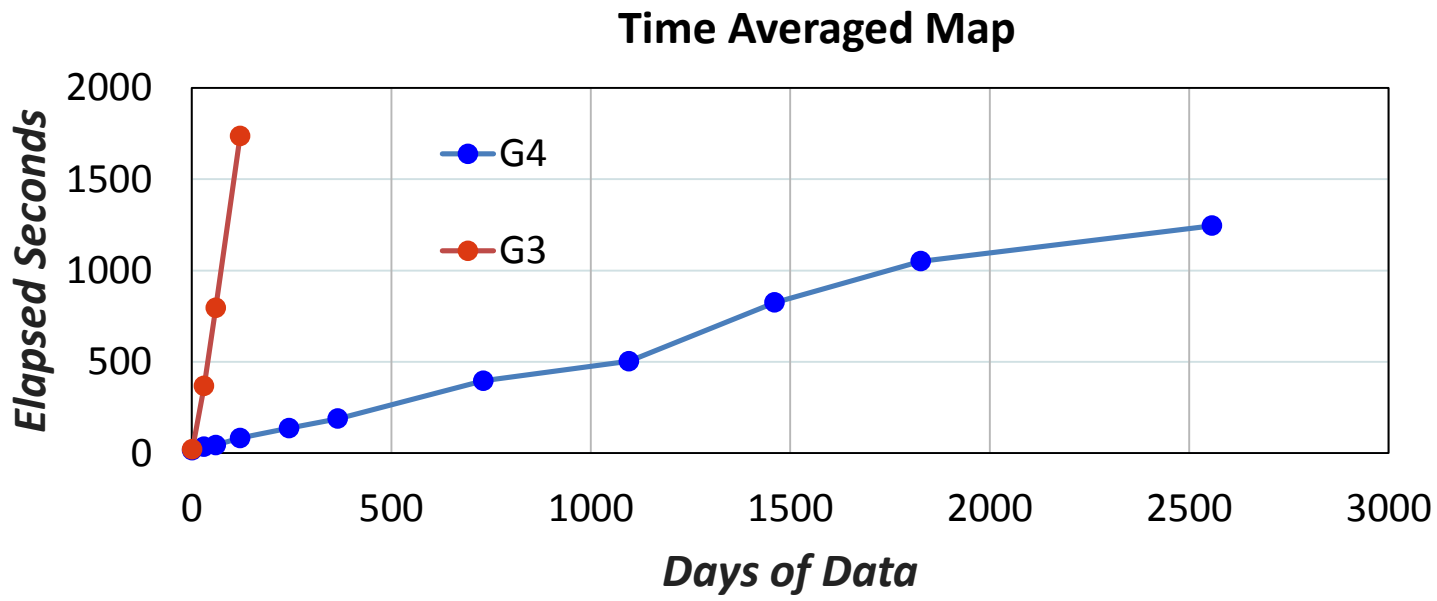


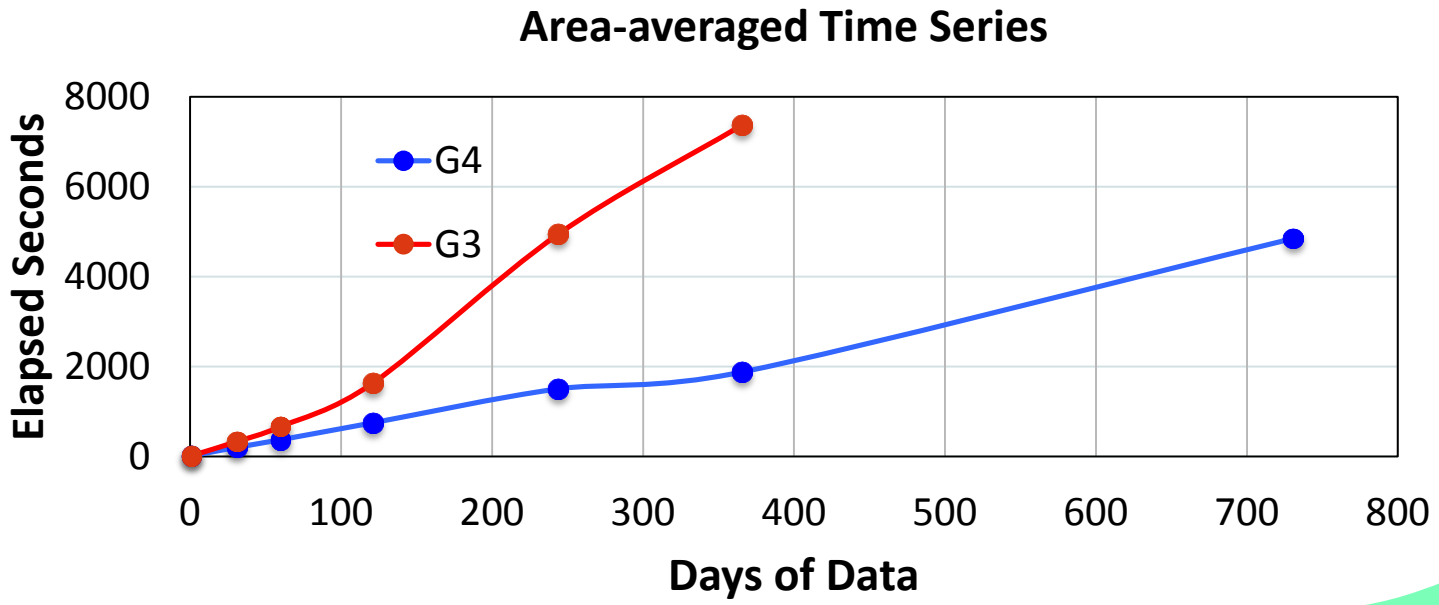
U.S.

China

Courtesy Jennifer Wei

Giovanni 4 Performance



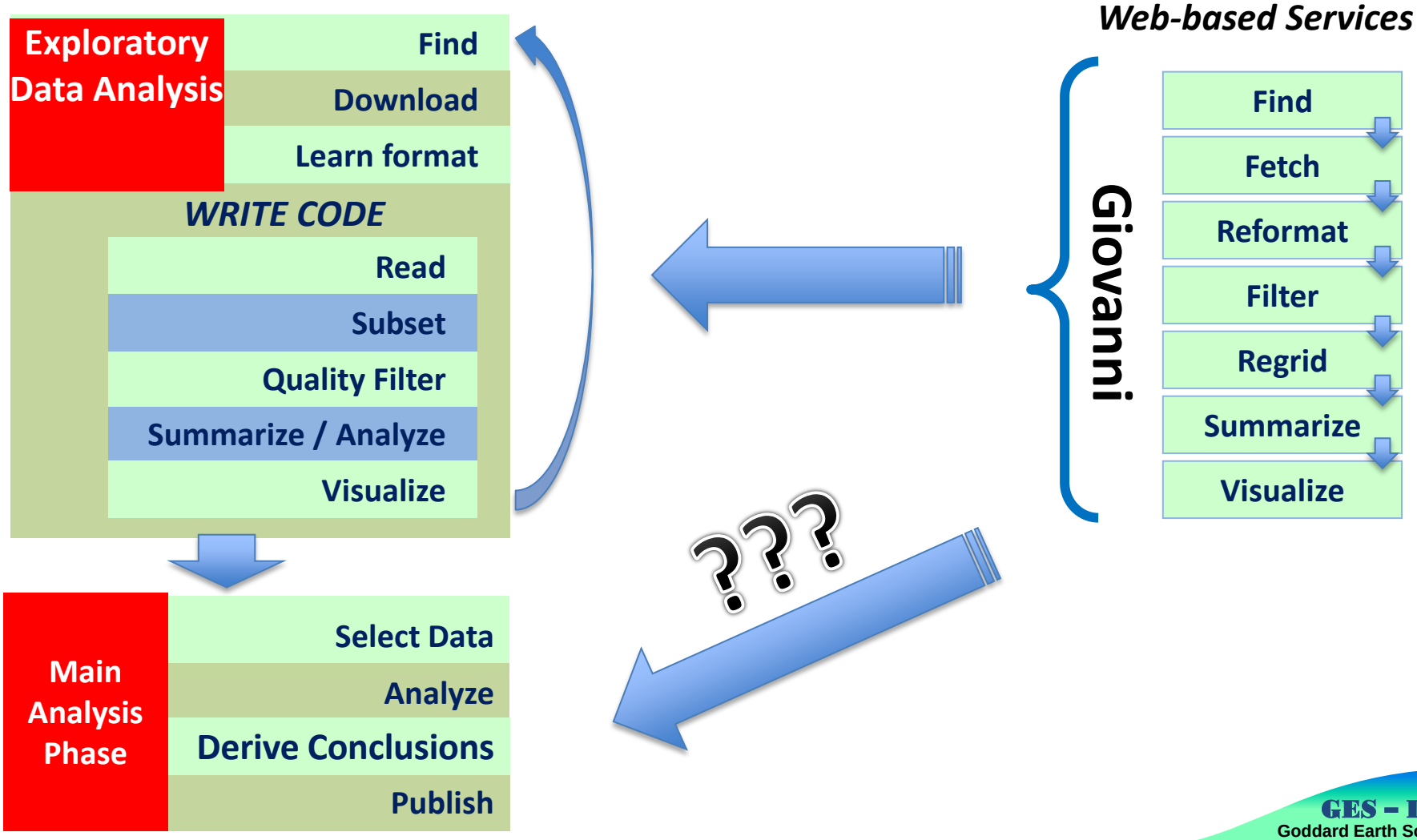


DISCUSS…

Features Still on the TO DO list

- ❑ *Pre-computed Climatology (up next)*
- ❑ OMI Level 2G
- ❑ Level 2 data support
- ❑ Cross sections (Z-Lat, Z-Lon, Z-Time)
- ❑ Time series of area statistics
- ❑ Zonal mean
- ❑ Multi-variable plots (overlays)
- ❑ Web Coverage Service interface
- ❑ MyGiovanni: user-contributed color palettes, shapefiles, data, algorithms
- ❑ Geometric Mean
- ❑ Units conversion
- ❑ More download options (KMZ, more ASCII, batch)

Your input can help us prioritize them

Giovanni was designed for exploratory data analysis…

1. …Should Giovanni evolve to support the Main Analysis Phase better?
2. What modifications would enhance “scientific rigor”?