

Federated Giovanni

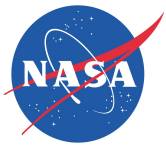
Multi-sensor Data Sharing and Visualization

<http://giovanni.gsfc.nasa.gov/giovanni/>

Mahabal Hegde

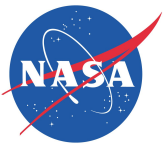
ADNET Systems/NASA GESDISC
maha.hegde@gmail.com

Principal Investigator: Christopher Lynnes
Project Funding: NASA ROSES ACCESS 2013



What is Giovanni?

- Stands for “Geospatial Interactive Online Visualization and Analysis”
- Developed at NASA’s Goddard DISC: originated in 2002



Giovanni: Capabilities

- Allows interactive exploration of gridded data
- 643 data variables from 16 instruments and 3 NASA Earth Science data centers
- Easy to share URLs for results and user selections

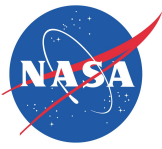


Giovanni: Screenshots

The screenshot shows the GIOVANNI website interface. At the top, there are navigation tabs for 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. Below this, the GIOVANNI logo and tagline 'The Bridge Between Data and Science' are displayed. A search bar is present. The main content area includes a 'Select Plot' section with options for 'Maps: Time Averaged Map', 'Comparisons', 'Time Series', 'Vertical', and 'Miscellaneous'. There are also fields for 'Select Date Range (UTC)' and 'Select Region (Bounding Box or Shapefile)'. A sidebar on the left contains 'Select Variables' with categories like 'Disciplines', 'Measurements', 'Platform / Instrument', and 'Spatial Resolutions'. A table of 'Number of matching Variables: 19 of 644' is visible.

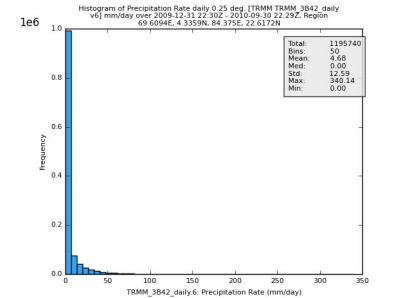
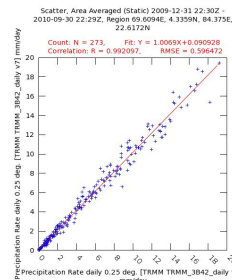
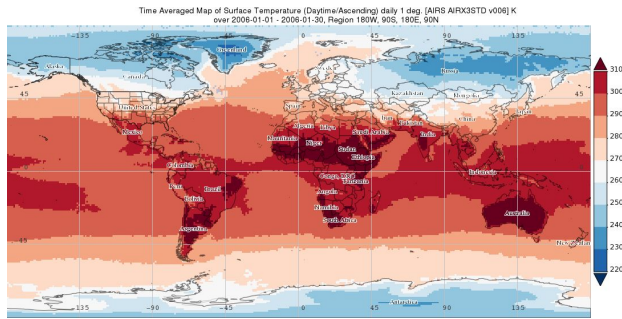
This screenshot displays the '2. Scatter (Interactive)' view. It features a scatter plot with a blue regression line. The x-axis is labeled 'Precipitation Rate daily 0.25 deg. [TRMM TRMM_3B42_daily v7 mm/day]' and the y-axis is 'Precipitation Rate daily 0.25 deg. [TRMM TRMM_3B42_daily v7 mm/day]'. The plot includes a regression equation: $y = 0.940x + 0.215; R = 0.890; N = 3264$. Above the plot, the date '2007-07-01' and coordinates 'Latitude: 5.125 to 16.875, Longitude: 69.625 to 86.375' are shown. To the right, there is a map with a red bounding box and a 'Reset Map and Chart' button. A 'History' panel on the right lists the current plot and a previous 'Time Averaged Map'.

This screenshot shows the '5. User-Defined Climatology' view. It features a global map titled 'DJF (2006-Dec - 2010-Feb) Aerosol Optical Depth 550 nm monthly 0.5 deg. [SeaWiFS SWOBS_L3MDS v004]'. The map uses a color scale from 0 to 0.937. A sidebar on the right contains a 'History' panel listing the current plot and several previous plots. At the bottom, there are buttons for 'Acknowledgment Policy', 'Help', 'Feedback', and 'Back to Data Selection'.

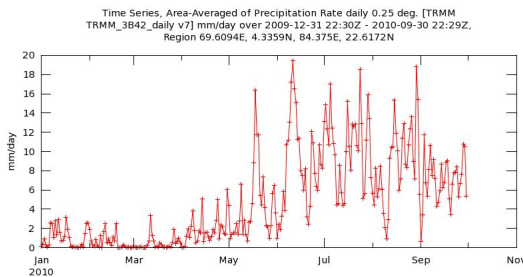


Giovanni: Capabilities

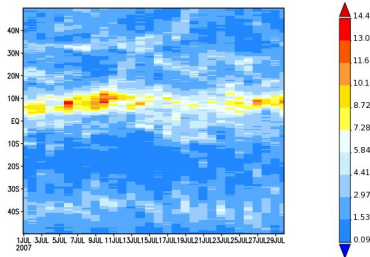
- 21 services (e.g. Time Average, Correlation)
- 10 visualizations (e.g. Map, Time Series)



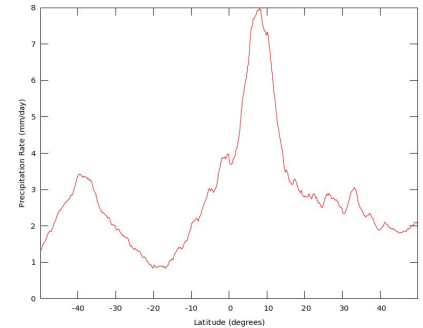
501-01 - 2010-09-30. The data date range for Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v7] is 2010-01-01 - 2010-09-30. The data date range for Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v6] is 2009-12-31 22:30Z - 2010-09-30 22:29Z. The data date range for Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v7] is 2010-01-01 - 2010-09-30. Title reflects the date range of the granules that went into making this result.



Hovmoller, Longitude-Averaged of Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v7] mm/day over 2007-06-30 22:30Z - 2007-07-30 22:29Z, Region 180W, 50S, 180E, 50N



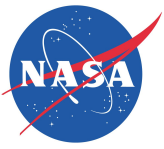
Zonal Mean of Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v7] mm/day over 2007-06-30 22:30Z - 2007-07-30 22:29Z, Region 180W, 50S, 180E, 50N



- Selected date range was 2010-01-01 - 2010-09-30. Title reflects the date range of the granules that went into making this result.

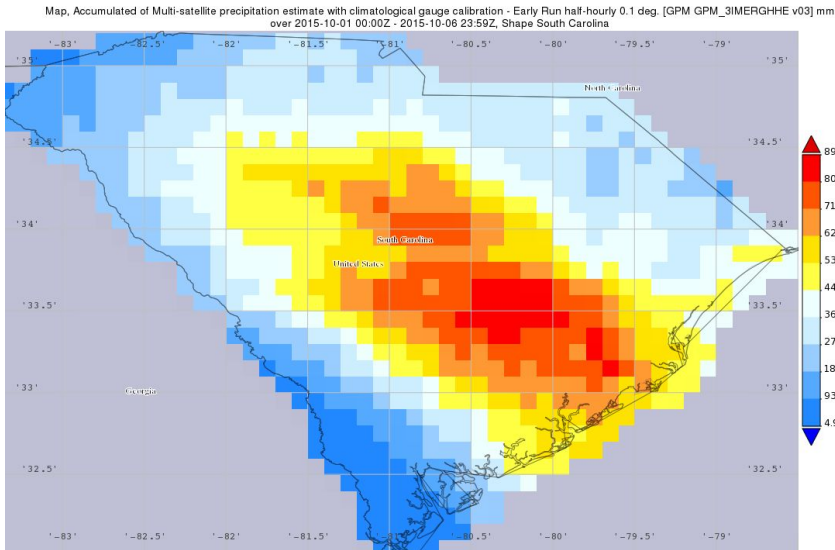
- Selected region was 180W, 60S, 180E, 90N. Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v7] mm/day has a limited data extent of 180W, 60S, 180E, 50N. The region in the title reflects the data extent of the subtitled granules that went into making this result. - Selected date range was 2007-07-01 - 2007-07-30. Title reflects the date range of the granules that went into making this result.

- Selected region was 180W, 60S, 180E, 90N. Precipitation Rate daily 0.25 deg [TRMM TRMM_3B42_daily v7] mm/day has a limited data extent of 180W, 60S, 180E, 50N. The region in the title reflects the data extent of the subtitled granules that went into making this result. - Selected date range was 2007-07-01 - 2007-07-30. Title reflects the date range of the granules that went into making this result.

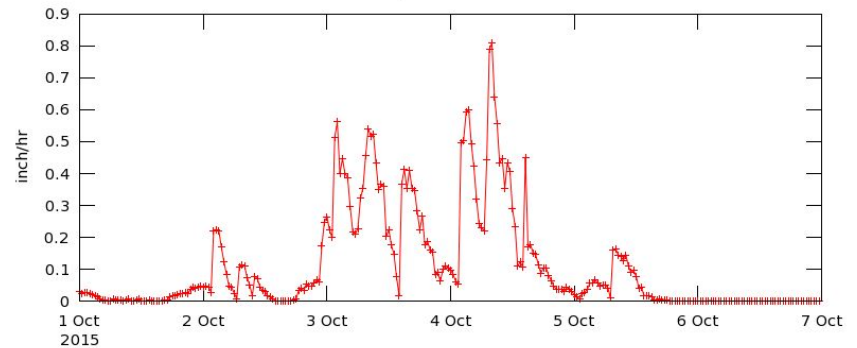


Giovanni: Capabilities

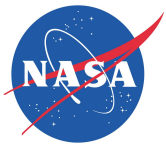
- Support for shape selection and unit conversions



Time Series, Area-Averaged of Multi-satellite precipitation estimate with climatological gauge calibration - Early Run half-hourly 0.1 deg. [GPM GPM_3IMERGHHE v03] inch/hr over 2015-10-01 00:00Z - 2015-10-06 23:59Z, Shape South Carolina

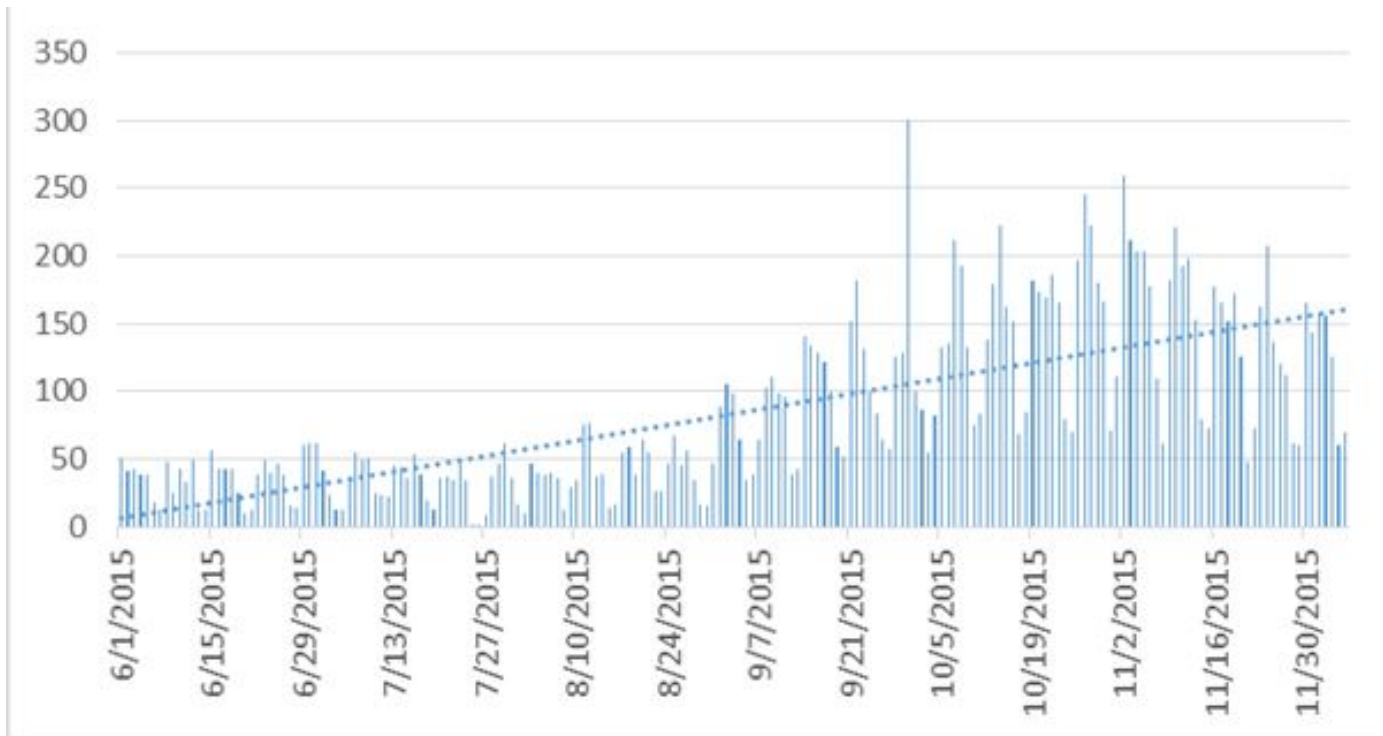


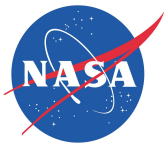
**Credits: Dr. Zhong Liu
GMU/NASA GSFC**



Giovanni: Usage

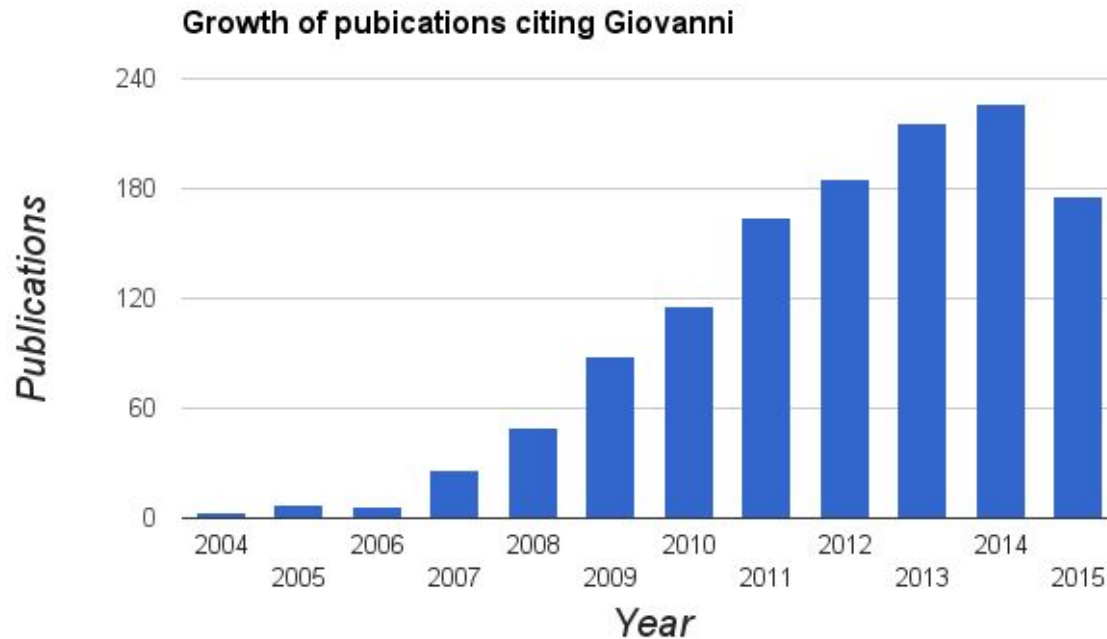
- Usage: 150+ unique users per day

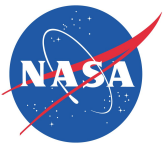




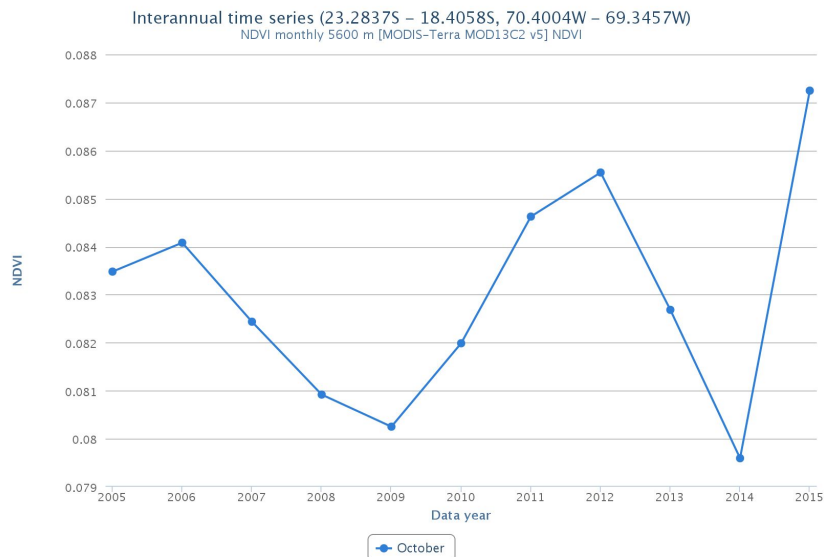
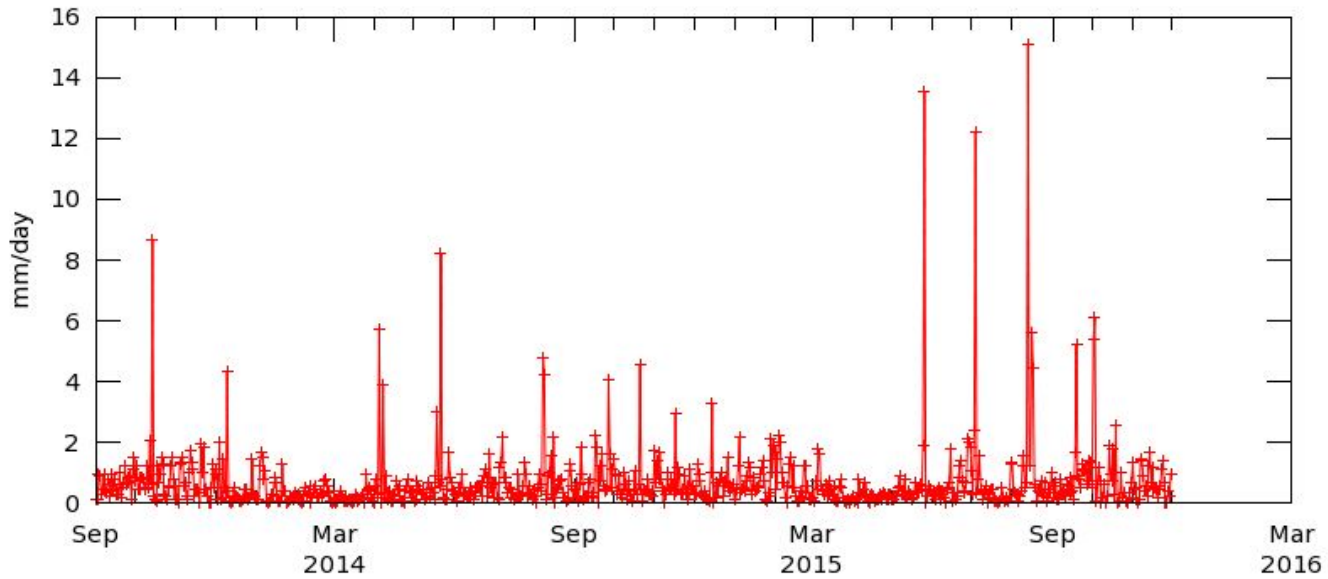
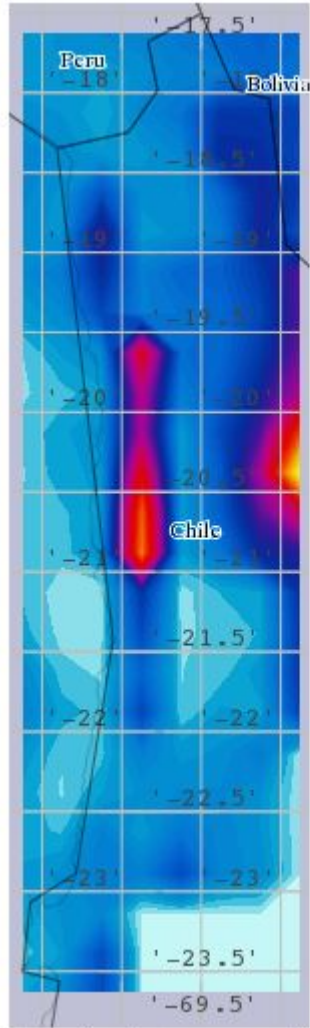
Giovanni: Usage

- Citations by its users: averages 200 publications per year





Examples: Atacama Desert Flooding



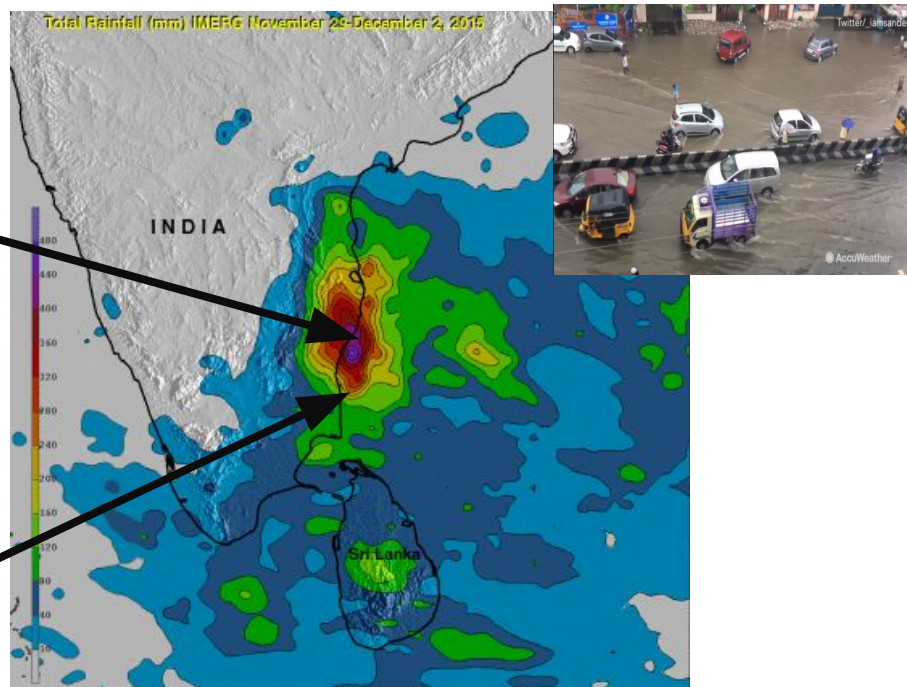
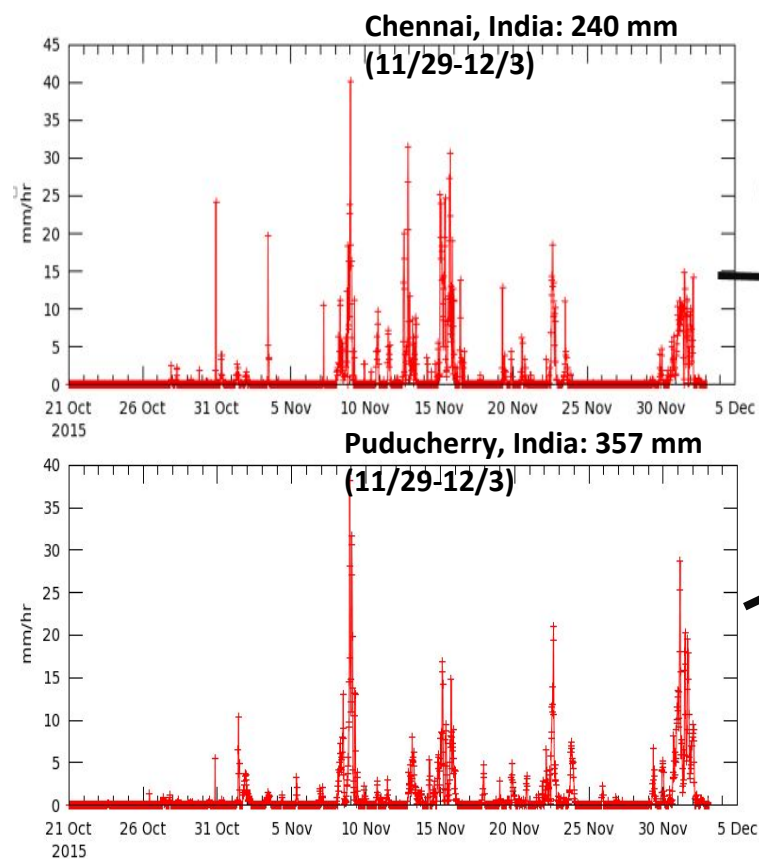
Credits: Dr. James Acker
ADNET Systems/NASA GSFC

Highcharts.com

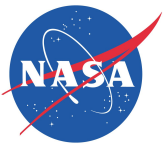


Examples: Historic Rainfall in South India

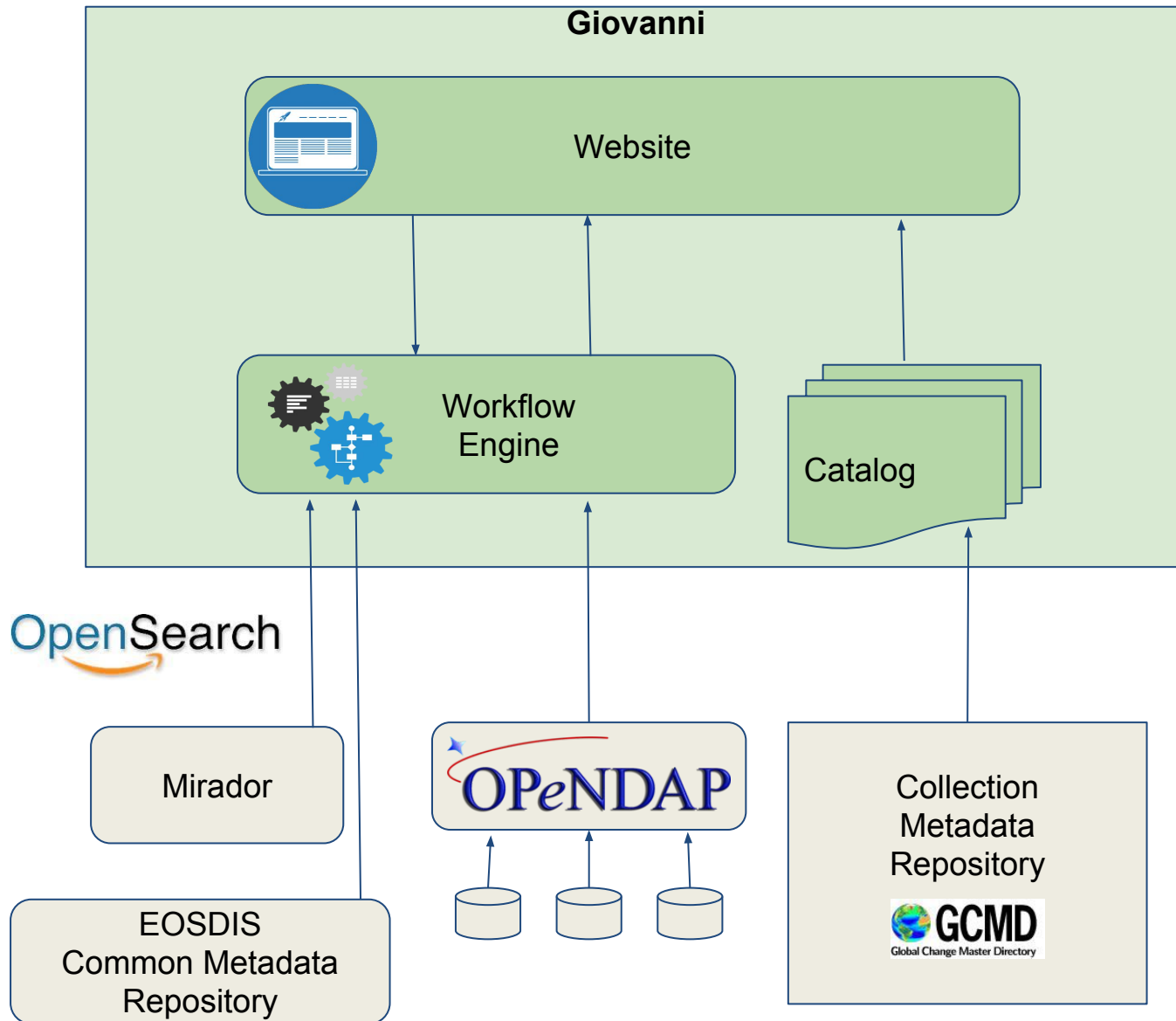
“Worst rain in 100 years” affects southeastern India. Extremely heavy rainfall caused deadly flooding in the middle of the month of November. Record setting rainfall has again caused deadly flooding in southern India on November 29th through December 3rd, with more anticipated in coming days. This IMERG analysis shows that unusually heavy rainfall totals of over 400 mm (15.7 inches) fell over southeastern India. Even higher totals of up to 490 mm (19.3 inches) are shown in the Bay Of Bengal just off the Indian coast.

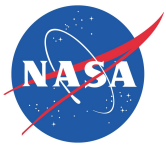


**Credits: Hal Pierce (NASA/SSAI) and Giovanni
Provided By: Dr. Dalia Kirschbaum, NASA GSFC**



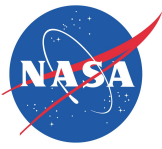
Giovanni Ecosystem





Federated Giovanni: Genesis

- User demand for non-GESDISC data in Giovanni
- Outside interest in hosting their own Giovanni instances

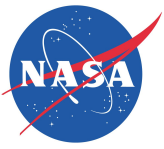


Federated Giovanni: Objectives

1. Allow other data centers to leverage Giovanni's services

Partner Data Centers:

- a. NASA GESDISC
- b. NASA JPL/PO.DAAC
- c. NASA MODAPS
- d. NASA OB.DAAC
- e. USGS/NASA LP DAAC



Federated Giovanni: Objectives

2. Enable users to compare data from multiple data centers

Example:

Comparison of MODIS and OMI Aerosols

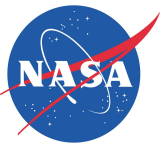
3. Development of services by wider community



Enabling Federation

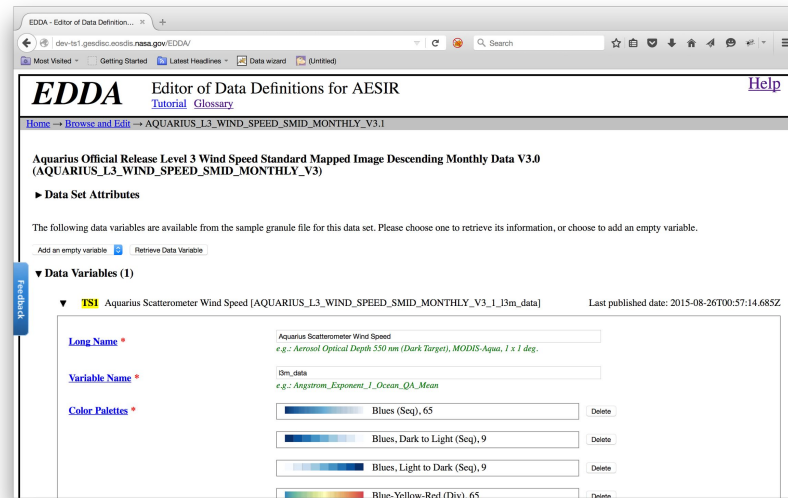
- Support for non-GESDISC data in Giovanni

Process	Standard/Tool
Data Search	ESIP OpenSearch
Data Access	OPeNDAP
Data Format	netCDF
Data Catalog	Apache Solr

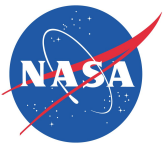


Enabling Federation: Tools

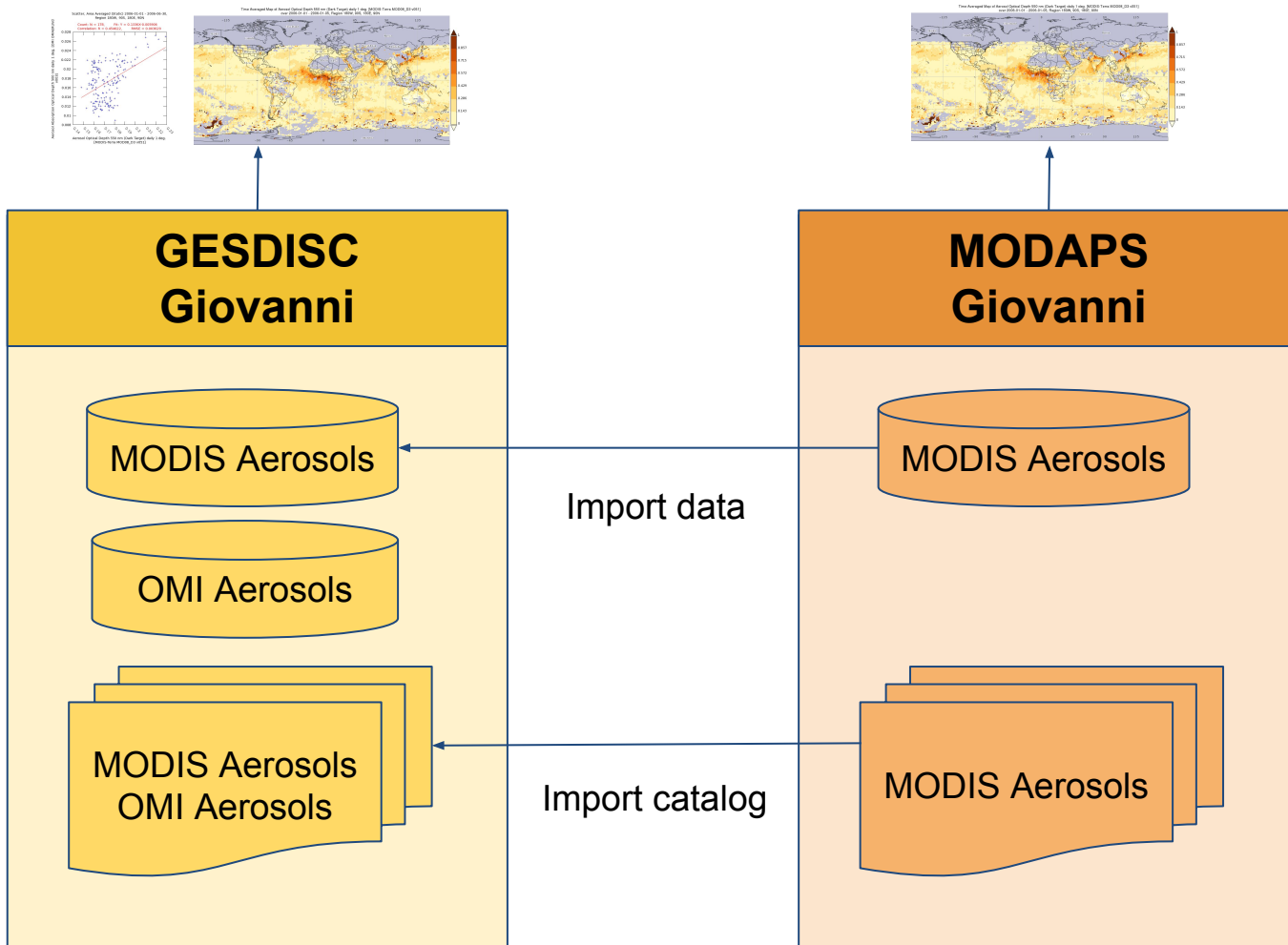
- Web based data catalog curation



- Utility for copying data between catalogs
e.g. copy_data.pl “Data ID” “Source Catalog URL” “Target Catalog URL”



Federated Giovanni: Data Sharing



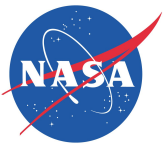


Enabling Federation: APIs

- API for plugging in algorithms

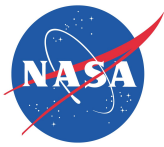
Sample Service Specification File:

```
SERVICE_NAME = AcMp
SERVICE_DESCRIPTION = "Accumulation of measurement over time at each grid point"
SERVICE_LABEL = "Map, Accumulated"
PLOT_TYPE = INTERACTIVE_MAP
ALGORITHM_CMD = g4_accumulate.pl -y ttl
OUTPUT_FILE_ROOT = accumulate
MAX_POINTS = 7568640000
DATELINE_METHOD =
CONVERT_UNITS_STEP = WRAPPER,WRAPPER
SERVICE_HELP = http://disc.sci.gsfc.nasa.gov/giovanni/documents/ag/user-  
manual#g4\_accumulate
```



Enabling Federation: Distribution

- Hosted on NASA Earthdata Code Collaborative
- Distributions are available as:
 - RPMs
 - Docker Image

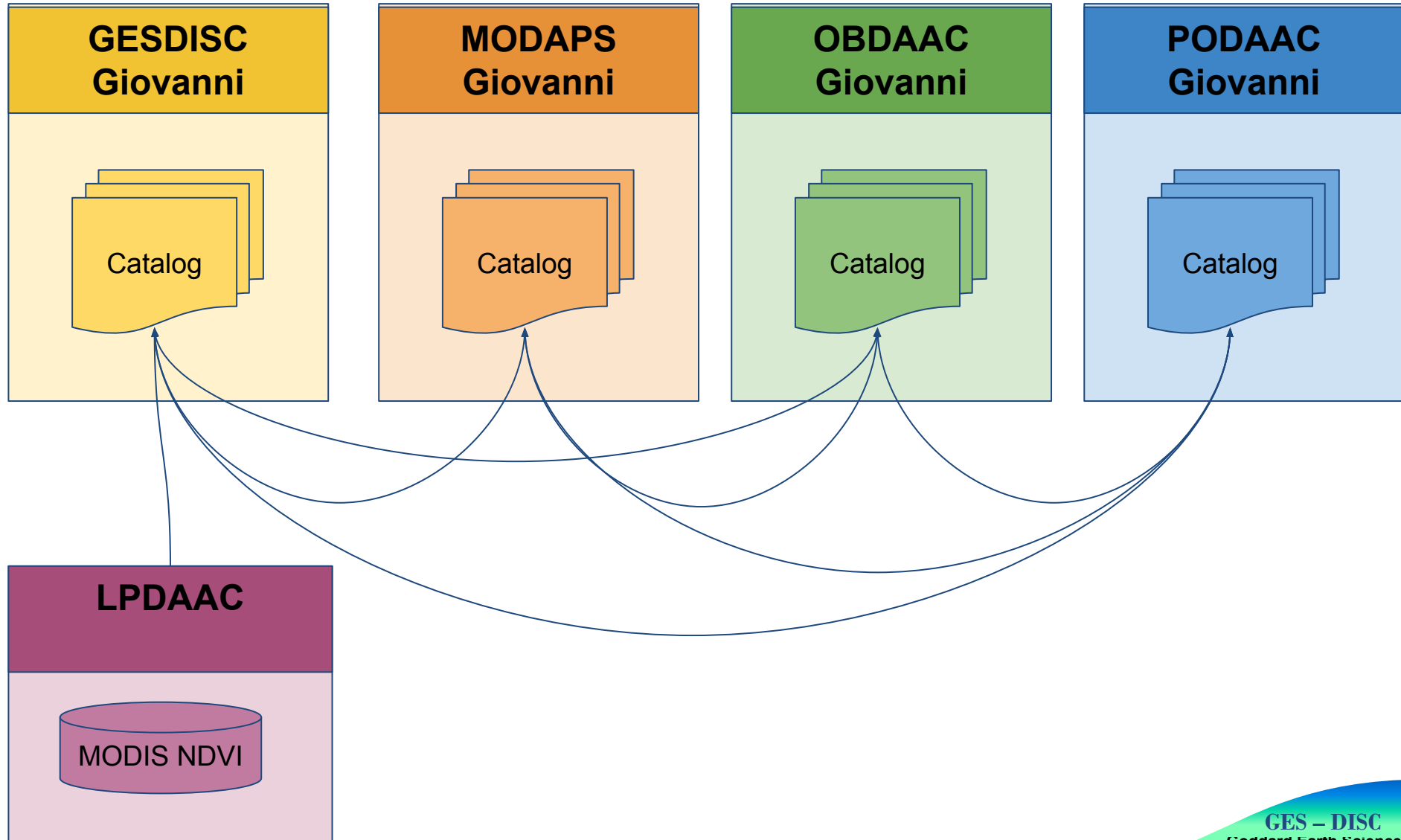


Federated Giovanni Adoption: Goals

- Data in NASA GESDISC Giovanni from five (5) data centers
 1. NASA GESDISC
 2. NASA MODAPS
 3. NASA OB.DAAC
 4. NASA PO.DAAC
 5. NASA /USGS LP DAAC
- Giovanni instances at four (4) data centers
 1. NASA GESDISC
 2. NASA MODAPS
 3. NASA OB.DAAC
 4. NASA PO.DAAC



Federated Giovanni Ecosystem





Federated Giovanni Adoption: Status

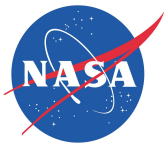
- Data in NASA GESDISC Giovanni from three (3) data centers
 1. NASA GESDISC
 2. NASA MODAPS
 3. NASA/USGS LP DAAC

- Giovanni instances in different stages of deployment at two (2) data centers
 1. NASA PO.DAAC
 2. NASA MODAPS



Things in the pipeline

- API for adding visualization
- Open sourcing of Giovanni



Acknowledgements

NASA GESDISC

Christopher Lynnes (PI), Steven Kempler, James Acker, Keith Bryant, Edward Seiler, Richard Strub, Christine Smit, Peisheng Zhao, Jake Davis

NASA MODAPS

Virginia Kalb, John Hord

NASA OB.DAAC

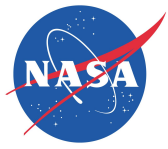
Sean Bailey, Robert Lossing

NASA JPL

Chris Mattman, Ross Laidlaw, Jessica Hausman

USGS LP DAAC

Cody Hendrix, Jason Werpy



Questions?

Thank You!

Search “NASA Giovanni”

Or

<http://giovanni.gsfc.nasa.gov>