



Welcome to Global Precipitation Measurement (GPM) Mission Applications Webinar Series

Webinar 2: Data Product Updates and Demonstration of Web-tools for Data Search, Analysis, Visualization, and Download



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NASA Applied Remote Sensing Training (ARSET)
<http://arset.gsfc.nasa.gov>



Webinar Objective

- This webinar series is designed to facilitate GPM precipitation data usage in environmental research, applications, and environmental decision support activities



Outline of the Webinar Series

1. Overview of GPM Mission, Data Products, and Data Access Tools **(12/8/2015)**
2. GPM Data Products Updates and Demonstration of Web-tools for Data Search, Analysis, Visualization, and Download **(3/15/2016)**
3. Demonstration of Case Studies of GPM Data Import and Analysis in GIS **(6/14/2016)**
4. Tutorial on Using Python Scripts for Reading GPM Data **(9/13/2016)**



Webinar-2 Agenda

- Brief Review of Webinar-1
 - GPM Mission
 - GPM Data Products

- GPM Products Updates

- Demonstration of Web-tools for GPM Data Search and Access:
 - Mirador
 - Giovanni
 - PPS-STORM

- Step-by-step Instruction to:**
 - Spatial and temporal Sub-setting of data
 - Data Visualization - Maps and Time Series
 - Data Formats and Download Options



Brief Review of Webinar-1

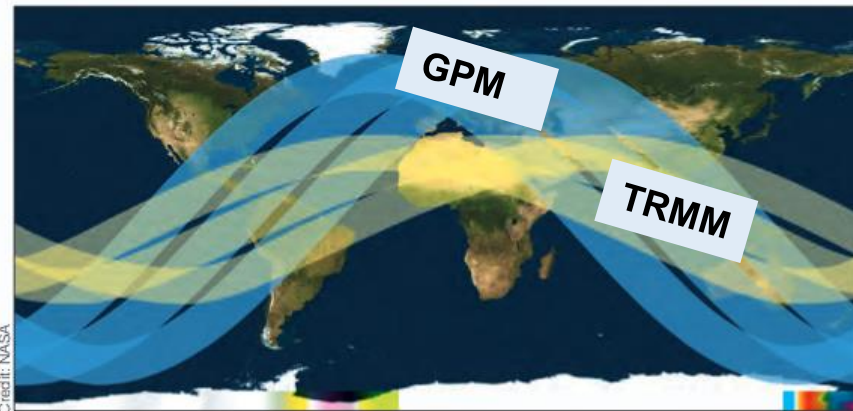
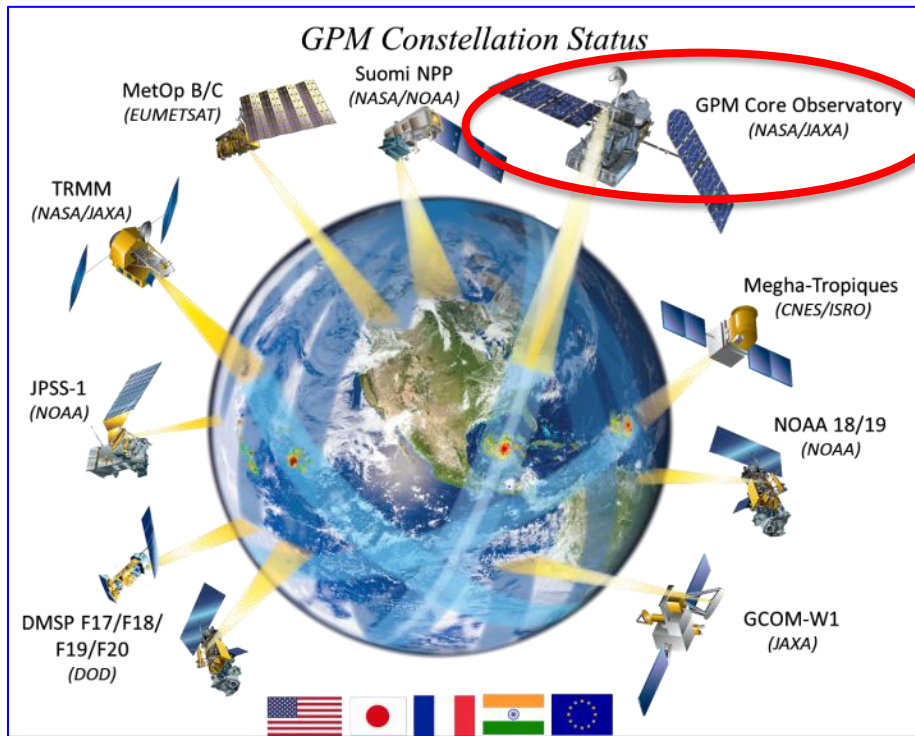
<http://pmm.nasa.gov/training>

Overview of GPM Mission, Data Products, and Data Access Tools (12/8/2015)

The screenshot shows the NASA GPM website interface. At the top, there are logos for NASA and GPM, and a search bar. The main navigation bar includes links for Home, GPM, TRMM, Science, Applications, Meetings, Data Access, Resources, and Education. The 'Data Access' sidebar on the left lists various resources like Data Downloads & Documentation, TRMM, GPM, Ground Validation, Data Sources, Data Recipes, Data News, Google Earth, NASA Worldview, Using the PPS FTP, Training, and Data FAQ. The main content area is titled 'Training' and features a section for 'Recent Training Sessions'. A red circle highlights the entry for 'Webinar 1 - December 8, 2015: Overview of Global Precipitation Measurement (GPM) Mission, Data Products and Data Access Tools'. The text below the title reads: 'Thank you for everyone who attended GPM Applications Webinar 1. For those who were unable to attend live, the recording can be viewed at <http://go.nasa.gov/1RFiwFQ> and you can download the presentation slides by clicking here. All the links and file downloads should be accessible during the replay, but if you have any trouble please contact us.' To the right of this section are buttons for 'Register for Upcoming Training Sessions', 'KEYWORDS' (with links for Data Access, training, ARSET, and webinars), and 'SHARE THIS ARTICLE' (with links for Google+ and Reddit). Below the main text is a section for 'Upcoming Training Sessions' with a list of goals and a footer for the webinar.

GPM Core satellite was launched on February 27th, 2014

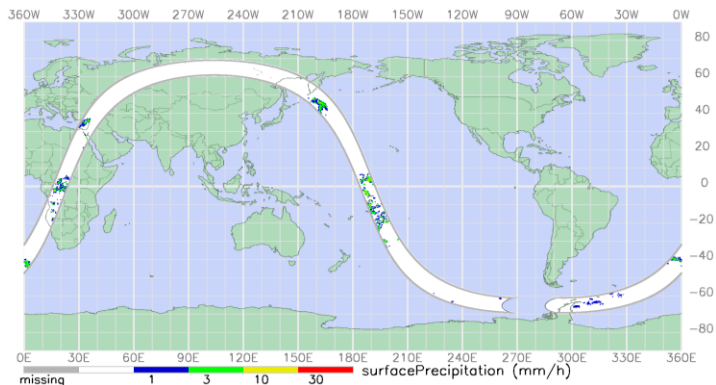
GPM Constellation Status



The area covered by three TRMM orbits [yellow] versus orbits of the GPM Core Observatory [blue]

GPM measurements span middle and high latitudes

GMI



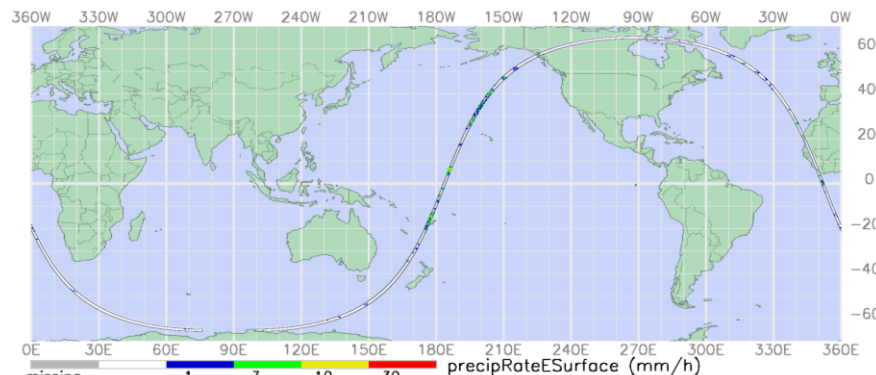
GMI Frequencies:
10.6, 18.7, 23.8, 36.5, 89, 166 & 183 GHz

Swath width 885 km

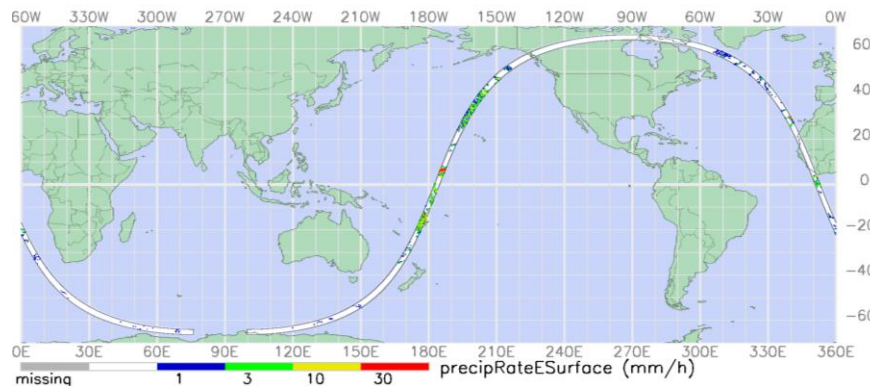
Resolution: 19.4km x 32.2km (10 GHz)
to 4.4km x 7.3km (183 GHz)

Higher spatial resolutions than TRMM TMI
High frequencies help measure snow

DPR



Ka 35.5 GHz, Swath Width 120 km, Resolution 5.2 km



Ku 13.6 GHz, Swath Width 245 km, Resolution 5.2 km



GPM Algorithms

<http://pps.gsfc.nasa.gov/atbd.html>

**Details of the algorithms can be found from the
Precipitation Processing System (PPS)**

GPM ATBD (Algorithm Theoretical Basis Documents)

[GPM/DPR Level-2 Algorithm Theoretical Basis Document](#)

[GPM GPROF \(Level 2\) Algorithm Theoretical Basis Document.](#)

[GPM Combined Radar-Radiometer Precipitation Algorithm Theoretical
Basis Document \(](#)

[US Integrated Multi-satellite Retrievals for GPM \(IMERG\)](#)



GPM Data Levels

Level 0 Raw Instrument Data



Level 1 Geolocated and Calibrated



Level 2 Geophysical Data Product
Derived from L1 Data



Level 3 Composites Of Level 2
Data Products

Level 1 and 2 Orbital Data
Highest spatial/temporal resolution

Precipitation Data
L-2 and L-3

Level 3 Gridded Data

Lower spatial/temporal resolution but
gridded and may be available at
multiple spatial/temporal resolutions



Summary of GPM Level-2 Precipitation Products

Sensor/Product Name	Spatial Resolution and Coverage	Temporal Resolution	Data Format
DPR Ku-only/ 2A-Ku DPR Ka-only/2A-Ka DPR KU & Ka/ 2A-DPR	5.2 km x125 m Single Orbit and 16 orbits per day (70°S-70°N)	20-120 minutes 24 hours	HDF5 and OPeNDAP
GMI/2A-GPROF	4 km x 4 km Orbital and 16 orbits per day (70°S- 70°N)	2 – 40 hours	
Combined GMI and DPR/2A-CMB	Orbital (70°S-70°N) 5 km x 5 km, Coincident Ku-Ka-GMI footprints	3 – 40 hours	

*In addition to surface rainfall rate in mm//hour, vertical precipitation profiles and latent heating are available in these data products



Summary of GPM Level-3 Precipitation Products




Sensor/Product Name	Spatial Resolution and Coverage	Temporal Resolution	Data Format
IMERG	0.1°x0.1° (90°S-90°N)	30-minutes(Near Real Time) with 6-hour latency, 16-hour latency and 3-months latency	HDF4, NetCDF, OPenDAP, ASCII GIF, PNG Images KML for Google Earth
3-CMB Combined GMI + DPR rainfall Averages	0.1°x0.1° (70°S-70°N)	Monthly	
3-DPR rainfall Averages	0.25°x0.25° 5.0°x5.0° (67°S-67°N) for Daily (70°S-70°N) for Monthly	Daily and Monthly Daily and Monthly	
3-GPROF GMI rainfall Averages	0.25°x0.25° (90°S-90°N)	Daily and Monthly	

*In addition to surface rainfall rate in mm//hour, vertical precipitation profiles and latent heating are available in these data products



Widely used GPM Data Products Based on the Users FTP Requests

- IMERG  For a variety of environmental applications
- 2AGPROF rainfall swath estimates for GMI and constellation radiometers
- 1C calibrated brightness temperature for GMI and constellation radiometers
- 2A DPR rainfall swath estimates



GPM Data Products Updates



Precipitation Measurement Mission (PMM)

The screenshot shows the PMM website interface. At the top, there is a navigation bar with tabs: Home, GPM, TRMM, Science, Applications, Meetings, Data Access, Resources, and Education. The 'Data Access' tab is highlighted with a red box. Below the navigation bar, there is a 'Data Access' sidebar menu on the left and a 'Data News' section in the center. A dropdown menu is open under 'Data Access', listing options: Data Downloads & Documentation, TRMM, GPM, Ground Validation, Data Sources, Data Recipes, and Data News. A blue arrow points to the 'Data News' option in the dropdown menu.

Home of all information about GPM/TRMM for:

- *Data Access and Updates*
- *Research and Applications*



Data Product Updates



Many Near-real Time GPM data products are now based on version-4 (V04) algorithms

[Level 1B GMI, Level 1C GMI, Level 1 Radar, Level 2 Radar, Level 2 Combined]

- V04 is the first version that uses GPM as the calibrator for the constellation measurements rather than TRMM.
- GMI is extremely well calibrated and the brightness temperatures in 1B and 1C are an important improvement over those in V03.
- V04 has improved retrievals in the Ku, Ka, and DPR level 2 products.
- GMI/DPR Combined product has also made retrieval improvements in V04.
- GPROF uses V03 – but will transition to V04 within a month or so.



IMERG Updates and Future Plans (1/3)

Multiple runs accommodate different user requirements for latency and accuracy

- “Early” – now 5 hours (flash flooding)
- “Late” – now 15 hours (crop forecasting)
- “Final” – 3 months (research data)

Native time intervals are half-hourly and monthly (Final only)

- value-added products at 3 hours; 1, 3, 7 days

0.1° global CED grid

- PPS and GES DISC provide subsetting by parameter and location
- initial release covers 60° N-S

	Half-hourly data file (Early, Late, Final)
1	<i>[multi-sat.] precipitationCal</i>
2	<i>[multi-sat.] precipitationUncal</i>
3	<i>[multi-sat. precip] randomError</i>
4	<i>[PMW] HQprecipitation</i>
5	<i>[PMW] HQprecipSource [identifier]</i>
6	<i>[PMW] HQobservationTime</i>
7	<i>IRprecipitation</i>
8	<i>IRkalmanFilterWeight</i>
9	<i>probabilityLiquidPrecipitation [phase]</i>
	Monthly data file (Final)
1	<i>[sat.-gauge] precipitation</i>
2	<i>[sat.-gauge precip] randomError</i>
3	<i>GaugeRelativeWeighting</i>
4	<i>probabilityLiquidPrecipitation [phase]</i>



IMERG Updates and Future Plans (2/3)

Multiple runs accommodate different user requirements for latency and accuracy

- “Early” – now 5 hours (flash flooding) → 4 hours
- “Late” – now 15 hours (crop forecasting) → 12 hours
- “Final” – 3 months (research data)

Native time intervals are half-hourly and monthly (Final only)

- value-added products at 3 hours, 1, 3, 7 days → precipitation phase in geo-TIFFs; additional support for shapefile-based area averaging

0.1° global CED grid

- PPS and GES DISC provide subsetting by parameter and location
- initial release covers 60° N-S → 90° N-S



IMERG Updates and Future Plans (3/3)

Current (Version 3) data record starts April 2014 (Final), March 2015 (Early), April 2015 (Late)

In June, Version 4 IMERG will be instituted

- “Initial Processing” with new data
- “Retrospective Processing” for recorded data during the GPM era (from April 2014)

In late 2017 or early 2018 Version 5 IMERG will be instituted

- covers the TRMM and GPM era (from January 1998, or at least February 2000)
- seeking to run an “Interim” reprocessing in Spring 2017 (using V.4)

TMPA, TMPA-RT continue to be run

- done to provide a consistent long record until IMERG covers the TRMM era
- shut down about 3 months after IMERG is extended
- could end early if key inputs are ended



GPM Data Access

<http://pmm.nasa.gov/data-access/data-sources#register>



Registering to Download Data (required)

In order to download data from the PPS FTPs you must first register your email address with the Precipitation Processing System, using this page:

<http://registration.pps.eosdis.nasa.gov/registration/>

Once you submit this form you will receive an email requesting you to verify your email address. Click the link in this email to complete the registration process. You will then receive a second email confirming your registration.

You can now log in to any of the PPS FTP servers (outlined below) using your email address as the username and password.

NOTE: Although direct links to the FTP are included on these pages, it is recommended to use a **dedicated FTP client** to access the PPS FTP. Certain web browsers are also able to browse the FTP, but some users have experienced errors with this method.



GPM Data Servers



<http://pmm.nasa.gov/data-access/>

FTP Servers

The Precipitation Processing System hosts several FTP servers to access the different types of TRMM and GPM data:

- **<ftp://arthurhou.pps.eosdis.nasa.gov>**: New server for Production (PROD) TRMM and GPM data.
 - **Click here for an outline of the directory structure for production GPM data.**
- **<ftp://jsimpson.pps.eosdis.nasa.gov>**: New server for Near-Realtime (NRT) TRMM and GPM data.
 - **Click here for an outline of the directory structure for realtime GPM data.**
- **<ftp://trmmopen.pps.eosdis.nasa.gov>**: Old server for "Production" TRMM data. Does not contain GPM data, but may be maintained to preserve access to the popular 3B42RT algorithm.
- **<ftp://pps.gsfc.nasa.gov>**: Old server for "Realtime" TRMM data. Will be decommissioned in the near future, pending full transfer of files.

Click here to learn the difference between "Production" and "Realtime" data sources.



GPM Near Real Time Data Access



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

Precipitation Processing System (PPS)

PPS Home | GPM Home | TRMM Home | GPM Instrumentation | Related Links | Contact Us

Welcome to the PPS (Precipitation Processing System) Public Website

The Precipitation Processing System (PPS) evolved from the Tropical Rainfall Measuring Mission (TRMM) Science Data and Information System (TSDIS). The purpose of the PPS is to process, analyze and archive data from the Global Precipitation (GPM) mission, partner satellites and the TRMM mission. The PPS also supports TRMM by providing validation TRMM ground radar sites. All GPM, TRMM and Partner public data products are available to the science community public from the TRMM/GPM FTP Data Archive. Please note that you need to [register](#) to be able to access this data. register with PPS at our registration portal: [PPS](#).

With this registration requirement is now mandatory per NASA policy and the new metric requirements. With us, you can use your registered Email address as both your user name and password to access our public data. Registered researchers can access our data archive here: [GPM Public Data Archive](#)

Users can find GPM near realtime data on our [jsimpson ftp area](#)

Users can also search for GPM, partner and TRMM data, order custom subsets and set up subscriptions using our [PPS Ordering Interface \(STORM\)](#)

Global Precipitation Measurement) and TRMM (Tropical Rainfall Measuring

updates

August 26, 2015: A new gridded text product that contains GPROF precipitation data from the GPM partner cross-track scanning radiometers (sounders) has been released. You can find the documentation for the [Summary Information for the GPM Constellation Crosstrack-Scanning Radiometers as Quarter-degree Gridded Test Product \(Here\)](#). These Products can be ordered through [STORM](#) or retrieved via [PPS's FTP archive](#) after completing a quick and mandatory registration process.

Navigation Menu:

- About PPS, GPM and TRMM
- Data
- Tools
- PPS/GPM Doc
- PPS/GPM ATB (Algorithm The Basis Document)
- PPS/TRMM Documentatio
- Other Documente
- Quick Links
 - > PMM (Precipitation Measurement)
 - > JAXA (Japan Aerospace Exploration Agency)
 - > GES-DISC (Global Earth Science Data Services Center)
 - > Colorado State University MEaSUREs Products
 - > Data Search, Custom Subsets and Subscriptions (STORM)

Dropdown Menu:

- GPM/TRMM and Partner Data Archive
- TRMM Realtime System
- TRMM Multi-Satellite Precipitation Analysis TMPA(3B42/43)
- TRMM Gridded Rain Text Products
- TRMM Fire Product
- GPM Trending Results
- TRMM Trending Results
- TRMM Composite Climatology (TCC)
- Registration Information for TRMM, GPM and Partner data products
- How to Get Access to GPM NRT Data



GPM Data Access

<http://pmm.nasa.gov/data-access/data-sources#register>

The screenshot shows the GPM Data Access website. The navigation bar includes Home, GPM, TRMM, Science, Applications, Meetings, Data Access, Resources, and Education. The main content area is titled 'Data Sources' and contains the following text: 'This section outlines the primary sources for downloading GPM and TRMM precipitation data from archive sites at Goddard Space Flight Center, including basic instructions for using each source.' Below this text is a list of data sources: FTP (PPS), STORM, Mirador, Giovanni TOVAS, OPeNDAP, FTP (GES DISC), GrADS Data Server (GDS), and GPM Ground Validation Data Portal. A red circle highlights this list, and a blue arrow points to 'FTP (PPS)'. Below the list is the heading 'Precipitation Processing System (PPS) FTP' and the URL 'http://pps.gsfc.nasa.gov'. On the right side, there are two sections: 'QUICK DATA LINKS' with links to TRMM Downloads, GPM Downloads, Precipitation Processing System (PPS) Home, GES DISC Home, and Giovanni TOVAS Data Viewer; and 'KEYWORDS' with links to data, GPM, TRMM, downloads, and PMM Science Team. On the left side, there is a 'Data Access' sidebar with links to Extreme Weather News, Data Downloads & Documentation (TRMM, GPM, Ground Validation), Data Sources, Data Recipes, Data News, Google Earth, and NASA Worldview. At the bottom left, there is a 'Connect With Us' section with links to Twitter and Facebook.



Demonstration of Selected GPM Data Access Tools



GPM Data Access

<http://pmm.nasa.gov/data-access/data-sources#register>

The screenshot shows the GPM Data Access website. The navigation bar includes Home, GPM, TRMM, Science, Applications, Meetings, Data Access, Resources, and Education. The left sidebar has a 'Data Access' menu with options like 'Data Downloads & Documentation', 'Data Sources', 'Data Recipes', 'Data News', 'Google Earth', and 'NASA Worldview'. The main content area is titled 'Data Sources' and contains a list of data sources: FTP (PPS), STORM, Mirador, Giovanni TOVAS, OPENDAP, FTP (GES DISC), and GrADS Data Server (GDS). A red box highlights 'STORM' and 'Mirador', and another red box highlights 'NASA Worldview' in the sidebar. A red arrow points from 'Data Sources' in the sidebar to the 'Data Sources' section. A yellow box highlights 'QUICK DATA LINKS' with links to TRMM Downloads, GPM Downloads, and Giovanni TOVAS Data Viewer. Another yellow box highlights 'KEYWORDS' with links for data, GPM, TRMM, downloads, and PMM Science Team.

GMI Data available from NASA Worldview (NRT and Archive)

<https://earthdata.nasa.gov/labs/worldview/>

FTP



GPM Data Access Using Selected Web-tools



Tools	Data Products and Formats	Analysis and/or Visualization	Data Download
<p>Mirador http://mirador.gsfc.nasa.gov</p>	<p>L1B, L2, and L3 GMI-GPROF IMERG Half-hourly, Monthly Orbital and Gridded Daily, Monthly HDF5, [Selected products in OPenDAP -- can be converted to ASCII, Binary, NetCDF]</p>	<p>N/A</p>	<p>Download by Select and Click on Data Files OR Batch Download of Multiple Files</p>
<p>Giovanni http://giovanni.gsfc.nasa.gov/giovanni/</p>	<p>IMERG Half-hourly, Monthly NetCDF, GeoTIFF, PNG</p>	<p>Visualization: Map, Time Series, Scatter Plot Histogram Analysis: Time-averaged Maps, Time Series, Scatter Plot, Map Correlations, Vertical Profiles, Time-averaged Differences</p>	<p>Download by Select and Click on Data Files</p>
<p>PPS/STORM https://storm.pps.eosdis.nasa.gov/storm</p>	<p>L1B and 1C, L2, L3 GMI, DPR, GMI-DPR Combined Data, Orbital and Gridded Daily, Monthly IMERG Half-hourly, Monthly HDF5, PNG</p>	<p>Map Visualization, Interactive Latitude/Longitude Point Data Value Display</p>	<p>FTP</p>



Mirador: Data Search and Access



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

Mirador is useful for searching data and downloading multiple data files

GPM L1, L2, and L3 Data are available from Mirador

Data Latency of ~days/month for some products

Live Demonstration



Giovanni

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

Giovanni is:

- 1) useful for downloading IMERG data (early, late, and final products) in multiple formats
- 2) very convenient for data analysis and visualization

Live Demonstration



Precipitation Processing System (PPS) Science Team On-Line Request Module (STORM)



<https://storm-pps.gsfc.nasa.gov/storm/>

Live Demonstration

STORM:

- 1) dedicated to access and visualization of GPM and TRMM data
- 2) Level-2 (orbital) and Level-3 (gridded) data easily accessible
- 3) THOR can be used to view HDF files

For data-related questions contact:
helpdesk@pps-mail.nascom.nasa.gov



Summary

GPM data access demonstrations via Mirador, Giovanni, and PPS were presented

Next Webinar

Demonstration of Case Studies of GPM Data Import and Analysis in GIS

(6/14/2016)



Thank You!