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

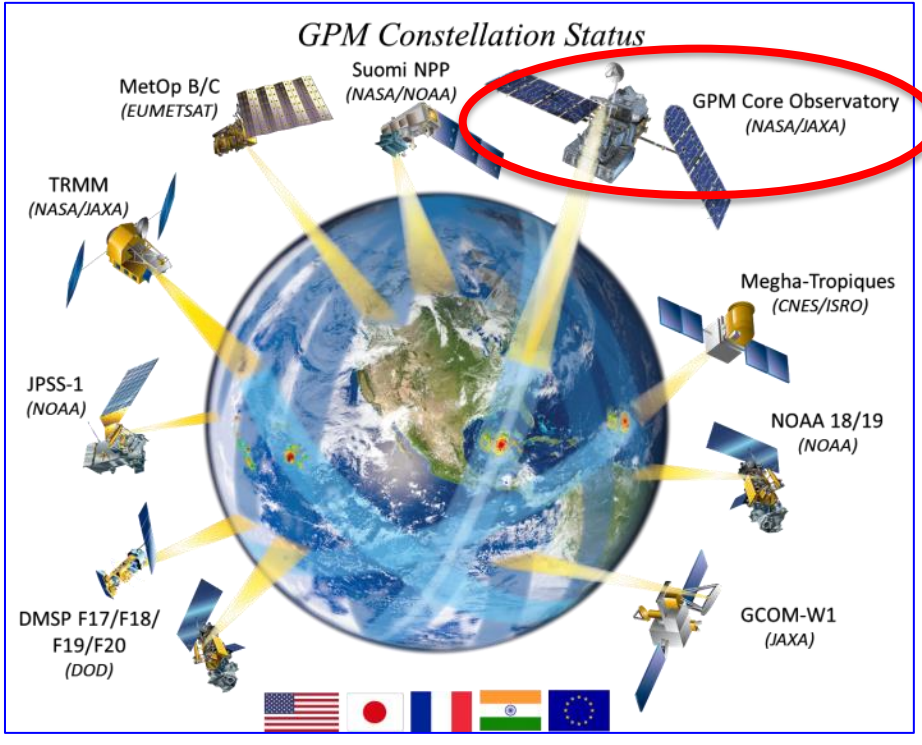
http://pmm.nasa.gov/training

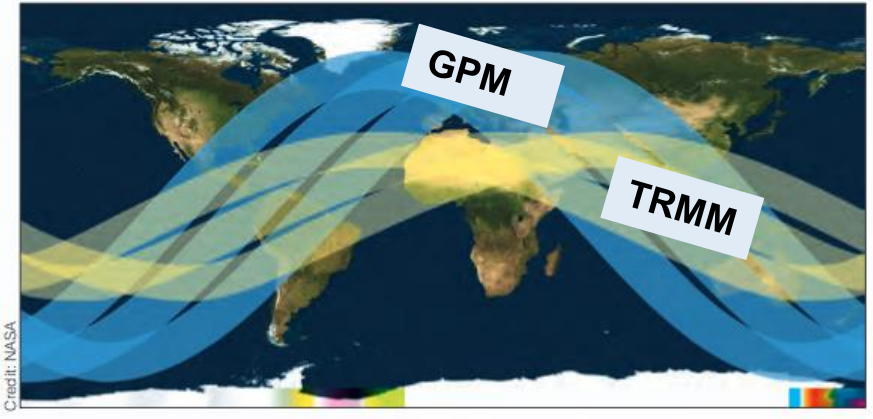
Overview of GPM Mission, Data Products, and Data Access Tools **(12/8/2015)**

GPM Core and Constellation Satellites

http://pmm.nasa.gov/GPM

GPM Core satellite was launched on February 27th, 2014



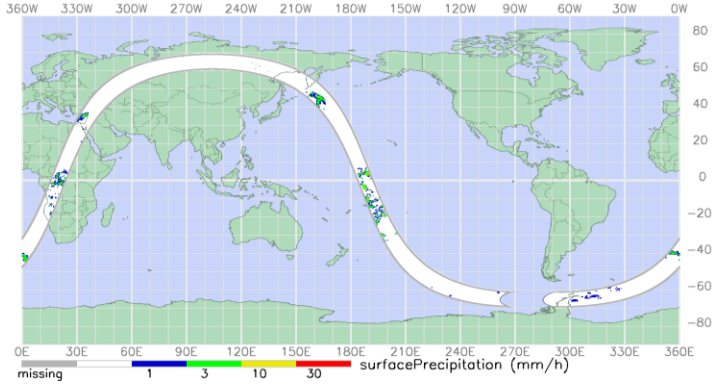


The area covered by three TRMM orbits [yellow] versus orbits of the GPM Core Observatory [blue]

GPM measurements span middle and high latitudes

GPM Sensors

GMI



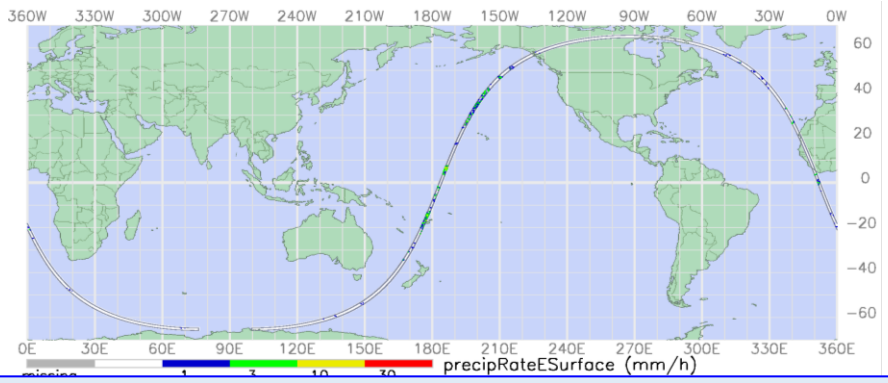
GMI Frequencies:
10.6,18.7,23.8,36.5,89,166 & 183 GHz

Swath width 885 km

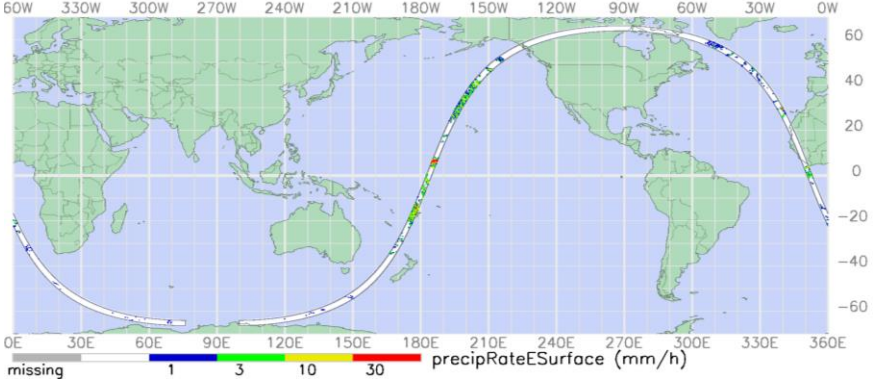
Resolution: 19.4km x 32.2km (10 GHz)
to 4.4km x 7.3km (183 GHz)

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	

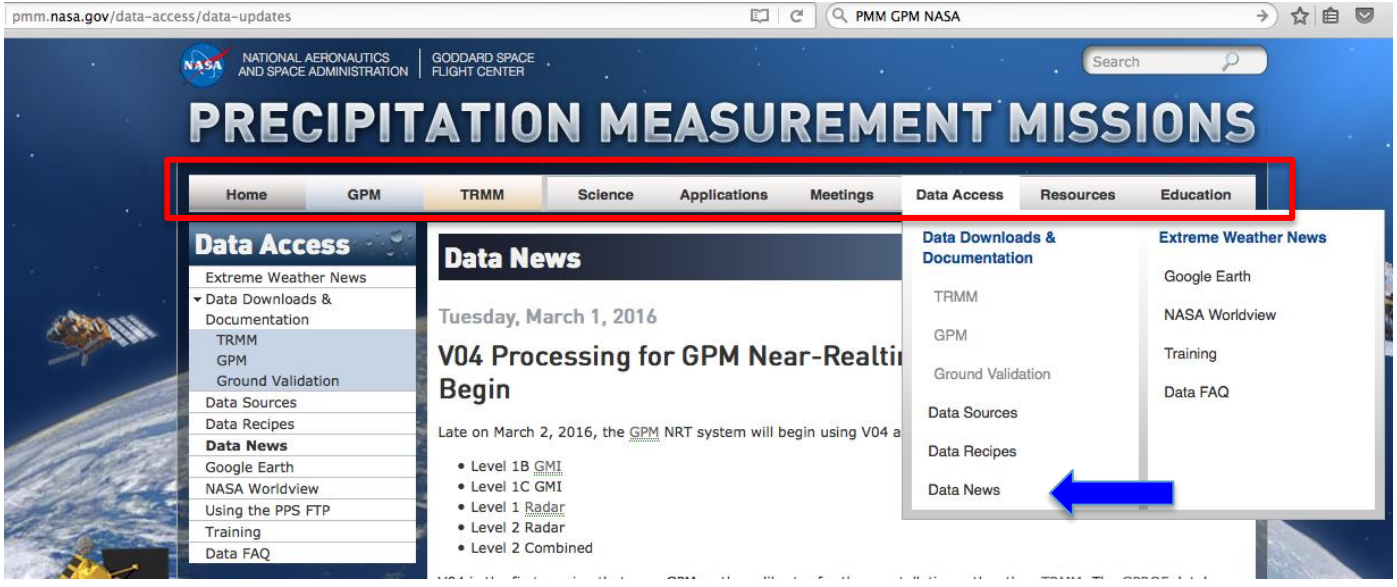
*In addition to surface rainfall rate in mm//hour, vertical precipitation profiles and latent heating are available in these data products

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)



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	*[multi-sat.] precipitationCal*
2	[multi-sat.] precipitationUncal
3	*[multi-sat. precip] randomError*
4	[PMW] HQprecipitation
5	[PMW] HQprecipSource [identifier]
6	[PMW] HQobservationTime
7	IRprecipitation
8	IRkalmanFilterWeight
9	*probabilityLiquidPrecipitation [phase]*
	Monthly data file (Final)
1	*[sat.-gauge] precipitation*
2	*[sat.-gauge precip] randomError*
3	GaugeRelativeWeighting
4	*probabilityLiquidPrecipitation [phase]*

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

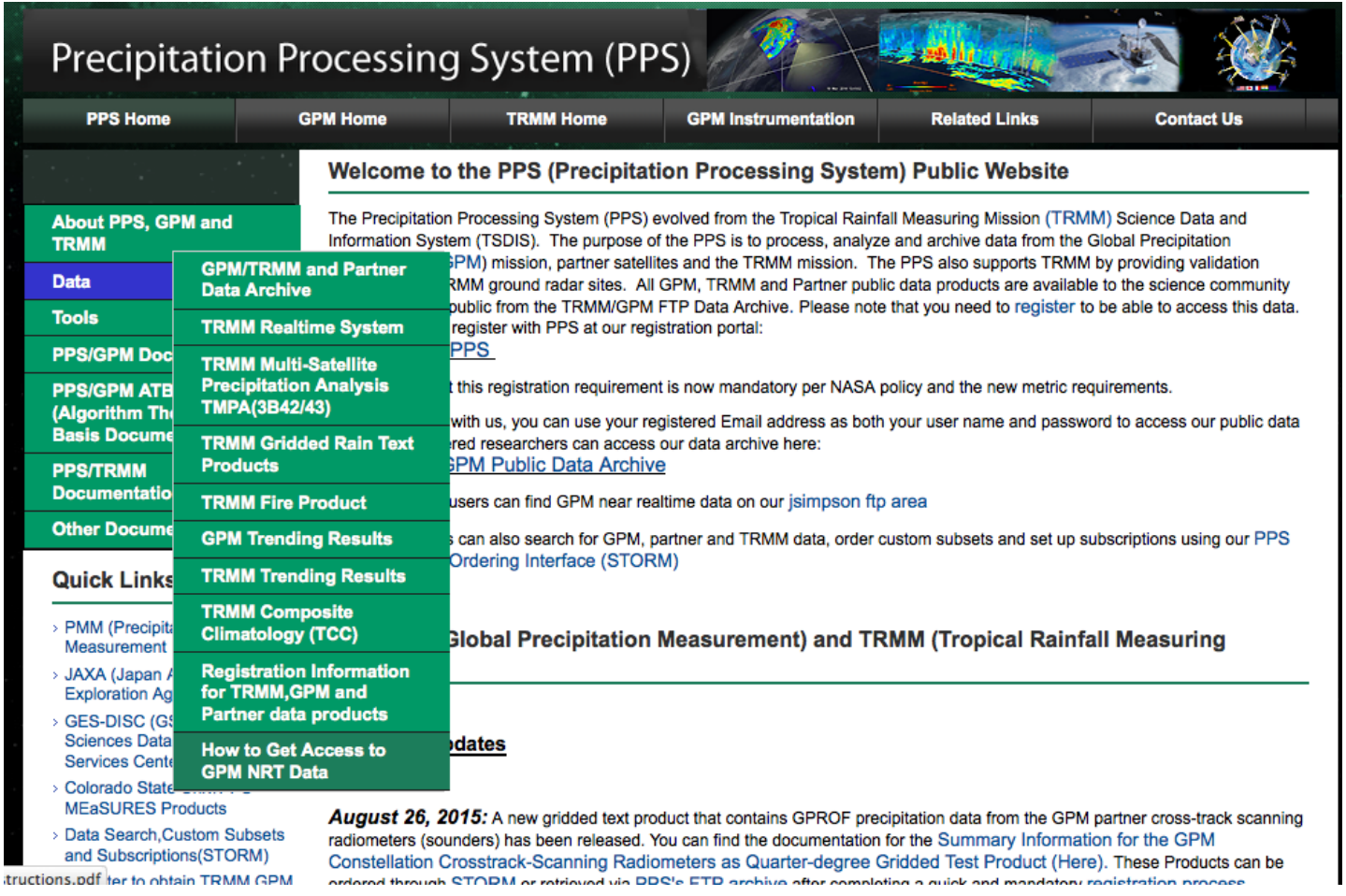
The Precipitation Processing System hosts several FTP servers to access the different types of TRMM and GPM data:

- **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/



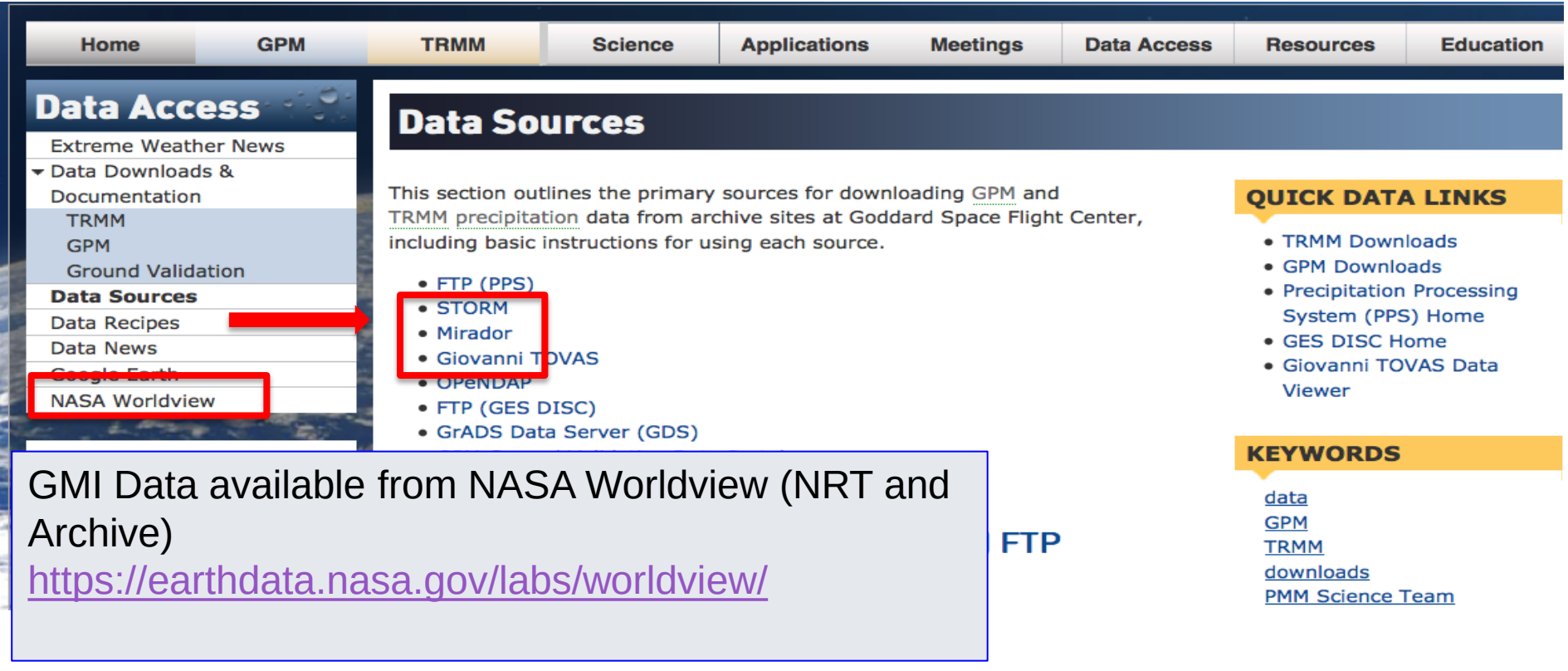
GPM Data Access

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

Demonstration of Selected GPM Data Access Tools

GPM Data Access

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



GMI Data available from NASA Worldview (NRT and Archive)
https://earthdata.nasa.gov/labs/worldview/

GPM Data Access Using Selected Web-tools

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

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!

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