# **NASA Precipitation and Other Earth Science Data**

# George J. Huffman NASA/GSFC





Tropical Rainfall Measuring Mission (TRMM) – first weather radar in space; 1998-2015

Global Precipitation Measurement (GPM) mission – higher latitudes, improved instruments, constellation; launched 2014



### **GPM CORE OBSERVATORY**

GPM Core Observatory

<u>DPR (Ku & Ka band)</u> <u>GMI (10-183 GHz)</u> 65° inclination 407 km altitude 5 km best resolution Rain 0.2–110 mm/hr & snow

Joint with Japan

### **GPM CONSTELLATION CONCEPT**



### **GETTING GPM DATA**

Data access pages (should) give all GSFC instances of data sets

 start with "Get Data" button on <u>http://pmm.nasa.gov</u>



### Example access page (IMERG)

- General notice at top
- algorithm description
- links to documentation
- summaries and <u>DownLoad</u> links for various formats/runs
- scroll down for other Level 3 data
- click other Level tabs for 1 and 2

#### URGENT UPDATE

#### Saturday, May 23, 2015

#### Large Gap in Near-Realtime Data

Starting at 08:38 <u>UTC PPS</u> stopped getting data from the <u>GPM</u> Mission Operations Center. Data was resumed 17:21 UTC. However, new GPS data was sent before older GPS data. The science data was sent out of order the GPS data. This meant that about 125 mins of 1B and 1C <u>GMI</u> data had no geolocation and perhaps more this had questionable geolocation. The same issues obviously also affected the <u>radar</u> and combined NRT whic are just missing for the period between 8:30 UTC and 17:30 UTC.

All of these issues impacted the early version of the IMERG data. The late product will also be affected when i latency reaches the affected period without combined data.

You should use GPM data from the affected period with caution.

Level 3 Level 2

Level 1

Geophysical parameters that have been spatially and/or temporally resampled from Level 1 or Level 2 data.

IMERG: Rainfall estimates combining data from all passive-microwave instruments in the GPM Constellation

This algorithm is intended to intercalibrate, merge, and interpolate "all" satellite microwave precipitation estimates, together with microwave-calibrated infrared (IR) satellite estimates, precipitation gauge analyses, and potentially other precipitation estimators at fine time and space scales for the TRMM and GPM eras over the entire globe. The system is run several times for each observation time, first giving a quick estimate and successively providing better estimates as more data arrive. The final step uses monthly gauge data to create research-level products.

#### **Documentation:**

- IMERG Technical Documentation
- IMERG Algorithm Theoretical Basis Document (ATBD)
- IMERG Day 1 Early Run Release Notes
- IMERG Day 1 Final Run Release Notes
- IMERG Day 1 Late Run Release Notes
- Transitioning from TMPA (3B42x) to IMERG

Resolution	🛛 Regions - Dates 🖗	Latency Ø	Format Ø	Source @	DL 😯
0.1° - 30 minute	Gridded, 90°N-90°S, March 2014 to present	6 hours (NRT / early run)	HDF5	NRT: FTP (PPS)*	0
			GIS TIFF + Wordfile	NRT: FTP (PPS)*	0
0.1° - 30	Gridded,	18 hours	HDF5	NRT: FTP	0

# **GETTING GPM DATA – A Few More Details**

# Systems that provide GPM data

- ftp://jsimpson.pps.eosdis.nasa.gov NRT
- *ftp://arthurhou.pps.eosdis.nasa.gov* production
- https://storm.pps.eosdis.nasa.gov production (order)
- http://mirador.gsfc.nasa.gov production (order)
- http://giovanni.gsfc.nasa.gov production (interactive)

# Latency

- Near-Real Time is within hours
- production is (at least) a few days
- IMERG has successive Runs
  - Early 6 hr (goal is 4) ... forward morphing
  - Late 16 hr (goal is 12) ... forward and backward morphing
  - Final 3 months ... forward/backward morphing, better input, precip gauges

# More about IMERG

- training: <u>http://arset.gsfc.nasa.gov/disasters/webinars/global-precipitation</u>
- recipes
- FAQ
- contact the developer



system requires free, automatic registration http://registration.pps.eosdis.nasa.gov

### **GPM APPLICATIONS: FLOOD AND LANDSLIDE MODELING**

A major landslide in Malin, India, caused 150 fatalities. GPM observed heavy monsoon rains before, during, and after the landslide

http://trmm.gsfc.nasa.gov/ publications\_dir/ potential\_flood\_hydro.html



Peak in streamflow observed downstream from landslide following the event.



Adler/Wu (U. of Maryland), *flood.umd.edu* 



### THE REST OF THE NASA EARTH SCIENCE DATA

Partial list of topics

- aerosols
- clouds
- land imagery
- soil moisture
- surface temperature
- surface wind (ocean-only)
- temperature and humidity soundings
- trace gases

Land, Atmosphere Near real-time Capability for EOS (LANCE) https://earthdata.nasa.gov/earth-observation-data/near-real-time

Goddard Earth Science Data and Information Services Center (GES DISC) http://mirador.gsfc.nasa.gov/

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

### AND NASA HAS SOME LONG-TERM MODELING EFFORTS

NASA Land Data Assimilation System (NLDAS), Global Land Data Assimilation System (GLDAS)

- <u>http://disc.gsfc.nasa.gov/hydrology</u>
- 3-hourly and monthly; 1.0° and 0.25° global grids
- support for several national and international hydrometeorological investigations and water resources applications

Goddard Earth Observing System Model, Version 5 (GEOS-5)

- <u>http://gmao.gsfc.nasa.gov/products/</u>
- real-time and archived forecasts (recent 6 months) and Data Assimilations
- hourly (2-D) and 3-hourly (3-D); 0.3125° x 0.25° lon./lat. at 72 levels
- field campaigns, instrument and science teams, other projects

Modern-Era Retrospective analysis for Research and Applications (MERRA)

- <u>http://gmao.gsfc.nasa.gov/products/</u>
- global reanalysis products, 1979-(delayed) present
- hourly (2-D, some 3-D); 2/3° x ½° lon./lat. native at 72 levels; some fields at coarser resolution
- oriented toward climate analysis applications

### FINAL LINKS:

- george.j.huffman@nasa.gov
- Twitter: NASA\_Rain
- Facebook: NASA.Rain
- http://pmm.nasa.gov

Various data animations at http://svs.gsfc.nasa.gov/

- past week of near-realtime IMERG
- <u>http://svs.gsfc.nasa.gov/</u> <u>cgi-bin/details.cgi?aid=</u> <u>4285</u>

<switch to animation>

