



GPM Applications Science and Outreach: Activities, Updates and Future Plans



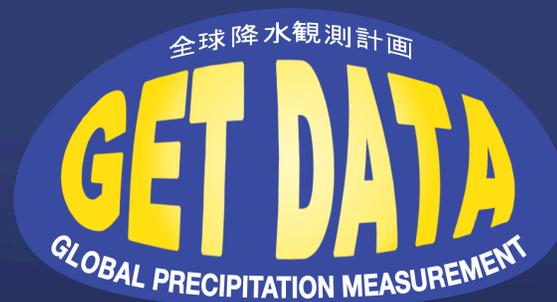
Dalia Kirschbaum

*GPM Associate Deputy
Project Scientist for
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Twitter: [NASA_Rain](#)

Facebook: [NASA.Rain](#)



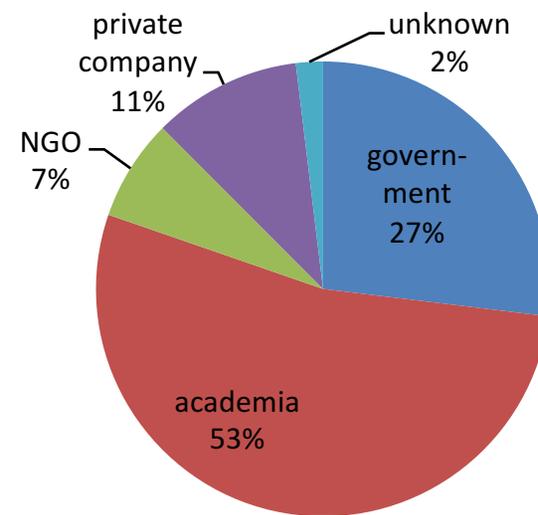
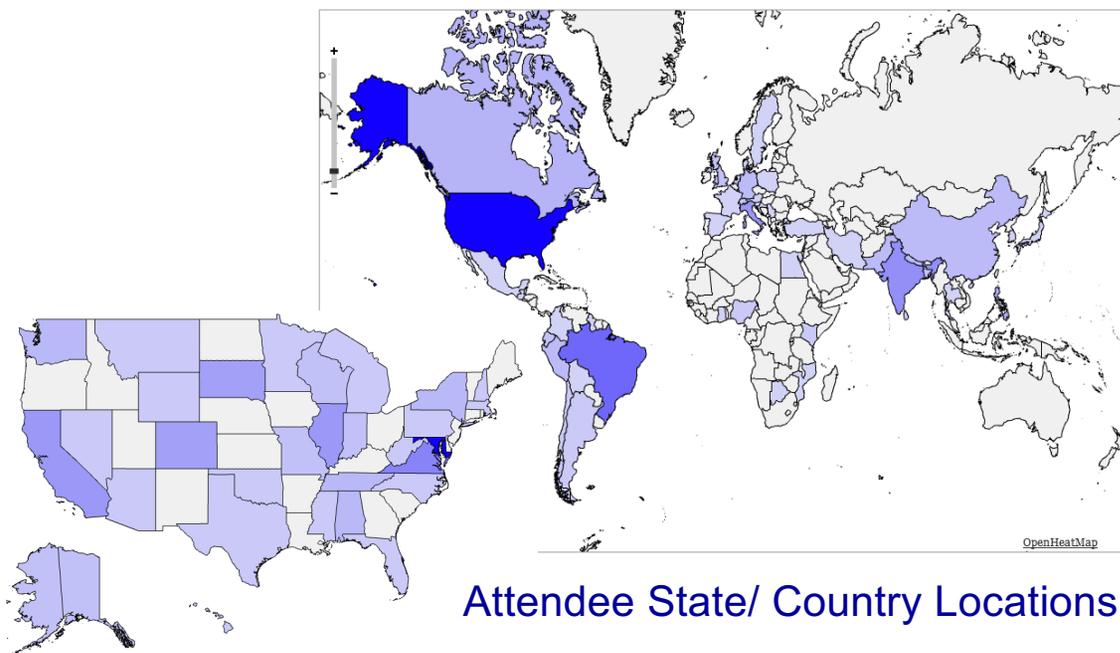


Applications Objectives and Accomplishments



- Engage end users in data access, processing, etc.
 - 4 webinar training sessions (2015-16) introducing GPM data
- Increase awareness of GPM and TRMM applications
 - BAMS paper (*accepted Oct. 2016*)
 - One pagers and short videos outlining GPM applications examples: floods, public health, agriculture, and tropical cyclone forecasting
 - Highlight slides provided to NASA HQ management
- Improve access and visualization of core GPM products for rapid ingestion and analysis
 - New visualization and data access capabilities
 - Updated Data Access Portal: <https://pmm.nasa.gov/data-access>

- Quarterly webinars (2 per day) from Dec. 2015 to Sept. 2016. Webinars were recorded available at: <https://pmm.nasa.gov/training>
- Topics included GPM mission updates, data products, demonstrations of how to find, download and use GPM data in various formats (e.g. ArcGIS)
- **329 participants** (213 distinct individuals) attended
- Participants represented **30 U.S. states** and **41 non-U.S. countries**.
- Recordings of the webinars have been accessed 631 times.



Attendee Institution Categories



GPM Data Training plans: 2017



GLOBAL PRECIPITATION MEASUREMENT

Dates	Training plan	Mechanism
Jan/Feb 2017	GPM products updates , Hands-on exercise for attendees to access GPM Level-3 (IMERG V4) data in their watersheds/river basins/regions using open source software (python, QGIS)	Webinar
May/June 2017	Hands-on Exercise for attendees to access GPM Level-2 data and constellation data by using open source software and GPM validation updates	Webinar
Aug/Sept 2017	Applications theme-based webinar with specific end-user organization(s) (Related to water resources management, disasters, agriculture, health)	Webinar (possible series)

In-person Trainings (Dates TBD): One to two hands-on training, each for 4-8 hours focusing on end-users needs and regions

Potential Stakeholders: The World Bank, the USAID, The American Water Resources Association (AWRA), Federal Emergency Management Agency (FEMA), US Department of Agriculture, US Water Partnership, US Department of Agriculture Extension Services, US Army Corp of Engineers, California Department of Water Resources, National Drought Monitoring Center among others.



[Home](#) > [BAMS](#) > [Early Online Releases](#) >

NASA's Remotely-sensed Precipitation: A Reservoir for Applications Users

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NASA's Remotely-sensed Precipitation: A Reservoir for Applications Users

[Dalia B. Kirschbaum](#)¹, [George J. Huffman](#)¹, [Robert F. Adler](#)², [Scott Braun](#)¹, [Kevin Garrett](#)^{3,4}, [Erin Jones](#)^{3,4}, [Amy McNally](#)^{1,2}, [Gail Skofronick-Jackson](#)¹, [Erich Stocker](#)¹, [Huan Wu](#)², and [Benjamin F. Zaitchik](#)⁵

¹ NASA Goddard Space Flight Center, Greenbelt, Maryland

² Earth System Science Interdisciplinary Center, University of Maryland, College Park, Maryland

³ Riverside Technology, inc., College Park, Maryland

⁴ NOAA/NESDIS Center for Satellite Applications and Research, College Park, Maryland

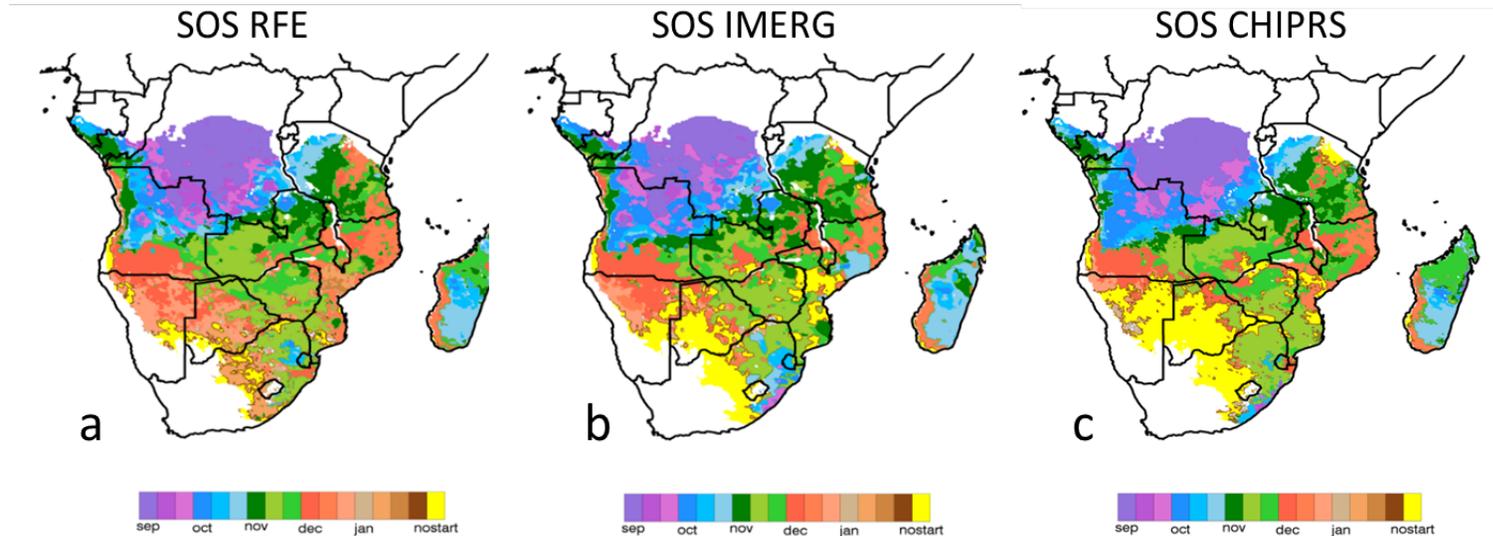
⁵ Johns Hopkins University, Baltimore, Maryland

DOI: <http://dx.doi.org/10.1175/BAMS-D-15-00296.1>

Published Online: 13 October 2016

- GPM data products
- 4 Case Studies (Tropical Cyclones, Flooding, Agriculture, Disease tracking)
- Discussion of community needs
 - I. Long Data Record
 - II. Clear labeling and quality control fields
 - III. Improved Data access, latency and visualization

Precipitation Estimates for Remote Agricultural Drought Monitoring

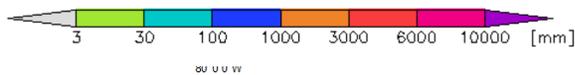
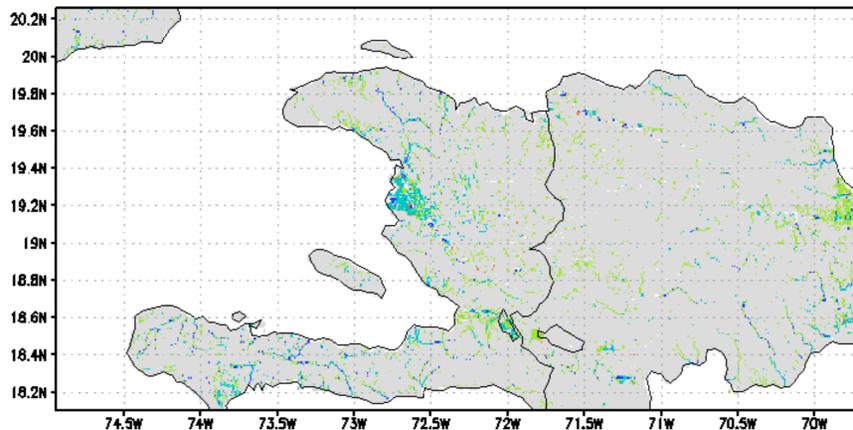


Start-of-season (SOS) for the 2015-16 Southern Africa growing season, computed with three different satellite derived rainfall estimates
Contribution from McNally et al.

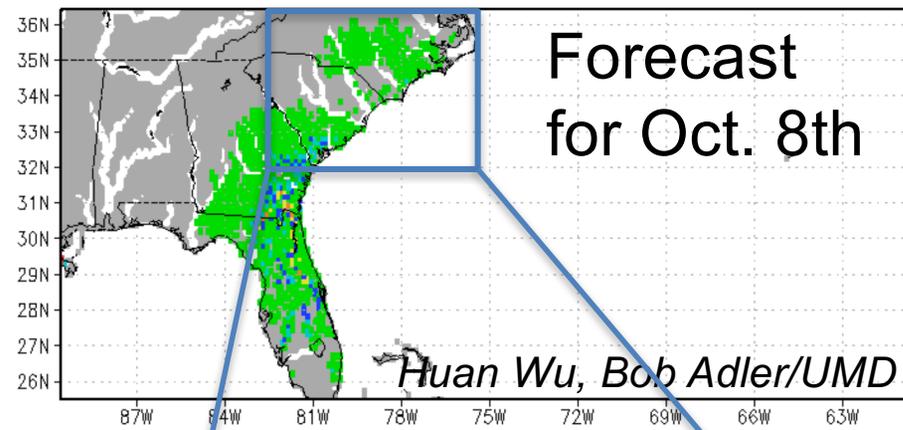
“While the IMERG product’s spatial resolution, temporal latency and, for this example, agreement with the CHIRPS shows great promise, its utility for **FEWS NET** will be better assessed when a longer time series is available.”

Flood Modeling and Forecasting for Hurricane Matthew

Oct. 5th Inundation map 1km res. [mm]
00Z05Oct2016

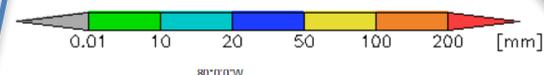


Flood Detection/Intensity (depth above threshold [mm])
15Z08Oct2016

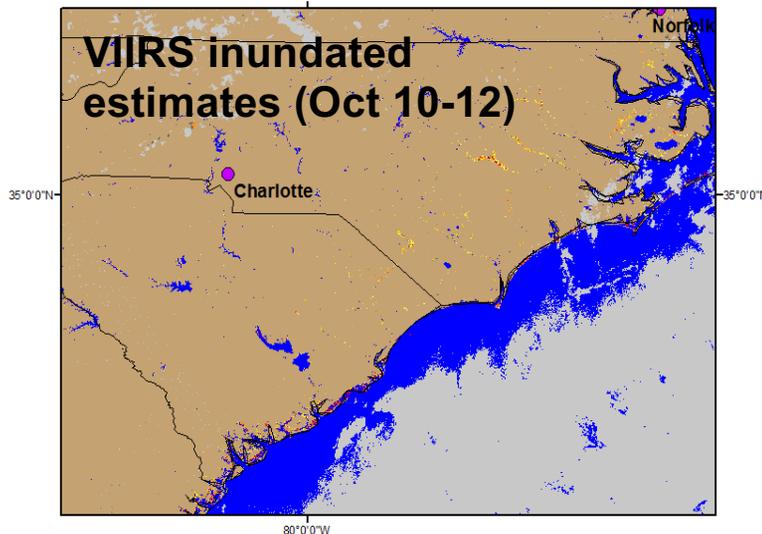


Forecast
for Oct. 8th

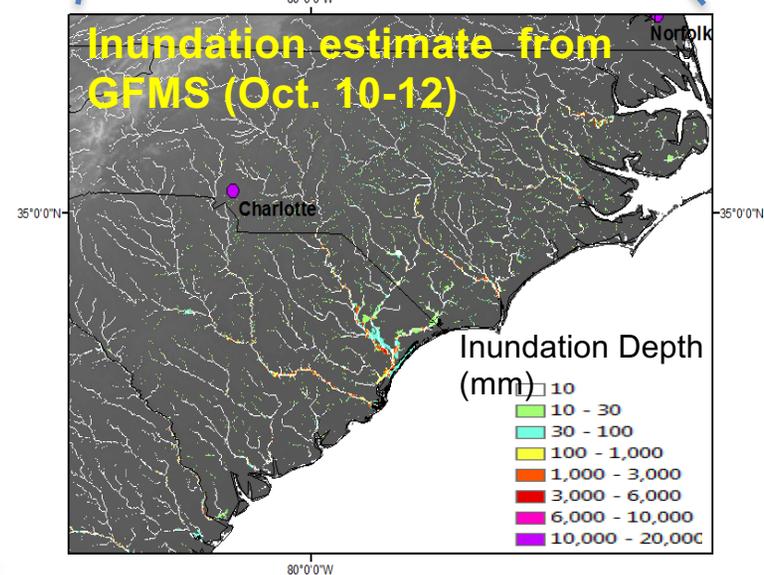
Huan Wu, Bob Adler/UMD



VIIRS inundated estimates (Oct 10-12)



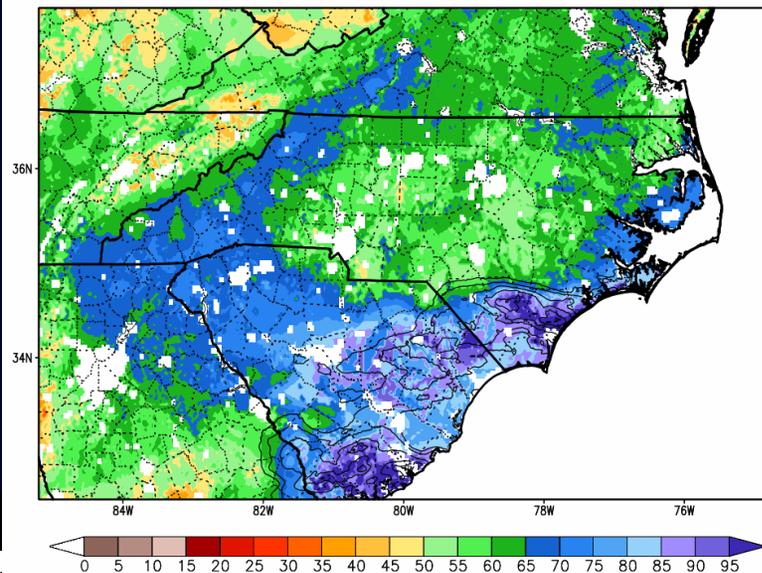
Inundation estimate from GFMS (Oct. 10-12)



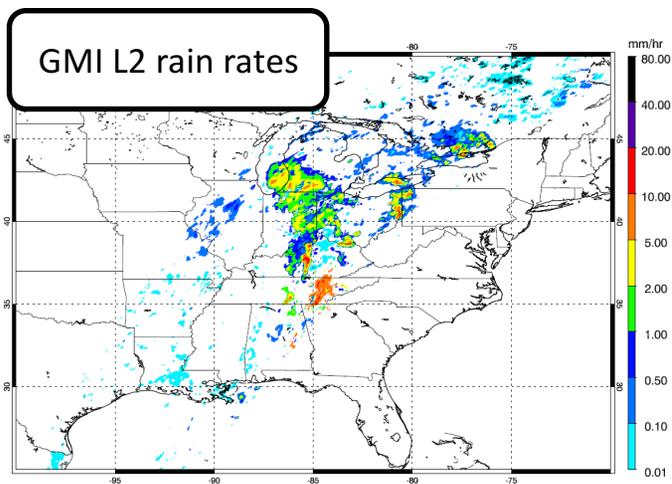
Samei Li, Donglian Sun/GMU



0-10 cm Relative Soil Moisture (available water; %) valid 00z 05 Oct 2015
Precipitation in previous hour (1,2,5,10,15,20,25 mm contours)



Examples of Daily NASA Products Provided to FEMA via the U.S Hazard Data Distribution System for Disaster Response.



Assimilation of GPM Products into WRF GSI.
Leverage SPORT connections with JCSDA to **transition techniques to operational NWP groups**

NASA Land Information System run operationally at MSFC using NOAA Stage IV precipitation and other forcing inputs to produce analyses and short term forecasts of soil moisture and other parameters. **GPM and SMAP data are being integrated.**

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

- Links to all major GPM and TRMM data resources – **if you're not sure where to go, start here.**
- Official data usage policy
- Frequently asked questions
- Latest data news and updates

PRECIPITATION MEASUREMENT MISSIONS

Home GPM TRMM Science Applications Meetings Data Access Resources Education

Data Access

- Extreme Weather News
- Data Downloads & Documentation
 - TRMM
 - GPM
 - Ground Validation
- Data Sources
- Data Recipes
- Data News
- Google Earth
- NASA Worldview
- Using the PPS FTP
- Training
- Data FAQ

Connect With Us

- Twitter
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- Youtube

Need Help?

- View Frequently Asked Questions
- View the PMM Glossary
- Contact Us

How to Access TRMM & GPM Precipitation Data

Precipitation data from the GPM and TRMM missions is made available free to the public in a variety of formats from several sources at NASA Goddard Space Flight Center. This section outlines the different types of data available, the levels of processing, the sources to download the data, and some helpful tips for utilizing precipitation data in your research.

- GPM Data Downloads & Documentation
- TRMM Data Downloads & Documentation
- Explanation of GPM & TRMM Data Sources
- Data Processing "Recipes"
- Precipitation Data in Google Earth
- Frequency Asked Questions (FAQ)

Questions? Read the Data FAQ

If you still have questions after reading the FAQ, then you may contact us and we will do our best to assist you.

TRMM & GPM Data Policy

TRMM and GPM data are freely available at all levels for which the particular sensor or sensor combination has been processed by GPM. For the GPM Core Observatory this is for Levels 0 through 3 products (as applicable). For the partner satellites in the GPM constellation this is Levels 1c through 3 (as applicable).

QUICK DATA LINKS

- TRMM Downloads
- GPM Downloads
- Precipitation Processing System (PPS) Home
- GES DISC Home
- Giovanni TOVAS Data Viewer
- Satellite Overpass Ground Coincidence Tool

DATA NEWS

Tuesday, September 27, 2016



<https://pmm.nasa.gov/data-access/downloads/gpm>

- Dataset description, documents, resolution, regions / dates, latency, format, source, and download link
- PPS downloads require free registration before access: <https://registration.pps.eosdis.nasa.gov>

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GPM Data Downloads

* Use of the PPS FTP and STORM requires you to first register your email address. [Click here to register.](#)

Level 3 Level 2 Level 1

Derived geophysical parameters at the same resolution and location as those of the Level 1 data.

2B-CMB: Combined GMI + DPR single orbit rainfall estimates

The GPM Combined Radar-Radiometer Algorithm performs two basic functions: first, it provides, in principle, the most accurate, high resolution estimates of surface rainfall rate and precipitation vertical distributions that can be achieved from a spaceborne platform, and it is therefore valuable for applications where information regarding instantaneous storm structure are vital. Second, a global, representative collection of combined algorithm estimates will yield a single common reference dataset that can be used to "cross-calibrate" rain rate estimates from all of the passive microwave radiometers in the GPM constellation. The cross-calibration of radiometer estimates is crucial for developing a consistent, high time-resolution precipitation record for climate science and prediction model validation applications.

Documentation:

- GPM Combined Radar-Radiometer Precipitation Algorithm Theoretical Basis Document
- CMB Level 2 Caveats

Resolution	Region - Dates	Latency	Format	Source	DL
5km	orbital, Past 2 weeks (NRT)	3 hours (RT); 40 hours (Prod)	HDF5	NRT: FTP (PPS)*	↓
			HDF5	Prod: FTP (PPS)*	↓
			HDF5	Prod: STORM	↓
			HDF5	Mirador	↓
			OPeNDAP	OPeNDAP	
			HDF5	Prod: FTP (GES DISC)	

2A-Ku: DPR Ku-only single orbit rainfall estimates

2A-Ka: DPR Ka-only single orbit rainfall estimates

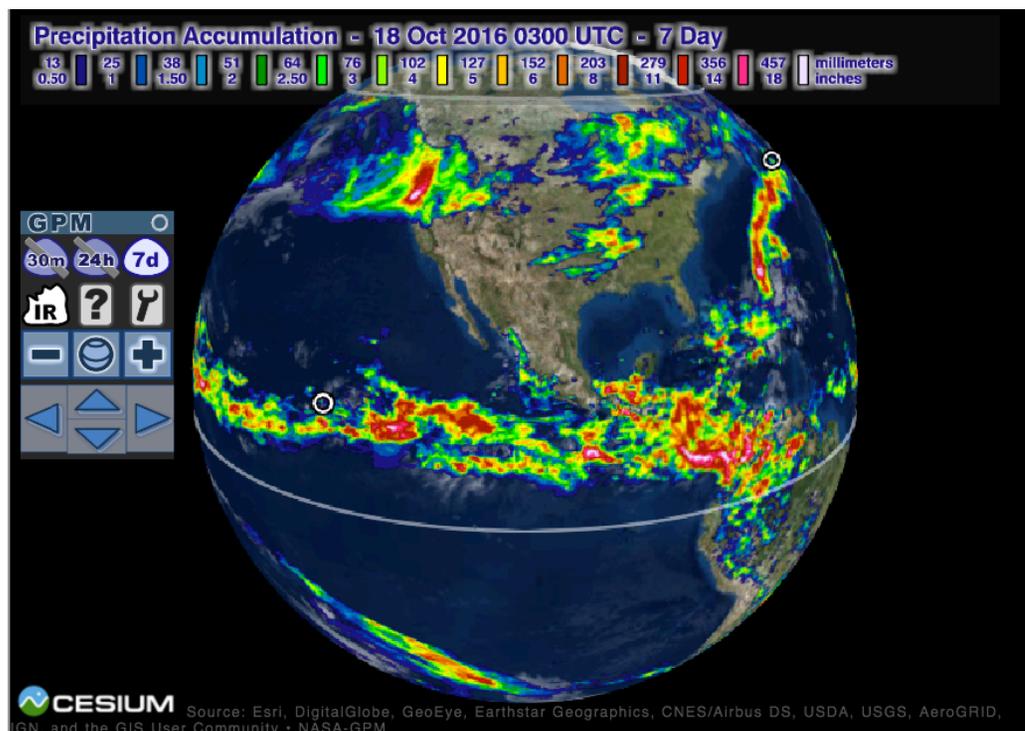
2A-DPR: DPR Ka&Ku single orbit rainfall estimates

2A-GPROF-constellation: Single-orbit rainfall estimates from each passive-microwave instrument in the GPM constellation

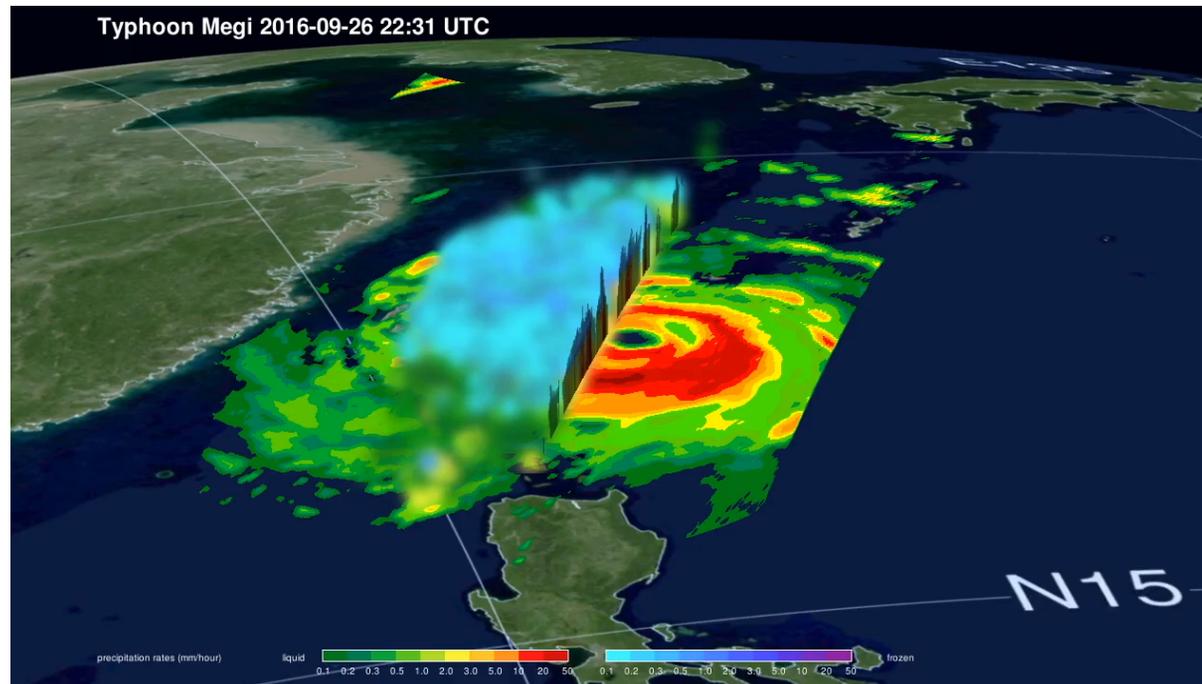
2A-GPROF-GMI: GMI single-orbit rainfall estimates

TRMM data downloads: <https://pmm.nasa.gov/data-access/downloads/trmm>

<https://pmm.nasa.gov/data-access/global-viewer>



- Displays the latest IMERG 30 minute, 1 day, and 7 day datasets on an interactive 3D globe in your web browser.
- Includes IR overlays and state / country labels.
- Uses Cesium.js, replaces our previous Google Earth KML viewer.
- Developed by Owen Kelley and Matt Lammers at the Precipitation Processing System.



- In-house tool for rapidly generating production-quality 3D visualizations of Level 2 GPM overpass data (GMI GPROF, DPR Ku-band)
- Generates stills and animations (3 styles) with labels and annotations. Supports arbitrary DPR cross-sections.
- Built on Visit (<https://wci.llnl.gov/codes/visit/>) and 3Delight
- **Contact us for more information on using this tool:**
<https://pmm.nasa.gov/contact>

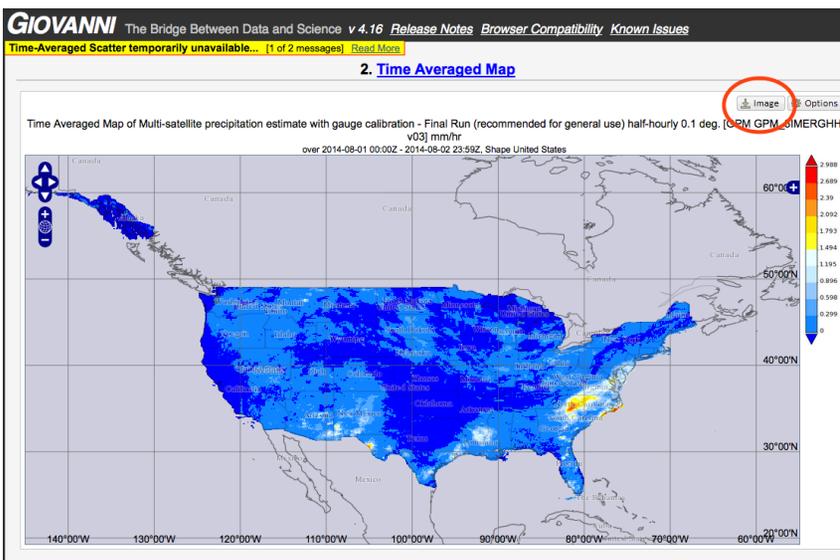
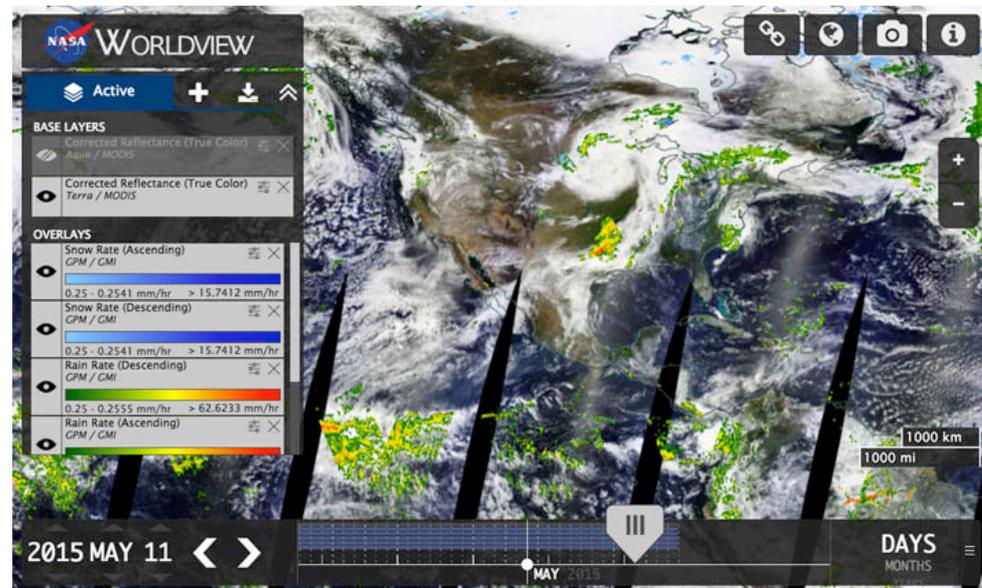
Coming Soon!

- Displays recent GPM and associated datasets in vector format on an interactive in-browser map (Mapbox.js)
- Supports regional sub-setting (for quicker download)
- **Supported datasets:**
 - IMERG 30mn, 3hr, 1day, 7day
 - GFMS Floods Nowcast (Bob Adler, Huan Wu)
 - Global Landslide Nowcast Model (Dalia Kirschbaum)
- Export file formats: geoJSON, topoJSON, arcJSON, TIF, SHP
- Publisher / consumer architecture – use the API to automate data collection or write your own consumer UI.

- Beta test at: <http://ojo-bot.herokuapp.com/openserach/classic>

NASA Worldview

- <https://worldview.earthdata.nasa.gov/>
- Interactive map for viewing multiple Earth Science datasets across time.
- View GPM data by clicking “Add Layer” -> Search for “GPM”



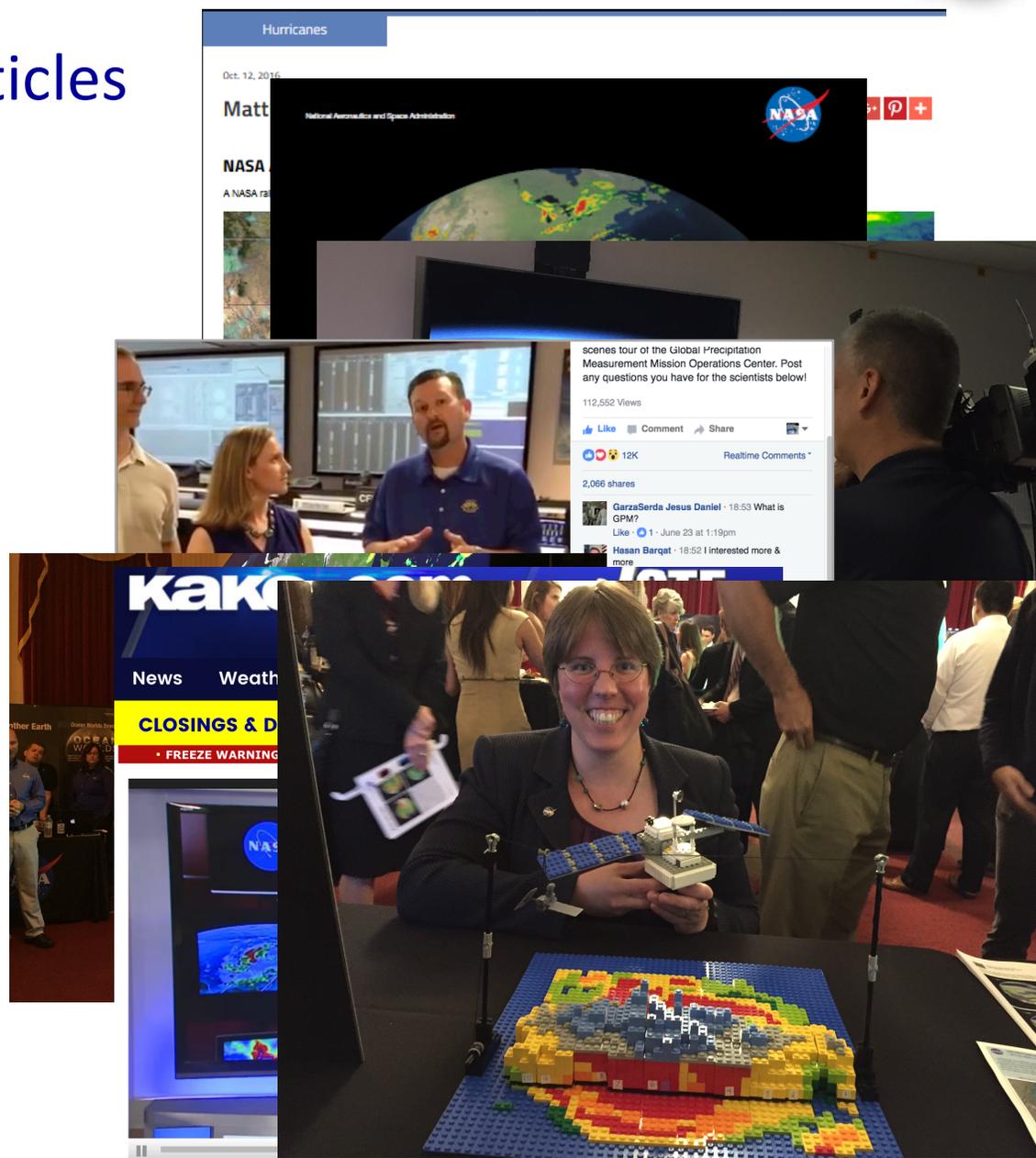
GES DISC Giovanni

- <http://giovanni.sci.gsfc.nasa.gov/>
- Tool for viewing and analysis of multiple Earth science datasets.
- View GPM data by searching for “IMERG” or “GPM”
- Time averaged maps, animations, time series, accumulations and more.



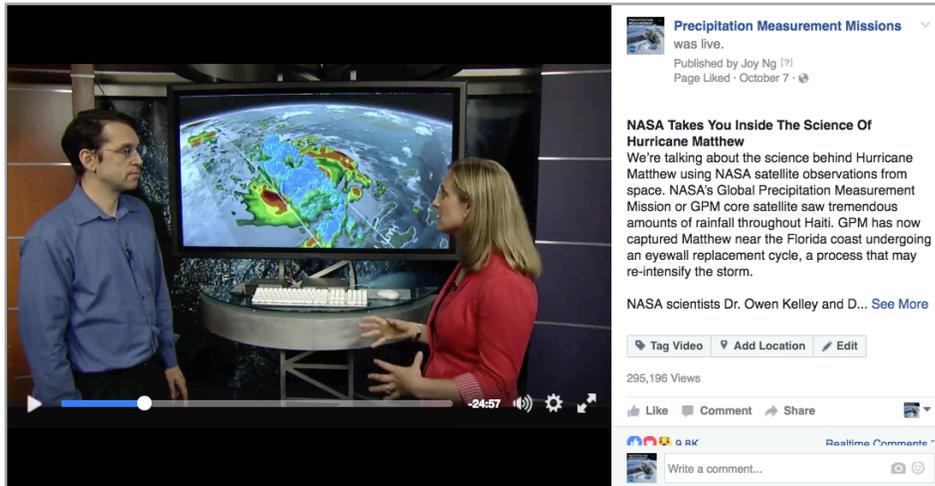
- **Jacob Reed** – GPM Webmaster, Social Media Lead, visualizer, graphic designer
- **Dorian Janney & Kristen Weaver** – education/outreach specialists
- **Ryan Fitzgibbons & Joy Ng** – GPM Lead Producer
- **Aries Keck** – NASA social media lead
- **Science Visualization Studio** – Develop science visualization products
- **Animation Studio** – Develop science animations
- **Office of Communications** – Feature articles, media interviews, Live Shots (Patrick Lynch, Rani Gran)
- **Hyperwall Staff** – Ports and runs GPM Content on Hyperwall
- **And you!**

- NASA Feature Articles
- Print materials
- Media Interviews
- Facebook Live
- Hyperwall talks
- Live Shots
- School Visits
- Tables at events
- Social Media



6/23/16 Tour of GPM MissionOps

- <https://www.facebook.com/NASA.Rain/videos/1128607627202016/>
- Total Views: **112,552**
- Peak Live Viewers: **5,447**
- Likes: **20,962**
- Comments: **4,460**
- Shares: **2,163**



10/7/16 Inside Hurricane Matthew

- <https://www.facebook.com/NASA.Rain/videos/1214008668661911/>
- Total Views: **295,195**
- Peak Live Viewers: **8,660**
- Likes: **7,746K**
- Comments: **3,285**
- Shares: **2,326**

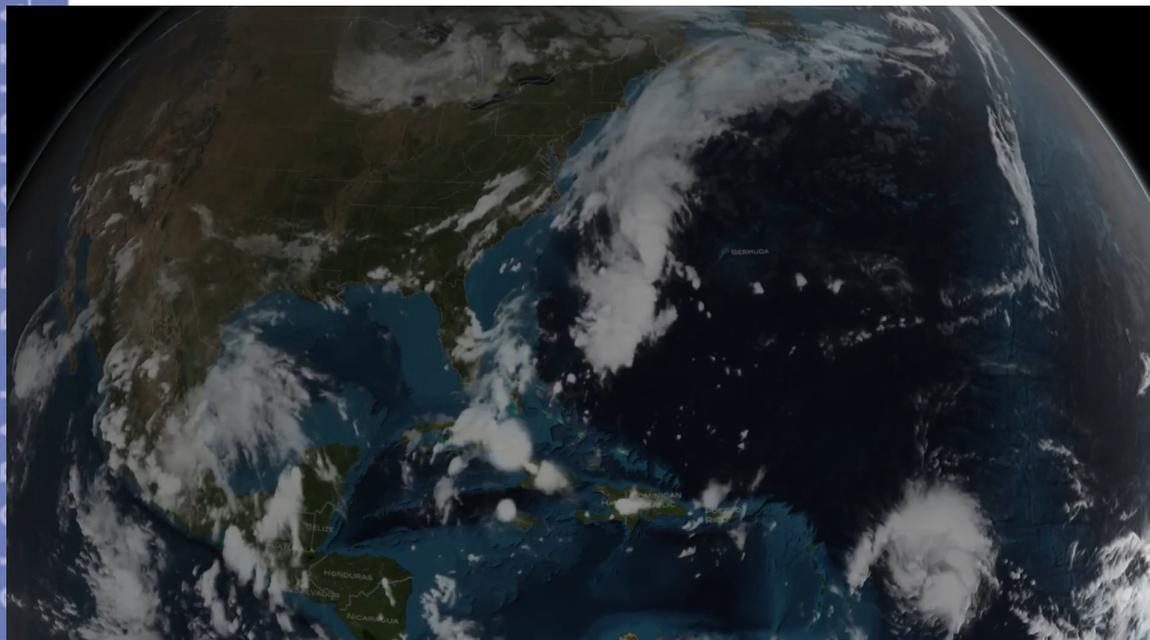
Facebook

Total Followers: **49,202**
 Past Year: **23,902**

Twitter

Total Followers: **17,513**
 Past Year: **2,921**

- GSFC conducted 48 Media Interviews, including Live Shots, In Person interviews, Print, Radio and Skype calls on Oct. 6th and 7th on how GPM and other missions observed Hurricane Matthew
- A 30 minute Facebook Live event Oct. 7th had over 8.6k concurrent views during the event and over 280k views, 2.2k shares
- Visualizations showing [GPM observations](#) of Hurricane Matthew were shared with media outlets across the country



<https://pmm.nasa.gov/education/>

Precipitation Education

Home
Current Activities
GPM Originals
Glossary & FAQ
GPM Mission

Water Cycle

The continuous movement of water on, above and below Earth's surface.

Weather & Climate

The atmospheric conditions that lead to our daily weather and global climate.

Technology

The spacecraft, instruments and people that study Earth systems.

Societal Applications

How studying our planet's rain and snowfall makes the world a better place.

Why Measure Rain and Snow?

Rain, snow, and other forms of precipitation affect every part of life on Earth. Rain falls on the crops we eat, fills the reservoirs of water we drink, and is an integral part of everyday weather and long term climate trends. This website, presented by NASA's Global Precipitation Measurement (GPM) mission, provides students and educators with resources to learn about Earth's water cycle, weather and climate, and the technology and societal applications of studying them.

[New to the site? Click here for a quick video tour.](#)

The GPM Core Observatory successfully launched on February 27th, 2014, [learn more.](#)

Global Precipitation Measurement

GPM is an International satellite mission that uses multiple satellites orbiting Earth to collect rain, snow and other precipitation data worldwide every three hours. On February 27th, 2014, NASA and the Japan Aerospace Exploration Agency (JAXA) launched a Core Observatory satellite carrying advanced instruments that improve our precipitation-measuring capabilities and bring all the data from the partner satellites into a unified global dataset.

- [Learn More about GPM](#)
- [See our Current Activities](#)
- [Water Cycle Basics](#)
- [Frequently Asked Questions](#)

[Advanced Search](#)

Browse Type		Browse Audience	
Video	Article	Formal	K-5
Image	Website	Informal	6-8
Interactive	Lesson Plan	Outreach	9-12

Featured Resources

Raindrop Tales: GPM Meets Mizu-Chan

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Facebook: **NASA.Rain**

<https://www.facebook.com/NASA.Rain>



Send Us Content and Ideas!

<https://pmm.nasa.gov/contact>

jacob.reed@nasa.gov

Check out and use GPM Visualizations!

<http://svs.gsfc.nasa.gov/Gallery/GPM.html>

Applications Working Group

Tuesday, Oct. 25 at lunch, anyone welcome!





GPM Social Media Accounts



GLOBAL PRECIPITATION MEASUREMENT



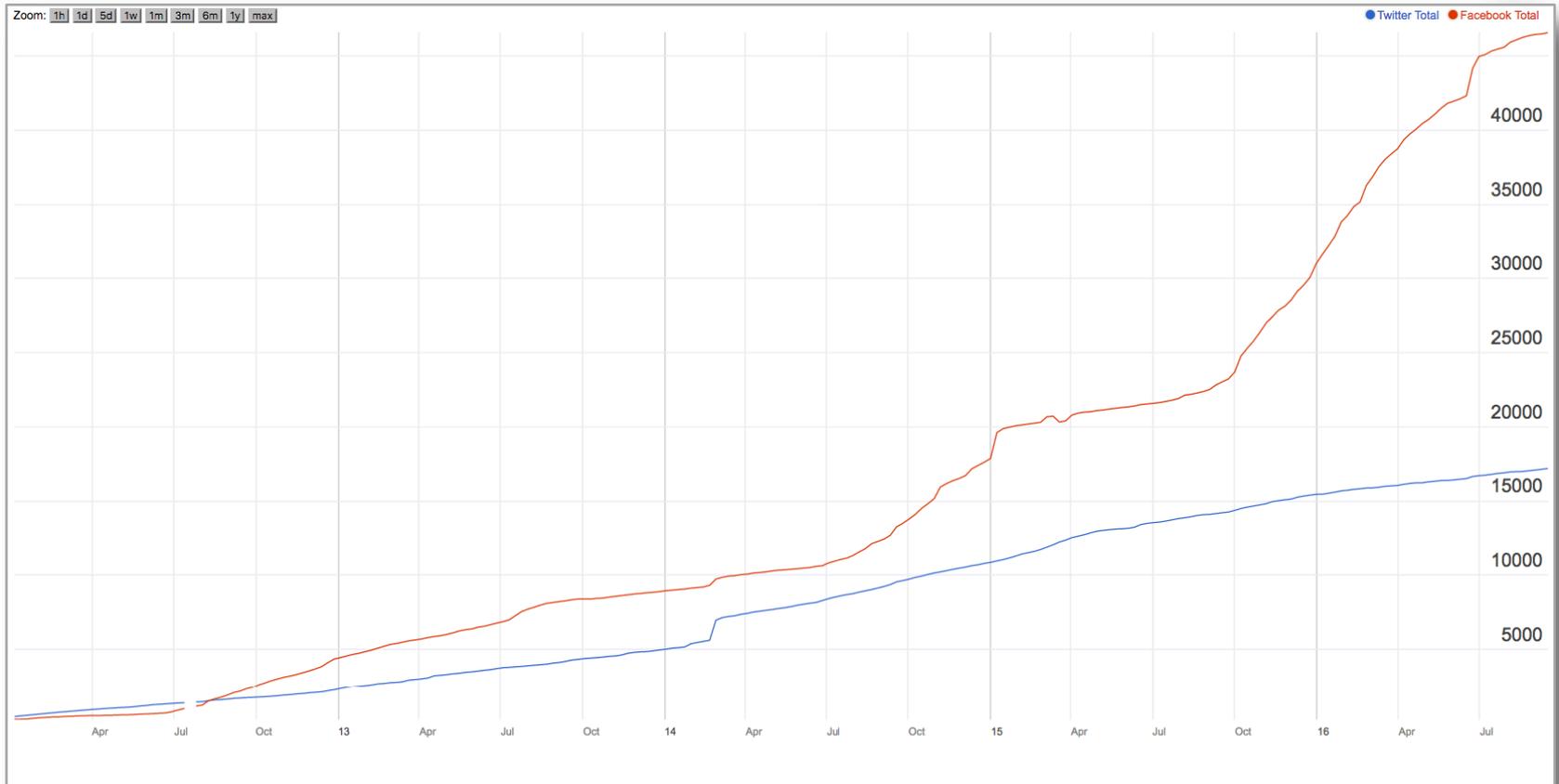
Twitter: **NASA_Rain**

https://www.twitter.com/NASA_Rain



Facebook: **NASA.Rain**

<https://www.facebook.com/NASA.Rain>



Followers Over Time (Jan 2012 – Oct 2016)

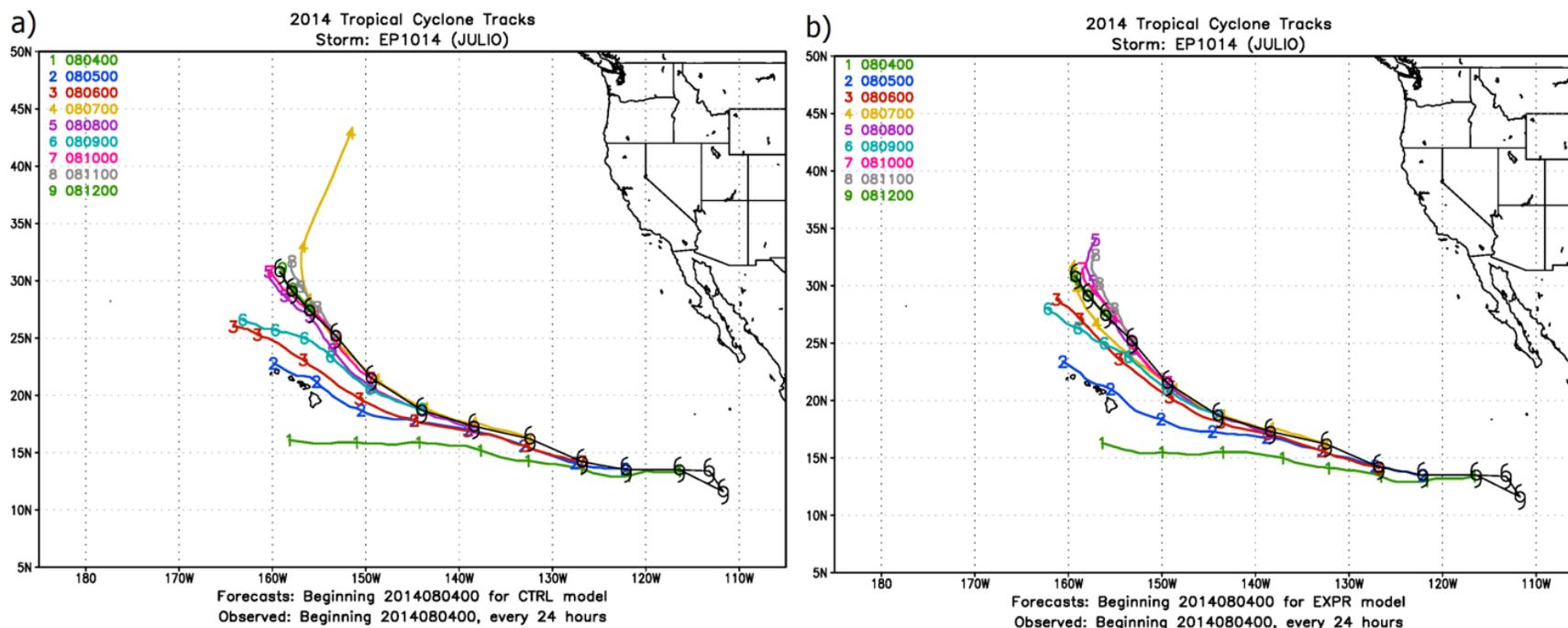
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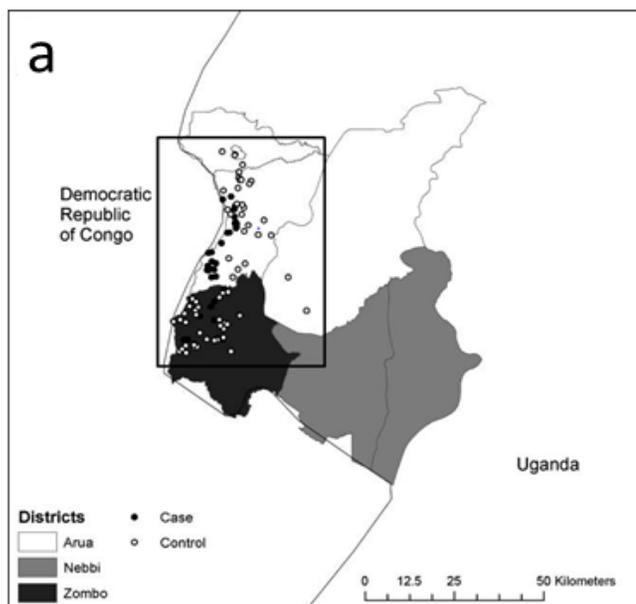
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GMI impact study for hurricane track prediction

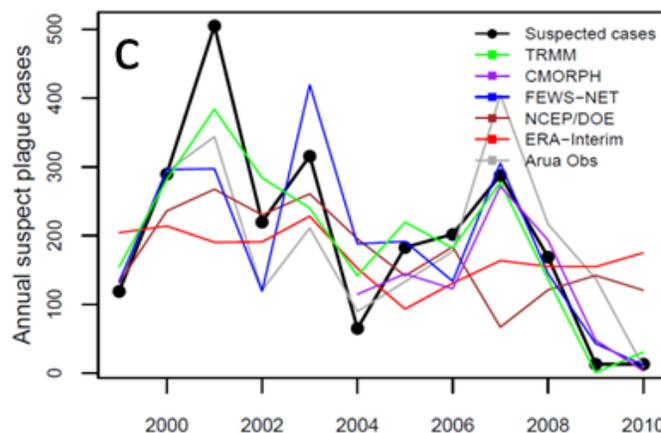
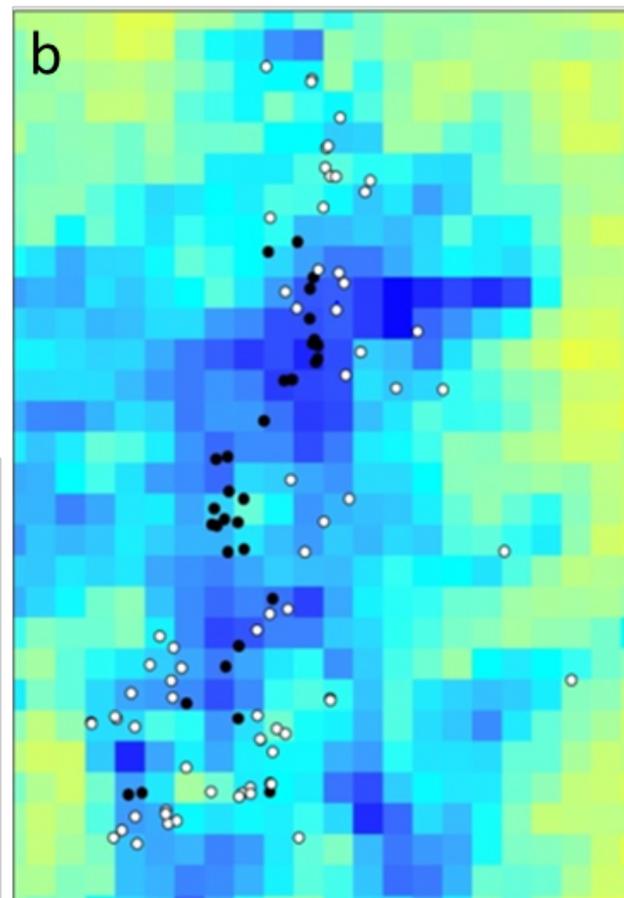
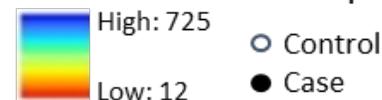


Julio track forecasts Aug. 4 – 12, 2014 with (a) and CNTL (b) experiments with GMI assimilation show. A positive impact from the assimilation of GMI observations on the track forecast can be observed for this case

Plague Outbreaks and Monthly Precipitation in Uganda

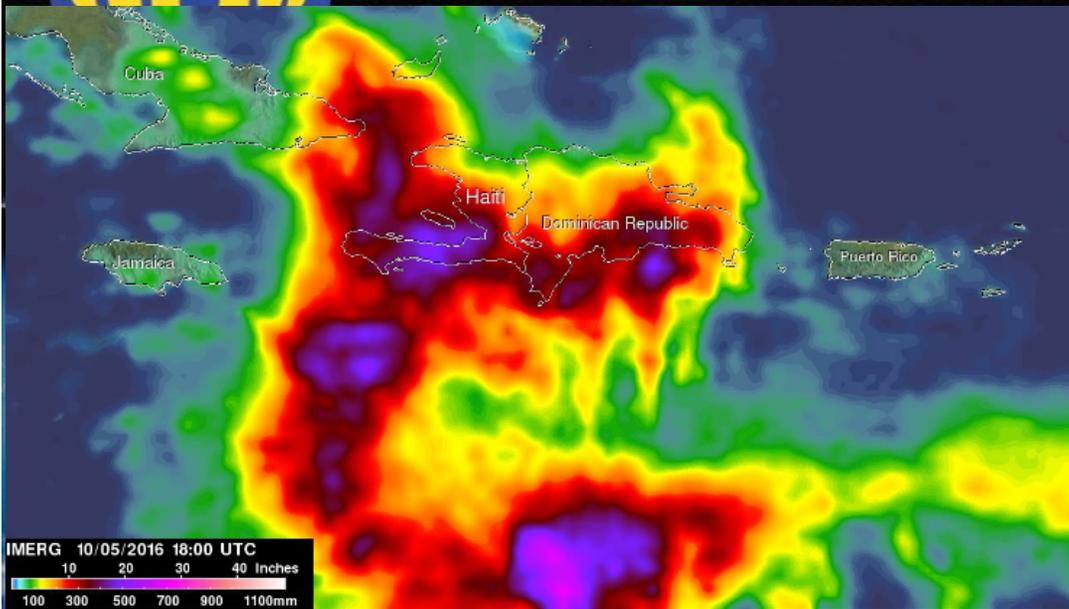


October Total Precipitation (mm)



adapted from MacMillan et al. 2012; Monaghan et al. 2012; Moore et al. 2012

GPM observes Hurricane Matthew's rapid intensification and eyewall replacement



- GPM observed intense rainfall accumulation (left) as Matthew intensified and battered Hispaniola and Cuba
- On Oct. 2nd (bottom left) GPM Core Observatory viewed a newly intensified Cat 4 storm south of Haiti, showing strong convection and heavy rainfall in the eye wall and rain bands
- GPM's Microwave Imager (bottom right) observed the storm going through eye wall replacement before impacting Florida as a Cat. 3. (Provided by MSFC SPoRT)
- This data was provided to FEMA and NWS Offices for situational awareness

