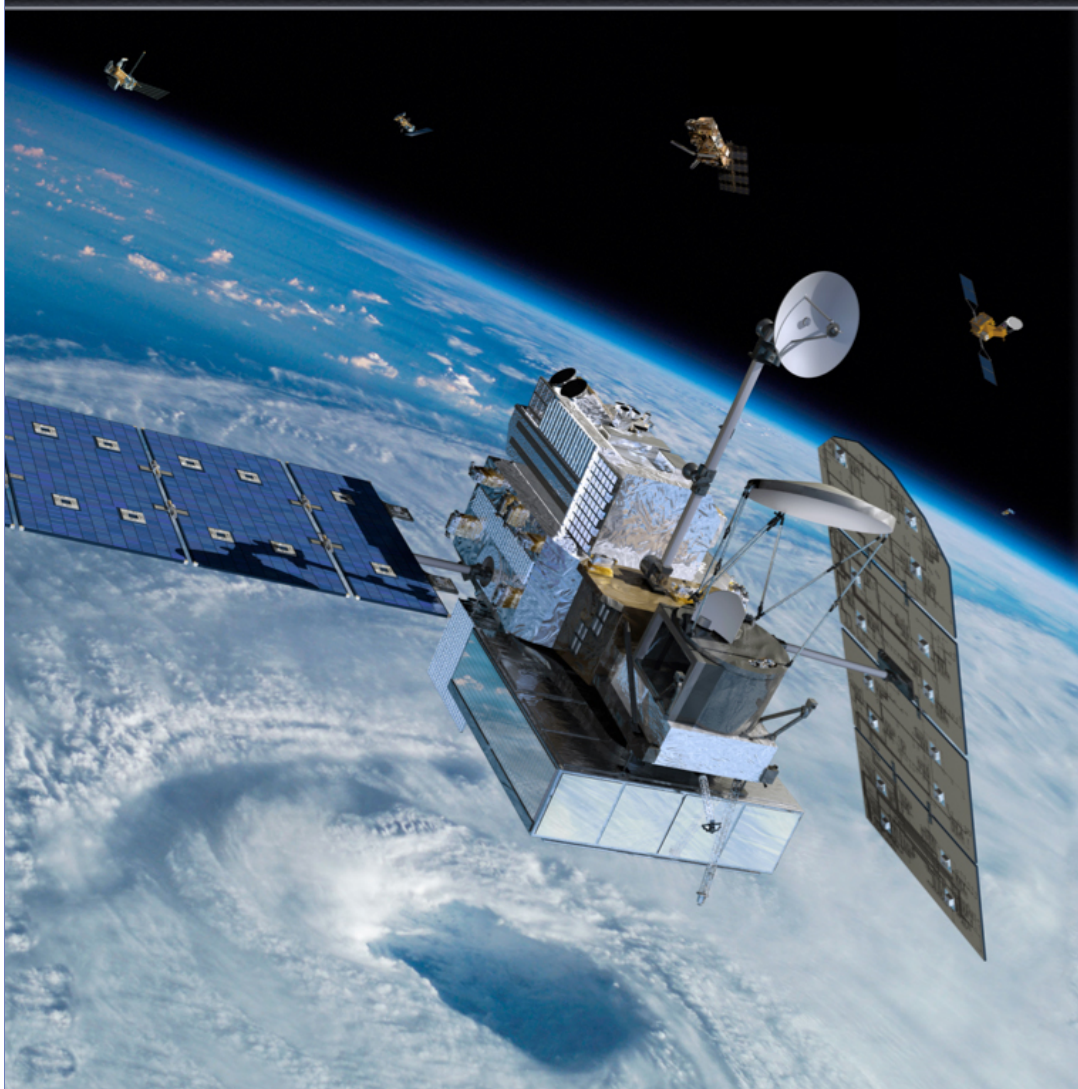




# GPM Science Status



**Gail Skofronick Jackson**

**GPM Project Scientist**

**(appointed 14 January 2014)**

**Succeeding Dr. Arthur Hou**

**(1947-2013)**

**NASA Goddard Space Flight Center**

**PMM Science Team Meeting**

**5 August 2014**

**[www.nasa.gov/gpm](http://www.nasa.gov/gpm)**

**Twitter: NASA\_Rain**

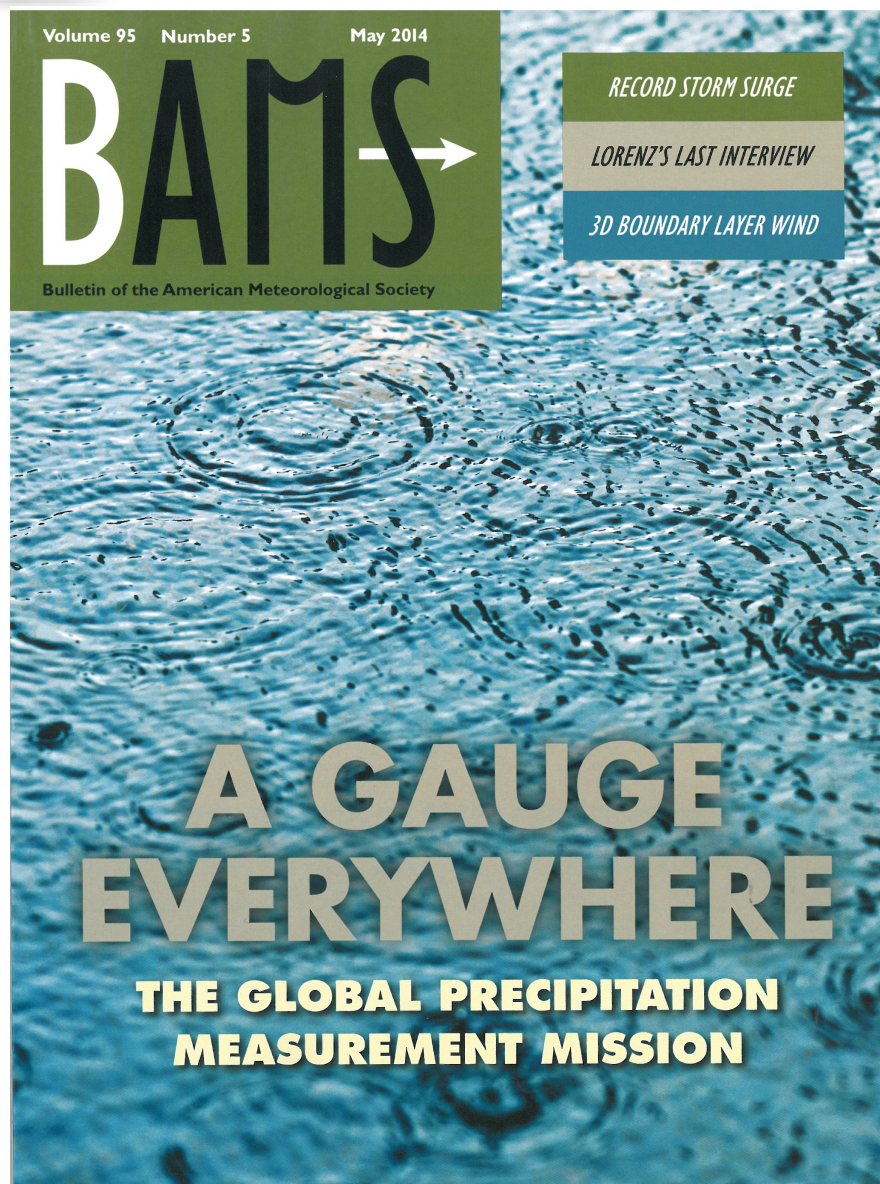
**Facebook: NASA.Rain**

## Memorial Symposium Aug. 4, 2014

Dr. Arthur Hou was an exemplary project scientist who **kept the GPM flame alive** during various GPM challenges. He **excelled in providing scientific oversight** for achieving GPM's many science objectives and application goals. **He forged international friendships with colleagues around the world.** His presence, leadership and generous personality set an example for all of us to follow.



*PMM Science Team Meeting, Baltimore, MD Aug 4-*



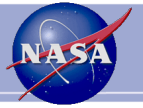
## The Global Precipitation Measurement Mission

by Arthur Y. Hou, Ramesh K. Kakar, Steven Neeck, Ardeshir A. Azarbarzin, Christian D. Kummerow, Masahiro Kojima, Riko Oki, Kenji Nakamura, and Toshio Iguchi

Bulletin of the American Meteorological Society, Vol. 95, Number 5, pp. 701-722, May 2014



# Leadership Updates

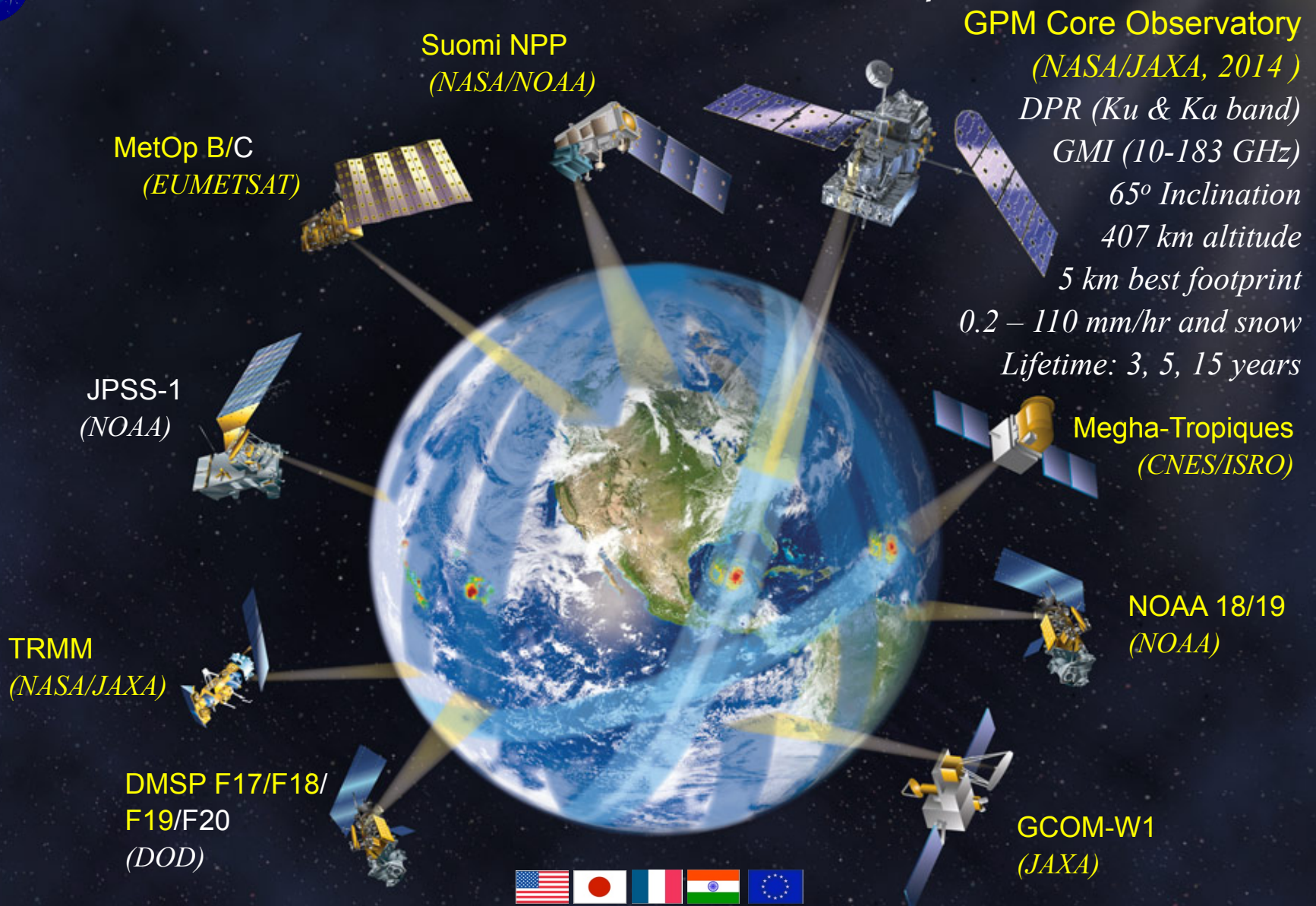


GLOBAL PRECIPITATION MEASUREMENT

- Gail Skofronick Jackson
  - GPM Project Scientist (appointed Jan 14, 2014)
- George Huffman
  - GPM Deputy Project Scientist (appointed June 6, 2014)
- Walt Petersen
  - GPM Deputy Project Scientist for Ground Validation (June 6, 2014)
- Erich Stocker
  - GPM Deputy Project Scientist for Data
- Dalia Kirschbaum
  - GPM Application Scientist Lead



# GPM Constellation Concept



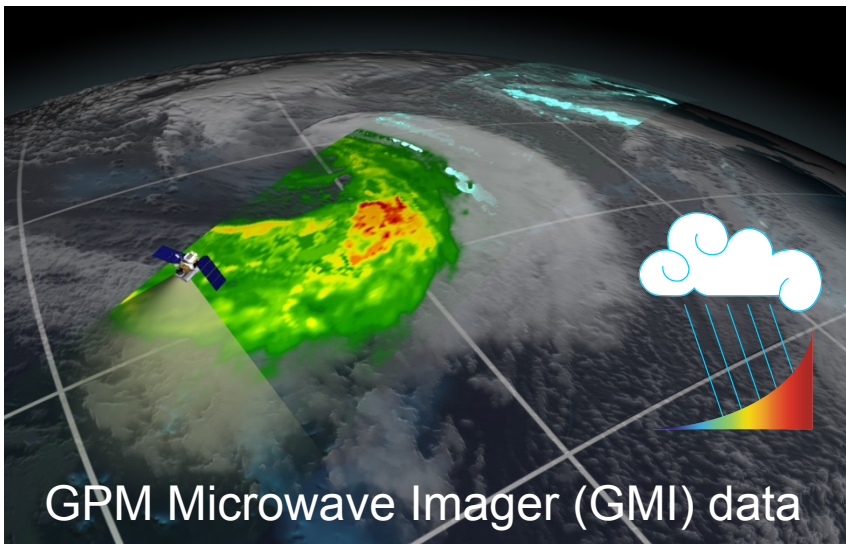
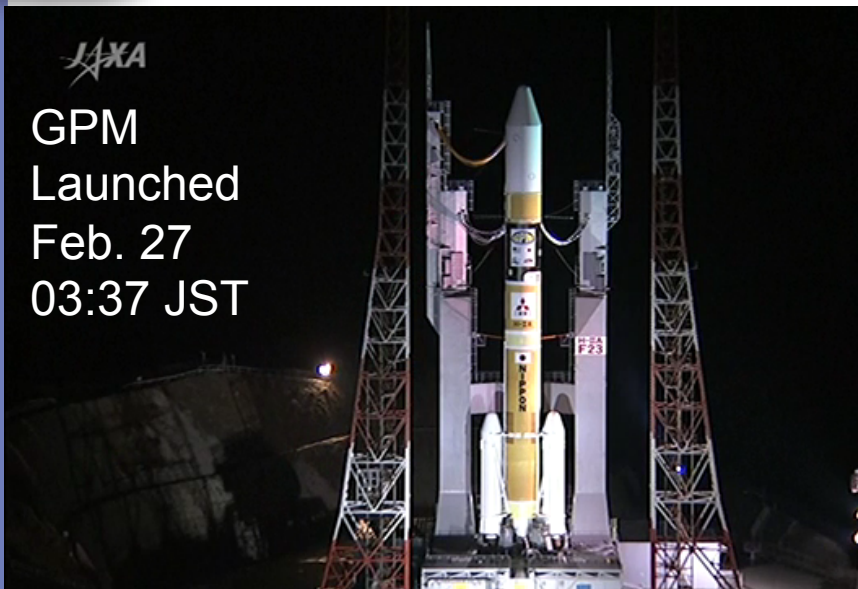
Next-Generation Unified Global Precipitation Products Using GPM Core Observatory as Reference  
Precipitation rates everywhere in the world every three hours



# GPM Launch and First Light Data

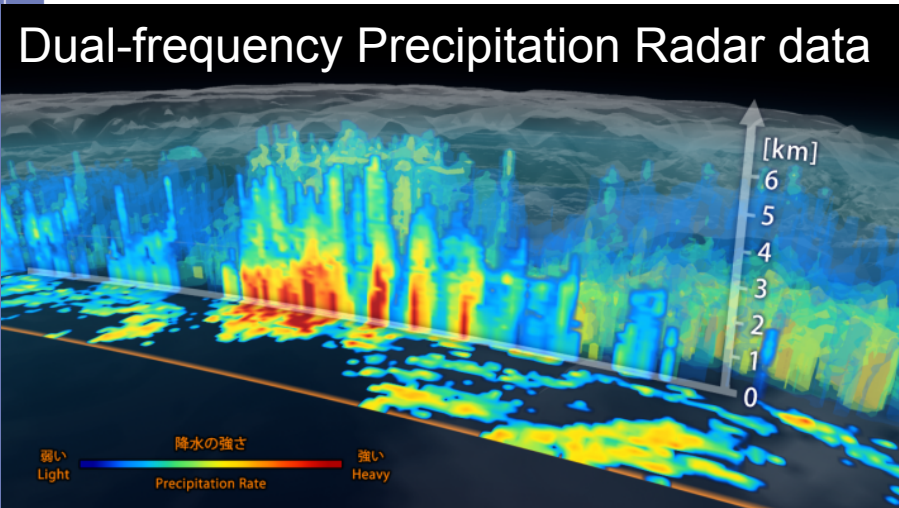


GLOBAL PRECIPITATION MEASUREMENT

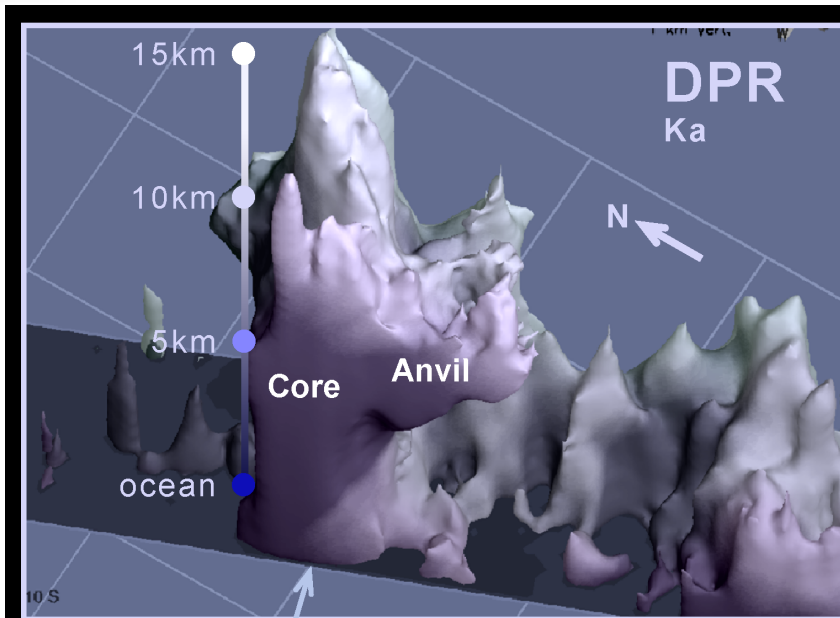


GPM Microwave Imager (GMI) data

[First Light Imagery from March 10](http://www.nasa.gov/gpm)  
[www.nasa.gov/gpm](http://www.nasa.gov/gpm)



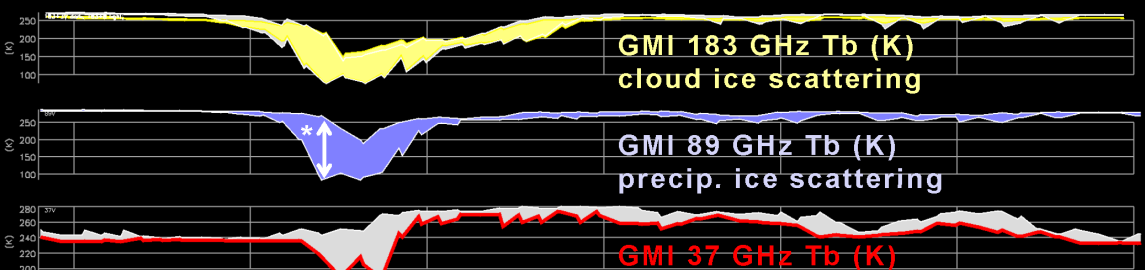
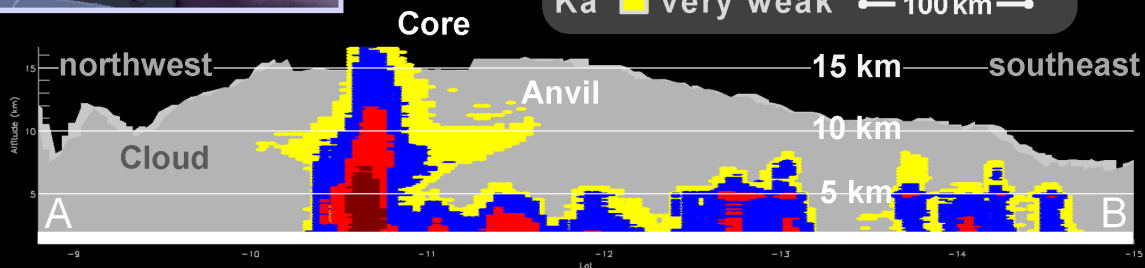
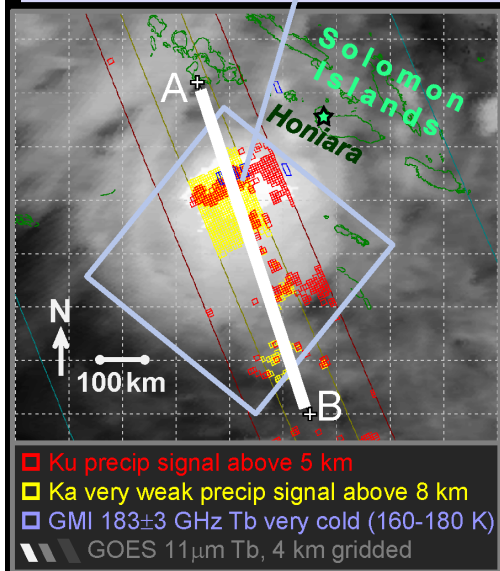
President Obama viewing GPM data 4/24



One day after flooding the Solomon Islands, the precursor to Tropical Cyclone Ita is seen by GPM

4 April 2014 0853 UTC 12°S 158°E

Precipitation Signal Strength  
 Ku ■ weak ■ mid ■ strong  
 Ka ■ very weak — 100km —



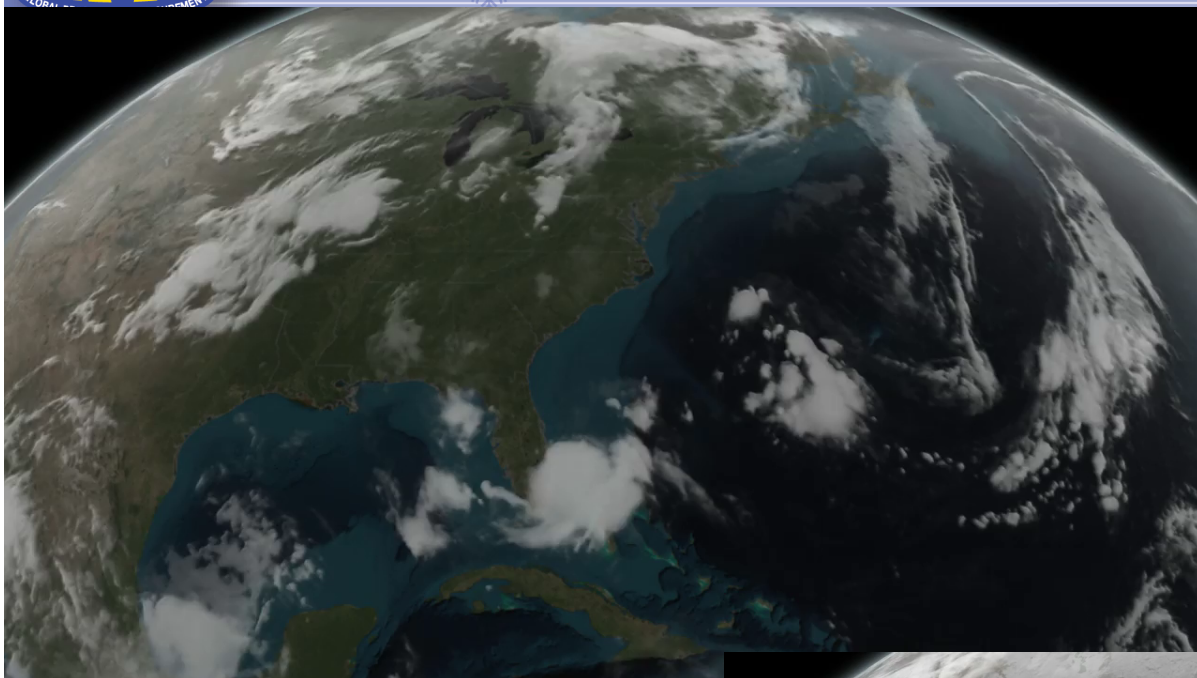
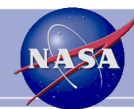
Scattering by large ice hydrometeors

\* The minimum-to-maximum range of Tb observed in the 3x3 pixel area closest to line AB

GPM data courtesy of NASA / JAXA



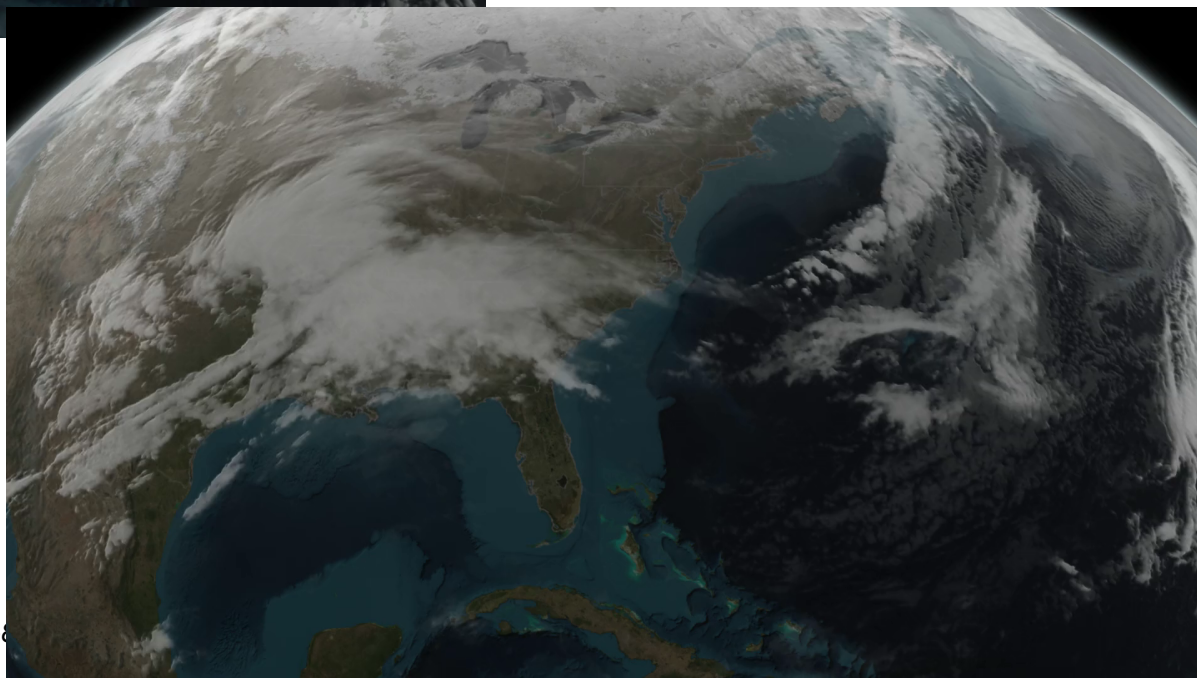
# Hurricane Arthur & March Snow Storm



**Hurricane Arthur  
First Atlantic  
Hurricane  
July 3, 2014**

GLOBAL PRECIPITATION

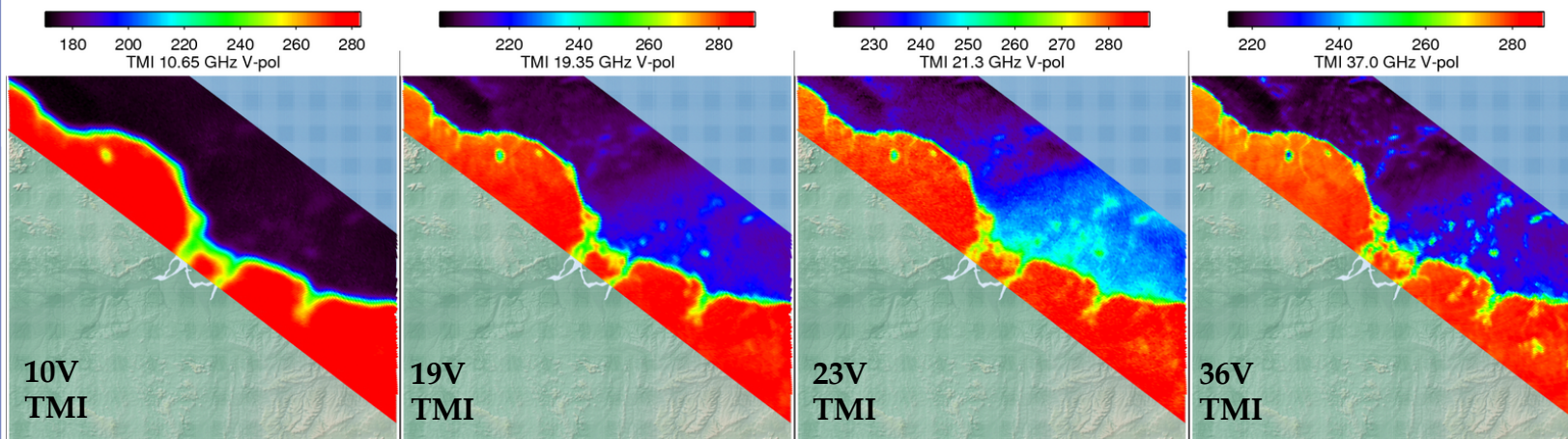
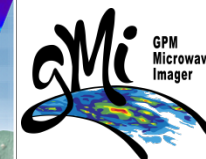
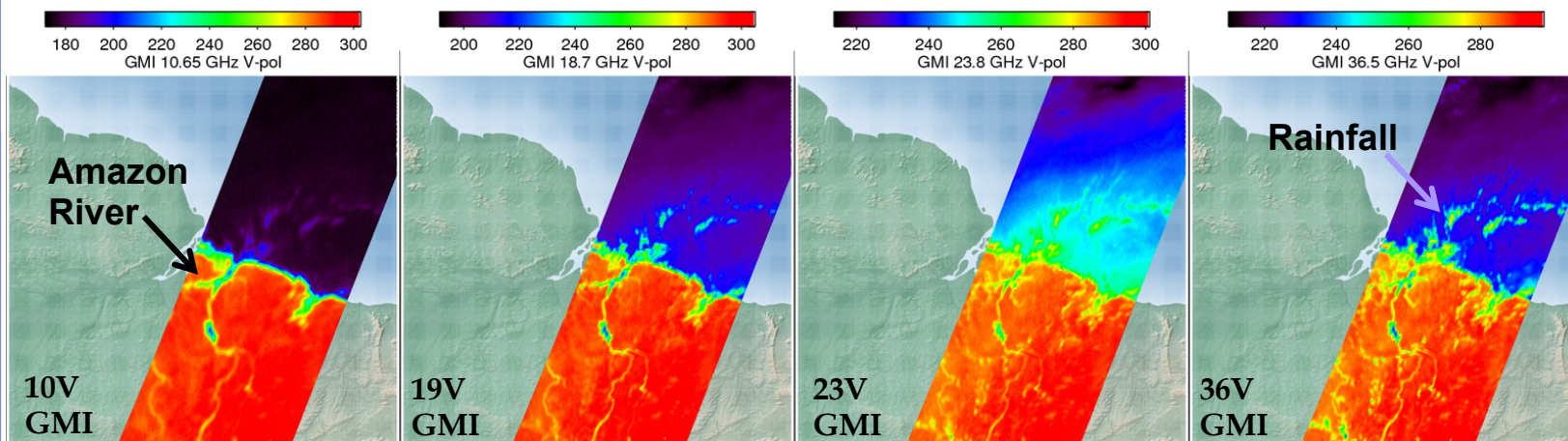
**Washington, DC  
Snow event, 18 cm  
March 17, 2014**



*PMM Science Team Meeting, Baltimore, MD Aug 4-6*

The GMI on GPM's Core Observatory has a 1.2 m reflector receiver dish, larger than TRMM's TMI, providing finer spatial resolution for more detail.

	10 GHz	19	23	36
TMI	48 km	24	22	13
GMI	26	15	12	11



NOTE: this page is short lived (10 m). Please **DO NOT** bookmark it or save it to Favorites; instead, bookmark <http://www.nrlmry.navy.mil/TC.html> thank you.

## 2014 Season Storms

All **Active** Year

### Atlantic

01L.ONE KML

### East Pacific

05E.ELIDA KML

04E.DOUGLAS KML

### Central Pacific

### West Pacific

91W.INVEST KML

90W.INVEST KML

### Indian Ocean

### Southern Hem.

Season: 15

Latest		Previous		Full		Pass_Mosaic		Text		Track		ATCF		Track+Image		WindVectors	
Environment		TPW		TPW+NAVEM_TPW		TPW+NAVEM_850_Winds		Wind_Shear		Aerosol_Optical_Depth		COAMPS_TC					
Sensor	% Cov	VIS	IR	IR-BD	Multi Sens.	85 GHz H	85 GHz weak	85 GHz PCT	Color	Rain	Wind	37GHz Color	37GHz V	37GHz H	SSM/T Vapor		
SSM/I	87	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
SSM/IS	74	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
TMI	28	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
GMI	56	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
AMS R2	96	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
WINDSAT	58	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
AMS SUB	60	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

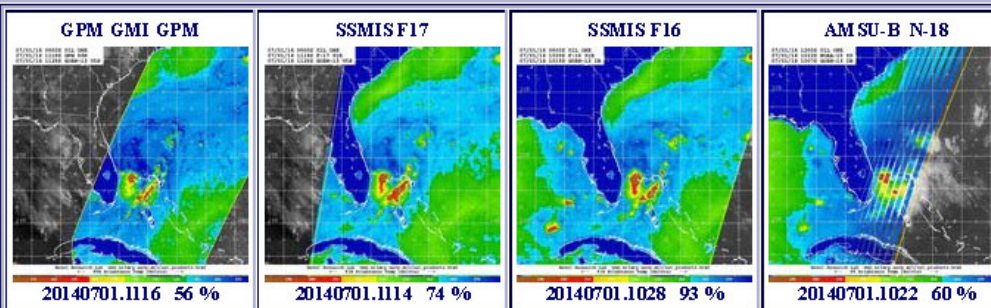
	VIS	IR	Vapor
GAC:	■	■	■
GEO:	■	■	■
MODIS:	■	■	■
VIIRS:	■	■	■
OLS:	■	■	■

## 01L.ONE

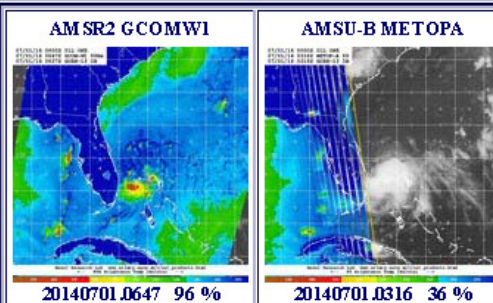
14:59:02 UTC(z)

Previous | Shift time 24 hrs/click: 140701.0136 <-> 140701.1116 | ■

Age <= 6 hrs.  
From 20140701.1116



Age 6-12 hrs.  
From 20140701.1116



**Images from Tropical Storm Arthur (7/1/14)**

[www.nrlmry.navy.mil/TC.html](http://www.nrlmry.navy.mil/TC.html)



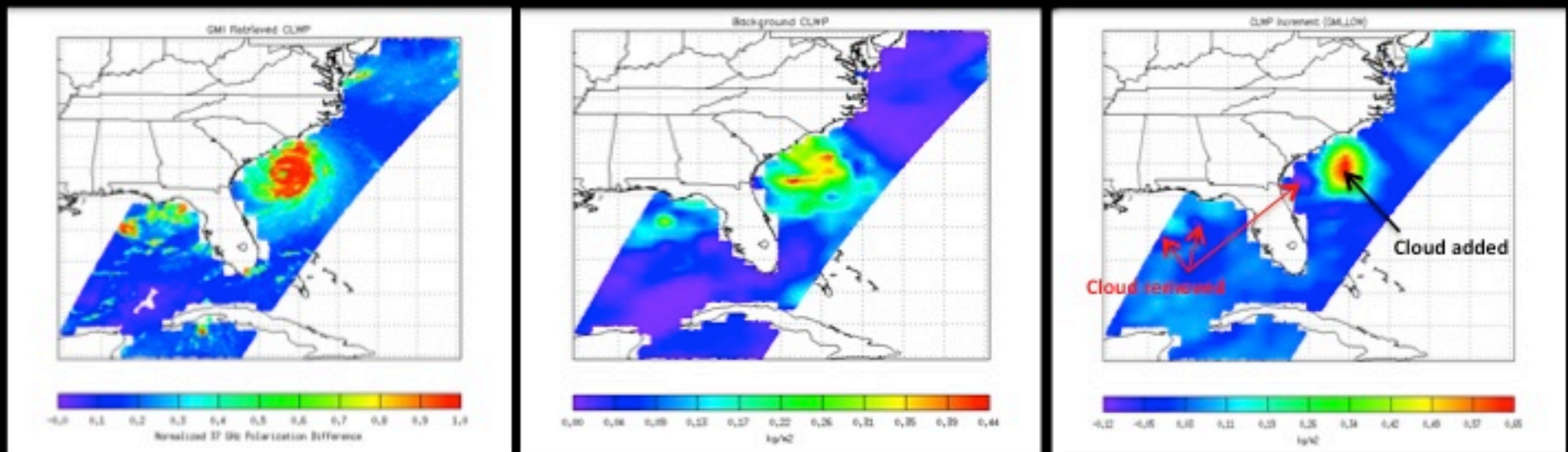
# Using GPM Data for Cloud and Precipitation Analyses

Global Modeling and Assimilation Office

**GPM Microwave Imager Observations**  
Hurricane Arthur (3 July 2014)

**GEOS-5 6hr Cloud Water Forecast**  
*before* assimilating GPM Microwave Imager data

**GEOS-5 Cloud Analysis Increment**  
*after* assimilating GPM Microwave Imager data

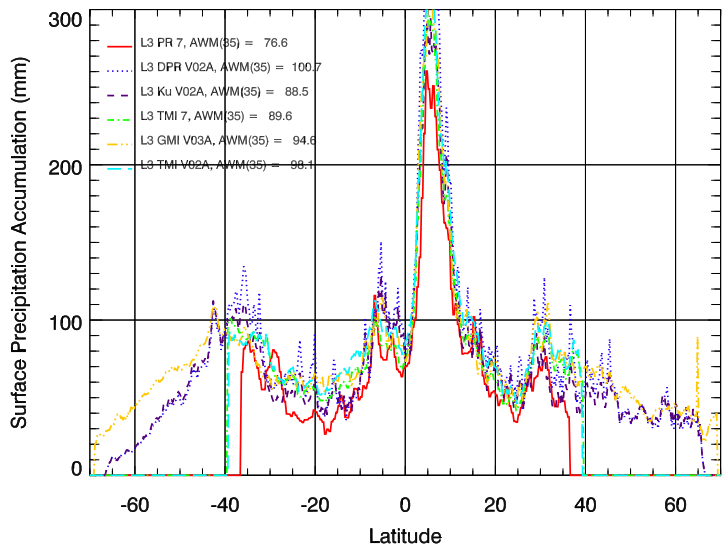


The GPM satellite was successfully launched on February 27th, 2014. GMAO is currently developing the all-sky radiance data assimilation system to utilize GPM Microwave Imager (GMI) radiance data in GEOS-5 to improve global cloud and precipitation analyses. This will contribute to improve near-real time weather forecasts including severe storms like hurricanes.



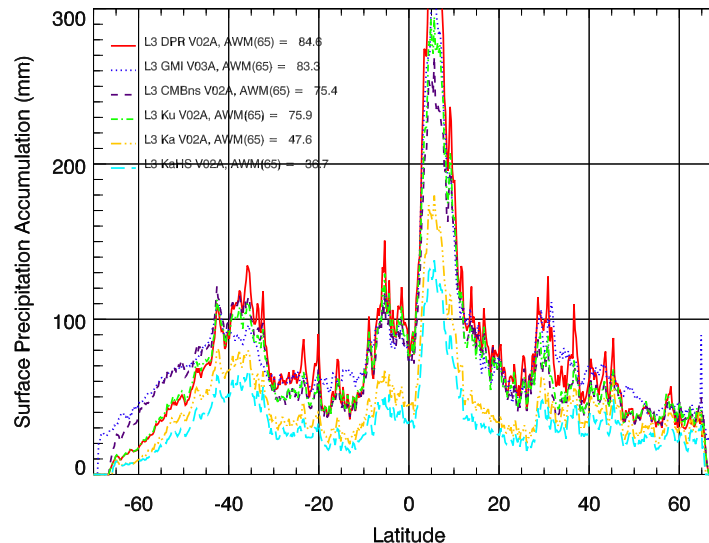
Figure Credit : Min-Jeong Kim, Jianjun Jin, Will McCarty, Ricardo Todling, and Ron Gelaro

Ocean Zonal Mean 1406



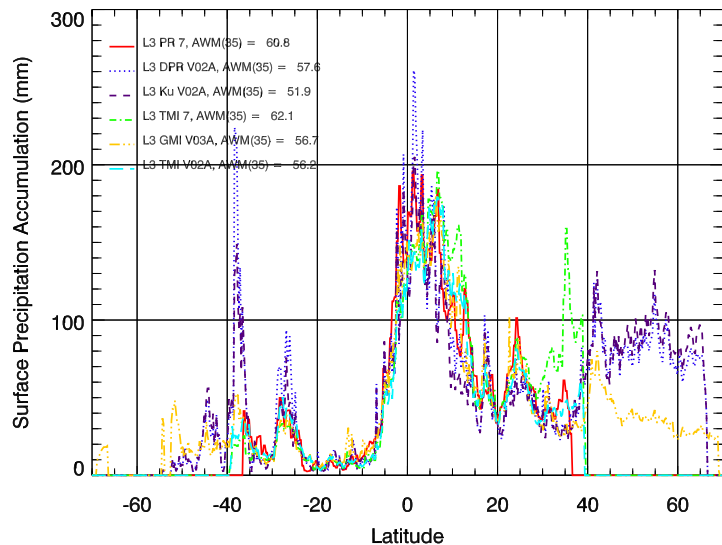
Wide GMI TMI Ocean mask: 2A12v6petty Alg version: 140708V02AV03A

Ocean Zonal Mean 1406



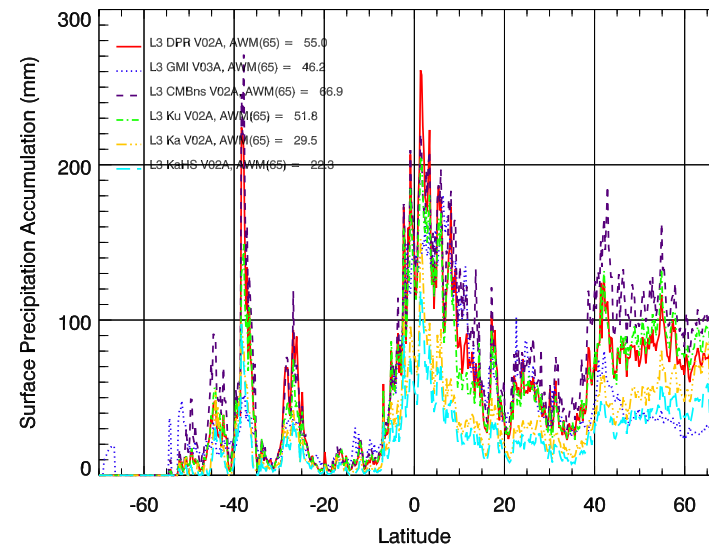
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Land Zonal Mean 1406

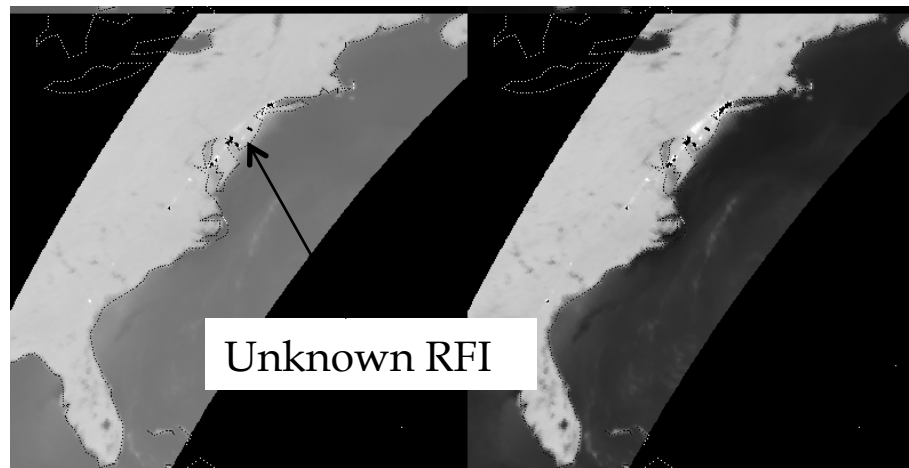
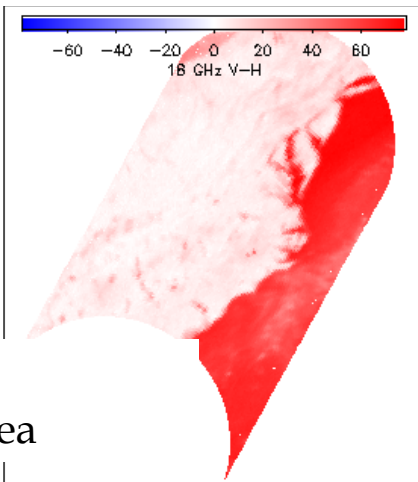
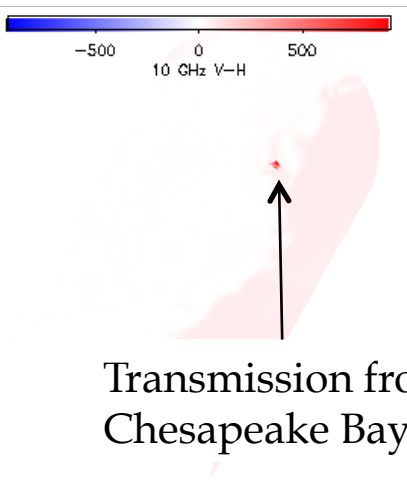
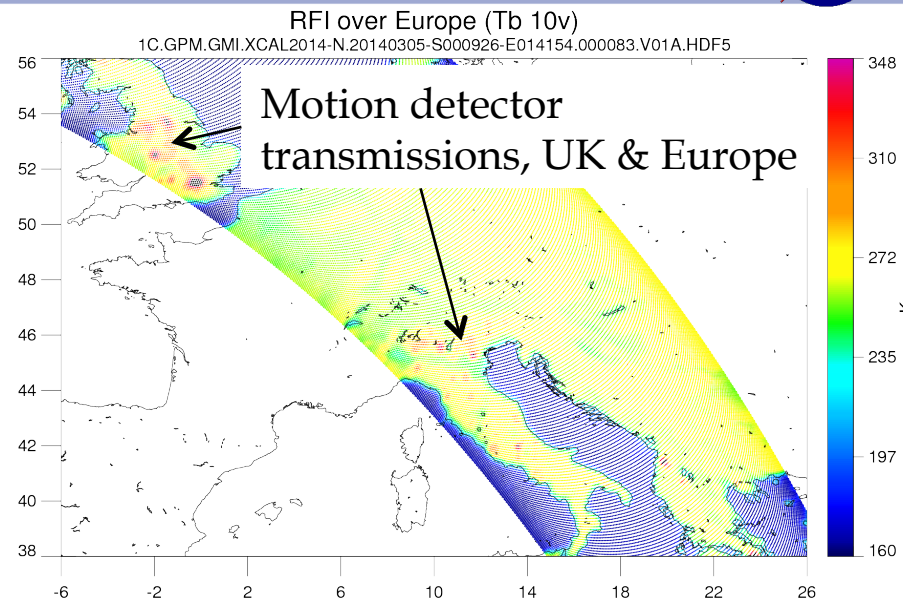
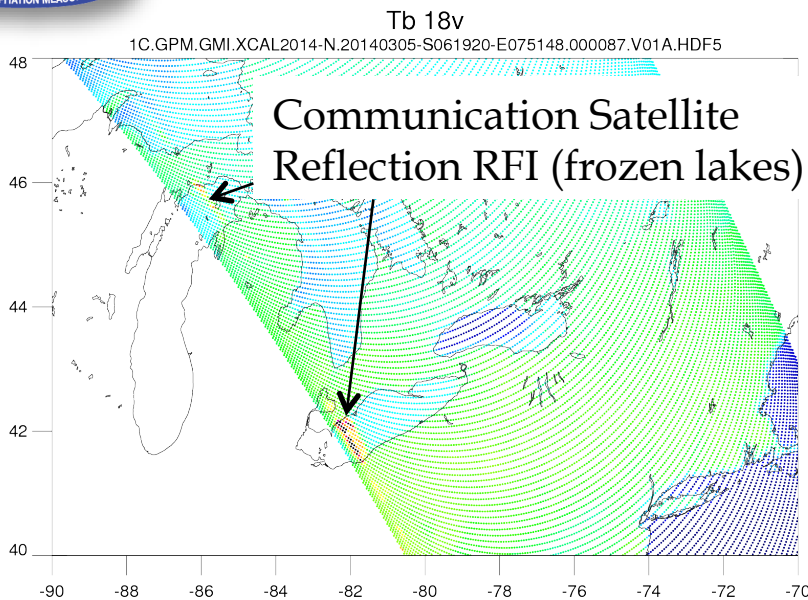


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Land Zonal Mean 1406

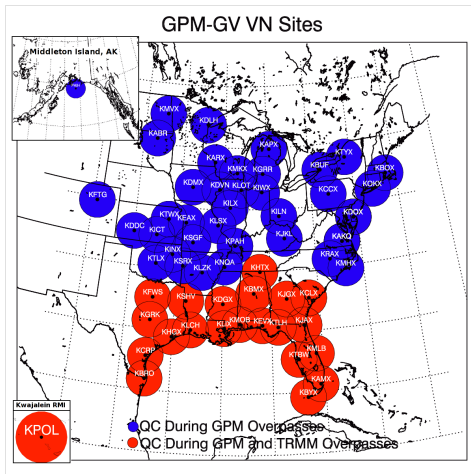
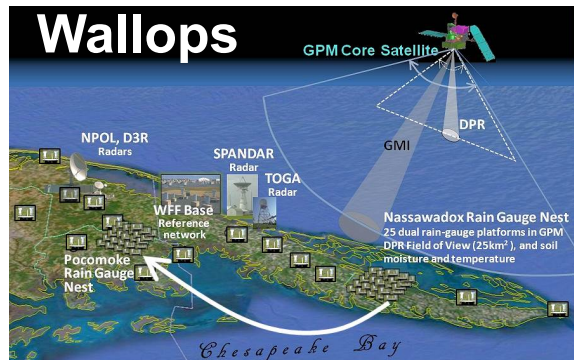


Wide GMI TMI Ocean mask: 2A12v6petty Alg version: 140708V02AV03A

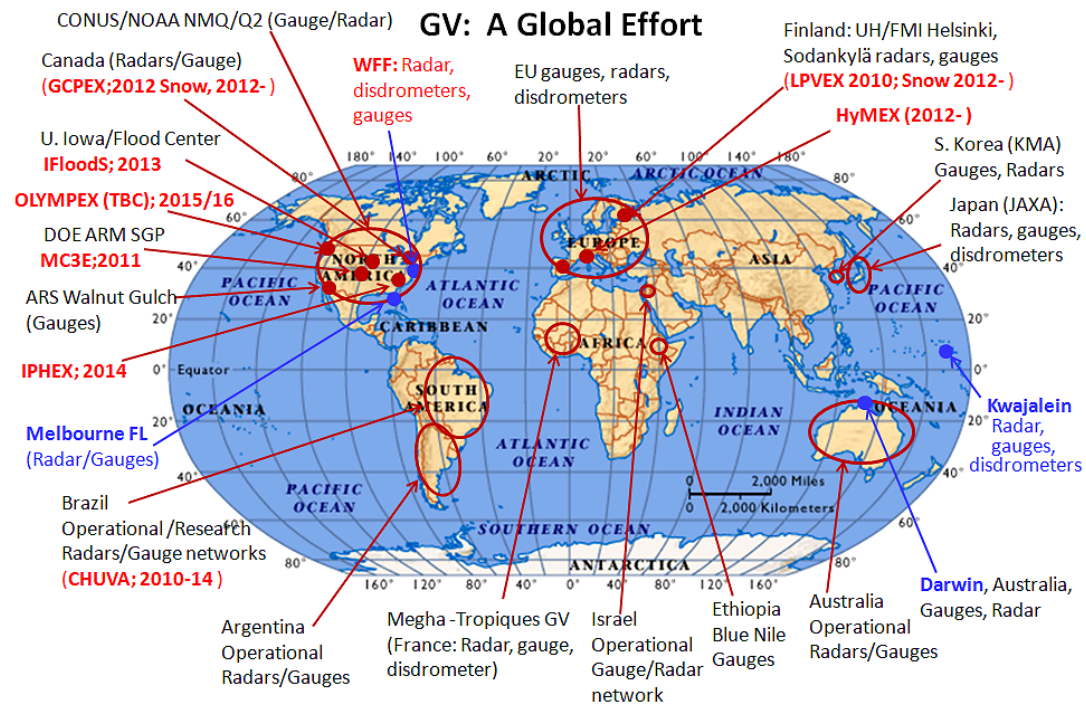


**RSS and xcal derived algorithms will identify RFI & mitigate if possible**

## Direct Validation



## A Global View of Precipitation with a Global Team



## Field campaigns for physical and hydrological validation





Arthur's tradition: Award WG/  
team that improves algorithm  
performance using actual data

- For providing precipitation rate and phase databases for GPROF2014
- For processing and delivery of orbit-coincident and accumulated precipitation datasets for validation use

## Dr. Pierre Kirstetter, University of Oklahoma

With team: Prof. Y. Hong (OU), Dr. J. J. Gourley (NSSL), and Mr. K. R. Morris (GSFC)



- I. For dedicated, innovative development and processing of datasets using the NOAA Multi-Radar Multi-Sensor (MRMS) product with satellite orbit coincidences to provide precipitation rate and phase databases for GPROF2014
- II. For the processing and continuous delivery of CONUS-wide gridded Ground Validation Level II orbit-coincident and Level III hourly-accumulated precipitation datasets for GPM pre and post launch validation use



# Precipitation Products and Release Schedule: PPS, GPROF, CMB, DPR Algorithm Talks



GLOBAL PRECIPITATION MEASUREMENT

Product Level	Description	Coverage	Latency* & Public Release
Level 1B GMI Level 1C GMI	Geolocated Brightness Temperatures (TBs) and intercal TBs (1C)	Swath, instrument field of view (IFOV)	<i>1 hour for near real time products for applic. users;</i> Released June 16, 2014
Level 1B DPR	Geolocated, calibrated radar powers	Swath, IFOV (produced at JAXA)	To be released Sept 2, 2014
Level 1C, partner radiometers	Intercalibrated TBs	Swath, IFOV	Released June 16, 2014
Level 2 GMI (GPROF2014)	Radar enhanced (RE) precipitation retrievals	Swath, IFOV	<i>1 hour latency</i> Released July 14, 2014
Level 2 partners	RE precip retrievals from 1C	Swath, IFOV	Released July 14, 2014
Level 2 DPR	Z, $\sigma_0$ , Characterization, DSD, Precipitation w/ vert. structure	Swath, IFOV (Ku, Ka, combined Ku/Ka)	<i>3 hour latency;</i> To be released Sept 2, 2014
Level 2 Combined GMI/DPR	Precipitation retrievals constrained with DPR & GMI	Swath, IFOV	<i>3 hour latency;</i> To be released Sept 2, 2014
Level 3 LH	Latent Heating (LH) products	0.25°x0.25° monthly grid	TBD
Level 3 Instrument Accumulations	GMI, partner radiometers, combined and DPR	0.25° x 0.25° daily and monthly grid	To be released Sept 2, 2014
Level 3 Merged Product (IMERG)	Merger of GMI, partner radiometer, and IR	0.1° x 0.1° at a 30 minute grid	<i>4 hr latency;</i> To be released Dec. 2014

\*All algorithms have additional latencies from 4 hours to 2 months after data collection for producing higher quality precipitation products for scientific investigations and climate studies

- The NASA GPM Science team has 56 NASA PI teams and 23 no-cost International PI teams
  - HSAF is newest International
    - Giulia Panegrossi and Sylvia Puca
- Thanks to all the Algorithm, WG and GV teams for their efforts pre and post launch



Science Team Meeting March 2013  
 Next Science Mtg is NOW Aug 4-8, 2014

**We need your help!**  
**Please provide Science Highlight Slides**



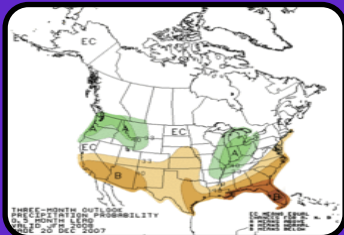
## Extreme Events and Disasters

- Landslides
- Floods
- Tropical cyclones
- Re-insurance



## Water Resources and Agriculture

- Famine Early Warning System
- Drought
- Water Resource management
- Agriculture



## Weather, Climate & Land Surface Modeling

- Numerical Weather Prediction
- Land System Modeling
- Global Climate Modeling



## Public Health and Ecology


- Disease tracking
- Animal migration
- Food Security

For more information on the TRMM and GPM Missions:

<http://gpm.nasa.gov>

<http://www.nasa.gov/gpm>

Twitter: NASA\_Rain    Facebook: NASA.Rain



We are all looking forward to scientifically rich uses of GPM data for many years ahead

PMM Science