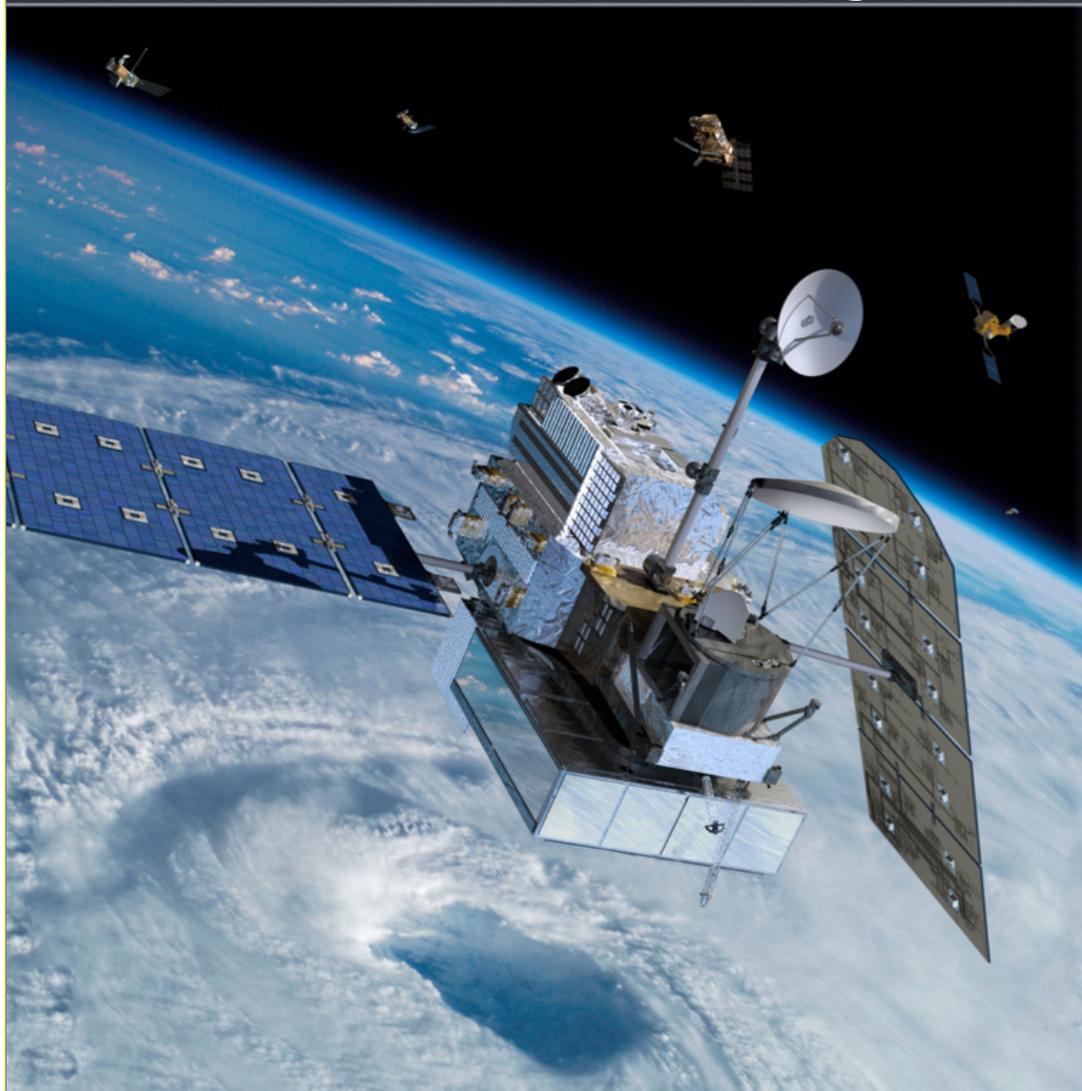




NASA HQ PMM Welcome and Program Status



Ramesh Kakar
GPM Program Scientist

NASA Headquarters

PMM Science Team Meeting
October 16-20, 2017

- NASA Earth Science Division Satellite Fleet
- GPM Status
- Recent Events
 - End of Prime Mission Review
 - Senior Review
 - CPEX
 - New ROSES Announcement
- GPM Data Products
- GPM Applications
- GPM field experiments

Earth Science Missions

President's Budget Request (May 2017)

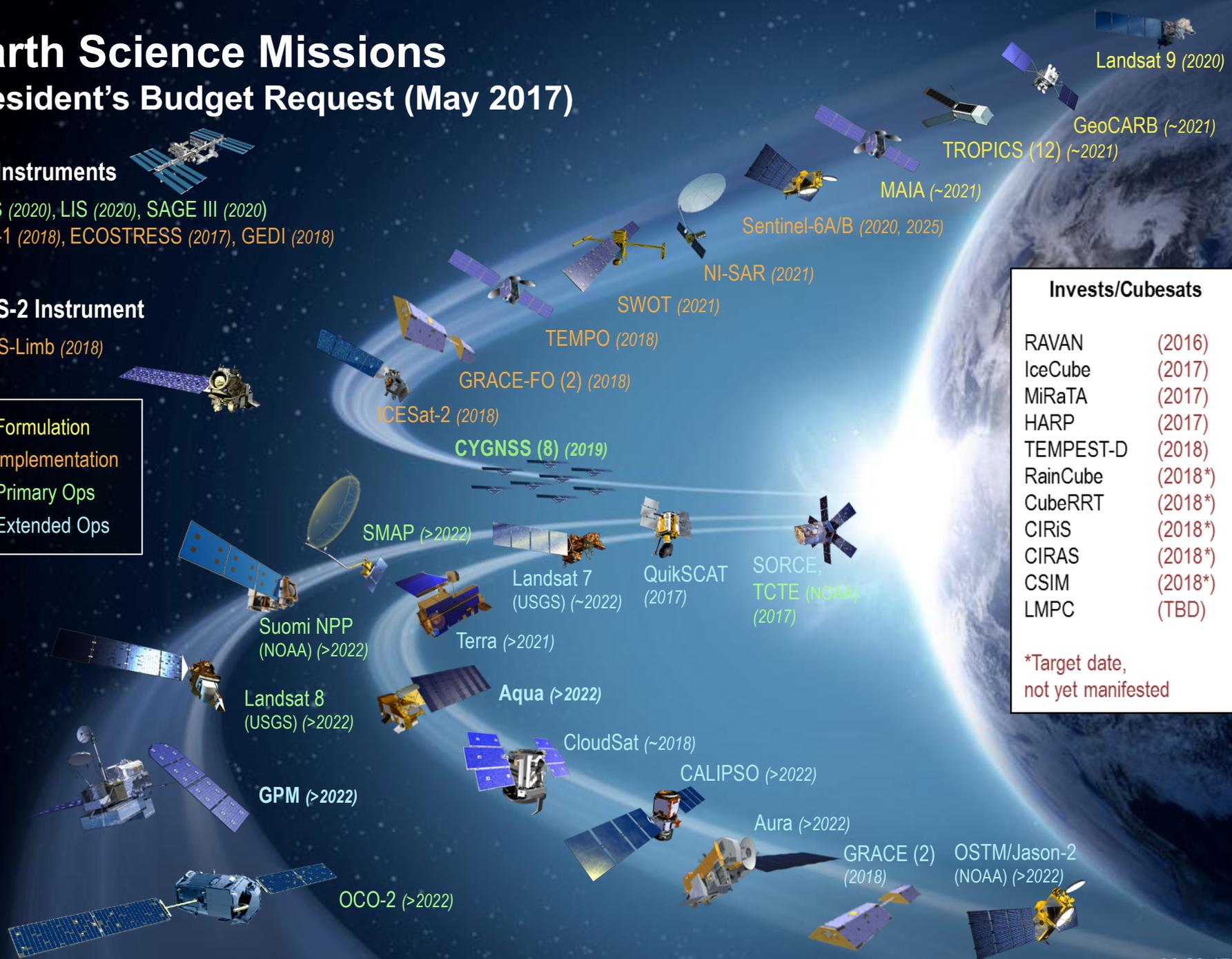
ISS Instruments

CATS (2020), LIS (2020), SAGE III (2020)
 TSIS-1 (2018), ECOSTRESS (2017), GEDI (2018)

JPSS-2 Instrument

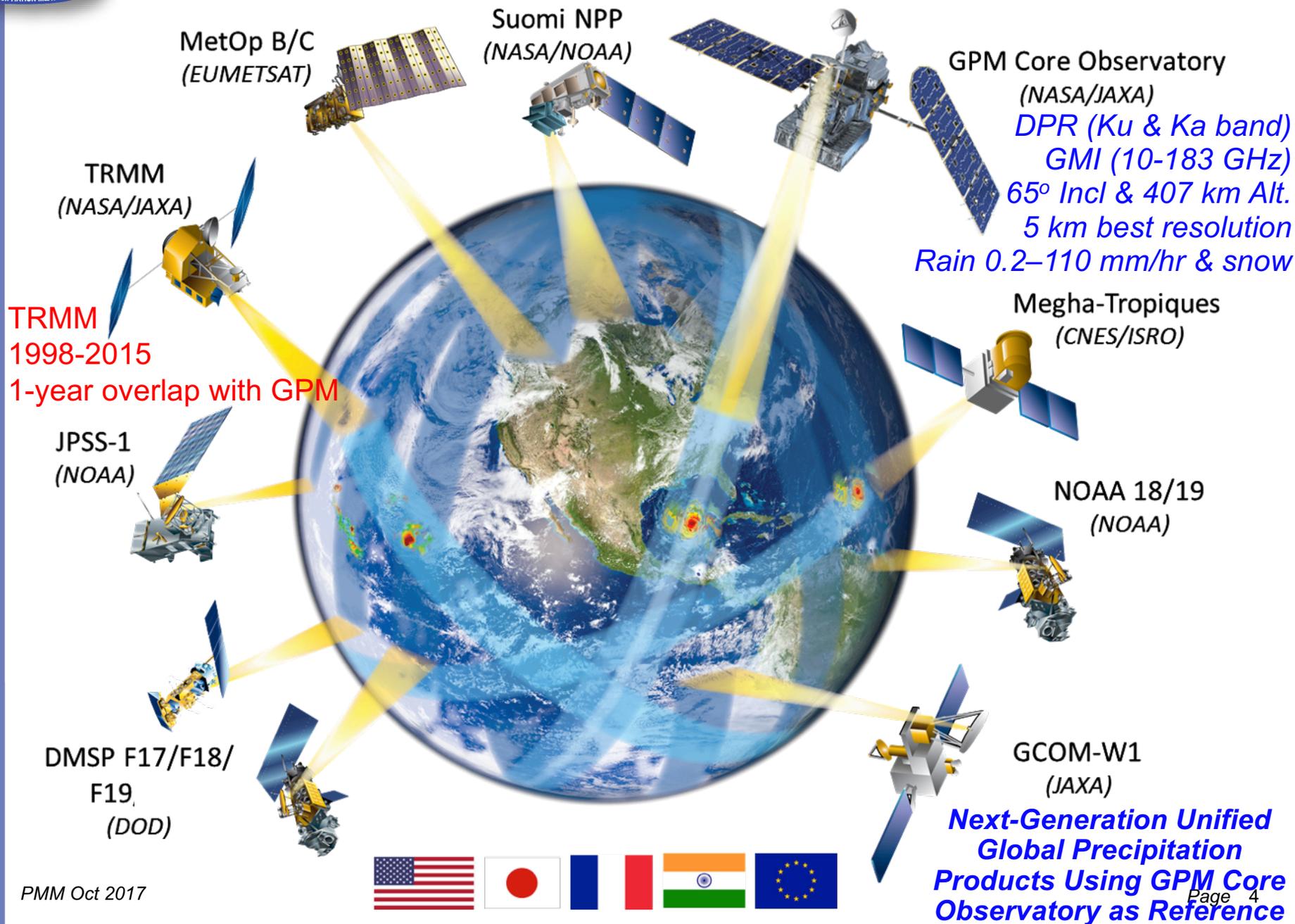
OMPS-Limb (2018)

■	Formulation
■	Implementation
■	Primary Ops
■	Extended Ops



Invests/Cubesats	
RAVAN	(2016)
IceCube	(2017)
MiRaTA	(2017)
HARP	(2017)
TEMPEST-D	(2018)
RainCube	(2018*)
CubeRRT	(2018*)
CIRiS	(2018*)
CIRAS	(2018*)
CSIM	(2018*)
LMPC	(TBD)

*Target date, not yet manifested





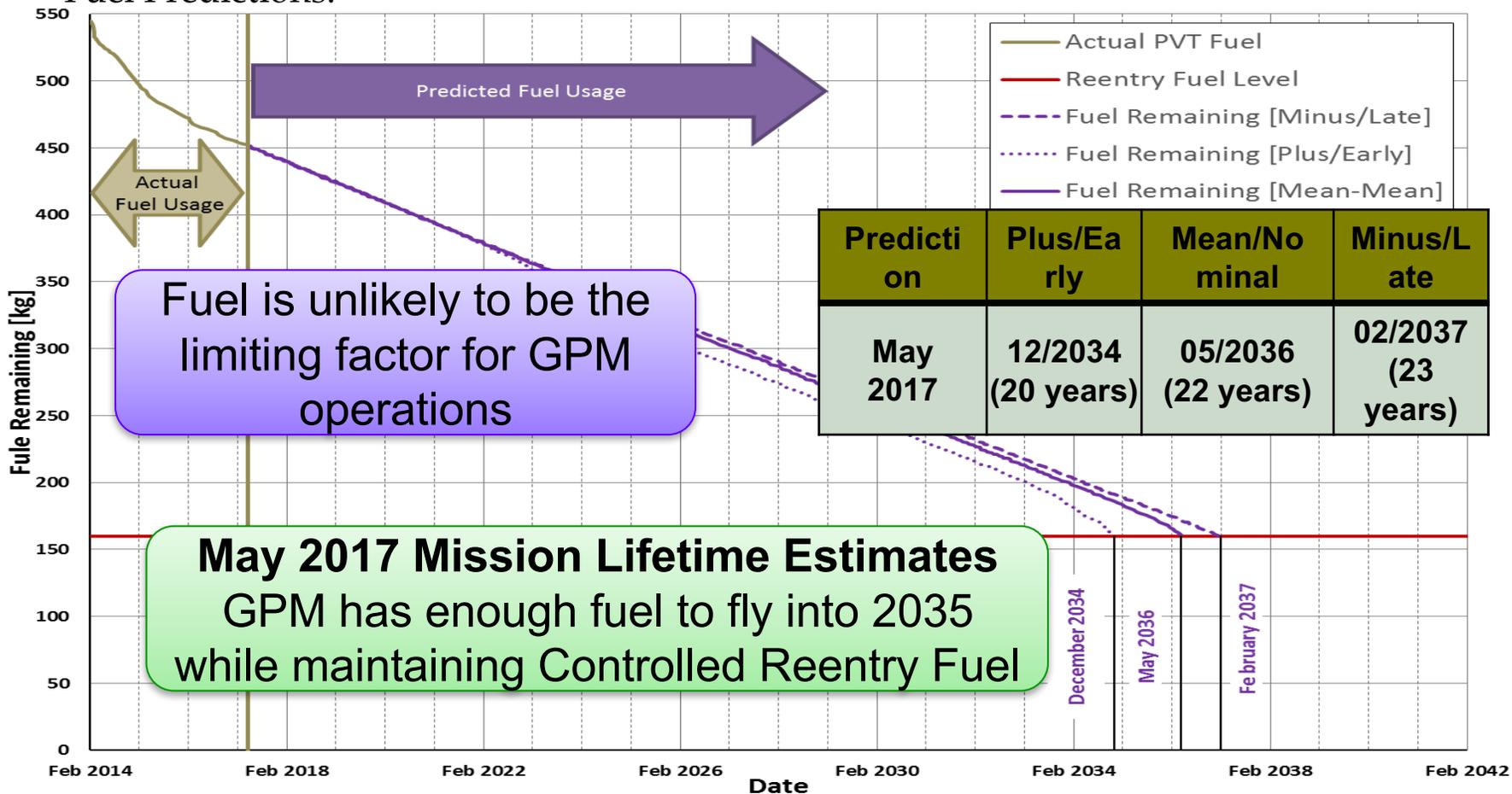
Celebrations included:

- New B32 Lobby Mural on TRMM & GPM
- Party Feb. 28, 2017

Reviews included:

- Senior Review
- End of Prime Review

- DPR is performing well
- GMI is an extremely well calibrated imager
GPM GMI is calibrated and stable. Comparisons with other well calibrated sensors and with radiative transfer models indicate absolute GMI calibration accuracy within 1K (likely < 0.25K).
- Fuel Predictions:



Fuel is unlikely to be the limiting factor for GPM operations

May 2017 Mission Lifetime Estimates
GPM has enough fuel to fly into 2035 while maintaining Controlled Reentry Fuel

8. Conclusions

The mission has met all success criteria and Level 1 science requirements, and has exceeded many Level 1 requirements including latency, data capture, and snow detection estimates. The mission has been a highly successful follow-on to the Tropical Rainfall Measuring Mission (TRMM) with over 250 publications to date. The GPM mission has presented to the 2017 Senior Review panel for input to mission extension.

Ramesh Kakar
Co-Chair
Program Scientist

Gregory Bell
Co-Chair
Program Executive

Table 1 Mission-specific findings

Mission	Science Score			Summary Science Score	Adject. Summary Science Score	Natl Int. Utility Score	Technical Risk Rating	Cost Risk Rating
	Sci. Merit	Relev. to NASA E.S.	Data Quality					
GPM	5.0	5.0	5.0	5.0	Excellent	High	Low	Low

SR Mission Extension Conclusions

Mission	Conclusions		Suggested Change in Scope
	FY18-20	FY21-23	
GPM	Continue	Continue	



CPEX 2017: A Field Experiment to study Convective Processes in the Tropics



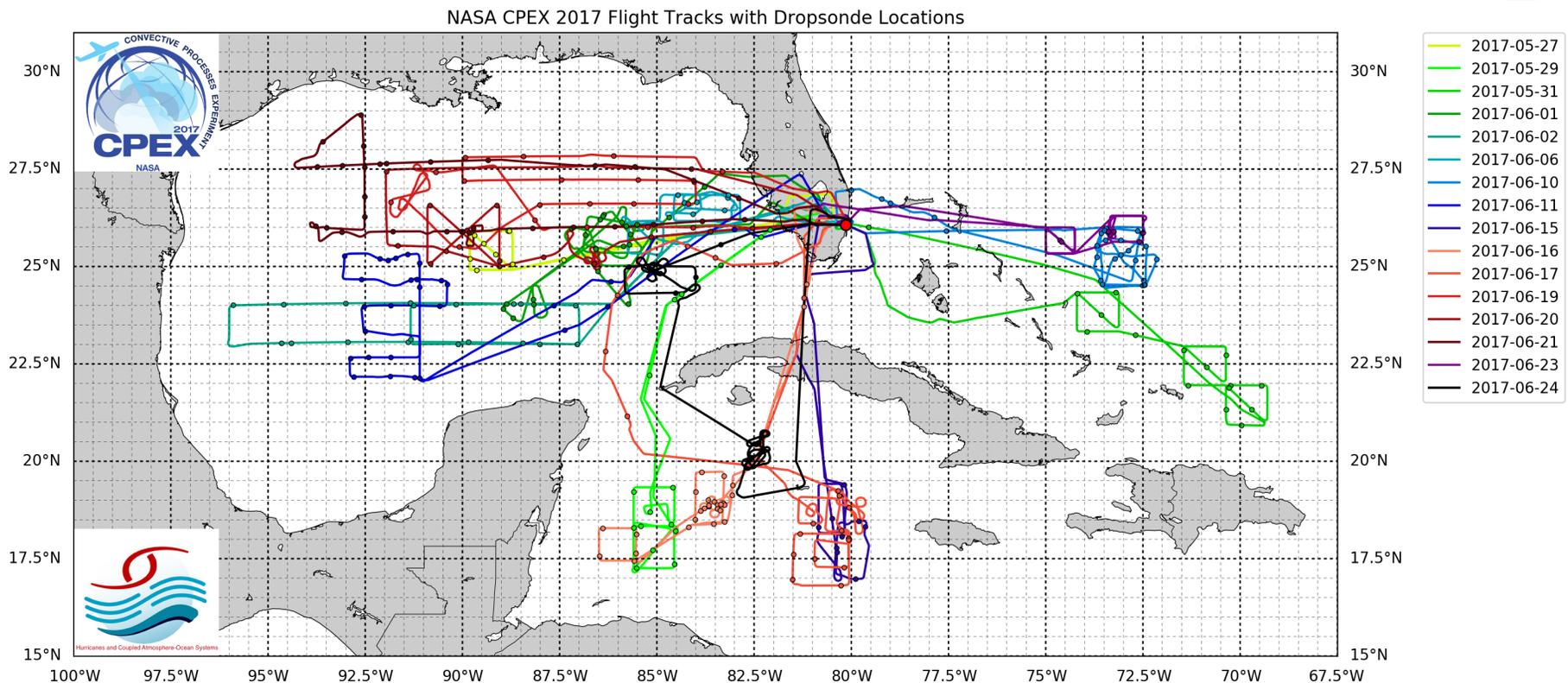
25 May – 24 June 2017

DC-8 based in Fort Lauderdale, Florida
DAWN, APR-2, HAMSr, MTHP, Dropsondes, MASC

CPEX Science Objectives

- 1. Improve understanding of convective processes** including cloud dynamics, downdrafts, cold pools and thermodynamics during initiation, growth, and dissipation
- 2. Obtain a comprehensive set observations, especially from DAWN**, in the vicinity of scattered and organized deep convection in all phases of the convective life cycle
- 3. Improve model representation of convective and boundary layer processes** over the tropical oceans using a cloud-resolving, fully coupled atmosphere-ocean model
- 4. Improve model assimilation of the wind, temperature and humidity profiles** from the wind lidar and dropsondes into numerical weather prediction models

NASA Convective Process Experiment (CPEX) 2017



Highlights:

- CPEX conducted a total of sixteen DC-8 flight missions from 27 May-24 June.
- The 16 missions covered a wide range of weather conditions from clear and calm wind, isolated convective cloud systems, to Tropical Storm Cindy (2017).
- It is the first field campaign that collected airborne observations continually from pre-tropical disturbance in the Caribbean Sea, to tropical depression, and formation of Tropical Storm Cindy in the Gulf of Mexico prior to landfall in Louisiana on 22 June.



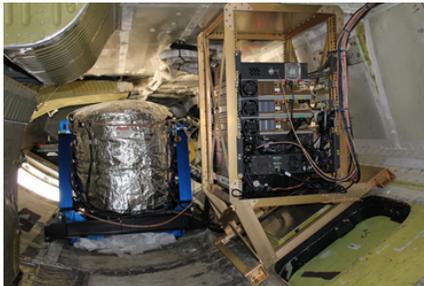
CPEX 2017: A Field Experiment to study Convective Processes in the Tropics



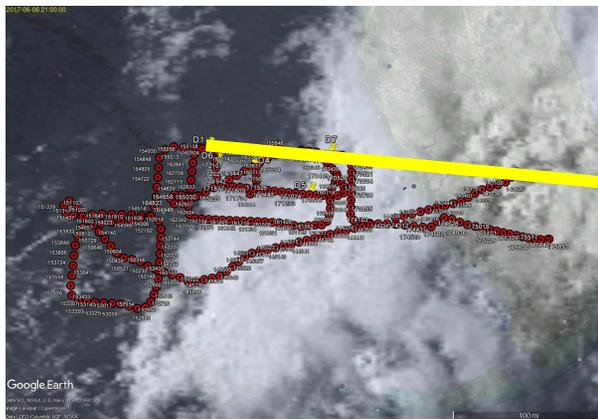
25 May – 24 June 2017

DC-8 based in Fort Lauderdale, Florida
DAWN, APR-2, HAMSRS, MTHP, Dropsondes, MASC

LaRC DAWN on NASA DC8



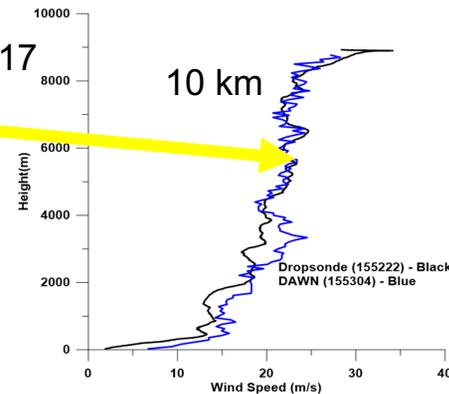
- DAWN is NASA's most capable airborne wind-profiling lidar
- Previously participated in NASA GRIP (2010) and Polar Winds (2014-15) airborne campaigns
- Laser pulses at 2-micron wavelength and 10 Hz are eyesafe at any range; daytime observations not compromised by solar background
- Data may be post flight processed multiple times with various number of shots accumulated (horizontal resolutions), vertical resolutions, and wind search bandwidths for maximum information extraction
- CPEX science flights indicate excellent vertical coverage and agreement with dropsonde winds (e.g. from 9.5km in plots below)



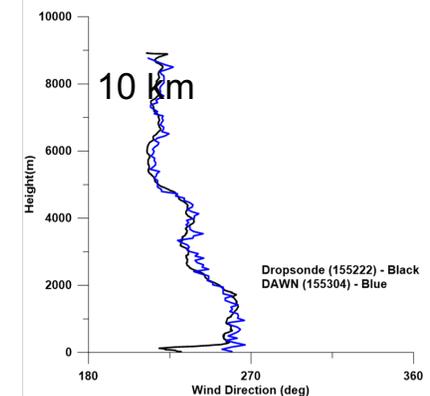
Each red circle is a DAWN sounding location

DAWN (blue) vs Dropsonde (black)

CPEX MISSION 06062017
Wind Speed Comparisons



CPEX MISSION 06062017
Wind Direction Comparisons



- **Science Mission Directorate**
 - **New NASA Research Announcement Expected**
 - **Precipitation Science Team**
 - **Solicitation: NNH18ZDA001N**
 - **Expected Release** February 2018
 - **NOIs Due** April 15, 2018
 - **Proposals Due** June 30, 2018
 - **Selections to be Made by** November 2018
 - Funds available: ~ \$7.0 M/year for 3 years
 - Number of Awards: ~ 55-60
-
- This solicitation will be for the selection of the 10th Precipitation Science Team
 - **No-cost research proposals can be accepted from international investigators to complement existing science team activities**

Previous ROSES Research Categories:

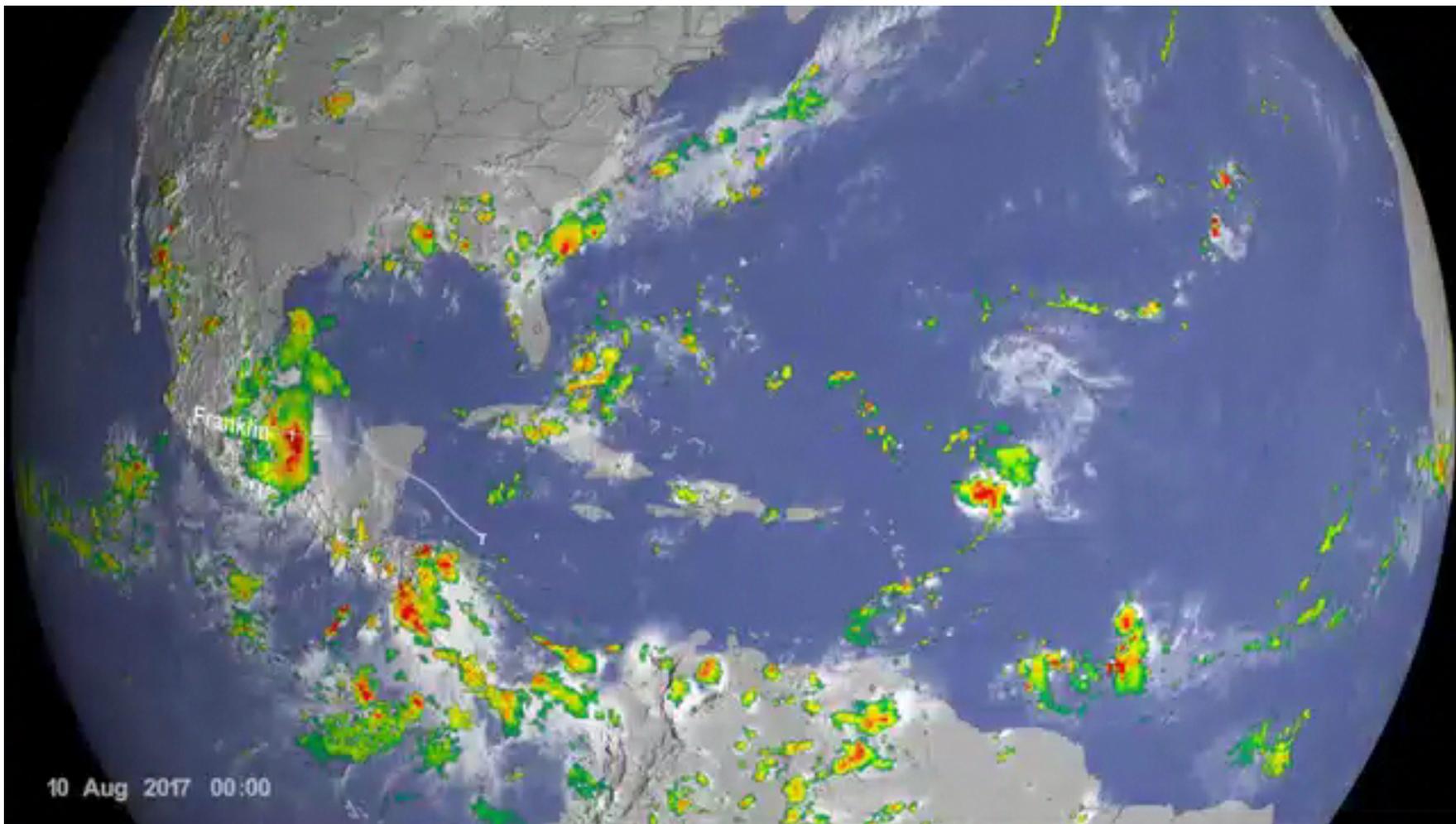
- 2.1. Algorithm/Product Validation and Enhancement (50% of available funding)
- 2.2 Utilization of Satellite/GV Products for Process Studies and Model Development (25% of available funding)
- 2.3. Methodology Development for Improved Applications of Satellite Products (25% of available funding)

- Want GPM data from NASA? gpm.nasa.gov
 - Products Available from: <http://pps.gsfc.nasa.gov>
 - Precipitation from DPR, GMI, Combined, IMERG, constellation partner
 - Levels 1 (calibrated instrument data), 2 (instantaneous swath), 3 (gridded, accumulated)
 - Application viewer tools
- TRMM V8 (=GPM V05) Level 1 (TB and Z) reprocessing began Oct 2, 2017
- TRMM Level 2 reprocessing expected early 2018
- TRMM+GPM IMERG reprocessing expected mid-2018
- In three years of operations:
 - thousands of scientific, application, and operational users have downloaded GPM data,
 - GPM generated more than 225 peer-reviewed publications,
 - communication efforts have reached about 4 million people online and 33,000 in person



Product Level	Description	Coverage	Latency* & Version
L1	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> Version 05
	Level 1B DPR	Geolocated, calibrated radar powers	Swath, IFOV (produced at JAXA) Version 05
	Level 1C, partner radiometers	Intercal	Version 05
L2	Level 2 GMI (GPROF2014)	Radar precipi	<div style="background-color: yellow; padding: 5px; text-align: center;"> Meeting Latency Requirements (Data Available To Users) GMI TB (avg 17 min) GMI RR (avg 23 min) DPR RR (avg 76 min) GMI+DPR RR (avg 83 min) </div>
	Level 2 partners	RE pre	
	Level 2 DPR	Z, σ_0 , C Precipitation w/ vert. stru...	
	Level 2 Combined GMI/DPR	Precipitation retrievals constrained with DPR & GMI	
L3	Level 2, 3 LH	Latent Heating (LH) products	0.25 x 0.25 monthly grid Version 04
	Level 3 Instrument Accumulations	GMI, partner radiometers, combined and DPR	0.25 x 0.25 daily and monthly grid Version 05
	Level 3 Merged Product (IMERG)	Merger of GMI, partner radiometer, and IR	0.1 x 0.1 at a 30 minute grid <i>4-5 hrs;</i> Version 04

*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



Now using one username for both accounts:



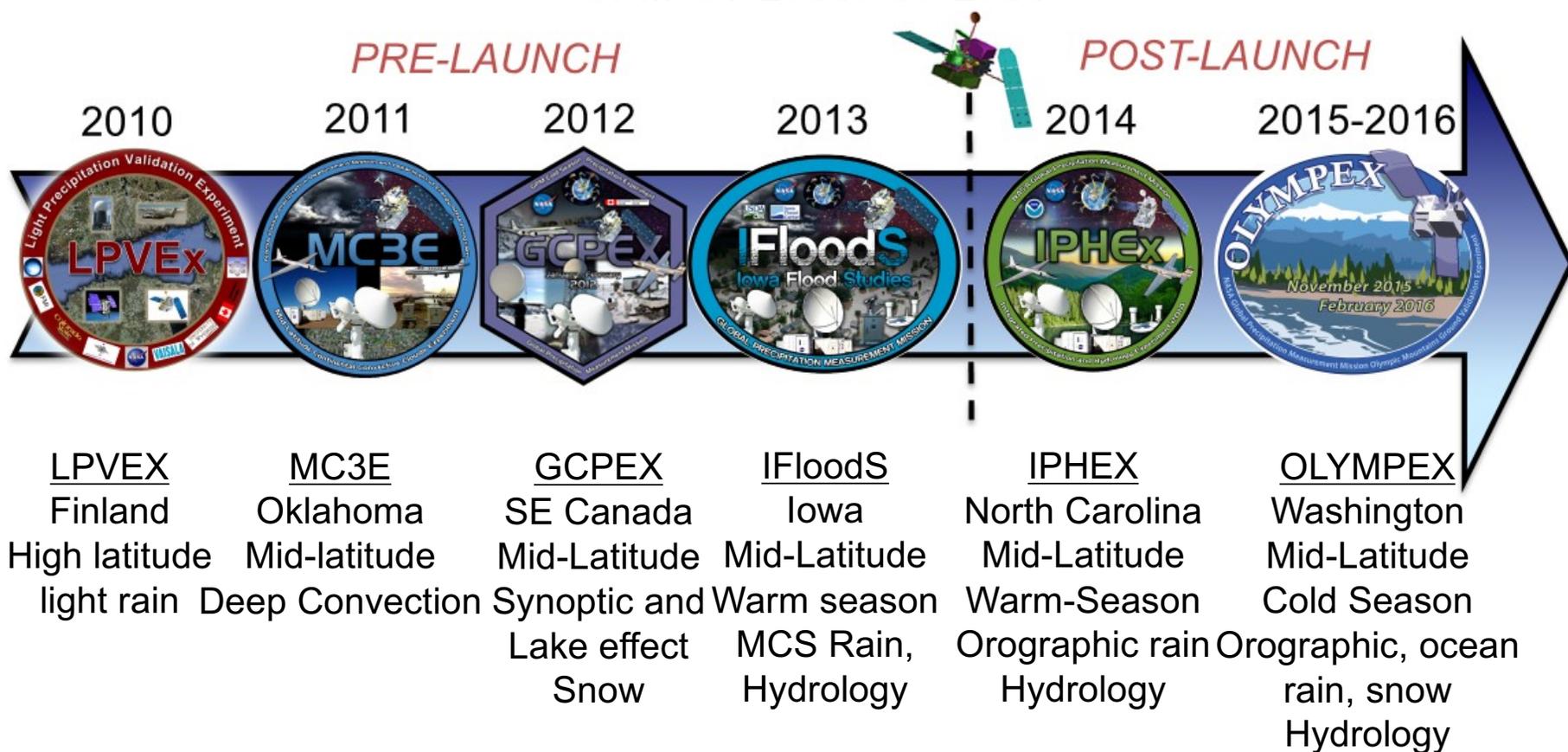
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<https://www.facebook.com/NASARain>

GPM GV Lead / Co-Lead



GV Contributions to International Partner Campaigns



- NASA Earth Science Division Satellite Fleet (**vigorous plan in place**)
- GPM Status (**excellent shape**)
- Recent Events (**very successful**)
 - End of Prime Mission Review
 - Senior Review
 - CPEX
- GPM Data Products (**very popular**)
- GPM Applications (**very useful**)
- GPM field experiments (**making it possible to validate GPM results**)