# GPM
Global Precipitation Measurement

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- ***Precipitation measurement technology***: *advancing precipitation measurement capability from space*
  - *through combined use of active and wide-band passive remote-sensing techniques to calibrate dedicated & operational PMW sensors to achieve global coverage*

- ***Water/energy cycle variability***: *advancing understanding of global water/energy cycle and fresh water availability*
  - *through better measurement of the space-time variability of global precipitation*

- ***Weather prediction***: *improving NWP skills*
  - *through more accurate and frequent measurement of instantaneous rain rates*

- ***Hydrometeorological prediction***: *advancing flood-hazard and fresh-water-resource prediction capabilities*
  - *through improved temporal sampling and spatial coverage*

- ***Climate prediction***: *improving climate prediction capability*
  - *through better understanding of precipitation microphysics, surface water fluxes, soil moisture storage, and latent heating*
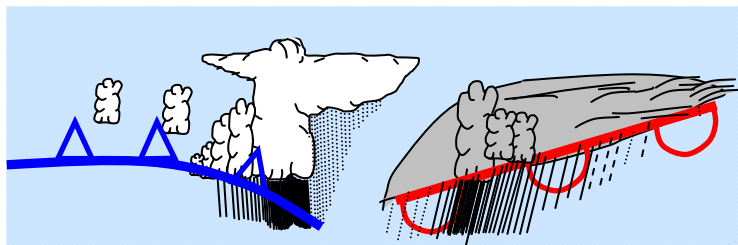
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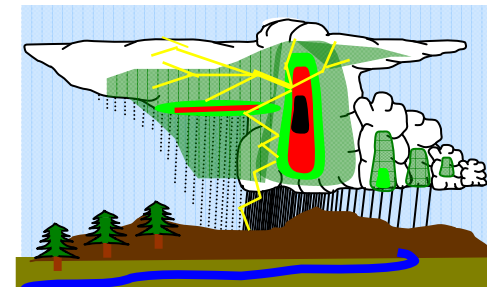
Science Objectives: Unify and advance global precipitation measurements for research & applications through

- *advanced active & passive microwave sensor measurements*
- *a consistent framework for inter-satellite calibration*
- *international collaboration in algorithm development and ground validation*

NASA Constellation Satellite
serving as a constellation coverage optimizer

- *Non-Sun-Synchronous orbit: ~40° inclination and 635 km altitude*
- *Multi-frequency radiometer (GMI)*
- *Improved near real-time hurricane monitoring & prediction*

Partner Constellation Satellites:

GCOM-W
DMSP-F18, F19
Megha-Tropiques
NOAA-N'
NPP
MetOp-B
NPOESS-C1

Polar Snowfal

GPM Core Satellite (NASA-JAXA)
serving as a physics observatory and calibration reference

- *Non-Sun-Synchronous orbit: 65° inclination and 407 km altitude*
- *Dual-frequency Precipitation Radar (DPR) built by Japanese: Ku-Ka Bands (13.6, 35.5 GHz)*
- *Multi-frequency GPM Microwave Imager (GMI): 10.65, 18.7, 23.8, 36.5, 89.0, 166, 183.3 GHz*
- *GMI provides a reference standard for uniform calibration of brightness temperatures of Constellation sensors*
- *DPR & GMI together provide microphysical measurements and a common cloud database for rain & snow retrievals from Core & Constellation sensors*
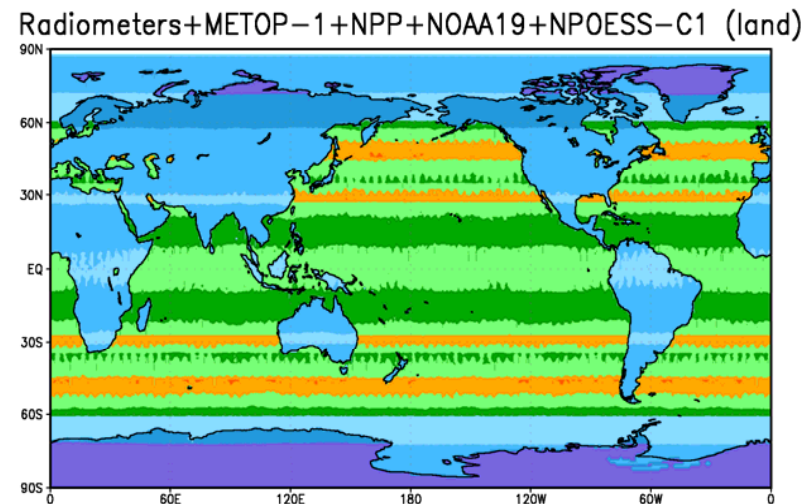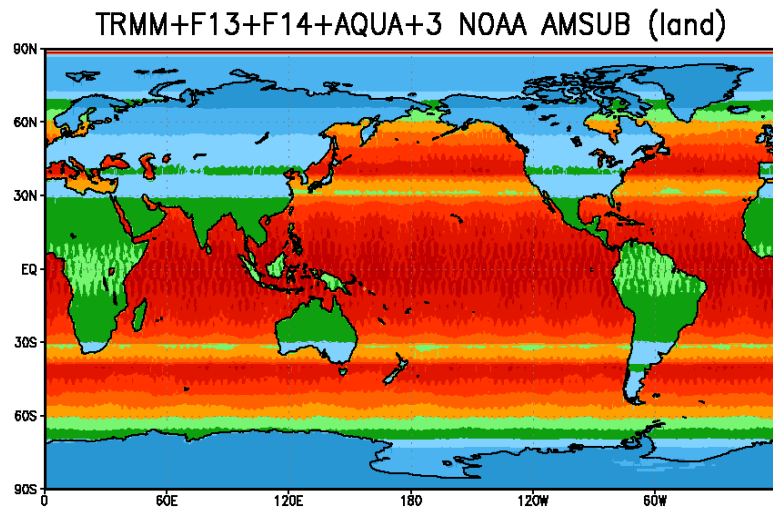
NASA

A C E   F L I G H T   C E N T E R

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Constellation Revisit Time: GPM in 2014 vs. Current Capability

4 Conical-Scanning Imagers plus
3 Cross-track Sounders Over Land

(≤ 3h over 45% of globe)

6 Conical-Scanning Imagers Plus
4 Cross-track Sounders Over Land
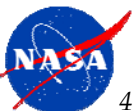
(≤ 3h over 92% of globe)

TRMM+F13+F14+AQUA+3 NOAA AMSUB (land)

Radiometers+METOP-1+NPP+NOAA19+NPOESS-C1 (land)

Lin & Hou (2006)

Hour

TMI, F13, F14, Aqua + 3 NOAA
AMSU-B's over land

GPM Core, NASA-1(40º), F18, F19, GCOM-W,
Megha-Tropiques + (MetOp-B, NPP, NOAA-N', &
NPOESS-C1) over land

G L O B A L   P R E C I P I T A T I O N   M E A S U R E M E N T
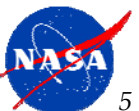
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Precipitation Measurement Mission (PMM) Science Team

- The GPM Mission is supported by U.S. and Japan Science Teams

- The 70 funded scientists on the NASA PMM science team support GPM in the following areas:

  - *Inter-satellite calibration method development*
  - *Precipitation algorithm development (rain, light rain, and snow)*
  - *Ground validation activities*
  - *Pursuing innovative techniques in precipitation data applications*
  - *Data system design & development*

International Partnership in GPM Ground Validation

- GPM participation in Canadian CloudSat-Calipso Validation Program

  - *GPM hardware contributions: AMFR (U.Mass), 2D video disdrometers (CSU), Parsivel disdrometers & Snowflake video imager (GSFC)*
  - *Unique datasets for snowfall algorithm development*
  - *Potential collaboration on satellite simulator algorithms with EarthCARE*

- U.S.-Finland collaboration on GPM Ground Validation

  - *Finnish national network of ground-based precipitation measurements in a region with frequent snowfall events and within the GPM Core sampling domain. Collaboration focuses on snowfall algorithm development and hydrological applications. Joint research plans in progress.*

C3VP Instruments