



## The Global Precipitation Measurement (GPM) Mission: Overview and U.S. Science Status

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The Global Precipitation Measurement (GPM) Mission is a satellite mission specifically designed to unify and advance precipitation measurements from a constellation of research and operational microwave sensors provided by a consortium of international partners. NASA and JAXA will deploy a Core Observatory in 2014 to serve as a reference satellite for precipitation measurements by the constellation sensors. The GPM Core Observatory will carry a Ku/Ka-band Dual-frequency Precipitation Radar (DPR) and a conical-scanning multi-channel (10-183 GHz) GPM Microwave Radiometer (GMI). The DPR, the first dual-frequency radar in space, will provide not only measurements of 3-D precipitation structures but also quantitative information on microphysical properties of precipitating particles. The DPR and GMI measurements will together provide a database that relates vertical hydrometeor profiles to multi-frequency microwave radiances over a variety of environmental conditions across the globe. This combined database will serve as a common transfer standard for improving the accuracy and consistency of precipitation retrievals from all constellation radiometers.

In addition to the Core Observatory, the GPM constellation consists of (1) Special Sensor Microwave Imager/Sounder (SSMIS) instruments on the U.S. Defense Meteorological Satellite Program (DMSP) satellites, (2) the Advanced Microwave Scanning Radiometer-2 (AMSR-2) on the GCOM-W1 satellite of JAXA, (3) the Multi-Frequency Microwave Scanning Radiometer (MADRAS) and the multi-channel microwave humidity sounder (SAPHIR) on the French-Indian Megha-Tropiques satellite, (4) the Microwave Humidity Sounder (MHS) on the National Oceanic and Atmospheric Administration (NOAA) Polar Orbiting Environmental Satellites (POES), (5) MHS instruments on MetOp satellites launched by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), (6) the Advanced Technology Microwave Sounder (ATMS) on the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP), and (7) ATMS instruments on the NOAA-NASA Joint Polar Satellite System (JPSS) satellites. Each constellation member may have its unique scientific or operational objectives but contributes microwave observations to GPM for the generation and dissemination of unified global precipitation data products.

Currently global rainfall products combine observations from a network of uncoordinated satellite missions using a variety of merging techniques. GPM is designed to provide the next-generation of precipitation products characterized by: (1) more accurate instantaneous precipitation estimate (especially for light rain and cold-season solid precipitation), (2) intercalibrated microwave brightness temperatures from constellation radiometers within a consistent framework, and (3) unified precipitation retrievals from constellation radiometers using a common a priori hydrometeor database consistent with combined radar/radiometer measurements by the GPM Core Observatory.

As a science mission with integrated applications goals, GPM will advance the understanding of global water cycle variability in a changing climate by offering insights into 3-dimensional structures of hurricanes and midlatitude storms, microphysical properties of precipitating particles, and latent heat associated with precipitation processes. The GPM Mission will also make data available in near realtime (within 3 hours of observations) for societal applications ranging from position fixes of storm centers, numerical weather prediction, flood forecasting, freshwater management, landslide warning, crop prediction, to tracking of water-borne diseases.

This presentation will give an overview of the GPM mission and its development status approximately one-year prior to launch.