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

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Abstract

The Global Precipitation Measurement (GPM) Mission is an international satellite mission designed to unify and advance precipitation measurements from a constellation of research and operational microwave sensors. NASA and JAXA will deploy the GPM Core Observatory carrying an advanced radar-radiometer system to serve as a physics observatory and a transfer standard for inter-calibration of constellation radiometers. The GPM Core Observatory is scheduled for launch in July 2013. NASA will provide a second radiometer to be flown on a partner-provided GPM Low-Inclination Observatory to enhance the near real-time monitoring of hurricanes and mid-latitude storms. JAXA will also contribute data from the Global Change Observation Mission-Water (GCOM-W) satellite. Additional partnerships are under development to include microwave radiometers on the French-Indian Megha-Tropiques satellite and U.S. Defense Meteorological Satellite Program (DMSP) satellites, as well as cross-track scanning humidity sounders on operational satellites such as the NPP, POES, JPSS, and MetOp satellites, which are used to improve the precipitation sampling over land. Brazil has in its national space plan for a GPM low-inclination radiometer, and data from Chinese and Russian microwave radiometers could potentially become available through international collaboration under the auspices of the Committee on Earth Observation Satellites (CEOS) and Group on Earth Observations (GEO).

The current generation of global rainfall products combines observations from a network of uncoordinated satellite missions using a variety of merging techniques. GPM will provide "next-generation" precipitation data products characterized by: (1) more accurate instantaneous precipitation measurement (especially for light rain and cold-season solid precipitation), (2) more frequent sampling by an expanded constellation of microwave radiometers including operational humidity sounders over land, (3) inter-calibrated microwave brightness temperatures from constellation radiometers within a unified framework, and (4) physical-based precipitation retrievals from constellation radiometers using a common *a priori* cloud/hydrometeor database constructed from GPM Core sensor measurements.

As a science mission with integrated application goals, GPM will (1) provide new measurement standards for precipitation estimation from space, (2) improve understanding of precipitation physics, the global water cycle variability, and freshwater availability, and (3) advance weather/climate/hydrological prediction capabilities to directly benefit the society. An overview of the GPM mission concept, NASA program status, science activities in the United States, as well as a wide range of international scientific collaborations in radiometer inter-calibration, retrieval algorithm development, and ground validation will be presented.