



Japanese Global Precipitation Measurement (GPM) mission status and application of satellite-based global rainfall map

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As accuracy of satellite precipitation estimates improves and observation frequency increases, application of those data to societal benefit areas, such as weather forecasts and flood predictions, is expected, in addition to research of precipitation climatology to analyze precipitation systems. There is, however, limitation on single satellite observation in coverage and frequency. Currently, the Global Precipitation Measurement (GPM) mission is scheduled under international collaboration to fulfill various user requirements that cannot be achieved by the single satellite, like the Tropical Rainfall Measurement Mission (TRMM).

The GPM mission is an international mission to achieve high-accurate and high-frequent rainfall observation over a global area. GPM is composed of a TRMM-like non-sun-synchronous orbit satellite (GPM core satellite) and constellation of satellites carrying microwave radiometer instruments. The GPM core satellite carries the Dual-frequency Precipitation Radar (DPR), which is being developed by the Japan Aerospace Exploration Agency (JAXA) and the National Institute of Information and Communications Technology (NICT), and microwave radiometer provided by the National Aeronautics and Space Administration (NASA). Development of DPR instrument is in good progress for scheduled launch in 2013, and DPR Critical Design Review has completed in July - September 2009.

Constellation satellites, which carry a microwave imager and/or sounder, are planned to be launched around 2013 by each partner agency for its own purpose, and will contribute to extending coverage and increasing frequency. JAXA's future mission, the Global Change Observation Mission (GCOM) - Water (GCOM-W) satellite will be one of constellation satellites. The first generation of GCOM-W satellite is scheduled to be launched in 2011, and it carries the Advanced Microwave Scanning Radiometer 2 (AMSR2), which is being developed based on the experience of the AMSR-E on EOS Aqua satellite. Collaboration with GCOM-W is not only limited to its participation to GPM constellation but also coordination in areas of algorithm development and validation in Japan.

Generation of high-temporal and high-accurate global rainfall map is one of targets of the GPM mission. As a proto-type for GPM era, JAXA has developed and operates the Global Precipitation Map algorithm in near-real-time since October 2008, and hourly and 0.1-degree resolution binary data and images available at <http://sharaku.eorc.jaxa.jp/GSMaP/> four hours after observation. The algorithms are based on outcomes from the Global Satellite Mapping for Precipitation (GSMaP) project, which was sponsored by the Japan Science and Technology Agency (JST) under the Core Research for Evolutional Science and Technology (CREST) framework between 2002 and 2007 (Okamoto et al., 2005; Aonashi et al., 2009; Ushio et al., 2009). Target of GSMaP project is to produce global rainfall maps that are highly accurate and in high temporal and spatial resolution through the development of rain rate retrieval algorithms based on reliable precipitation physical models by using several microwave radiometer data, and comprehensive use of precipitation radar and geostationary infrared imager data. Near-real-time GSMaP data is distributed via internet and utilized by end users. Purpose of data utilization by each user covers broad areas and in world wide; Science researches (model validation, data assimilation, typhoon study, etc.), weather forecast/service, flood warning and rain analysis over river basin, oceanographic condition forecast, agriculture, and education.

Toward the GPM era, operational application should be further emphasized as well as science application. JAXA continues collaboration with hydrological communities to utilize satellite-based precipitation data as inputs to

future flood prediction and warning system, as well as with meteorological agencies to proceed further data utilization in numerical weather prediction system and forecasts.