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Near-real-time global rainfall map using multi-satellite data by JAXA and its validation

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As a prototype of the Global Precipitation Measurement (GPM) precipitation map product, Japan Aerospace Exploration Agency (JAXA) has developed and operated near-real-time data processing system and distributed browse images and rainfall products via the Internet (http://sharaku.eorc.jaxa.jp/GSMaP/). Core algorithms of the system are based on the combined PMW-IR algorithm developed under the Global Satellite Mapping of Precipitation (GSMaP) project. The system has started processing of GSMaP_NRT V1 since November 2007, and major update of the algorithm to GSMaP_NRT V2 has been applied since October 2008. Horizontal resolution of GSMaP_NRT is 0.1-degree latitude/longitude grid. The datasets are provided in near real time (about four hours after observation). Daily product of the GSMaP is utilized for the International Precipitation Working Group (IPWG) satellite precipitation validation/intercomparison studies. Currently GSMaP_NRT, as well as other satellite-based rainfall products, are compared to regional ground rain gauge and radar network data in near-real-time basis over United States (University of Maryland), South America (University of Maryland), Australia (Bureau of Meteorology), and Japan (Osaka Prefecture University).

The GSMaP rainfall products during 1998-2006 were produced by the post-processing system. We analyzed six high resolution satellite rainfall estimates from various centers and universities with reference to the gauge-calibrated ground radar data provided by the Japan Meteorological Agency (JMA Radar-AMeDAS precipitation analysis) during the period from January to December 2004 and strengths and limitations of the satellite estimates are examined around Japan. Validation results tended to be better for the products with temporal interpolation, based upon the morphed technique using GEO IR information. Satellite estimates were poor for light rainfall during the warm season and for very heavy rainfall. Further analyses of satellite estimates were conducted in terms of data sources and surface types. Effective performance by the merger of PMW sounders over the ocean was verified by radar validation, in addition to the best results of the PMW imagers. Overall, validation results over the ocean were best, and results over mountainous regions were worst. Performance was poor over coasts and small islands, due to the problem of PMW retrievals. This study focused on hydrometeor profiles of orographic heavy rainfall over the Japanese Archipelago, which could be related to the poor performance of satellite estimates in very heavy rainfall.