Next-generation satellite precipitation products for understanding global and regional water variability

17-19 May 2011
Menorca, Punta Prima

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A major challenge in understanding the space-time variability of continental water fluxes is the lack of accurate precipitation estimates over complex terrains. While satellite precipitation observations can be used to complement ground-based data to obtain improved estimates, space-based and ground-based estimates come with their own sets of uncertainties, which must be understood and characterized. Quantitative estinmation of uncertainties in these products also provides a necessary foundation for merging satellite and ground-based precipitation measurements within a rigorous statistical framework.

Global Precipitation Measurement (GPM) is an international satellite mission that will provide next-generation global precipitation data products for research and applications. It consists of a constellation of microwave sensors provided by NASA, JAXA, CNES, ISRO, EUMETSAT, DOD, NOAA, NPP, and JPSS. At the heart of the mission is the GPM Core Observatory provided by NASA and JAXA to be launched in 2013. The GPM Core, which will carry the first space-borne dual-frequency radar and a state-of-the-art multi-frequency radiometer, is designed to set new reference standards for precipitation measurements from space, which can then be used to unify and refine precipitation retrievals from all constellation sensors. The next-generation constellation-based satellite precipitation estimates will be characterized by intercalibrated radiometric measurements and physical-based retrievals using a common observation-derived hydrometeor database. For pre-launch algorithm development and post-launch product evaluation, NASA supports an extensive ground validation (GV) program in cooperation with domestic and international partners to improve (1) physics of remote-sensing algorithms through a series of focused field campaigns, (2) characterization of uncertainties in satellite and ground-based precipitation products over selected GV testbeds, and (3) modeling of atmospheric processes and land surface hydrology through simulation, downscaling, and data assimilation.

An overview of the GPM mission, science status, and synergies with HyMex activities will be presented.