A research framework to evaluate Level 2 active and passive rainfall products using ground radar-based National Mosaic QPE.

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Abstract

A characterization of the error associated to satellite precipitation estimates arises as major information for applications ranging from water budget studies to forecasting natural hazards related to extreme rainfall events. Low orbiting platforms are the backbone of future GPM global precipitation estimates. It is fundamental to understand their ability to detect, classify and quantify precipitation to provide feedback to algorithm developers as well as for merged "level-3" products. Comparing satellite QPEs with reference values derived from ground-based measurements provides the potential to address a variety of sources of errors in spaceborne QPE. We use here the NOAA/NSSL Ground Radar-based National Mosaic QPE (NMQ) to provide a consistent reference research framework for creating conterminous US (CONUS)-wide error characterization of precipitation retrievals. A good reference should provide trustworthy information at fine scale on the rainfall variability (i) to temporally match with the instantaneous rainfall estimates from space and (ii) to resolve the spatial variability of rainfall within the satellite field of view. Specific error factors for passive (e.g. surface conditions) and active (e.g. attenuation of the radar signal) sensors are investigated. Systematic biases and random errors quantified at the satellite pixel scale are useful for satellite-based rainfall products. Examples are provided on the error structure of TRMM Precipitation Radar (PR) and Microwave Imager (TMI) quantitative precipitation estimation (QPE) at ground.

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