Development of a Rapid Prototyping Capability for Hydrological Applications of Global Precipitation Measurements

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The future NASA/JAXA Global Precipitation Measurement (GPM) mission includes a primary focus on water management applications that use land surface models to simulate the main variables in surface water and energy budgets. GPM is envisioned as a constellation mission, centered about a core satellite surrounded by various constellation satellites, many of which will be existing assets with passive microwave (PMW) radiometer systems (e.g., the DMSP and other operational satellites). However, owing to variable launch schedules, mission changes, etc., the configuration (number of satellites, orbit times, sensor types) of the GPM constellation will likely change before and during the mission, thereby impacting the quality of the combined-sensor precipitation estimates. This proposed RPC experiment is aimed at evaluating and characterizing the rainfall estimates from GPM for decision support needs in the context of earth science applications using land surface and hydrological models. Precipitation estimates are gathered from the existing passive/active satellite systems (DMSP, TRMM, Aqua, etc.) and are analyzed in a blended-satellite precipitation technique to simulate GPM-like data. The impact of various constellation configurations is examined against local rainguage and radar data, as well as against hydrological runoff models. The focus area is the Arkansas–Red River basin in the central United States during June–August 2007. Though these evaluations are focused around water management issues, they are still relevant for cross-cutting applications to address real-world problems, such as agricultural production, water resource management, flood prediction, and water supply.