



On the Development of the Synthetic GPM Simulator

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The next-generation Global Precipitation Measurement (GPM) mission core satellite will have a better capability of detecting light rain and falling snow in middle and high latitudes via a dual-frequency radar (i.e., the GPM dual-frequency precipitation radar or DPR) and a multi-frequency radiometer (i.e., the GPM Microwave Imager or GMI). This improvement requires more complex rainfall algorithms that can handle multi-sensor and multi-frequency signals of warm/cold/mixed rain over land/ocean in the Tropics as well as high latitudes. To facilitate such algorithm development, this project aims to develop a Synthetic GPM Simulator composed of a unified GPM instrument simulator (forward model) coupled with multiple CRM simulations and a TRMM-derived empirical cloud-precipitation database. The Synthetic GPM Simulator will be built upon the existing multi-sensor satellite simulator, the Goddard Satellite Data Simulator Unit (SDSU).

Development of the Synthetic GPM Simulator supports the GPM unified algorithm architecture by sharing physics modules (i.e., single-scattering, radiative transfer, and microphysics) and an ancillary database (surface emissivity and surface radar backscatter) needed for doing retrievals among GPM algorithm teams. Also, the simulator-generated testbed will support GPM pre-launch algorithm verification phase 1 (evaluation of algorithms using regional CRM simulations and/or real data verified at select locations, 01/11 ~ 01/12) and phase 2 (statistically robust global verification of algorithms using multi-orbit synthetic data generated from satellite simulators, 01/12 ~ 01/13). Although the main purpose is to support GPM algorithms, development of the Synthetic GPM Simulator will also support radiance-based CRM evaluations as well as radiance-based rainfall assimilation systems.