

EarthCARE's Potential to Evaluate a Global Storm-Resolving Model Using Joint Simulator

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Abstract

EarthCARE, equipped with a suite of passive and active sensors, including Cloud Profiling Radar (CPR), Atmospheric LIDar (ATLID), Multi-Spectral Imager (MSI), and Broad Band Radiometer (BBR), is designed for comprehensive studies of clouds, aerosols, precipitation, and their radiation impact. The CPR's Doppler capability is crucial for assessing the terminal velocity of rain and ice particles and for understanding convective motions.

Global storm-resolving models (GSRMs, Satoh et al. 2019; Stevens et al. 2019) have been used to generate detailed simulations of mesoscale convective systems using a kilometer-scale horizontal grid. New observations, such as Doppler velocity from EarthCARE, will provide insights into the evaluation and improvement of GSRMs.

Moreover, the utilization of satellite simulators — comprehensive radiative transfer models designed to simulate satellite signals using outputs from atmospheric models like GSRMs — plays a crucial role in this process. These simulators are integral for assessing, enhancing, and aligning numerical models with satellite observation data.

This study investigates EarthCARE's potential to enhance GSRM evaluations and improvements using a satellite simulator. We also introduce our collaboration with a satellite remote sensing group in developing retrieval algorithms.