Improvement and Evaluation of 1-moment Cloud Microphysics using GPM Satellite Data

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A radar simulator as observation operators has been developed for GPM/DPR data assimilation in JMA. A function to simulate the melting layer and an artificial noise-filter to reproduce the detection limit of radar were implemented into the simulator. Using the radar-simulator and RTTOV, we verified the predictions of the operational Meso-Scale Model (MSM) against GPM satellite observation data. Compared to DPR, the amount of rain in the lower troposphere was underestimated, and compared to GMI using RTTOV-SCATT, the amount of cloud ice was further underestimated. We found that the reasons for the underestimation were due to the large evaporation rate of rain and the large conversion rate of cloud ice into snow. These errors were successfully reduced by revision to the PSD for rain, the terminal velocity of cloud-ice and the conversion methods between water species. This improvement has a large impact for precipitation and atmospheric profiles in the forecast of MSM. In this presentation, I would like to show the improvement of 1-moment cloud microphysics in our operational system.