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Evaluation of microwave radiances of GPM/GMI for the all-sky assimilation in WRF-RTTOV framework

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This study evaluates the statistical characteristics of radiance simulation at lower troposphere humidity sounding channel (183±7V) from radiative transfer model for television infarred observartion satellite operational vertical sounder (RTTOV-SCATT). The input data used in RTTOV-SCATT includes vertical hydrometeror profiles (cloud water, ice, snow and rain), humidity and surface fluxes. In addition, the simulations from Weather Reseach Forecast (WRF) model were performed at 15km resolution using ERA-Interim (71km at 6h interval) datasets. This study was tested on three different deep convective events to ensure robustness (hudhud, vardah and kyant cyclones) over the Bay of Bengal from 7-14th october 2014, 6-12th december 2016 & 21-27th october 2016 respectively. While examining the observed-first guess (FG departure) statistics, the ranges vary high upto ±100 K at 183±7V due to high scattering from frozen hydrometeors in comparison to ±50 K at 37V in all the convective events. To study the FG errors with reference to cloud amount, a symmetric error model was used. The normalized probability density function (PDF) of FG departure shows close resemblance to gaussian at 37V channel. The goodness of fit test, h-statistics and skewness of observed and simulated distribution show optimum results for thinplate shape in all the convective events. These results illustrate a potential to integrate the GMI sensor data within a WRF data assimilation system.

Keywords: GPM/GMI, all-sky radiance, assimilation, RTTOV-SCATT, WRF