

# **Validation of the Results of the Cloud-Resolving Model with the Satellite Data of Infrared and Microwave Bands around Japan Region during the Winter Season**

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## **1. Introduction**

To confirm the accuracy of the results using a cloud-resolving model, it is useful to compare the simulation results with the satellite observations. This study shows the comparison between brightness temperatures ( $T_{BB}$ ) of infrared and microwave bands obtained from the satellite observations and those calculated using the Satellite Data Simulator Unit (SDSU; Masunaga et al. 2010) on the simulation results by the Cloud Resolving Storm Simulator (CReSS; Tsuboki and Sakakibara 2002) during the winter season in 2008-2009.

## **2. Daily simulations using the CReSS and satellite data**

We carried out daily simulations using the CReSS whose horizontal grid resolution was 5 km over the Sea of Japan from 24 December 2008 to 7 April 2009. The GSM and MGDSST data provided by JMA were used as the initial and boundary conditions. The simulation started 12Z and continued for 36 hours.

Data of microwave (89.0 GHz)  $T_{BB}$  were obtained about two times in a day by the AMSR-E/Aqua. Since data of infrared (Ch-1)  $T_{BB}$  were obtained every hour by the MTSAT, we selected the nearest time passing the Aqua over the Sea of Japan from the simulation results and calculated  $T_{BB}$  for these bands using the SDSU.

## **3. Results**

Figure 1 shows horizontal distributions of infrared and microwave  $T_{BB}$  obtained from the satellite observations (MTSAT and AMSR-E/Aqua) and simulation results (CReSS-SDSU) at 17 UTC on 25 December 2008. A cloud cover region depicted by  $T_{BB}$  less than 260 K is seen over the almost all of the Sea of Japan by the MTSAT observation. Although the cloud cover is reproduced in the central and northern regions, a cloud free region depicted by  $T_{BB}$  about 270-280 K appears in the south of the Sea of

Japan in the CReSS-SDSU.

A high microwave  $T_{BB}$  in horizontal polarization about 200-220 K in the northern region of the Sea of Japan shown in the CReSS-SDSU corresponds to that shown in the AMSR-E observation. In vertical polarization, there are band-shaped significant low  $T_{BB}$  regions less than 240 K. Solid particles should excessively exist in these regions.

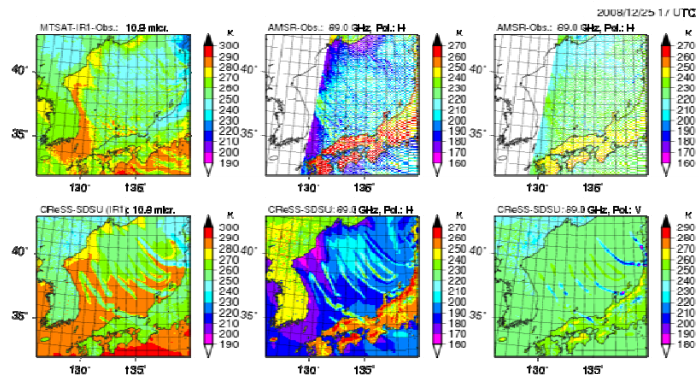


Fig. 1. Horizontal distributions of infrared  $T_{BB}$  (left), microwave  $T_{BB}$  in horizontal polarization (center) and those in vertical polarization (right) at 17 UTC on 25 December 2008. Upper (lower) panels are obtained from the satellite observation (MTSAT and AMSR-E/Aqua) and calculated from the simulation results (CReSS-SDSU), respectively.

#### 4. Summary and discussion

We compare infrared and microwave  $T_{BB}$  calculated using the SDSU on the simulation results by the CReSS with those obtained from the satellite observations. The lower cloud fraction shown in the simulation should be considered that the coarse horizontal grid resolutions is a failure to reproduce the snow clouds. The cause to overestimate the solid particles in snow clouds should be in the cloud microphysical processes of the CReSS, in particular, the conversion process from snow to graupel.

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#### References

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