EMS Annual Meeting Abstracts
Vol. 16, EMS2019-529, 2019

Effects of cloud detection to the innovation of brightness temperature measured by ground-based microwave radiometer

Yunyoung Song (1), Myoung Hwan Ahn (1), Domenico Cimini (2,3)

(1) Department of Atmospheric Science and Engineering, Ewha Womans University, Seoul, Republic of Korea, (2) National Research Council of Italy, Institute of Methodologies for Environmental Analysis, Potenza, Italy, (3) Center of Excellence CETEMPS, University of L'Aquila, L'Aquila, Italy

Assimilation of brightness temperature (Tb) measured by ground-based microwave radiometers (MWRs) into numerical weather prediction (NWP) models requires a quality control process including cloud detection. Here, we show that utilization of infrared radiometer (IRT) in addition to the MWR data could improve the characteristics of innovation, the difference between the measured and background Tbs. The large spectral and temporal variabilities of clouds shown in the down-welling infrared radiation (at window wavelength) are utilized for the IRT cloud detection, while the temporal variability captured by the microwave Tb at window channel (31.4 GHz) is utilized (31.4 GHz method). The effect with different types of cloud detection to the innovation is evaluated by comparing Tbs simulated using the RTTOV-gb with the input data from NWP data and the measured data obtained from a MWR installed at the Changwon weather station during 2012-2013. The root mean square difference (RMSD) between the two data set show 22.35 K, 2.03 K, and 2.30 K considering no cloud detection, the IRT method, and 31.4 GHz method, respectively. When both cloud detections are applied, RMSD is reduced to 1.85 K which is the smallest. Seasonal error statistics show lower values in winter (RMSE is 0.81 K, Bias is -0.13 K) and large in summer (RMSE is 3.46 K, Bias is -1.48 K). This is expected considering the higher water vapor content and variability, although there may be residual uncertainty in clouds rejection. In the conference, other improvements in the innovation characteristics such as symmetry, skewness are going to be presented in addition to the specific cases showing importance of simultaneous application of both cloud detection algorithms.