Radiance-Based Evaluation of CWBGFS cloud simulation: from the View of Himawari-8 Observation

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ABSTRACT

The comparison between numerical model-simulated and satellite-observed radiance (or brightness temperature; BT) is so called radiance-based evaluation. The outgoing longwave radiation in specify Himawari-8 Advanced Himawari Imager (AHI) infrared (IR) observing bands include the cloud information such as cloud cover and cloud top height. The study couple the Community Radiative Transfer Model (CRTM) and Central Weather Bureau global forecast system (CWBGFS) to generate synthetic satellite observed IR BTs. The synthetic satellite image can provide the cloud features of model. In this study, the model and satellite data during April to August 2018 are using to evaluate the performance of CWBGFS initial forecast. The National Centers for Environmental Prediction (NCEP) FNL (Final) Operational Global Analysis data is also considered as reference. The cloud occurrences difference between CWBGFS and observation are less than 2 % in all inspection area except for Taiwan and south east part of China region. The overestimate in high-level cloud occurrences are about 6 to 11 %. On the contrary, the mid-level cloud occurrences show 5 to 10 % negative deviations. The occurrences of low level cloud are very similar between model and observation. The BT differences in the 10.4-µm between model and observation are always cold bias. The result indicates that the model cloud intensity tends to develop stronger than the observation, especially for high-level cloud. Overall, the CWBGFS perform similar to NCEP FNL and has capabilities to produce reliable pattern of cloud. However, the radiance-base evaluation can identify some disadvantages and well feedback to the model developer in CWBGFS.