Development of KIAPS Observation Processing System: AMSU-A Bias Correction Modules

Sihye Lee, Ju-Hye Kim, Hyoung-Wook Chun, and Jeon-Ho Kang

Data Assimilation Team, Korea Institute of Atmospheric Prediction Systems (KIAPS), Seoul, Korea, sh.lee@kiaps.org

As a part of the KIAPS Observation Processing System (KOPS), we have developed the modules for satellite radiance data pre-processing and quality control, which include observation operators to interpolate model state variables into observation space radiance. AMSU-A (Advanced Microwave Sounding Unit-A) Level-1D radiance data was extracted using the BUFR (Binary Universal Form for the Representation of meteorological data) decoder and a first guess was calculated with RTTOV10.2. Both softwares were run via the parallel interface, i.e. MPI. For initial quality checks, the pixels contaminated by large amount of cloud liquid water, heavy precipitation, and sea ice were removed. Different channels for assimilation, rejection, or monitoring were selected for different surface types since the errors from the skin temperature were caused by inaccurate surface emissivity. In radiance data pre-processing, correcting the bias caused by the instruments and radiative transfer model errors is crucial. We have developed bias correction modules in two steps, based on 30-day innovation statistics (observed radiance minus background; O-B). The scan bias correction was calculated individually for 10 degree latitude bands. Then a global multiple linear regression of the scan-corrected innovations against several predictors (e.g., 850-300 and 200-50 hPa thicknesses, surface skin temperature, and total column precipitable water [1]) was employed to correct the air-mass bias. Some weighting is applied to the regression for assimilation channel selections for such reason that stratospheric channels are not dependent on the surface skin temperature predictors.

References

[1] B. A. Harris and G. Kelly. “A satellite radiance bias correction scheme for data assimilation”, *Q. J. R. Meteorol. Soc.*, vol. 127, pp. 1453-1468, 2001.