S6-06

All-sky infrared radiance assimilation of Himawari-8 in the global data assimilation system at JMA

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Infrared all-sky radiance (ASR) assimilation has been developed for Himawari-8 in the global data assimilation system of JMA. Compared to clear-sky radiance (CSR) assimilation currently implemented, this development is expected to enhance the observation coverage, reduce sampling dry bias, and extract more observation information in meteorologically sensitive regions, and then improve analysis and forecasts. There are many challenges in the development of infrared ASR assimilation including poor representation in radiative transfer model (RTM) and forecast model in cloud scenes, strong situation-dependency of observation statistics, and high non-Gaussianity and non-linearity. We developed cloud-dependent quality control, bias correction (BC), and observation error (OE) models to address these challenges in addition to using the state-of-art RTM (RTTOV ver13).

Data assimilation cycle experiments suggested the ASR assimilation of water vapor bands of Himawari-8 improved short-range forecasts of upper- and middle tropospheric water vapor and temperature over CSR assimilation. Sensitivity experiments demonstrated two important findings: (1) OE correlation and cloud-dependent OE standard deviation are important, but cloud-dependency of OE correlation is not so much, (2) cloud-dependent BC predictors are essential in the presence of large (negative) observation-minus-background bias.