Development of all-sky infrared radiance assimilation of geostationary satellites

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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 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, and observation error models to address these challenges in addition to using the state-of-art RTM (RTTOV ver13). We recently accounted for cloud-dependent inter-band observation error correlation that rapidly increases with the cloud effect.
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. However, as of writing this abstract, the improvement does not stay beyond the forecast at day 2 and three is some degradation in wind forecasts. The latest development and results will be presented.

Keywords: satellite data assimilation, geostationary satellite, all-sky radiance assimilation

