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# All-sky microwave humidity sounder assimilation in the Korean Integrated Model forecast system

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## Abstract

The Korean Integrated Model (KIM) and hybrid data assimilation system were extended to assimilate all-sky radiance from microwave satellite sensors. Initially, RTTOV-SCATT (version 11.3) was implemented to assimilate the Microwave Humidity Sounder (MHS) 183 GHz channels over the ocean. While there is no cloud/precipitation control variables in our system, temperature and humidity profiles are improved in the all-sky assimilation. In the cycled analysis and forecast experiments, an assimilation of the MHS in a cloudy region shows globally substantial benefits; a 1.11% reduction in the humidity root-mean-square-error occurred in the background field compared to clear-sky radiance assimilation as verification against the ECMWF IFS analysis. Even though the MHS all-sky assimilation's impact on the Northern Hemisphere mid-latitudes is not remarkable, it nonetheless produces a highly realistic humidity analysis increment for heavy rainfall events over East Asia. This improvement is consistent from the analysis initial time to 120 h forecasts.

**Keywords:** all sky assimilation, East Asia, heavy rainfall, microwave satellite, RTTOV SCATT

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