

Assimilation of ATOVS level-1c radiance data at JMA

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Since 28 May 2003, JMA has been used NOAA/NESDIS pre-processed radiances data (level-1d) in the ATOVS radiance assimilation system (Kazumori et al. 2003). The AAPP (ATOVS and AVHRR Processing Package) software was introduced to the JMA numerical weather prediction system on 25 August 2004. The ATOVS level-1b data from NOAA/NESDIS and the direct broadcast ATOVS data received at the Meteorological Satellite Center of JMA are pre-processed routinely and converted to the level-1c radiance data.

A new system for the ATOVS level-1c data assimilation was developed and RTTOV-7 (Saunders et al. 2002) was introduced as the radiative transfer model for the assimilation. In the system, the 1D-Var pre-process step and the 3D-Var analysis have been modified to deal with each instruments as an independent source of radiance data and these data are assimilated on its original scan geometry. Several pre-processing procedures in the 1D-Var step were improved. A horizontal thinning procedure was improved for three-satellite usage and new criteria for clear/cloud/rain conditions were defined for the level-1c data. A retrieval algorithm of cloud liquid water was introduced for the AMSU-A cloud detection. The removal of rain data based on the AAPP pre-process procedures was installed. Moreover, a new bias correction scheme for level-1c radiance was developed (Kazumori et al. 2004).

Preliminary observation system experiments were carried out with the T213L40 operational resolution of Global Spectral Model by using the radiance data of ATOVS (AMSU-A and AMSU-B) of NOAA15, NOAA16 and NOAA17 instead of current NESDIS pre-processed radiance data. The results of the experiment demonstrated large positive impacts on 500hPa geopotential height (Figure 1). And improvements of analysis field and forecast field are confirmed against radio-sonde observation for temperature and geopotential height (not shown). The new system was implemented on 2 December 2004.

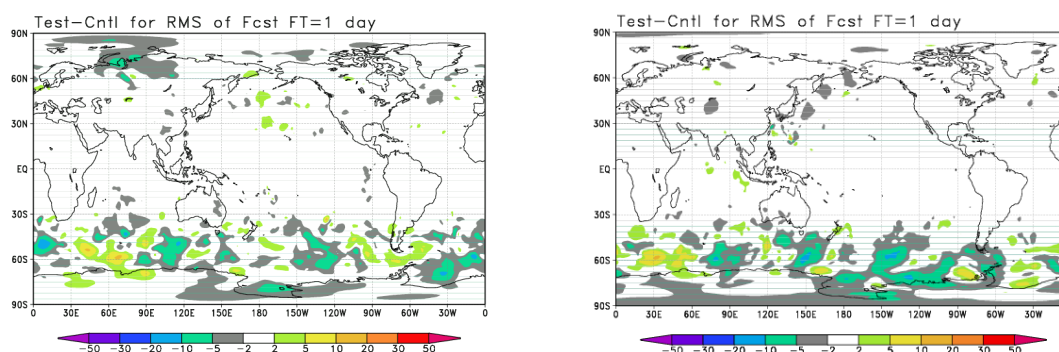


Figure 1. Differences of the averaged Root Mean Square forecast error for the 500-hPa geopotential height between the TEST and CNTL at one day forecast for the January 2004 (left) and August 2004 (right). They are produced by the forecasts verified against their own initial conditions during 31 day period from 1 to 31 January 2004, and during 31 day period from 1 to 31 August 2004, respectively. The negative value indicates smaller errors in the TEST run.

Reference

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