

Improvement of ATOVS radiance assimilation

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JMA has been assimilating radiances of AMSU-A/B from NOAA15-17 and Aqua satellites in the global data assimilation system. In August 2006, several changes were made in ATOVS pre-processings such as improving QC, recalculating scan bias correction, and modifying AMSU-A observation errors assigned. The QC improvement includes update of an algorithm to derive total column cloud liquid water (TCCLW) used for detecting cloud/rain-affected radiances and correcting air-mass dependent observation biases, stricter gross-error QC, adding rain detection based on TCCLW, removal of edge scans and revision of channel selection. Among them, observation error modification had the largest impacts on NWP performance. The details of this modification can be found in Okamoto et al. (2006).

Cycle experiments were carried out for 20 July through 9 September 2004 (EXP1) and 20 December 2004 through 9 February 2005 (EXP2) to assess these changes. With the new ATOVS pre-processings, the fit of temperature analysis against radiosondes became better in the Tropics and Southern Hemisphere although worse in the stratosphere of the Northern Hemisphere. The forecast impacts for the 850 hPa temperature and 500 hPa geopotential height are positive in the Tropics and Southern Hemisphere while neutral in the Northern Hemisphere. This is shown in Fig.1 in terms of improvement rate of root mean square forecast error (RMSFE) defined by $[(\text{RMSFE}_{\text{cnt1}} - \text{RMSFE}_{\text{test}}) / \text{RMSFE}_{\text{cnt1}}]$. Especially there are obvious positive impacts in short-range forecast in the Southern Hemisphere. Typhoon track forecast errors are clearly reduced at the forecasts of 30-h and hereafter (Fig.2).

References

Okamoto, K. H. Owada, Y. Sato, and T. Ishibashi, 2006: Use of satellite radiances in the global assimilation system at JMA. in Technical Proceedings of the 15th International ATOVS Study Conference, Matatea, Italy, 4-10 October 2006.

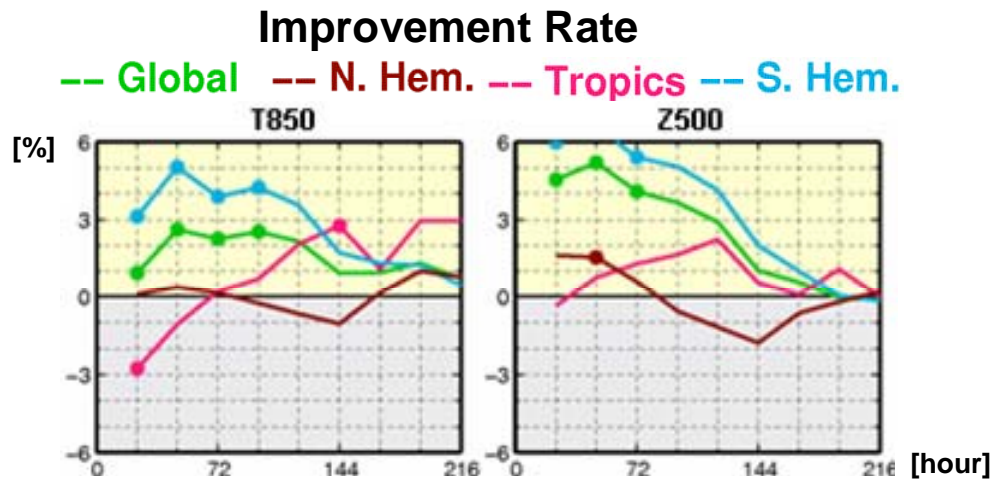


Fig.1: Improvement rate (see text) of forecast error of 850 hPa temperature and 500 hPa geopotential height as a function of forecast hours up to 216 hours for the experiment of EXP1. Dots on these score lines represent statistical significance.

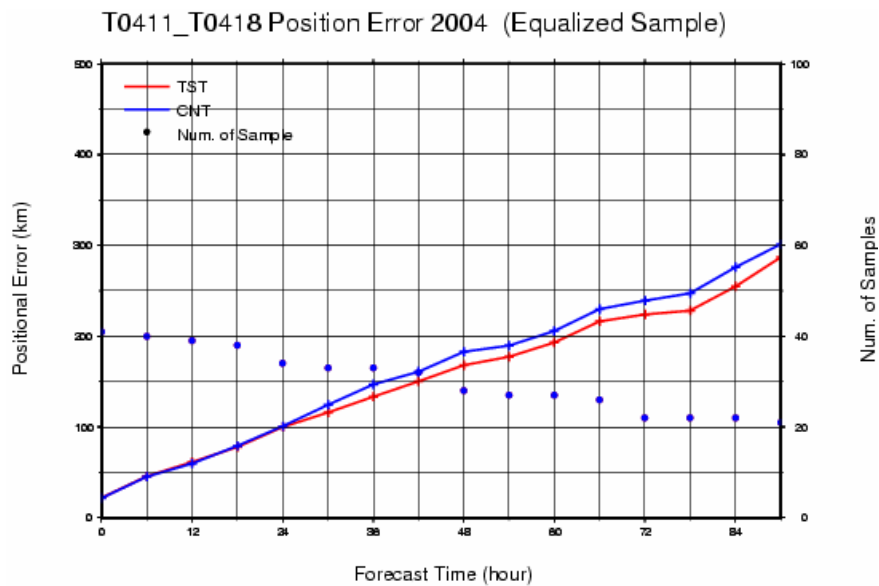


Fig.2: Typhoon track forecast errors of the run with improved ATOVS processing (red line) and old processing (blue line) in EXP1. The number of cases used in this statistics is dotted with the scale at the right.