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Report on the progress of the satellite data assimilation in Korea Meteorological Administration

This paper reports the recent progress of the satellite data assimilation in the numerical weather prediction at Korea Meteorological Administration (KMA).

Progress of the satellite data assimilation in KMA

Korea Meteorological Administration (KMA) continues to progress in assimilating the new satellite information into its regional and global NWP models. Since 2007, MODerate-resolution Imaging Spectroradiometer (MODIS) polar wind has been assimilated in the global NWP model of KMA. The impact of the retrieved SSM/I sea surface wind was tested. The retrieved wind data will be assimilated into the global model.

For the regional NWP models, QuikSCAT wind is assimilated in semi-operational mode in the 10km resolution KMA Weather and Research Forecasting model (KWRF). Assimilating the Regional ATOVS Re-transmission Service (RARS) data in KWRF at the developing stage.

1. MODIS polar wind

MODIS polar wind from Terra and Aqua has been assimilated in Global Data Assimilation and Prediction System (GDAPS) of KMA since May 2007. Infra-Red (IR) wind above 700hPa and Water Vapor (WV) wind over 550hPa is used over the ocean, and both IR and WV above 400hPa is assimilated at land. The data is tinned in 140km resolution horizontally and quality control rejects data, which shows REF less than 0.6. The observation error of MODIS polar wind follows the value of SATOB for the operation.

The impact of MODIS polar wind spread from the polar region to the mid-latitude and the forecast performance is improved. In the Northern Hemisphere, the RMSE of 5 day forecast geopotential height is reduced from 54m to 48.3m (Figure 1).

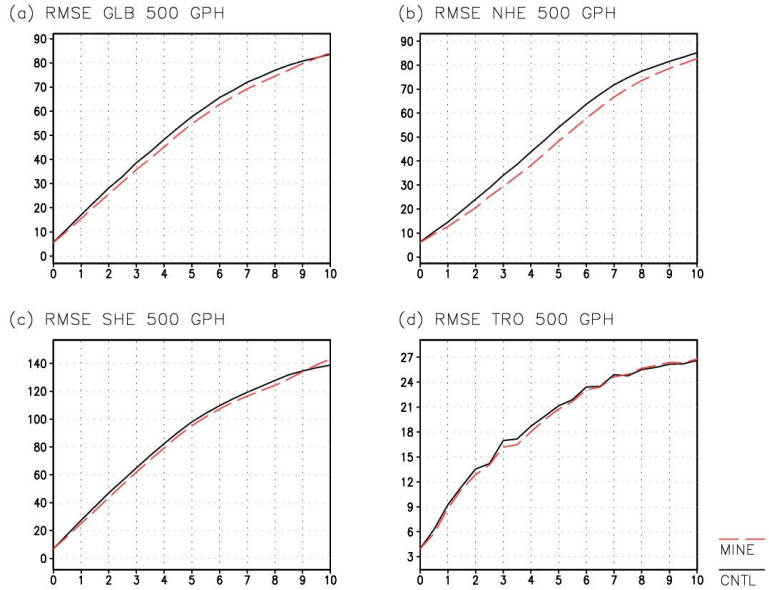

Figure 1. Averaged 500hPa geopotential height RMSE for the summer season (June, July and August) 2006. Solid and dashed lines are the results without and with QuikSCAT assimilation, respectively. a) Global averaged, b) the Northern Hemisphere, c) the Southern

Hemisphere, and d) Tropics.

2. QuikSCAT sea surface wind

KMA has operated KWRF since May 2007. The KWRF is 10km resolution and its domain contains most of the North Western Pacific (Figure 2). One of the most important information sources for this area is from satellite such as QuikSCAT. The QuikSCAT wind can plays an important role in NWP, when typhoon is approaching to the Korean peninsula.

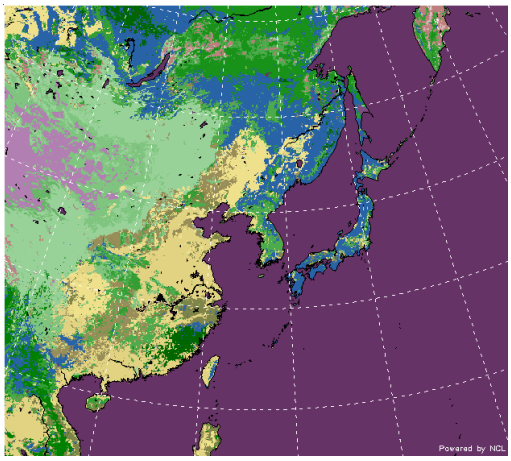

Figure 2. KWRF domain.

The QickSCAT sea surface wind is assimilated in KWRF 6 hourly assimilation system and its performance is evaluated. The forecast performance is improved in general (Figure 3) and typhoon track forecast is better with the QuikSCAT assimilation (not shown here). With this verification results, the QuikSCAT data is going to be in operation in this October.

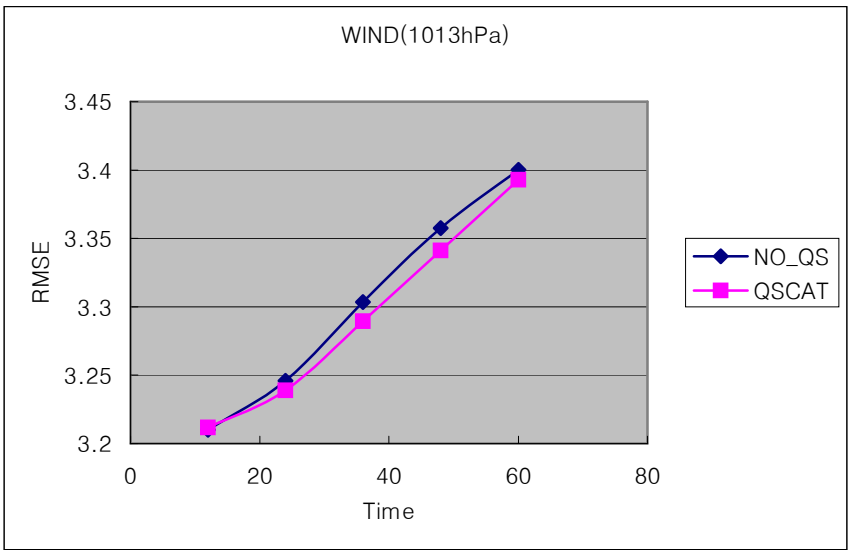

Figure 3. Domain averaged surface wind RMSE against observation for the period from 10 July to 10 August 2007. NO_QS stands for the results without QickSCAT and

QSCAT is with QuickSCAT .

3. On going development and the future plan

Sea surface wind is retrieved from SSM/I radiance data using the one dimensional variation technique (1dVar). The forward operator is RTTOV version 8 and the idealized test was performed with the simulated background and observation. The information gain is shown in the moisture field and surface wind, but not in the temperature filed. This result is as we have expected because the SSM/I channels are mainly controlled by surface condition and moisture field and it is assumed that the 1dVar works properly.

Up to now, the simulated background and observation are used to check up the retrieval processes (i.e. 1dVar). In order to implement the real data, it is necessary to correct the bias. KMA plans to assimilate the retrieved sea surface wind from SSM/I for GDAPS operationally in 2008.

The RARS data is available in KMA. KMA has been working to assimilate it in KWRF. Up to now, the operator and statistics such as observation error, bias correction are developed and initial results with real data is archived. However, further refinement for the quality control and error statistics are necessary to implement it in operation.