

Mesoscale Ensemble Prediction experiment for WWRP Beijing Olympic 2008 RDP -- 2007 preliminary experiment --

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The WWRP Beijing Olympic 2008 Forecast Demonstration / Research and Development Project (B08FDP/RDP) is an international research project for a short range forecast of the WMO World Weather Research Programme (WWRP), which succeeds the Sydney 2000FDP. The B08FDP/RDP is divided into two components; the FDP component for a short range forecast up to 6 hours based on the nowcasting, and the RDP component for a short range forecast up to 36 hours based on the mesoscale ensemble prediction system (MEPS). Aims of the project are to improve understanding of the high-resolution probabilistic prediction processes through numerical experimentation and to share experiences in the development of the real-time MEP system. Collaborating with JMA, the Meteorological Research Institute (MRI) has been participating in the RDP component since 2006.

In 2007, a preliminary experiment for B08RDP was conducted from 24 July to 31 August by six participants; MRI/JMA, NCEP, Meteorological Service of Canada (MSC), Austrian Zentral Anstalt fur Meteorologie und Geodynamik (ZAMG), National Meteorological Center of the China Meteorological Administration (NMC/CMA) and the Chinese Academy of Meteorological Sciences of CMA (CAMS/CMA). Intercomparisons of 36 hour EPS forecast with a horizontal resolution of 15 km were conducted, and the forecast products were uploaded on the website of the B08RDP (<http://www.b08rdp.org>) in near real time base.

Specifications of the 2006 and 2007 experiments are listed in Table. 1. In 2007, a version of the JMA nonhydrostatic model (NHM; Saito et al., 2007a) as of May 2007 is employed as for the forecast model, where the turbulent closure model, trigger functions in the Kain-Fritsch convection scheme and the atmospheric radiation scheme have been modified. The domain has been enlarged from 221 x 201 grids of the 2006 experiment (Saito et al., 2007b) to 232 x 200 grids and shifted westward (Fig. 1), so that the southwestern corner of the verification domain is not embedded in boundary relaxation layers (24 grids = 360 km).

Initial condition of the control run is given by the JMA operational regional analysis, while for the initial perturbations, the targeted moist global SV method (T63L40) is employed in 2007, replacing the simple downscaling method of the JMA operational one-week EPS (global BGM method with TL159L40) used in the 2006 experiment (WEP). This global SV method (GSV) was originally developed at JMA for new operational typhoon EPS, while the final norm is targeted to the common verification area in B08RDP. The Lanczos method using TL/ADJ models of the JMA operational global-4DVAR is employed. Figure 2 shows time sequence of ensemble spreads for surface conditions with WEP and GSV. Spreads with GSV increase more rapidly compared with WEP. RMSEs of ensemble means by GSV are also smaller than those by WEP (figure not shown). As for the lower boundary condition, initial perturbations are evaluated using a statistical relationship between perturbations of the soil temperature and the atmospheric lowest level temperature, and are added to the 4 layer soil temperatures.

Results of the 2007 experiment were verified comparing with ground stations and sonde data. Performance of MRI/JMA products were relatively good in general for surface conditions in terms of RMSEs of ensemble mean, while following shortcomings were found. 1) Convective rains are underestimated. 2) Maximum temperatures in very hot days (>35C) are underestimated. 3) Spreads are still smaller compared with the forecast errors.

Toward the 2008 experiment, modifications of the forecast model, implementation of the lateral boundary perturbation method, test of new/revised initial perturbation methods, and application of meso-4DVAR analysis to the Beijing area (Kunii et al., 2008) are underway.

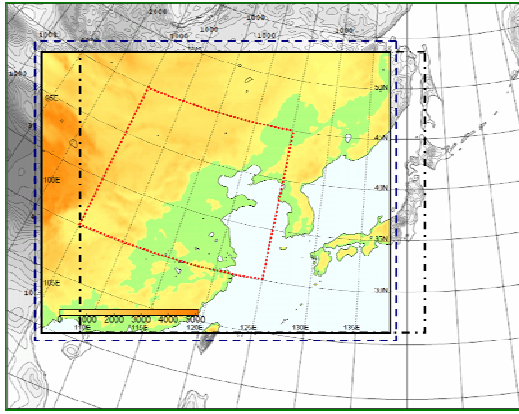


Fig. 1. Domain of the MRI/JMA 2007 experiment (colored rectangle). Fan-shaped sector over east China indicates the domain of the common verification area (105°E-125°E, 30°N-45°N) in B08RDP. Rectangle with black broken lines shows the domain of the 2006 experiment. Rectangle with blue broken lines is the domain of the Meso 4D-Var analysis for the 2008 experiment.

Table 1. Specifications of the 2006 and 2007 MEP experiments by MRI/JMA.

	2006 Experiment	2007 Experiment
Forecast model	NHM as of March 2006	NHM as of May 2007
Horizontal grid	221×201 ($\Delta x = 15\text{km}$), Lambert conformal projection	232×200 ($\Delta x = 15\text{km}$), Lambert conformal projection
Vertical grid	Terrain-following, 40 levels, $\Delta z=40\text{-}1180\text{m}$, $H=22\text{km}$	No changes
Number of members	11 members	No changes
Initial condition	JMA operational regional 4D-Var (20 km resolution)	No changes
Initial perturbation	JMA one-week global EPS (TL159)	Targeted moist global SV (T63L40)
Lateral boundary	JMA RSM forecast (no perturbation)	No changes
Soil temperatures	4 layer prognostic soil temperatures	4 layer prognostic soil temperatures, Initial perturbations are added

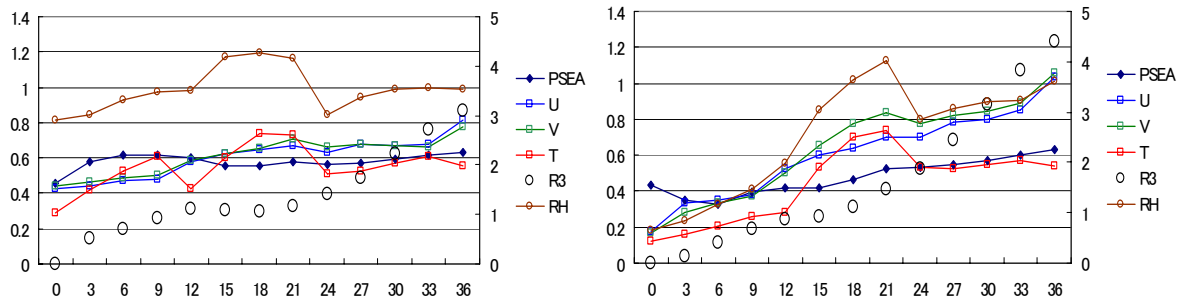


Fig. 2. Time sequence of ensemble spreads for surface conditions (PSEA; sea level pressure, U and V; 10m winds, T; 2m temperature, R3; 3 hour accumulated rain, RH; 2m relative humidity). Unit on the vertical axis is hPa for PSEA, m/s for U and V, degree for T, mm for R3 and % for RH. Verification period is 5 days from 2 to 6 July 2007. Left) Wep. Right) Gsv.

References

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