Analysis of the Predictions of Blocking occurred on 15th December 2005

Mio Matsueda[1]; Masayuki Kyouda[2]; Hiroshi Tanaka[3]; Tadashi Tsuyuki[4]

[1] Life and Environmental Science,Univ. of Tsukuba; [2] NPD,JMA; [3] CCS, Univ. Tsukuba; [4] NPD/JMA

http://air.geo.tsukuba.ac.jp/~mio/

In 1992, the European Center for Medium-Range Weather Forecasts (ECMWF; Molteni et al. 1996,QJRMS) and the National Centers for Environmental Prediction (NCEP; Toth and Kalnay 1997,MWR) employed the ensemble techniques for operational medium-range forecast for the first time. Generally, ensemble forecast data had not been offered outside due to the huge data size.However, the recent rapid progress of communication networks enable us to get vast operational ensemble forecast data from some NWP centers. Matsueda et al. (2006, SOLA) constructed the Multi-Center Grand Ensemble (MCGE) forecast, consisting of three operational ensemble forecast data by JMA, NCEP, and CMC, on a quasi-operational basis. They have revealed that MCGE forecasts are more skillful than single-center ensemble forecast without weights among ensemble members and bias corrections using monthly deterministic and probabilistic scores, such as Anomaly Correlation (AC), Root Mean Square Error (RMSE), and Brier Skill Score (BSS) for 500hPa geopotential height and 850hPa temperature over the Northern Hemisphere (20N-90N) in September 2005. Furthermore, Matsueda et al.(2007, SOLA) investigated the daily forecast skills of three single-center ensembles in detail. They indicated that he reduction of forecast error with MCGE has little dependence on the atmospheric flow and the RMSE of MCGE can be reduced up to about 20% whether the atmospheric field is easily-predictable or not. They showed a very interesting case in terms of the prediction of blocking occurred at the upstream of the Rocky mountains on 15th December 2005.However, they did not analyze the prediction of this blocking in detail. In this study, we have analyzed the predictions of this blocking.

All of NCEP ensemble members initialized at 12UTC 10th December predicted the wrong locations of the blocking, whereas JMA ensemble members and most of CMC ensemble members predicted the right locations of the blocking. First, in order to identify the cause of the mis-prediction, we conducted the JMA-GSM (TL159L40) experiment with the initial value of NCEP control run. The JMA model run from the initial value of NCEP control run mis-predicted the location of blocking like NCEP control run. The time evolution of JMA model run from NCEP analysis is same as that of NCEP control run. From this result, we may conclude that this mis-prediction is due to the initial value. Also, we conducted the JMA-GSM experiments with the initial values of 10 NCEP perturbed runs. All perturbed members mis-predicted the location of blocking.

Secondly, in order to identify the highly sensitive areas, which induced the mis-prediction, in the initial value, we performed the sensitive analysis based on ensemble forecast data (Enomoto et al. 2004). According to this analysis, there are some sensitive areas off the east coast of Japan. Actually, the differences between the control runs of JMA and NCEP in the sensitive areas at the initial time were relatively large compared with other areas. Also, NCEP perturbed runs did not have some effective initial perturbations in the sensitive areas. This seems to be one of the reasons of collective mis-prediction.