Influence of Typhoon Bogus Parameters on the Typhoon Forecasts

Masaru Kunii
Meteorological Research Institute, Tukuba, Japan

1. introduction

It is important to produce the accurate initial fields to improve the forecast of typhoons. Due to the lack of adequate observational data near the typhoon center, the typhoon bogus data, which is produced empirically, has been used in producing initial fields by the 4-dimensional variational data assimilation (4DVAR) system for meso-scale model (MSM) of the Japan Meteorological Agency (JMA). However, there is some arbitrariness in setting the bogus parameters such as the arrangement and the observational errors and those parameters don't depend on the first guess from which the bogus profile is calculated, so the usage of the bogus data is not considered as optimal in the current assimilation system.

In this paper, grasping the property of bogus data, the sensitivity experiments on the effects of the density and observational error of them are carried out.

2. Experiment design

Under the present circumstances, the bogus data are arranged as concentric circles with an interval of 200km in radius, and their observational errors are set at the same level of in-situ observations like radio sonde. In order to evaluate the sensitivity of bogus parameters with 4DVAR system, a series of experiments are executed (Table 1). The target is Typhoon MA-ON (2004), and the assimilation period is 3-hour from 09UTC 8 October 2004. The typhoon bogus data are assimilated as the observational data at 12UTC.

Table 1 The index of experiments

Exp	Error Ratio	Density Ratio	Level
CNTL	None	None	All
TYB	1	1	All
ERROR1/2	0.5	1	All
ERROR2	2	1	All
DENS2	1	2	All
DENS1/2	1	1/2	All
ERROR1/2U	0.5	1	Under 600hPa

3. Influence of bogus parameters

Figure 1 shows the averaged errors of forecasted typhoon tracks from all experiments. The

result of DNS2 and DNS1/2 were much worth than CNTL, without bogus. In DNS2 experiment, error correlation among bogus data can't be ignored because of relatively short distance between them. Conversely DNS1/2 was not enough to modify the initial fields. The experiments ERR1/2 and ERR2 were also worse than CNTL at the later stage of forecast period, but ERROR1/2U improved the forecast over TYB.

Figure 2 shows the averaged errors of forecasted typhoon central sea-level pressure from all experiments. The results from the experiments DNS2, DNS1/2, ERR1/2 and ERR2 got better or neutral, but that of ERR2 got worse.

The results suggest that the typhoon forecasts are sensitive to initial fields and that the typhoon bogus is effective for producing analysis fields only when the bogus parameters are specified appropriately.

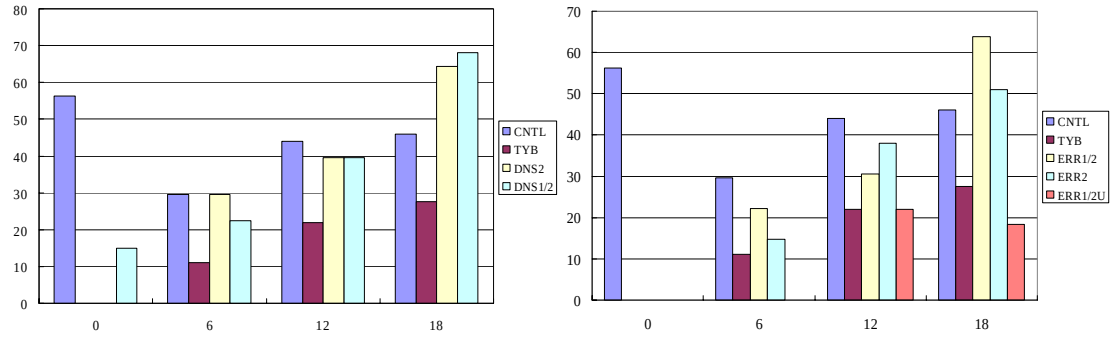

Fig.1 The errors of forecasted typhoon tracks at every 6 hours from 12UTC 8 October 2004. X-axis represents forecast time and y-axis represent typhoon track error.

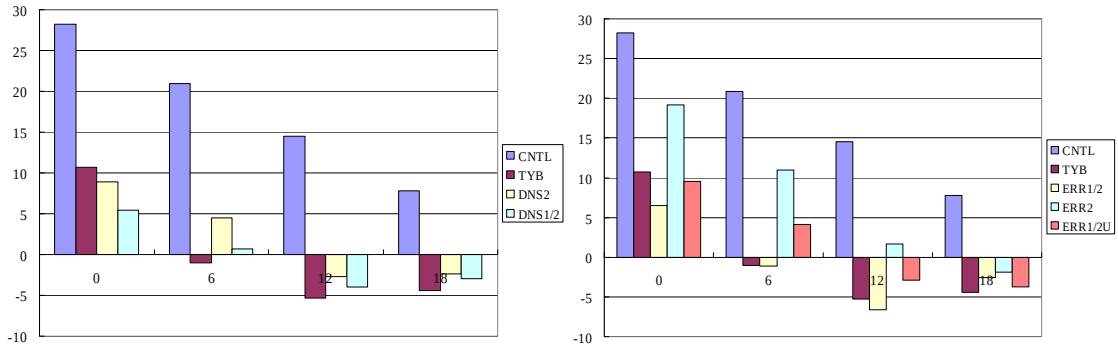

Fig.2 The errors of forecasted typhoon central sea-level pressure at every 6 hours from 12UTC 8 October 2004. X-axis represents forecast time and y-axis represents the error of typhoon central sea-level pressure.

Corresponding author address : Masaru KUNII, Meteorological Research Institute, 1-1 Namigane Tukuba Ibaraki 305-0052, Japan email : mkunii@mri-jma.go.jp