1C.3 PREDICTABILITY OF TROPICAL CYCLOGENESIS IN JMA ENSEMBLE PREDICTION SYSTEM

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1. INTRODUCTION

The Japan Meteorological Agency started operation of Ensemble Prediction System (EPS) in March, 2001. We examined the predictability of tropical cyclogenesis using the EPS for Typhoon No. 13(T0313,Dujuan) and 14(T1314, Maemi).

2. ENSEMBLE PREDICTION SYSTEM

The EPS runs in the JMA Global Spectral Model with 1.25 degree spatial resolution and 40 vertical layers up to 216 forecast hours. The total number of members is currently 24 (both positive and negative perturbations of 12 pairs) and the perturbation method is Breeding Generation Method in the northern side of 20 deg S. The Singular Vector Decomposition (SVD) method will be introduced soon. By using the EPS, the forecast has been much improved, especially beyond 3 day forecast. It is known that when the spread (defined by the root mean square error of the difference between the field of the ensemble mean and that of each members) is smaller the forecast skill is higher.

In this paper we examine the performance of the JMA/EPS for tropical cyclogenesis and prediction of intensification/ weakning of tropical cyclone.

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3. CASE STUDY - TYPHOON 0313

We examine cases of T0313 in 2003. T0313 was generated east of Philippines at 12Z, 29 August. Fig. 1 shows the surface pressure fields for the control run(top-left figure, without any perturbation) and 24 members of the 5 day forecast starting from the initial values at 12Z, August 25, 2003. The center position of T1303 at that time was located at 18N, 133E, east of Luzon Island. There is no typhoon in the control run, however there are several typhoon signatures in some members (such as middle-bottom, forth-column and bottom) with reasonable location and intensity. The upper 4 figures on the righ column also shows the similar locations with slightly shifting eastward. The forth-column and middle line figure also good in position with weaker intensity. We examine the spread in time in Fig. 2. Fig. 2 represents the spread of the surface pressure of all 24 members in time, starting from 12Z, August 25, 2003. On August 30, there are two areas with large spread; that is, over the south-east tip of Taiwan and around 20N, 140E. When we trace back the large spread, we find the area on August 26(second column, first line) with a magnitude of about 1.5 hPa. Then the area develops in time and moves westward slowly. This area on August 30 is located north of the actual typhoon genesis area(east of Phillipines), but reasonably resembles. On August 29 a new area developed at east side of the previous area with larger spread and reached over 20 deg N, 140 deg E. This

area reflects from the generation over the region, shown in Fig. 1. The generation area for this large spread is different from the actual genesis location, but this also tells the likelihood of tropical cyclogenesis under several members.

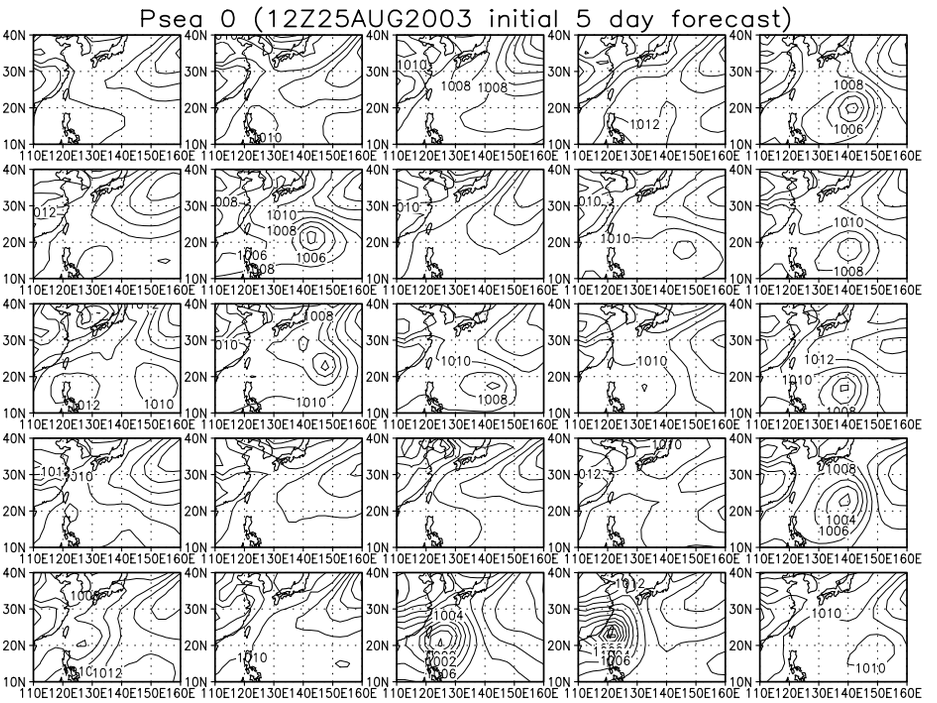

Fig. 1 5-day forecast of surface pressure of all members starting from 12Z, August 25, 2003. The top left side is for the control run (without any perturbation). Contour interval is 2 hPa.

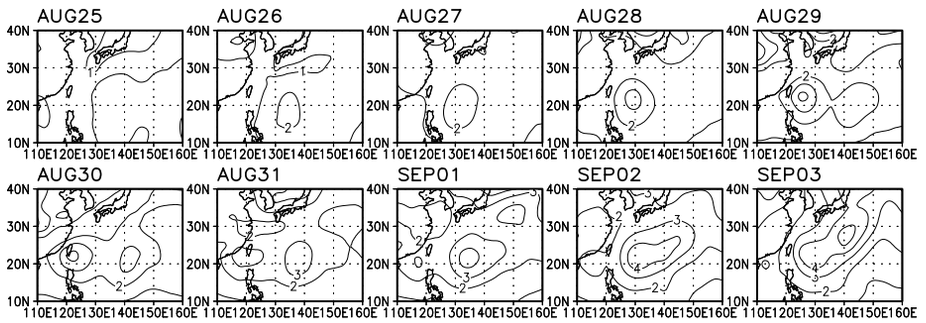

Fig. 2 Temporal evolution of the spread of the surface pressure, starting from 12Z, August 25, 2003 calculated from all members shown in Fig. 1. The contour interval is 1 hPa.

There are several candidates to explain why the EPS improves the predictability for tropical cyclogenesis. One is the perturbed moisture field. In the EPS, we set larger perturbation for moisture, so that we may have more chances to represent the realistic moisture distribution. In the EPS system the model is not coupled with ocean, but air-sea interaction may contribute to variation of moisture over the ocean. We are sure that in addition to the EPS, to assimilate the remote-sensing moisture data brings us more accurate forecast. Another one is the vertical shear. There are many studies on the effect of the vertical shear for tropical cyclogenesis and intensification of tropical cyclone. We need further study on this.

4. SUMMARY

In this paper we examined the performance of the Ensemble Prediction System at JMA and confirmed some capability for tropical cyclogenesis. Further studies are necessary to understand the model performance and dynamics why we get better forecast in some members.

REFERENCES

Kyouda, M., 2000: Weekly Ensemble Forecast, Numerical Simulation Training Textbook (In Japanese), JMA, 30-34.