

The Ensemble Prediction System for Medium-Range Weather Forecasting at JMA

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The JMA ensemble prediction system (EPS) for medium-range weather forecasting has been operated since March 2001. It produces 9-day forecasts once a day with GSM-T106L40. The ensemble size is 25, of which initial perturbations are generated by bred vectors.

When it became operational, initial perturbations are generated only in the extratropical Northern Hemisphere (90N-20N). This perturbation area may be enough to predict baroclinic disturbances. This version of the EPS is called EPS-0103.

In summer, the weather condition around Japan is influenced by convective activities over the tropical ocean, especially around the Philippines islands. It was found that the ensemble spread of EPS-0103 was smaller than errors of the ensemble mean forecast in the Far East in summer. So initial perturbations were extended into the tropics (90N-20S) and the amplitude of humidity perturbations was increased by about 40% because the analysis error of humidity is relatively larger. This version of the EPS is called EPS-0202. Details of EPS-0202 are as follows.

1. The perturbation area is extended to the tropics.
2. In the breeding cycle, the perturbation amplitude which is based on the total climatological rms variance is increased from 10% to 15%.
3. In EPS-0103, when adding perturbations to the analysis for generating the ensemble of initial conditions, their amplitude was increased by 50%. This procedure was removed in EPS-0202.
4. The order of the perturbation amplitudes of humidity is 21%.

Fig.1 shows that the spread of EPS-0202 is larger than that of EPS-0103. Fig.2 shows that the probabilistic forecasts of EPS-0202 are more skillful than those of EPS-0103 in the Brier score. Fig.3 compares the Brier score for the probabilistic forecasts for intensity tropical cyclones. It is found that EPS-0202 is skillful than EPS-0103.

Based on the above results, EPS-0202 was put into operation in February 2002.

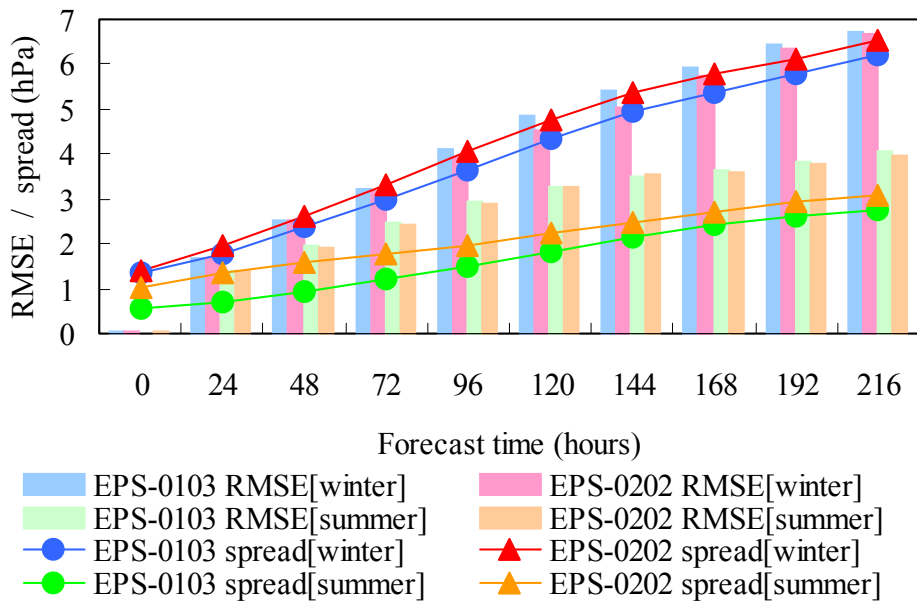


Fig.1 Spread and RMSE of the ensemble mean forecast for MSLP in the Far East in summer(21 June - 20 July 2001) and winter(1 – 31 December 2001).

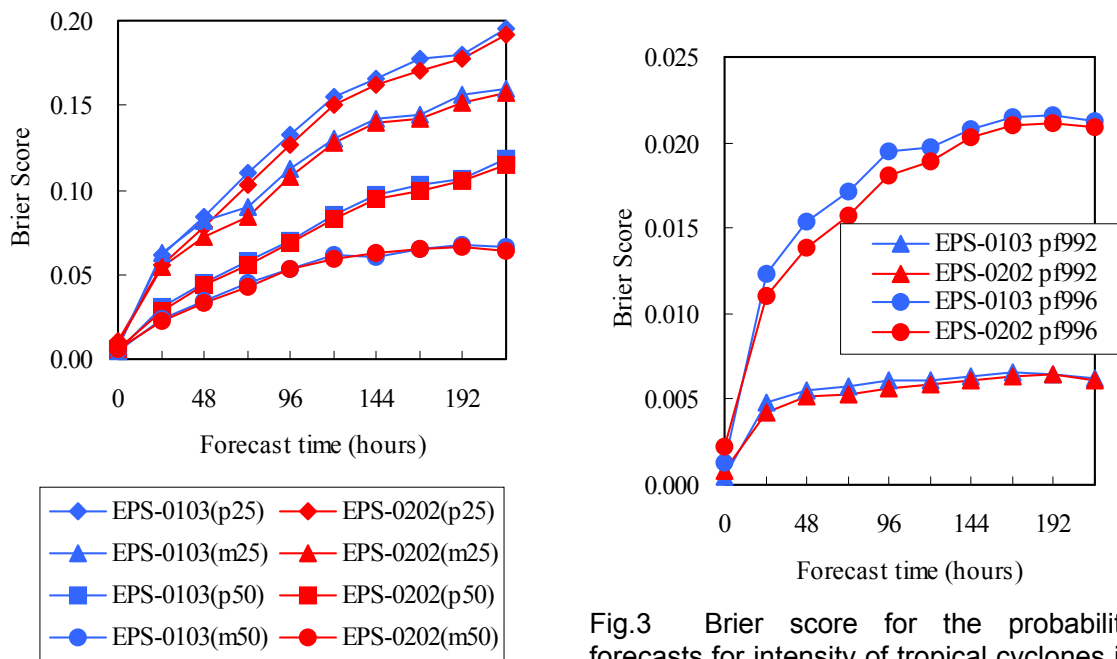


Fig.2 Brier score for the probability forecasts for the Far East 500hPa height for period of 21 June - 20 July 2001. P25,m25,p50 and m50 denote the probabilistic forecasts of height anomalies of more than +25m, less than -25m, more than +50m and less than -50m, respectively.

Fig.3 Brier score for the probability forecasts for intensity of tropical cyclones in the Northern Hemisphere sea level pressure for period of 1 July - 24 August 2001. Pf992 and pf998 denote the probabilistic forecasts of sea level pressure around the tropical cyclone below 992hPa and 998hPa, respectively.