

Launch of the JMA's Global Ensemble Prediction System for one-month prediction

JMA plans to replace the current One-month Ensemble Prediction System (One-month EPS) with the Global Ensemble Prediction System (Global EPS; GEPS) on Thursday, 23 March, 2017, to produce prediction maps and gridded datasets for one-month prediction available on the TCC website. GEPS is an integrated system to support for issuing typhoon information, one-week forecasts and one-month forecasts by JMA. Based on this change of the EPS, the total number of ensemble members (50) to produce one-month prediction products is the same as the current one, however, configuration of the set of ensemble members from each initial date will be changed slightly. The major changes compared with the current One-month EPS and related performance are described below.

Change of operational configuration of ensemble members from each initial dates

For the purpose of producing one-month prediction products available on the TCC website every Thursday, GEPS is run once a week with 50 members, which are composed of 13 members each integrated from initial fields at 00 UTC and 12 UTC every Tuesday and Wednesday, while those of the current One-month EPS are composed of 25 members each integrated from initial fields at 12 UTC every Tuesday and Wednesday. Based on this change of operational configuration, in terms of dissemination of gridded datasets for one-month prediction, 50 members will be composed of the set of 24 members (Tuesday) and the set of 26 members (Wednesday) from Thursday, 23 March, 2017.

Major updates

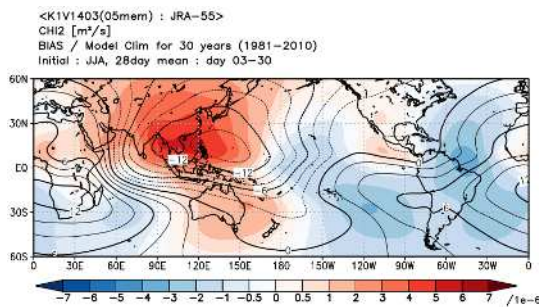
Major changes in the new GEPS compared with the current One-month EPS are given as follows:

- Atmospheric global circulation model (AGCM)
 - A low-resolution version of JMA Global Spectral Model (GSM) launched in March 2016 (GSM1603), is used with some additional improvement of physical processes.
 - Its horizontal resolution increases from TL319 (55km) to TL479 (40km) from initial time up to 18 days ahead. It is the same as current one, TL319 (55km), after 18 days ahead.
 - The number of vertical resolution increases from 60 to 100, and the pressure of the top level from 0.1 to 0.01 hPa.
- Ensemble method
 - The combination of Local Ensemble Transform Kalman Filter (LETKF) and Singular Vector (SV) methods is introduced to produce the initial perturbation, which are developed by the Numerical Prediction Division (NPD) of JMA, as an alternative to the current Breeding Growing Mode (BGM) method to produce the initial perturbation.
 - The Sea Surface Temperature perturbation is introduced to make the boundary condition.

Performance

In advance of the upgrade, a full set of hindcast experiments for the 32-year period from 1981 to 2012 has been executed using the new system. Atmospheric initial conditions for the experiments were taken from the Japanese 55-year Reanalysis (JRA-55; Kobayashi et al. 2015), which is an advanced reanalysis dataset produced by JMA. Verification of the hindcast for the 30-year period from 1981 to 2010 indicates prediction skill enhancement. For example, forecast mean error of weak Asian monsoon in summer becomes better in terms of velocity potential at 200 hPa (Figure 1) and anomaly correlation coefficients of geopotential height at 500 hPa over the Northern Hemisphere for all seasons (Figure 2) show improvement under the new system.

(a) Current One-month EPS



(b) Global EPS (GEPS)

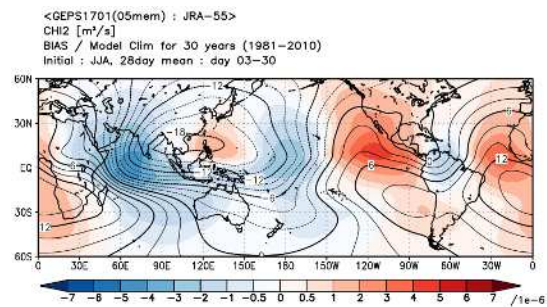


Figure 1 Climatological fields of velocity potential at 200 hPa (contour) and its mean error (shaded) in summer by (a) the current One-month EPS and (b) Global EPS (GEPS)

The contour interval is 2×10^6 m²/s.

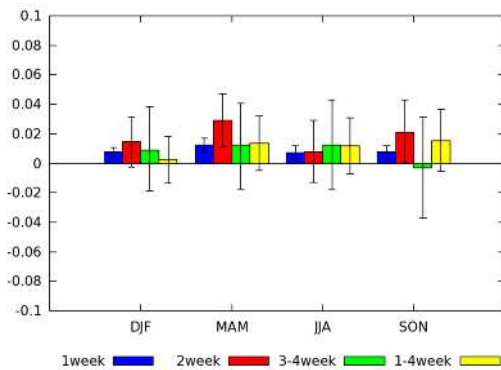


Figure 2 Difference of anomaly correlation coefficients of one-month mean geopotential height at 500 hPa

Positive value means that the anomaly correlation coefficients of Global EPS (GEPS) is larger than that of the current One-month EPS (larger values indicate more accurate forecasts)

Products for one-month forecast are available on the TCC website at <http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html>.

The gridded datasets used for operational forecasting and hindcasting are also available exclusively to registered NMHSs. To register, please contact TCC at tcc@met.kishou.go.jp.

References

Kobayashi, S., Y. Ota, Y. Harada, A. Ebata, M. Moriya, H. Onoda, K. Onogi, H. Kamahori, C. Kobayashi, H. Endo, K. Miyaoka, and K. Takahashi, 2015: The JRA-55 reanalysis: General specifications and basic characteristics. *J. Meteor. Soc. Japan*, **93**, 5-48.