

Upgrade of the Global Ensemble Prediction System for One-month Prediction

1. Improvement of One-month Prediction

The Japan Meteorological Agency (JMA) upgraded its Global Ensemble Prediction System (Global EPS) for one-month prediction on 24th March 2020 (Yamaguchi et al. 2020). In addition to improved physical parameterization schemes in the forecast model (a low-resolution version of the Global Spectral Model (GSM)), a two-tiered Sea Surface Temperature (SST) method (Takakura and Komori, 2020) was also implemented. In this approach, the oceanic lower-boundary condition in Global EPS forecasts with lead times exceeding 11 days is relaxed from the anomaly-fixed SST to the ensemble-mean SST based on prediction using the Seasonal Ensemble Prediction System (Seasonal EPS), which is JMA's atmosphere-ocean-coupled model operationally applied for forecasts with lead times of over a month. This approach involves a much smaller computational cost than the operation of a full atmosphere-ocean coupled EPS.

The results of a 30-year hindcast experiment indicate that the forecast skill of the new Global EPS for 200-hPa velocity potential in the tropics (an important factor in predicting sub-seasonal oscillation phenomena such as the Madden-Julian Oscillation) is better than that of the previous Global EPS (Fig. 1-1). Forecast skill for four-week precipitation over many regions of Asia and the Pacific in boreal summer is also superior (Fig. 1-2).

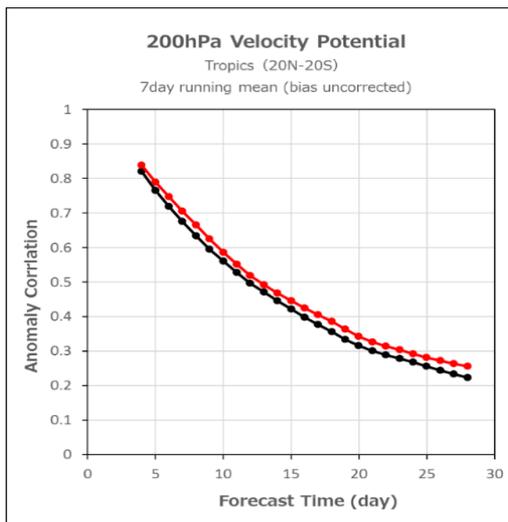


Figure 1-1 Annual average forecast skill for 200-hPa velocity potential as estimated from the 30-year hindcast experiment (1981 – 2010)

Red: anomaly correlation with the new version;
black: with the previous version

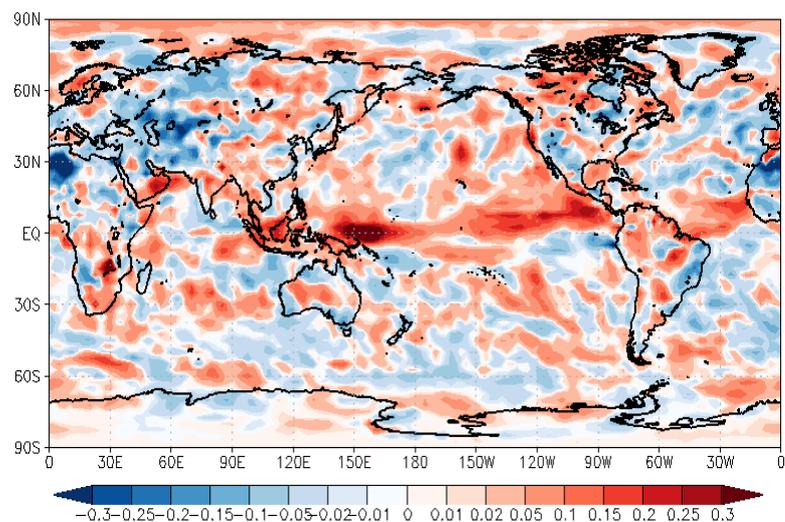


Figure 1-2 Anomaly correlation difference for four-week precipitation in boreal summer (June – August) as estimated from a 30-year hindcast experiment (1981 – 2010)

Warm and cold colors indicate improved and degraded regions respectively.

2. Release of Higher-resolution Global Gridded Data for One-month Prediction

Along with the Global EPS upgrade, JMA released higher-resolution global 1.25-degree grid data for one-month prediction in GRIB2 format, which involves spatial differencing and complex packing for reduced data volume. JMA plans to continue provision of the current low-resolution 2.5-degree grid data during the transition period over the next year or so. The data are provided to authenticated users in the following website.

<https://ds.data.jma.go.jp/tcc/tcc/gpv/index.html>

3. **Change of Specifications in Hindcast Data for One-month Prediction**

The number of hindcast ensemble members for one-month prediction was increased from 5 to 13 per initial time, and the number of initial times was reduced from 3 to 2 per month. The increase supports evaluation of model performance with smaller sampling errors and reliable probabilistic information. The hindcast data are provided to authenticated users in the same website as the previous paragraph.

4. **Plans for One-month Prediction**

JMA plans to upgrade its Forecast Products in Support of Early Warnings for Extreme Weather Events to a higher-resolution version within the next year, as well as to increase the horizontal and vertical resolutions of the Global EPS and improve the 2-tier SST method with upgrading of the Seasonal EPS in the near future.

5. **References**

Yamaguchi, H., M. Ikegami, K. Ochi, Y. Ota, R. Sekiguchi and T. Takakura, 2020: Upgrade of JMA's Global Ensemble Prediction System. CAS/JSC WGNE Res. Activ. Atmos. Oceanic Modell., submitted.

Takakura, T., and T. Komori, 2020: Two-tiered sea surface temperature approach implemented to JMA's Global Ensemble Prediction System. CAS/JSC WGNE Res. Activ. Atmos. Oceanic Modell., submitted.