

Verification of Quantitative Precipitation Forecasts over Japan from the Operational Numerical Weather Prediction Models (WGNE precipitation forecast intercomparison project)

Takuya Sakashita, Masayuki Hirai
Numerical Prediction Division, Japan Meteorological Agency
(E-mail: sakashita@met.kishou.go.jp, m-hirai@met.kishou.go.jp)

1. Introduction

The Japan Meteorological Agency (JMA) has verified quantitative precipitation forecasts (QPFs) from operational NWP models over Japan in the framework of the WGNE precipitation forecast intercomparison project. A number of reports on this project have already appeared (e.g., Ebert et al. 2003). Hirai and Sakashita (2004) reported the findings on the verification results before September 2003 over Japan. This paper reports the results of the verification up to September 2004.

2. Verification methods

Table 1 indicates the specifications of the QPFs data sent by each NWP centers as of September 2004. A fine resolution data from DWD becomes available this year. The verification methods and other specifications of the data are the same as Hirai and Sakashita (2004). Both the observational data from the rain gauge network and QPFs are upscaled by averaging or downscaled by interpolation to a verification grid of 80km mesh on polar stereo projection.

3. Verification results

(1) 24-h QPFs Verification Results

Figure 1 shows the time series of frequency bias score (BS) and equitable threat score (ETS) of 24h-accumulated precipitation for 3-day forecasts (FT=48-72h) over Japan. ETS for most models tends to have seasonal variations: high ETS in winter and low ETS in summer. It is also found that BS shows a seasonal difference for some models. The similar features of ETS are reported by the verification in the United States, Germany and southwestern Australia (Ebert et al. 2003).

Figure 2 shows BS and ETS for 3-day forecasts (FT=48-72h) with respect to precipitation thresholds in the summer of 2004. Most models tend to overestimate the frequency of light precipitation, as in the summer of 2003 (Hirai and Sakashita 2004).

(2) 6-h QPFs Verification Results

Figure 3 shows BS and ETS for 6-h

forecasts in the summer of 2004. It is found that BS for each model is larger in daytime (from 09 to 15 o'clock in Japan standard time) than nighttime and that BS at the beginning of forecast (FT=00-06h) is especially high for some models (e.g., UKMO and JMA). Similar results are seen in the summer of 2003 (Hirai and Sakashita 2004). The features described above are not so significant in winter for all models (not shown).

References

- Ebert, E. E., U. Damrath, W. Wergen and M. E. Baldwin, 2003: The WGNE assessment of Short-term Quantitative Precipitation Forecasts. *Bull. Am. Meteorol. Soc.*, **84**, 481-492.
- M. Hirai and T. Sakashita, 2004: Verification of Quantitative Precipitation Forecast from Operational Numerical Weather Prediction Models over Japan. *CAS/JSC WGNE Research Activities in Atmospheric and Oceanic Modelling*, **34**, 0601-0602.

Table 1. The specifications of the QPFs data sent by NWP centers as of September 2004.

NWP center	horizontal resolution of data(deg.)	forecast time (h)	verified since	
ABoM	1.25×1.25	12,24,36,...,120	Aug 2002	*1
DWD	0.50×0.50	6,12,18,...,72	Jul 2002	*2
ECMWF	0.50×0.50	6,12,18,...,72	Apr 2002	*3
NCEP	1.00×1.00	6,12,18,...,72	Aug 2002	*4
UKMO	0.83×0.56	6,12,18,...,96	Oct 2001	*5
JMA	0.56×0.56	3,6,9,12,...,72	Apr 2002	*6

*1: Australian Bureau of Meteorology

*2: Deutscher Wetterdienst

24-h accumulated QPFs data received before Sep 2002.

*3: European Centre for Medium-Range Weather Forecasts

*4: National Centers for Environment Prediction (Aviation model)

*5: United Kingdom Meteorological Office

12-h accumulated QPFs data received before Sep 2002.

*6: Japan Meteorological Agency

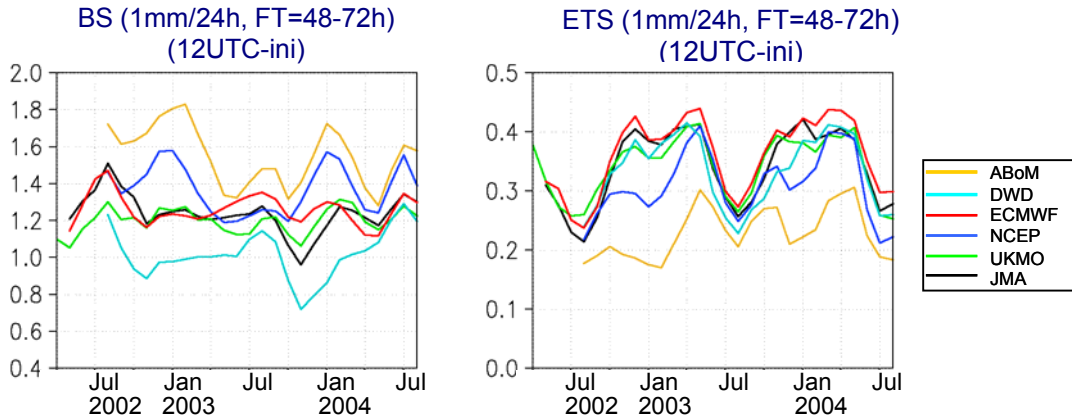


Fig. 1. Monthly time series of BS (left) and ETS (right) of 24-h precipitation for 3-day forecasts (FT=48-72h) from April 2002 to August 2004. The threshold is 1[mm/24h]. Scores are calculated for three consecutive months (from the previous month to the next month).

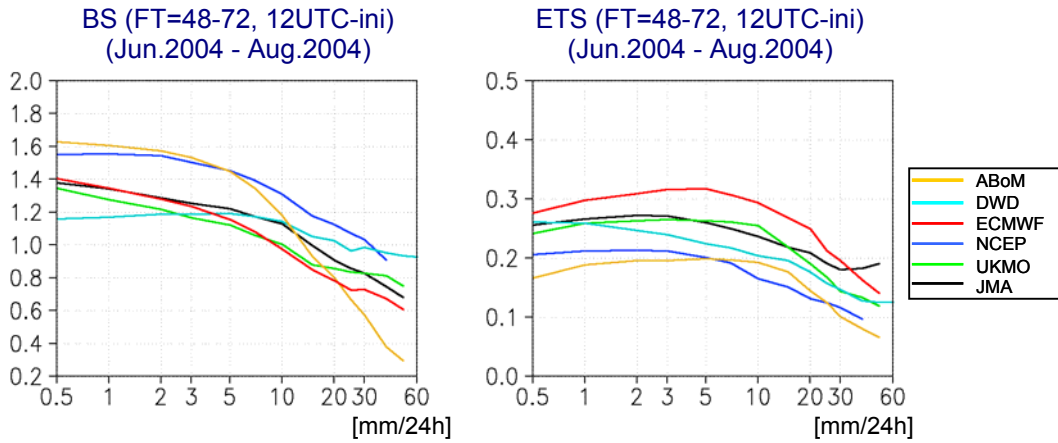


Fig. 2. BS (left) and ETS (right) with respect to precipitation threshold of 24-h precipitation for 3-day forecasts (FT=48-72h) from June 2004 to August 2004. Initial time for each model is 12 UTC. The score is not plotted when the number of events in either observation or forecast is less than 450.

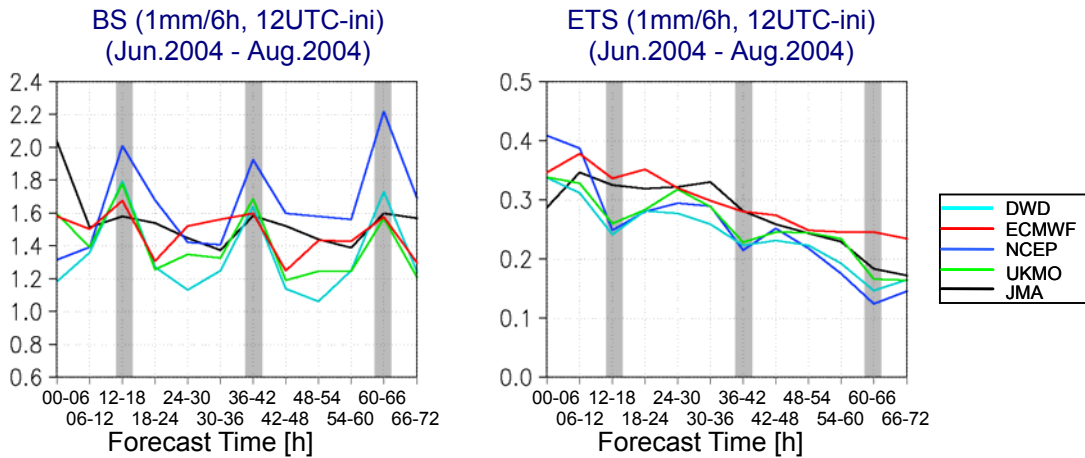


Fig. 3. BS (left) and ETS (right) from June 2004 to August 2004 with respect to forecast time. Precipitation threshold is 1[mm/6h]. The shaded area indicates daytime in Japan (from 09 to 15 o'clock in Japan standard time).