



Detection of forecast busts on regional surface solar radiation using multi-center grand ensemble forecast

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Forecast of surface solar radiation using numerical weather prediction (NWP) model is used for stability of energy management system with photovoltaics. However, the energy management system is exposed to blackout and production of excessive surplus power, because NWP model has a risk of forecast bust. We investigated the availability of global ensemble forecast for detection of forecast busts in regional forecast. This study used the global ensemble forecast as multi-center grand ensemble (MCGE) archived by TIGGE (The International Grand Global Ensemble) project. Previous studies showed ensemble spread (ES) relate to forecast skill. It is considered that ES and ES of MCGE (ESg) can be used as the predictor of the forecast busts.

The detectability of forecast busts on operational 5km regional forecast predicted by Japan Meteorological Agency (JMA-MSM) using lognormal ES (L NES) and ES of MCGE (L NESg) in Kanto Plain, Japan. One- to six-day ahead global ensemble forecast at four leading NWP centers (European Centre for Medium-Range Weather Forecasts: ECMWF, Japan Meteorological Agency: JMA, National Centers for Environmental Prediction: NCEP, and Met Office, UKMO) were used to detect of daily surface solar radiation of regional forecast in 2015.

Root mean square error for the ensemble mean of MCGE (EMg) and regional forecast of JMA-MSM are 27.6 and 28.6 Wm^{-2} for the one-day ahead forecast, respectively. The forecast error of the EMg was found to be comparable with that of the JMA-MSM. In October 2015, the correlation between the absolute value of forecast error coefficient (IFcl) on the JMA-MSM and L NESg for the one-, three-, and five-day ahead forecasts are 0.68, 0.63, and 0.45, respectively. The correlation for one- and six-day ahead forecast was found to have 95% statistical significance at ten and seven months, respectively. The correlation coefficient between IFcl and L NESg was higher in winter than in summer season. The L NESg can be, therefore, a valuable predictor for detection of forecast busts in the regional forecast. The annual R values for the L NESg for one- to six-day ahead forecasts are 0.40, 0.39, 0.38, 0.35, 0.32, respectively. The seasonal variation of R values decreased as the forecast lead time increased from one- to six-day ahead.