複数予報機関の全球アンサンブル予測を利用した日射量予測の大外し検出
Predictor of Large Forecast Error on Surface Solar Radiation using Multi-Center Grand ensembles forecast.

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Forecasting of surface solar radiation (SSR) using numerical weather prediction (NWP) models is better forecast accuracy than statistical models for forecast lead time in the range of several hours to several days. Large forecast errors (forecast busts) for SSR and therefore photovoltaic power generation may lead to either a shortage of power supply or production of excessive surplus power. Ensemble forecasting with NWP models has been developed to improve forecast accuracy by taking the average of individual ensemble forecast members and to consider forecast uncertainty and reliability by generating a probabilistic forecast of meteorological fields. A multi-center grand ensemble (MCGE) is a useful technique for evaluating the uncertainty of a weather forecast. MCGE decrease uncertainty by individual NWP centers. Lognormal ensemble spread (standard deviation of ensemble forecast) of MCGE ($LNES_g$) and single-NWP-center ensembles (LNES) relates to the forecast error (e.g., RMSE), and can be used as a predictor of reliability for the weather forecast. This study used 1- to 6-day global ensemble forecasts at four leading NWP centers (European Centre for Medium-Range Weather Forecasts: ECMWF, Japan Meteorological Agency: JMA, National Centers for Environmental Prediction: NCEP, and the UK Met Office: UKMO) for 2014 to 2016. We investigated the detectability of forecast busts of daily SSR over the Kanto Plain in central Japan in a day-ahead 5 km regional forecast operated by the JMA.

The positive correlations between the forecast error coefficient (Fc) and LNESg has 95% statistical significance in most months. Particularly, the correlations of winter season were higher than that of summer season. In the top 10%, 5% and 1% forecast busts in all and five winter months, the Receiver Operating Characteristic (ROC) scores of the MCGE in 1- to 6-day ahead forecast indicated statistical significance. The ROC score of five winter months was higher than that of all months. The maximum ROC score was 0.78 of MCGE in 3-days head forecast. The LNESg evaluated using global ensemble forecast can therefore be a valuable predictor for detection of forecast busts in the regional forecast.

In future plans, we predict for shortage of power supply and excessive surplus power event using proposed method in this study. Moreover, we estimate predictability the tendency of forecast busts (over or under-estimate) using MCGE for stable energy management.

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