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Statistical Correction for Short-term Wind Forecasting

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The uncertainty of wind speed forecasts from Numerical Weather Predictions (NWP) is a main source of errors in wind power forecasts. Despite increased accuracy of wind power forecasts in the last years, large wind power forecast errors still occur due to local weather and/or synoptic systems that either develop locally or that are phase-shifted relative to the forecast. The main error sources of NWP are, amongst others, inaccurate initial and/or lateral boundary conditions and inadequate representation of local forcing.
Wind measurements in the WMEP program and the wind field forecasts of DWD-LM(German Weather Service – Local Model) in 2004 and from Sept. to Dec. of 2006 are used for correcting DWD-LM wind forecasts. In order to remove systematic error, phase error, or local-scale error in wind forecasts, three kinds of methods, bias correction, phase correction and Cressman technique are applied.
Using bias increments changing with wind direction, the wind forecasts are modified. After bias correction, RMSE (Root Mean Square Error) of corrected forecasts decrease 0.1m/s to 0.4m/s. Diurnal or seasonal change of bias is also important. In addition, with optimum phase-shift vectors, the phase-shift correction is applied. It reduces the RMSE about 0.1m/s to 0.5m/s at different time steps. Moreover, statistical Cressman correction increments were obtained by Cressman technique and used to correct wind forecasts. After Cressman correction, the RMSE of wind forecasts decreases 0.1m/s to 0.2m/s. The results show that bias correction, phase correction and Cressman scheme do, to some extent, improve wind speed forecasts. That contributes to the improvement of wind power forecasts.
As part of the new EU-project “SafeWind”, we are continuing that study with NWP-data from the European Centre for Medium-Range Weather Forecasts (ECMWF) and wind speed observations over Europe.