Geophysical Research Abstracts
Vol. 19, EGU2017-3633, 2017
EGU General Assembly 2017

Spatio-temporal modelling for short term wind power forecasts. Why, when and how.

Amanda Lenzi (1), Ingelin Steinsland (2), and Pierre Pinson (3)

(1) Department of Applied Mathematics and Computer Science, DTU, Copenhagen, Denmark (amle@dtu.dk), (2) Department of Mathematical Sciences, NTNU, Trondheim, Norway (ingelins@math.ntnu.no), (3) Department of Electrical Engineering,, DTU, Copenhagen, Denmark (ppin@elektro.dtu.dk)

This study is based on a case study of 349 wind farms in Western Denmark with available energy production every 15 minutes for 6 years. Our aim is to do short term forecasting up to 5 hours ahead based on previous observations. We want sharp and calibrated probabilistic forecasts for both individual wind farms and for aggregated energy production, for example the energy production in the whole region. To obtain this we propose two Bayesian spatio-temporal models, and obtain full probabilistic forecasts of wind power. The models are based on the stochastic partial differential equation (SPDE) approach to spatial-temporal modelling which enables fast inference using integrated nested Laplace approximations (INLA) as well as dimension reduction.

We provide detailed analysis on the forecast performances on the individual and aggregated level based on appropriate metrics tailored for probability forecasts for both the spatial temporal models as well as for temporal models for individual wind farms. The case study as well as simulation studies demonstrate that forecasts that are individually reliable do not need to produce an aggregated forecasts that are reliable. Indeed, the case study shows that even when all individual forecasts are calibrated can the aggregated forecasts be so uncalibrated that less that 20% of the observations fall within the 95% forecast interval. T he results and methodology are both relevant for wind power forecasts in other regions as well as for spatial-temporal modeling and decisions in general.