Geophysical Research Abstracts
Vol. 19, EGU2017-10374-1, 2017
EGU General Assembly 2017

Scaling forecast models for wind turbulence and wind turbine power intermittency

Olmo Duran Medina (1), Francois G Schmitt (2), and Rudy Calif (3)

(1) Univ. Lille, Lab. Oceanology and Geosciences UMR 8187, France, (2) CNRS, UMR 8187, Laboratory of Oceanology and Geosciences, Wimereux, France, (3) Lab. LARGE, Université des Antilles, France

The intermittency of the wind turbine power remains an important issue for the massive development of this renewable energy. The energy peaks injected in the electric grid produce difficulties in the energy distribution management. Hence, a correct forecast of the wind power in the short and middle term is needed due to the high unpredictability of the intermittency phenomenon. We consider a statistical approach through the analysis and characterization of stochastic fluctuations. The theoretical framework is the multifractal modelisation of wind velocity fluctuations.

Here, we consider three wind turbine data where two possess a direct drive technology. Those turbines are producing energy in real exploitation conditions and allow to test our forecast models of power production at a different time horizons. Two forecast models were developed based on two physical principles observed in the wind and the power time series: the scaling properties on the one hand and the intermittency in the wind power increments on the other. The first tool is related to the intermittency through a multifractal lognormal fit of the power fluctuations. The second tool is based on an analogy of the power scaling properties with a fractional brownian motion. Indeed, an inner long-term memory is found in both time series.

Both models show encouraging results since a correct tendency of the signal is respected over different time scales. Those tools are first steps to a search of efficient forecasting approaches for grid adaptation facing the wind energy fluctuations.