

Nonlinear statistical models to improve wind power forecasts

M. Pilar Muñoz*

Universitat Politècnica de Catalunya, Barcelona, Spain pilar.munyo@upc.edu

Josep A. Sánchez

Universitat Politècnica de Catalunya, Barcelona, Spain josep.a.sanchez@upc.edu

M. Dolores Márquez

Universitat Autònoma de Barcelona, Bellaterra, Spain MariaDolores.Marquez@uab.cat

Given the need to control energy financial markets, forecasting wind power generation has become an important subject of research. One of the most common and important component of wind power forecasting models is wind behavior. Usually, data show different behaviors depending on the wind direction. This is the case of the data from Gibraltar strait, presented in this work; it shows two clearly different wind directions. In order to better fit the wind direction, deterministic (Threshold) and stochastic (Markov Switching) models for circular variables with Von-Mises conditional distribution are implemented and tested with this data. Results show a better agreement between observed and modeled data when considering a stochastic mechanism that governs the change between regimes. The study includes a code implemented in the R package MSwM (cran.r-project.org/web/packages/MSwM/index.html) that deals with the proposed models. This improved prediction of wind direction enhances the capability to forecast energy generation.

Key Words: Wind power, wind direction, Von_Mises distribution, forecasting