Geophysical Research Abstracts
Vol. 14, EGU2012-2667, 2012
EGU General Assembly 2012

Onshore and offshore wind resource evaluation in the northeastern area of the Iberian Peninsula: quality assurance of the surface wind observations

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Offshore wind energy is becoming increasingly important as a reliable source of electricity generation. The areas located in the vicinity of the Cantabrian and Mediterranean coasts are areas of interest in this regard. This study targets an assessment of the wind resource focused on the two coastal regions and the strip of land between them, thereby including most of the northeastern part of the Iberian Peninsula (IP) and containing the Ebro basin. The analysis of the wind resource in inland areas is crucial as the wind channeling through the existing mountains has a direct impact on the sea circulations near the coast. The thermal circulations generated by the topography near the coast also influence the offshore wind resource.

This work summarizes the results of the first steps of a Quality Assurance (QA) procedure applied to the surface wind database available over the area of interest. The dataset consists of 752 stations compiled from different sources: 14 buoys distributed over the IP coast provided by Puertos del Estado (1990-2010); and 738 land sites over the area of interest provided by 8 different Spanish institutions (1933-2010) and the National Center of Atmospheric Research (NCAR; 1978-2010). It is worth noting that the variety of institutional observational protocols lead to different temporal resolutions and peculiarities that somewhat complicate the QA. The QA applied to the dataset is structured in three steps that involve the detection and suppression of: 1) manipulation errors (i.e. repetitions); 2) unrealistic values and ranges in wind module and direction; 3) abnormally low (e.g. long constant periods) and high variations (e.g. extreme values and inhomogeneities) to ensure the temporal consistency of the time series.

A quality controlled observational network of wind variables with such spatial density and temporal length is not frequent and specifically for the IP is not documented in the literature. The final observed dataset will allow for a comprehensive understanding of the wind field climatology and variability and its association with the large scale atmospheric circulation as well as their dependence on local/regional features like topography, land-sea contrast, etc. In future steps, a high spatial resolution simulation will be accomplished with the WRF mesoescale model in order to improve the knowledge of the wind field in the area of interest. Such simulation will be validated by comparison with the observational dataset. In addition, studies to analyze the sensitivity of the model to different factors such as the parameterizations of the most significant physical processes that the model does not solve explicitly, the boundary conditions that feed the model, etc. will be carried out.