Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07088, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07088
EGU General Assembly 2008

Identification of homogeneous surface wind regions and evaluation of numerical simulations performance in reproducing their wind variability

P. A. Jiménez (1,2), J. F. González-Rouco (1), J. P. Montávez (3), E. García-Bustamante (1,2) and J. Navarro (2)

(1) Departamento de Astrofísica y ciencias de la atmósfera, Universidad Complutense de Madrid, (2) División de Energías Renovables, CIEMAT (3) Departamento de Física, Universidad de Murcia.

The surface wind variability over the Comunidad Foral de Navarra (CFN), a complex terrain region located in the Northeast of the Iberian Peninsula, is analyzed, and the capability of the WRF (Weather Research and Forecasting modeling system) model to reproduce this observed variability evaluated. Wind speed and direction measurements at 41 meteorological stations covering the period form 1992 to 2005 are employed to represent the surface circulations.

The regional wind variability is analyzed by dividing the region into subregions of similar temporal wind variability. This regionalization is performed using two methodologies based on principal component analysis, cluster analysis and rotation of the selected principal components. Both methodologies produce similar results thus supporting the robustness of the identified wind subregions. The meridional wind variability is similar in all subregions whereas the zonal wind variability is responsible for differences between them. Spectral analysis of wind variability within each subregion reveals a dominant annual cycle and varying presence of higher frequency contributions in the subregions.

In order to accurately evaluate the performance of the simulations, the whole observational period was simulated with the WRF model at a high spatial resolution over the target region (2 km). Boundary conditions are provided by the ERA-40 reanalysis.

The methodologies employed to identify the wind regions are applied to the simulated wind to compare results with those obtained with observations, and provide an evaluation of the numerical simulations capability to reproduce the observed surface wind regions and their variability. The model net was masked to use only grid points co-located near observational sites. The model identifies the majority of the subregions found in the observations, and shows some skill in reproducing their temporal variability.

Finally, a couple of inference studies are performed to evaluate to what extent the identified wind subregions are influenced by the representation of the spatial wind variability by a finite number of observational locations and by the finite length of the observational period. With this aim, the regionalization methodologies are applied to the wind from the whole simulated grid field over the study area. Consistency with the subregions identified from the observational dataset is found with additional wind regions identified outside the network coverage.