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Assessment of the wind speed variability over the Iberian Peninsula using a high-resolution climatic database

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The strong spatio-temporal variability is one of the main features of the wind field and could lead to several consequences ranging from social to economical impacts. This fact has motivated several studies focused on the comprehension of this variability. The homogeneous and long time series provided by Reginal Climate Models (RCMs) facilitate the attribution wind trends to global/regional changes isolating the local effects that characterize the observational sites.

Under this umbrella, the aim of this work is to assess the role of the different processes involved in the wind speed variability analyzing the detection of cycles and trends over a region characterized by a wide variety of wind regimens. For that we used a wind database that was created by dynamically downscaling the ERA40 reanalysis and ECMWF analysis data. The database encompass the Iberian Peninsula (IP) with a 10 km spatial resolution and spans the period 1959-2007 providing hourly resolution. In a previous work, the skill of this simulation to reproduce realistically the wind field over the IP was demonstrated.

First, a regionalization is performed in order to identify the regions over the IP with similar wind speed variability. For each region the mean temporal series are obtained by averaging the individual series. The wavelet transform is applied to the regional time series to identify the time scales of wind variability. In addition, the wind speed trends are analysed at each grid point for the complete domain using regression analysis. The statistical significance of the trend is evaluated using the Mann-Kendall test.

The results reveals declining values of wind speed in winter associated with a decrease of cyclonic situations. Conversely, an upward trend stands out in summer, which can be linked to an enhancement of the Iberian thermal low circulation. Interestingly, wavelet analysis identifies some regions lacking an annual cycle.