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Relationship between North Atlantic circulation and wind variability in the Northeast of the Iberian Peninsula

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Estimation of changes in the surface wind field and related wind power is a topic of scientific interest but it is also an issue of relevance with ecological, economic and political implications for society within a variety of timescales, ranging from hourly meteorological forecasts to long term climate prediction. Monthly and seasonal range prediction of wind and wind power can potentially allow electricity system operators to estimate the available energy to conveniently adapt demand and resources. Long term climate prediction with General Circulation Models (GCM) driven by future climate change scenarios supports the idea that the regional climate evolution will respond to changes in atmospheric circulation regimes. Future changes at the regional wind fields as a result of the global and regional climate evolution can plausibly have significant impacts on energy resources, in agriculture, structures design, surface roughness, air pollution, extreme wind events or severe storms occurrence and wave fields.

This work analyses the relation between regional wind in the Comunidad Foral de Navarra (CFN, Northeast of the Iberian Peninsula) and North Atlantic circulation. For this purpose a multivariate method based on Canonical Correlation Analysis is applied. The local variables are monthly averages of the zonal and meridional wind components at 35 stations distributed over the CFN for the period 1992 to 2005; the large scale variables are monthly sea level pressure, wind components at 10 meters and geopotential heights (850 hPa, 500 hPa and 300 hPa) over the North Atlantic area.

The analysis isolates two modes of large scale circulation which can account for 70% of the variance of the regional variable, thus explaining the main wind flow patterns in the region. Results show potential for the application of this approach to study the variability of wind in the region over the 20th century and also in the context of climate change scenario simulations.