



Frequentist and Bayesian analyses of the uncertainty associated with regional wind estimations

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A statistical downscaling technique is used to analyze the surface wind variability in a region of complex terrain in the northeast of the Iberian Peninsula. This type of procedure provides an added value with respect to the global model simulations that show limitations in reproducing the regional spatial scales. However, the downscaling strategy involves a source of uncertainty that adds to the cascade of uncertainties associated with the estimations.

The uncertainties in the downscaling step are analyzed on the basis of the methodological sensitivity to changes in some options of the statistical model. 14 years of observations were used to understand the relation of the regional wind over the northeastern Iberian Peninsula and the large scale circulation over the North Atlantic area. The sensitivity of the downscaling technique (Canonical Correlation Analysis) is explored by sampling all parameters that are important for the model configuration. The relative importance of each parameter together with the spatial and temporal variability of the uncertainty in the wind estimates is explored.

This can be considered as a classical (frequentist) approach to the treatment of the uncertainties. From this point of view, a certain degree of subjectivity is involved in the selection of possible values for the parameters of the model. Alternatively, a more objective assessment of this type of methodological uncertainty is possible applying a Bayesian analysis. The procedure implies that prior knowledge in the model parameters can be updated by using the available observations during the calibration period. Thus, the optimal parameters and the uncertainty associated with the method are estimated based on the possible constraints imposed by the observations.

A robust assessment of the uncertainties derived from the downscaling step has many implications for the understanding of past and future estimations of the wind field. It will be illustrated why single estimations should be managed with care and it also will be show how a Bayesian treatment can assign weights (probabilities) to each possible combination of parameters discriminating which cases are more realistic according to the information provided by the observed fields.