

Meteorological Downscaling for Cost-Efficient Wind Resources Assessments

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Estimating the potential of wind energy resources for a given location for medium to small wind turbines requires a good knowledge of the local medium-small scales wind behaviour. Even in developed countries where the meteorological data networks are quite dense and of good quality, it is often unrealistic to use wind data from the nearest meteorological station to estimate the wind resources of the studied location. One promising method to cope with the lack of in situ data is to use large scale climatology from meteorological models like ERA-Interim, combined with small scale meteorological simulations to reach a first step toward the very-small scales : a high density description of the wind on a 2,5km resolution grid over a 500x500km domain. This technique named Dynamical Downscaling, is expensive in terms of IT costs, it has consequently to be associated with statistic techniques to determine a panel of large scale representative meteorological situations upon which the downscaling method will be performed.

The whole process is being applied deployed over a large region covering France. Some results are already available, in particular we selected 102 representative meteorological situations, for which we re-constructed good quality large scale wind roses using the 102 meteorological simulations compared to the reference wind roses (20 years of ERA-Interim). A good quality of the re-constitution is the required condition of success before the downscaling and small scale climatology can be considered.

The second step towards the very small scales is tackled using an efficient-low costs methodology for terrain numerical modelling, roughness and obstacles integration in the zone to be considered, and this, taking into consideration the typical differences of characteristics between meteorological models based data sets and physical towers MCP based data sets.

This second issue can only be performed with close interactions with end-users and the result has to be released in such a way that they find the key characteristics they need.

The objective of this work is to be able to optimize the “wind resources assessment study” prices in order to allow small private investors to get a valuable business plan even for Small Wind Turbines domestic projects.