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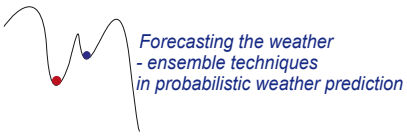

Wind resource identification and high resolution modelling at the Met Office

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The Met Office Unified Model (MetUM) is used operationally for both global and limited area numerical weather prediction. Forecasts which cover the United Kingdom are now run at horizontal resolutions of 25 km (the global model) and at 12 km, 4 km and 1.5 km (the limited area models).Furthermore, in research mode, recent improvements to the MetUM physics have enabled realistic simulations at sub-one-kilometre horizontal resolution to be performed.

Over the last 2 years the UK Met Office has introduced and developed an advanced wind-energy site-screening and planning tool (the Virtual Met Mast). It is designed to assess the feasibility of and assist the design of potential wind farm sites. The tool can be used for both onshore and offshore locations and provides virtual wind climatological data for periods of up to several decades. The approach relies on data from the Met Office limited area mesoscale numerical weather prediction (NWP) models, to which downscaling corrections are applied to account for local complexity. These corrections include those which represent the effects of local topography, local surface roughness variations and near-coast effects. In the standard version local variations in topography are modelled using a relatively simple linear model, and a local wind map obtained. The corrected NWP data are extended to cover long periods (over several decades) using a technique in which the data are related to alternative long-term datasets.

For situations of highly complex terrain, refined local roughness and topography corrections are based on very high resolution MetUM modelling. Simulations of a week and longer have been run at horizontal resolutions as fine as 100 m. The boundary conditions for these limited area simulations are generated by multiply nesting the 100 m model within progressively coarser resolution limited area models which are themselves nested within global model simulations initialised using operational global analyses.

To supplement the operational NWP forecasts historical periods from 2001 have also been reforecast to provide over 10 years of finer scale NWP data. In addition to the UK 4km models for central and south-eastern Europe have been run. These have also been post-processed to form wind resource maps.

Example results are presented for a range of proposed wind farm sites. The Virtual Met Mast predictions are compared with observations made at hub height and it is shown that the Virtual Met Mast offers a reliable and cost-effective solution for assessing the potential of wind farm sites.