Geophysical Research Abstracts, Vol. 8, 09284, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09284

Add-on values for wind resources assessment via mesoscale model MM5

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The viability of a wind power project is mainly driven by local wind resources. While no wind means no wind power, too much wind and/or too variable wind represents problems for contemporary wind turbines. In case of a highly variable wind, nacelle has to be realigned in timely fashion and sudden changes in wind velocity can lead to unstable power output from an array of wind turbines. To answer such a problem, we use mesoscale model MM5 to downscale highly spatially and temporally resolved data. This approach allows us to validate model results against almost any measurement site within the model domain as well as to produce highly resolved wind atlases for further wind resources assessment at the location of developers interests. Extra information of wind changes and sudden variation is also derived to add a value to our modelling effort. For offshore conditions where only scarce measurements exist, our approach encompasses validation against coastal, near-coast and if available offshore measurements. While assuming that most complex flow is bound to coast-line, we examine time-averaged wind distribution along angular sectors to describe the offshore flow. When this approach is compared with actual wind resources assessment tools based on undisturbed potential flow theory, which disregards any coastal discontinuity to a simple roughness change, the outcome from mesoscale model shows larger transition zone between land and sea. However, to be able to estimate model error in the domain within a given setup and input data, additional offshore data are needed.