Geophysical Research Abstracts, Vol. 8, 07908, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07908

Assessing and validating WAsP and MM5 simulations of the wind resource at the German North Sea coastline.

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Since suitable onshore sites for wind farm on land are limited, while potential areas for offshore sites are huge, large offshore wind farms are proposed. The knowledge of the offshore wind resource is of vital importance for the planning of expensive wind farms whereas the offshore measurements are scarce and expensive. An accurate assessment of the wind resource in coastal zones is very complex since the land sea discontinuity of and surface affects both the surface roughness and the thermal stability. Therefore, growing interest in harnessing offshore wind energy requires reliable tools for the wind resource estimation at these sites.

Most commonly used tool for wind resource predictions on land as well as offshore is the WAsP program. An alternative approach for wind resource assessment is the use of mesoscale meteorological models. Mesoscale models used in numerical weather prediction (NWP) are limited area models with sufficiently high horizontal and vertical resolution to resolve regional features such as the coastline, orography or convection.

The aim of this study is to validate and compare the WAsP and MM5 simulations of the wind resource over the German Bight in the North Sea. The dynamical MM5 model simulations downscale NCEP analysis wind field data without using mast measurements, whereas WAsP method requires measured data to predict other sites. In this study, WAsP simulations are performed using measured data at the German North Sea coastline. The predicted wind speeds by WAsP and MM5 are validated using *in situ* measured data from North German coastal and island. In addition, the MM5 wind fields are further downscaled from the model grid size of 4 km to the order of a few 100 m taking the local land surface features into account.