Geophysical Research Abstracts
Vol. 14, EGU2012-11394, 2012
EGU General Assembly 2012

Parameterization of wind farms in COSMO-LM

E. Stuetz, G. Steinfeld, D. Heinemann, and J. Peinke
ForWind, Carl-von-Ossietzky University Oldenburg, Germany (elisabeth.stuetz@forwind.de)

In order to examine the impact of wind farms in the meso scale using numerical simulations parameterizations of wind farms were implemented in a mesoscale model.
In 2008/2009 the first wind farm in the german exclusive economic zone - Alpha Ventus - was built. Since then more wind farms are erected in the german exclusive economic zone. Wind farms with up to 80 wind turbines and on an area up to 66 square kilometers are planned – partly only few kilometers apart from one another. Such large wind farms influence the properties of the atmospheric boundary layer at the meso scale by a reduction of the wind speed, a enhancement of the turbulent kinetic energy, but also an alternation of the wind direction. Results of models for the calculation of wakes (wake models), idealistic mesoscale studies as well as observations show, that wind farms of this size produce wakes, which can expand up to a few 10 kilometers downstream.
Mesoscale models provide the possibility to investigate the impact of such large wind farms on the atmospheric flow in a larger area and also to examine the effect of wind farms under different weather conditions. For the numerical simulation the mesoscale model COSMO-LM is used. Because the wind turbines of the wind farm cannot be displayed individually due to the large mesh-grid size, the effects of the wind turbine in a numerical model have to be described with the help of a parameterization. Different parameterizations, including the interpretation of a wind farm as enhanced surface roughness or as an impuls deficit and turbulence source, respectively, are implemented into COSMO. The impact of the different wind farm parameterizations on the simulation of the atmospheric boundary layer are presented. as well as first tests of idealistic simulations of wind farms are presented. For this purpose idealistic runs as well as a case study were performed.