



Wind farm induced changes in wind speed and surface fluxes over the North Sea

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Offshore wind farm deployment in the North Sea is foreseen to expand dramatically in the coming years. The strong expansion of offshore wind parks is likely to affect the regional climatology on the North Sea. We assess this impact by conducting a regional climate model simulation over future wind farms built near the German coast.

In order to achieve this, the wind farm parameterisation of Fitch et al. 2012, where wind farms are parameterised as elevated sources of turbulent kinetic energy and sinks of momentum (Blahak et al 2010 and Fitch et al 2012) is implemented in COSMO-CLM at a 1.5 km resolution.

As a first step, COSMO-CLM's ability to reproduce wind profiles over the North Sea is evaluated using wind speed data from the FINO1 meteorological mast, together with QuikScat scatterometer data, for a time period of 2000-2008.

Subsequently, the impact of windfarms on the regional climate over a period of ten years (1999-2008) is assessed. A large scale wind farm can create wakes which depending on the wind direction could affect the power production of a neighbouring farm. Furthermore, wind farms decelerate the flow and create a vertical circulation in the inflow region. As a result, changes in vertical fluxes of moisture are observed. This leads to enhanced low level cloud cover which may trigger changes in precipitation.