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Neue Windböenparametrisierung im COSMO-Modell - Vergleich mit Messungen aus der Deutschen Bucht

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With the growing interest in offshore wind energy, mesoscale atmospheric models are increasingly being used not only for broad wind yield potential assessment, but also for short-term wind power forecasting purposes. During extreme weather events, prediction of wind gusts plays a key role concerning an optimized, safe integration of wind power into the power supply system. Despite recent developments in model numerics and computational capacity, wind gusts still can not be computed explicitly and have to be parametrised.

On the present study the state-of-the-art limited area mesoscale model COSMO is used to analyse gusts over the german bight during selected winter storms in 2009.

GME analysis data was used to drive model simulations and a dynamical downscaling is performed with 3 nests. The last nest is finally performed at a horizontal grid resolution of 1.6 km and a vertical resolution of 50 levels, the last 10 corresponding to FINO measurement heights. Model output is given every half hour.

2 different gust parametrisations are compared. The default parametrisation as applied in operational use at the German Weather Service (DWD), which is based on a empirical, TKE-based approach for the Prandtl-Layer and a physically based gust parametrisation after Brasseur (2001). The Brasseur parametrisation is mainly based on a relation between the turbulent structure of the boundary layer and static buoyancy represented by a vertical virtual potential temperature profile. Hence, the gust output of COSMO is not only compared to gust observations at FINO1 but further validated by comparison of TKE output with observations extracted from sonic anemometers also located on the FINO1 measurement mast.

Simulations are also performed during a summer period in June 2009, where strong fluctuations of the mean wind have been measured at FINO. Synoptical analysis showed an inflow of cold air over the warmer northern sea, which poses ideal conditions for convective situations. Here, the abillity of the Brasseur parametrisation to forecast convective gusts is also analysed.

Further, the Brasseur parametrisation is slightly altered to compute gusts at 100m height instead of the default output at 10m above sea level. This alteration has shown only slight changes in the modeled gust output.

The Brasseur parametrisation tends to slightly overestimate gusts, which can also be observed at the TKE profiles, but generally performs quite well.