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Revisiting marine atmospheric boundary layer parameterisation: Validation over the North Sea 2004-2006 using FINO-1 data

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The marine atmospheric boundary layer (MABL) flow is relevant for a number of applications, such as the climate simulation studies, the numerical weather prediction models and in particular for offshore wind energy harvesting. The proper understanding the air sea interaction is crucial for accurate simulations of the wind field properties such as the mean wind speed, the vertical wind profile and the turbulence fluxes.

In this study one year of wind, temperature and turbulent flux measurements from offshore FINO-1 platform are examined and compared to the numerical simulations with the Weather Research and Forecasting Model (WRF). In these simulations, the turbulent kinetic energy based parametrization of Planetary Boundary Layer (PBL) was used. The main aim of comparison is to determine the quality of PBL parametrization in the WRF model by validating the MABL properties with the measurements. We propose to improve existing PBL parametrization by adjusting the parameters of the PBL scheme to the MABL observations. Alternative PBL parametrization approaches for further improvement are also introduced. In addition, the sensitivity of the MABL to the Sea Surface Temperature (SST) resolution is examined for PBL wind forecasts.