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The planetary boundary layer over North Sea: measurements and mesoscale simulations

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The offshore wind power utilisation over North Sea has large commercial potential in the near future. The detailed knowledge of wind properties such as the mean speed, wind profiles, turbulence intensity in the lower part of the planetray boundary layer (PBL) are crucial for utilisation of wind power. Wind properties depend primarily on the horizontal pressure gradient as well as on the PBL structure (such as vertical stability and wind shear).

In this study three years of wind measurements from offshore FINO platform are examined. The simple statistics as well as the vertical wind shear and temperature profiles of data are computed. The spectral analysis of wind speed time series is carried out in order to determine the dominant scale of eddies. The wind properties are determined as a function of the PBL structure. For selected cases, the simulations with Weather Research and Forecasting Model (WRF) are performed and validated to determine the capability of WRF to capture PBL and wind properties as measured by FINO platform. In the future work we intend to use validated WRF results for wind resource assessment and wind power forecast in the North Sea region.