Standardization of Marine Meteorological Data from FINO Offshore Platforms


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In order to investigate conditions for offshore wind power utilization in the German coastal areas, three research platforms were constructed in the North Sea (FINO1 and FINO3) and in the Baltic Sea (FINO2). To improve the comparison of the wind conditions measured at these platforms, the research project FINO-WIND is launched by Deutscher Wetterdienst (DWD) and partners. The project will establish a consistent archive of standardized wind data of the platforms adjusted for local effects.

Introduction

Measurement masts at each platform are equipped with a range of meteorological sensors at heights of about 30 m to 100 m above sea level. Standardization and interpretation of the data is required in order to compare the results of the different platforms. This will improve the knowledge of the marine ambient conditions at the three locations. Quality control and data representativeness of wind data from offshore platforms pose a special challenge as the measurements are subject to a number of local influences, as there are effects from measurement mast, neighbouring wind parks, surface roughness, and tide. Moreover, standards such as IEC (International Electrotechnical Commission) are of limited use as some requirements do not cover the demands of offshore masts e.g. due to the wake effects of the structure. In the FINO-WIND project, therefore, a standardization method is developed. Focusing on wind data, the mast effects of all three masts are intensively investigated by comparison with wind tunnel measurements. The black dots display the LiDAR and cup anemometer wind speed measurements. The ratio of the modeled inflow wind speed and the wind speed calculated at the cup-anemometer position is derived for every 10°-angle of the mast. By comparing wind speed measurements of a simplified mast segment model in a wind tunnel with the LiDAR calculations of a simply modeled mast segment, the CFD model is verified.

Reference:

Conclusions and Outlook

All of the mast corrections derived here show the same mast distortion effects for each of the FINO masts. We find large wind speed reductions for the anemometers if they are downwind of the mast and slight wind speed reductions if they are upwind of the mast. The anemometers show speed-up effects during lateral inflow. For each of the FINO masts one distinctive mast correction method with least uncertainties will be identified to be applied to measured wind speeds in the future. As wind farms are being built close to each FINO platform, wake field situations for each mast from existing and planned wind farms in the surroundings will be investigated in order to estimate these effects on the measured wind speeds.

References:

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