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Standardized assessment of meteorological data from offshore platforms

T. Neumann[1P]*, F. Bégué[1], S. Müller[2], B. Tinz[3], P. Schwenk[4]

[1]UL International GmbH – DEWI, [2]WIND-consult, [3]Deutscher Wetterdienst, [4]DNV GL, *contact: t.neumann@dewi.de

Abstract

In order to investigate conditions for offshore wind power generation in the German coastal areas, three research platforms were constructed in the North Sea (FINO1 and 3) and the Baltic Sea (FINO2). Measurement masts at each platform are equipped with a range of meteorological sensors at heights of 30 to 100 m above sea level. In order to compare the results of the different platforms standardized analysis and interpretation of the data is necessary. This is one major topic of the joint research project “FINO-Wind”.

The new approach to quality control of data is based on a flagging scheme followed by data correction for mast effects. The core procedure of the quality control process has been long term tested in the measurement network operated by Deutscher Wetterdienst (DWD). It was adapted to the specific requirements of the meteorological data measured at different heights in a marine environment. The quality control consists of formal checks, followed by climatological, temporal, repetition and consistency checks which are adapted from either meteorological standards or carefully chosen from several years of experience with the measurements and data from the three FINO platforms. Based on this work recommendations for measurement and data assessment on offshore platforms shall be provided and published.

Data quality check with *ValidatF*

Measured data and configuration file of each platform

Formal check

✓ search forbidden characters

- wind direction 0 … 360°
- wind speed 0 … 60 m/s

✓ value within worldwide valid ranges

- air temperature -50 … 60° C
- air pressure 860 … 1055 hPa

not OK → flag 1

OK

Climatological check

✓ is the value reasonable with regard to climate range of the area?

✓ based on 30-year climatology of ERA*-Interim reanalysis climatology boundaries are defined for:

- every parameter
- geographical position of each platform
- month of the year

not OK → flag 2

OK

Temporal check

✓ reveals outliers

✓ at least three fixed-date values are needed

not OK → flag 3

OK

Repetition check

✓ examine whether a value remains unchanged over an unusual long period of time

- REPEAT1: possible irregularities
- REPEAT2: values are flagged as wrong

not OK → flag 4

OK

Consistency check

✓ sub-checks are performed to verify the different elements against each other

✓ based on general principles of physics

- for example: dew point is not allowed to be higher than the air temperature

not OK → flag 5

OK

Flag overall OK

OK

Manual check

not OK

Flag not OK

Application of mast correction [1] on wind speed data and upload into FINO database.

History of *Validat*

- originally developed and operationally used by the DWD for years to validate marine meteorological data
- system based on the high quality control tool (hqc) as well as on a data validation and data completion system
- is subdivided into separate modules with ever more stringent criteria, separated for every element
- after the successful completion of every sequence, the data are assigned standardized quality flags

New challenges within project FINO-Wind:

- vertical profile measurements of meteorological parameters

→ *Validat* has been completely revised and adjusted to the new purposes of profile measurements

→ ***ValidatF***

*) ERA-Interim is a global atmospheric reanalysis from 1979 to present. It is produced with a 2006 version of the IFS (Cy31r2) and continues to be updated in real time [source: http://www.ecmwf.int/en/research/climate-reanalysis/era-interim]

Conclusions

Project FINO-Wind provides:

- quality validation tool Validatf
- consistently checked data provided in the FINO database of BSH
- thoroughly derived mast corrections for each of the FINO masts
- initial analysis of wind park situations for each platform
- meteorological investigations based on improved data sets

References

[1] T. Neumann, F. Bégué, F. Wilts, T. Leiding, B. Tinz, L. Gates, C. Senet, P. Schwenk, I. Bastigkeit, S. Müller, Standardization of meteorological data from offshore platforms, EWEA Offshore 2015, Copenhagen.

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