



# Q&A Webinar Metocean Study HKN

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Questions: from the audience

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In the answers we refer to the Metocean report for HKN; full reference for this report is: Metocean desk study and database for Dutch Wind Farm Zones Hollandse Kust (noord), DHI, 12 March 2019, version 2.2. The report is published on <https://offshorewind.rvo.nl/>

**Question:** What are the percentage 95%, 50% and 5% referring to for the associated parameters?

**Answer:** For the associated parameters, for instance by the Normal sea-state (NSS) parameters, the 95%, 50% and 5% are confidence intervals. Tp 95% for instance means that for the given wave height the peak period ( $T_{NSS}$ ) has a probability of 95% to be less than the mentioned value for the peak period, see also section 8.4.5 of the Metocean database report.

**Question:** Wind data is included in the Metocean Database and I understand this is taken from CSFR. Is any post-processing done on the wind data before it is entered in the database, besides the vertical profile?

**Answer:** The CSFR wind data has been shifted near the coast to improve the results of the coastal effect (see section 3.3.1.3 of the Metocean database report). The wind data was also biased corrected (directionally) based on the measurements at OWEZ. The wind speeds at different heights above sealevel have been computed using the log profile as retrieved from the measurements (see section 3.3.1.4 of the Metocean database report for normal conditions and section 9.3.2 for the wind profile for extreme wind conditions).

**Question:** The Metocean Database is only certified for HKN. Other wind farm areas are calculated with the same models, why are the other wind farm data not certified?

**Answer:** It is correct that the metocean data for the other wind farms are calculated with the same calibrated models as for the HKN WFZ and DHI believes the accuracy of the results is comparable with HKN data. The reason that only HKN data is certified is that for HKN on-site measurements are available and the model results are actually tested on HKN location (so assuring that no local effects are missed by the numerical models at this location) and the bathymetry data is available in higher resolution at HKN. The effect of the higher resolution on other windfarm side is expected to be small, as main seabed features are captured in the bathymetry of the models.

**Question:** Are the numerical model only validated on the 2 stations shown in the presentation?

**Answer:** The validation of the numerical models was performed at all available stations (around 20). The presentation is showing only some examples. The Metocean report is showing all station on which the calibration and validation of the models has been performed on (see section 3.2 of the Metocean database report for overview of all observations used for calibration and validation of the models).

**Question:** What is the resolution of the model outside the Hollandse Kust Wind Farm Zone?

**Answer:** Resolution of the database is depending on the area. For HKN the resolution is some 200 m for HD model and 400m for wave model, other WFZ are around 400m for HD model and 600m for wave

model. Please refer to the report for more information (see chapter 4 of the Metocean database report for the description of the HD models used and chapter 5 of the report for the wave models applied).

**Question:** Can we download the bathymetry of an area from the database?

**Answer:** The database will provide the water depth at any points you extract - but it is not possible to download areas. However, much of the background bathy data (from EMODnet and RVO.nl) is public and may be acquired externally

**Question:** Can we receive current speed on several water depths?

**Answer:** Yes, current data is available as surface current (95% of water depth) and on depths of 75%, 50% and 25% of water depth as well as near bottom currents (5% of water depth). The current speed consists of a tidal component and a residual component, which both have a different vertical profile. Description of the profile can be found in the Metocean data report (see section 8.3.4 of the Metocean database report for normal conditions and section 9.5.1 for extreme current conditions).

**Question:** Have currents been computed with a 3D numerical model?

**Answer:** No, currents are taken from 2D horizontal models and typical profiles are applied for the tidal part and for the residual part of the total current signal. Description of the profile can be found in the Metocean data report (see section 8.3.4 of the Metocean database report for normal conditions and section 9.5.1 for extreme current conditions).

**Question:** Where are the applied vertical current profiles based on?

**Answer:** DHI has validated vertical current profiles with measurements at HKN site for a period of 14 months. The measurements gave 10-minute averaged current velocities at 10 levels. There are some instances for which we could not simulate the measured current speeds fully. DHI did not succeed in explaining all the outlying current speed fully, so there are phenomena in the area which are not 100% predictable with the models.

**Question:** Can the certified database be used for all design calculations?

**Answer:** Database for Hollandse Kust (noord) is fully certified by DNV GL, there is no exception for use on the data for one certain analysis.

**Question:** Is the database available globally?

**Answer:** The Dutch Database is only available for the Dutch North Sea Area, in which Hollandse Kust (noord), (west), IJmuiden Ver and Ten Noorden van de Waddeneilanden are situated. Also the areas surrounding these wind farms are included in the database. DHI's web-based database provides data globally but this requires the users to pay some fees.

**Question:** What does the wind power spectra comparisons tell us about the high frequency (gust) wind speeds?

**Answer:** The model data (CFSR on hourly time step) does not give us information about the high frequencies. The purpose of this is to assess a representative time average of the model (CFSR) wind speed - in this case 2 hours - in particularly relevant to peak/extreme values. Further, the analysis/plot helps to indicate/show which frequencies are NOT resolved by CFSR model data, and hence has to be accounted for by other methods.

**Question:** How about the wind spectra comparisons in Figure 8.7 of the Metocean report?

**Answer:** See former question, with the addition that the measurements informs us down to 10-min frequencies. But relating to turbulence scale we refer to the Frøya profile given in e.g. ISO 19901.