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Interactive
comment

Interactive comment on "Understanding and mitigating the impact of data gaps on offshore wind resource estimates" *by* Julia Gottschall and Martin Dörenkämper

Anonymous Referee #2

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The paper is motivated by the impact of the measurement gaps due to device failures. The paper could easily be extended to also the onshore situations, and it would be interesting and relevant to see how successful the gap-filling can be when the measurement data characteristics are similar to that from the typical remote sensing campaigns in the wind resource assessment practice. It would also be very informative if the impact of the several shorter gaps would be calculated, and compared with the impact of a long gap with equal duration as the combined shorter gaps (it can happen on a met mast, in winter time, that several shorter gaps occur due to e.g. icing).

The final results (Figure 11) are rather surprising: the gap-filling procedure does not

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Discussion paper

help long-term extrapolation, and does not harm it at best. Thus the conclusion must be that gap-filling is not necessary for resource assessment (for the 30-day gap though), opposite to the authors' claim in the Discussion chapter, P18L5. The main contribution of this paper is in demonstrating how succesful gap-filling can be in the reconstruction of a wind time-series with gaps.

The paper is clearly written and otherwise acceptable with a minor revision.

Specific comments

Abstract

- P1L6-7: sentence unclear "mitigation of the gaps' impact by a factor of ten ..." Introduction,

- P1L12: wind resource also is often re-assessed based on the WTG data, and sometimes a met-mast, all of which also may have gaps.

- P1L15-16: would be interesting to quantify the impact of the uncertainty in terms of the wind project value, e.g. a 1% uncertainty in the wind speed that results in 2% or more uncertainty of the wind farm production which is almost directly related to the earning and compared to an expected return of investment of e.g. 8%.

Data basis

- P4L3-11: Filling gaps with data from below scaled by the ratio of mean wind speeds is unnecessarily rough. Luckily the wind speed gaps in the raw measuremetns at the considered heights of 92 m are very short so this probably does not have a significant impact to the outcome of the whole wind speed analysis. Nevertheless, if possible, it would be necessary to apply a more refined method (e.g. using the extrapolated wind profile from two data points below on a 10-minute basis).

- Table 1: The wind distribution parameters A and k are presented, but what are their confidence intervals (Weibull fitting is not perfect because the wind is not entirely

Weibull distributed)? Further analysis in the paper should then take these confidence intervals into account when the impact of the gaps, and of their mitigation, is presented and discussed. (e.g. P10L30, the error of the k is reduced from 0.017 to 0.007, but what if the uncertainty of the computed k is e.g. 0.1 in the first place?).

- P7L3: Please use the common terminology for NWP and climate modelling: "longitudinal" –> zonal, "lateral" –> meridional

Applied procedures

- P9L6-7: "start state" or perhaps "start date"?

- P10L14-15: while I agree that it would not add much to the study to use a sector-wise approach in the linear correction, it is probably not completely true that 50 km is a sufficient distance (from the coast) that such an approach would not be necessary. Please delete this claim.

- P10L16-20: Please show the magnitude of the noise applied. Applying a random noise in such a way poses a risk that the resulting time-series loses its physical consistency.

- Figure 6 (and associated analysis): is there any dependency of the gap-filling success on the WRF errors (as compared with the non-gapped met mast data)? I.e. there is a certain match between the gap impact itself (red line) and the error of the corrected series (blue), but what makes this correlation not perfect? Model error, or another (stochastic) effect?

- P11, section 3.2.1.: please clarify if WRF is also used for gap-filling when ERA5 is used for the long-term extrapolation?

- P11L10: Using ERA5 directly for MCP is authors' choice and should be stated like this. Typical case is to use downscaled e.g. ERA5 (Windpro/ConWX, Vortex, ...).

Results

- Table 3: again, these results should be accompanied by the underlying uncertainty in the calculation of the statistical parameters.

Discussion

- P18L5: why do you say that gap-filling should be an integral part of wind resource assessment?

- Figure 11 shows that gap-filling or not has no impact on the long-term wind assessment.

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