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

Anonymous Referee #1

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The paper presents a study of the impact, in terms of common wind-related error metrics, of gaps in measured time series of wind speed and direction, for wind resource estimates of offshore sites. The impact of gaps is studied both with and without gap-filling, using a measure-correlate-predict (MCP) technique in combination with numerical model data from a mesoscale model and a reanalysis dataset.

The paper is generally well written, sufficiently introduces the problem and the state-of-the-art, and presents the results in a clear way. However, some improvements should be made when describing the methods, to allow the readers to reproduce the results (see specific comments below).

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Discussion paper

The scope of the paper is somewhat narrow: three sites with fairly similar wind climates, one type of MCP method used, and just two years of measurements considered. Although this makes the paper easy to read and interpret, I believe it would be valuable to extend the scope, as the authors also hint at in the discussion, but perhaps that can be done in a subsequent paper. For instance, I would like to see periods longer than two years considered when seasonal errors due to gaps are investigated, as it can require more years to converge to "seasonal-average" representative results.

All in all, I found the paper interesting and valuable and would recommend accepting it with minor revisions.

1 Specific comments

- P1L6-7 - impact on what? the error? if so, what kind of error? as it stands, it's ambiguous. The abstract should speak for itself.

- P1L7-10 - again, it is unclear what "impact" means here, before it is clarified in P1L6-7

- P5L26 - You have chosen to investigate the impact on mean wind speed, direction, and Weibull A and k, but I think it would also be interesting to additionally show the impact on power, be it power density, or estimated production for reference turbines.

- P5L26 - How was the Weibull-fit made? e.g. maximum likelihood, or WAsP-like moments-based fit that preserves the wind power of the histogram? or something else?

- P6Fig3 - As I understand it, the Dantysk wind farm was constructed during 2014.

Did you consider whether the Fino3 measurements were disturbed by the emerging farm during days with flow from the east?

- P8 - Please also state what simulation duration and spin-up time was used with WRF

- P8 - It would be instructive to show the bias of the reference data compared to the measurements and how it varies with time, especially how it varies with season. If the reference data bias varies with season, which is often the case, it will probably be one of the dominating factors in explaining the MCP errors, particularly when the gap falls in one continuous period like here.

- P10L7 - Please be more specific in detailing the method. I assume you:

  - Use the modeled wind speed data as the predictor (x)
  - Use the measured wind speed data as the predictand (y)
  - group x, y pairs (in time) by 0.5 m/s bins of x
  - calculate the mean and standard deviation of y in each bin
  - make a piece-wise linear fit to the mean of y and use that as the correction function

  Is this correct?

- P15 - As you mention, it may have been better to use the center point of the gaps as the reference time, as opposed to the period start. Especially when considering the season, since the central point better represents the time of the gap.

- P16 - Can you offer a deeper explanation for why the gap-filling before long-term extrapolation leads to equally large errors as not gap-filling first? it seems counter-intuitive

- P17L5-6 - How is the RMSE $= 0.003$ for the black curves calculated here? in other words, what is considered the "target" result? the mean?

2 Technical corrections

- P2L10 - "threshold of amount of lengths of data gaps", perhaps just "threshold of lengths of data gaps"?

- P3L13-14 - "And with Section 6 we conclude our contribution." to me it sounds like you put the emphasis on ending the paper, rather than concluding on the results of the study. I would suggest rephrasing it.

- P3L23 - "next" → "nearest"?

- P4Fig1 and P8Fig4 - Please make sure you adhere to the guidelines related to copyrights and distribution licenses for the background maps. See the author guidelines.

- P5Fig5 and P15Fig10 - Please add panel labeling, e.g. (a), (b), etc.

- P7L23 - Please spell out "grid points (GP)" the first time it's used

- P7L23 - The "x" symbol seems like a regular x rather than a "times" symbol, e.g. like LATEX's $\times$ made using: `$\times$`

- P9L7 - Note that colons are recommended between hours, minutes, and seconds. Example from the guidelines: 25 July 2007 (dd month yyyy), 15:17:02 (hh:mm:ss)

- P10L8-10 - The explanation seems more convoluted than it needs to be. Why not state that you used the piece-wise linear fit as the correction function?

C4

- P15L14 - "both" → "but"?

- P18L6 - Incomplete sentence. "At this it should also be"...

- P18L13 - Should "so" be removed here?

- Everywhere: please use the abbreviation "Fig." in running text, as per the Author guidelines.

- Everywhere: I would suggest adding a space, e.g. `$\,$` with LaTeX, between units, e.g. $\mathrm{m\,s^{-1}}$ rather than $\mathrm{ms^{-1}}$