

Response to the associate editor

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The manuscript proposes the use of ASCAT satellite winds, combined with observations from a few existing offshore tall towers, to train a ML method to give the vertical profile of wind speed. The approach is innovative and the results are promising, thus the paper deserves publication. What is lacking at this point is a discussion of the (limited) practical applications of the method, given that: it requires offshore tall-tower data, it was only applied and valid for about 4% of the available data (from Table 3), there are better alternatives (e.g., mesoscale simulations), and the authors are not willing to share their codes.

Reviewer #1 was unsatisfied with the limited changes made to the manuscript to address their concerns. I must agree that the general tone of the manuscript was not changed, the (limited) practical applications of the method were not properly discussed (i.e., only about 4% of the cases from Table 5), and the limitations of the method (only useable where there are tall towers with multi-year measurements) were not addressed. Reviewer #2 did not want to provide a second review, but they had similar concerns. Thus as Editor I am requesting the following minor revisions:

Thank you very much to the reviewers for their comments after the responses and to the associate editor for her reply. We hope that our revision of the paper gives better clarity on our research output and its limitations. We agree it is proof of concept study. Furthermore, we hope our general tone is aligned with the reviewers and editors view on our results.

1. Please modify section 5 title to be "Conclusions and limitations" and add a discussion of the limitations of your method there

The title was changed and an additional paragraph starting in Line 451 was added:

"Although the results are promising, further work is needed to mature this concept of satellite extrapolation with machine learning techniques. This concept is limited by the fixed sampling rate of the satellite observations and the restrictive training area needing multi-year hub-height wind speed observations. This methodology does not have the same practical uses such the alternatives used throughout this work for comparisons (i.e. reanalysis or mesoscale models) but is a step towards improving long-term satellite wind measurements for wind energy purposes."

2. Explain better in the introduction that this is a proof-of-concept paper with limited validation/comparison with other techniques (i.e, ad-hoc mesoscale simulations with or without data assimilation).

This was added in the abstract in hopes to help soften the tone in Line 15 "... results shown in this proof-of-concept study demonstrate the limited applicability ..."

This is further emphasised in the introduction, in Line 70: "As this work is a proof of concept, the model will be assessed in multiple spatial and temporal levels with more established techniques (i.e reanalysis and mesoscale models)."

3. In Section 2, explain why so few data were used at the three FINO sites (4% at most according to Table 3).

We added in Line 165: "Due to the fact that ASCAT collocates with the FINO masts twice a day on average and that all 30 minute input data for the model need to be available for the training process, each mast location only yields a training dataset of under 5000 data points. It should be noted that the choice of 30 minutes averaging of the FINO measurements was to maximize the available collocations. Using larger temporal averaging of one or more hours would represent a larger portion of data with sim-

ilar wind statistics but would limit the dataset further due missing data in the averaging time window.”

Furthermore, we added a point in the discussion about this in Line 328 as ”... [the RFM shows] an improvement of over 81 % and 30 %. This result is however limited in that the RFM predictions represent a much smaller fraction of the entire FINO datasets compared to the model outputs due to the data availability of ASCAT defined from the polar orbital paths.”

Minor comments:

1. Line 121: unclear still what ”daily” means. Is it once a day (if so, at what time)? Or is it a daily average (if so, over how many hours and what is the temporal frequency of the raw information)?

Daily as in a daily averaged SST values from various satellite products outlined in the link provided in Line 132. These averaged values are recorded for the start of each day, i.e. each SST grid cell has an associated value at YYYY-MM-DD 00:00:00 UTC. A full description of the dataset is explained in the link provided in Line 132 and the papers cited in Lines 127 and 130.

We added in Line 123 ”... foundation temperature available once per day from the Baltic Sea/North Sea ...”.

2. Table 5: what are the units of bias? Maybe it is normalized? Then it should be renamed as normalized bias.

It is normalized bias and that is now changed

3. I was confused by Section 3.2: on one hand, it is an application of the same model described in section 3.1, and yet it gives wind speeds at different levels and for the entire 12 year period, thus 5739 concurrent ASCAT observations? Or just 1148? Or all of them?

This part is unclear, I agree. It is the model that was described, trained and evaluated in the previous section, applied to the entire dataset. This is now clarified in the caption as ”the random forest model (ML) applied to the entire collocated dataset”

I would also like to ask you to seriously reconsider sharing your codes. Given how little applicability this method already has, if you do not even share the code, then your work will be even less useful. I remind you that ”Copernicus Publications encourages authors to also deposit software, algorithms, model code, video supplements, video abstracts, International Geo Sample Numbers, and other underlying material on suitable FAIR-aligned repositories/archives whenever possible.” Having said this, it is not required for publication that you share the code, but if you could consider sharing it upon request or similar wording, it would be a wise decision

We have no problem at all with sharing the codes. We have added in the *Data availability* section in Line 461 ”The model code is available upon request.”