Response to Reviewer 1 – WES-2021-5
March 23, 2021

We thank the reviewer for taking time to assess this manuscript and for the useful comments below. Please find our responses below in blue.

General Comments

The study discusses vertical extrapolation methods for the estimation of wind speed time series from near-surface measurements. For that, the classical logarithmic approach has been compared to i) a single column model, ii) a logarithmic profile with a correction for long-term stability and iii) a machine learning approach using the Random Forest Regression. The authors could show that the machine learning approach is a valuable tool for vertical offshore wind extrapolation and discusses in addition the importance of the used features.

The manuscript is well-structured and the topic is interesting and of high relevance. The introduction describes the problem and state-of the-art, methods are well explained and results are presented in a clear way. Therefore, I would recommend accepting it with minor revisions in case the fact does not matter that most of the text and figures, except for the feature importance part, has already been published in the project report Optis (2020a)[1].

We thank the reviewer for the general feedback and are happy to hear the topic and results are of relevance. We acknowledge that much of this work was recently published in the mentioned technical report, as was required as part of our contract with the Bureau of Ocean Energy Management. However, these technical reports generally do not reach a wide audience. This work in particular would reach even less given that it is hidden in the 2nd chapter of a report entitled "Best Practices for the Validation of Offshore Wind Resource Models." It is for these reasons that we felt it justified to publish in a wind energy journal that would attract a wider audience.

Ultimately, we defer to the editor on a resolution regarding the previously published technical report.

Specific Comments

Page 2, line 36/37: "These buoys generally provide years worth of wind speed measurements less than 5 m and" _– _please check this sentence, I guess the worth is not intended to be there. Also, I guess you mean at a height of less than 5 m?

Nice catch. We have corrected this sentence but have left the word 'worth' as this was added by NREL's communication team.

Page 3, lines 50-51: This is really a beautiful, German sounding, nested sentence. I would suggest to ease it a bit.

Hah, we're glad you liked the sentence, but we agree it's a mouthful. We removed the part about the monotonic increase of wind speed with height, which should be obvious to anyone with any familiarity with the subject.

Page 3, line 53: The separation between the classical and the corrected logarithmic profile is not clear here. As I understand, you talk about the classical approach in line 52/53 and afterwards about the corrected one developed by DTU, is that right? The confusing part is here the beginning of the sentence "This method, developed by researchers". It sounds to me as if you are referring to the classical method mentioned in the sentence before.

We have added "novel" in the first and second sentences in this paragraph to make clear the DTU method is the novel approach that builds on the logarithmic profile.

Page 3, line 61: I was expecting a description of the second novel approach somewhere below but could not clearly find one. Did you mean the machine learning approach? In that case, I would suggest to clearly state clearly that this is the second approach.

Yes the 2nd approach is the machine learning approach. We have modified to intro sentence to this approach to clarify this connection.

Page 9, line 164: please specify what you mean with "we randomly sampled 20 sets". Does it refer to the hyperparameter tuning?

Yes it refers to the hyperparameter turning. We have added to this sentence to make that point clear.