

Interactive comment on “Inter-annual variability of wind climates and wind turbine annual energy production” by Sara C. Pryor et al.

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Response to review of Inter-annual variability of wind climates and wind turbine annual energy production

PLEASE NOTE A FULL COPY OF THE MANUSCRIPT WITH TRACKED CHANGES IS ATTACHED AS A SUPPLEMENT TO THIS RESPONSE.

Review 1

Interactive comment on “Inter-annual variability of wind climates and wind turbine annual energy production” by Sara C. Pryor et al. Anonymous Referee #1 Received and published: 20 July 2018

C1

Synopsis: The ms analyses the inter-annual variability of wind speed and wind turbine energy production over the contiguous United States from WRF simulations and turbine data. They find that the usual assumption of 6 % variability is too high. The ms deals with an interesting and relevant topic that deserves publication. I suggest publishing the ms after minor revisions according to the points listed below. Response: Thank you for your comments and for this positive assessment.

Revision items (1) Figure 4b shows the power spectrum of the simulated wind speeds. It could be interesting to quantify how much the spectrum is deformed on its right-hand side (frequency larger than 1 per day) due to the turbulence parameterisation active in WRF. At least, a possible influence of the turbulence parameterisation on the high-frequency part of the spectrum should be mentioned. Response: This is correct, use of parameterizations in the mesoscale model and a 12 km grid resolution means high frequency variability is suppressed (linked to point 2)

(2) I wonder whether the authors know the study by Larsén et al. (2016). This study deals with the shape of the wind speed power spectrum and identifies a height dependence of this spectrum. The curves shown in Figure 4b of this ms should be discussed taking into account this height dependency. Response: Yes we are aware of that study. We have added this reference (and their earlier work in 2012) and text to discuss this point in section 3.1.

(3) Parts of the ms (especially in Section 3) are a bit difficult to read, because the text contains so much abbreviations and percentage numbers. I wonder whether a slight rewording (and maybe the insertion of additional subsections) would help to increase the readability. Not all readers will digest the paper as a whole but usually they would like to pick from parts of it which refer to their needs. Response: We have undertaken some rewording throughout the manuscript to hopefully aid readers in following our discussion (see also response to points 4 and 5).

(4) Part of the difficulty to read the paper comes from the fact that a Gaussian statistics

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(and the “6 %” value stems from such statistics) is compared to a distribution-free statistics throughout the paper. This produces vague statements such as (see, e.g., p.12, lines 10 and 11) “would appear to be conservative”. This makes it very difficult for the reader to extract a clear and simple “take-home message”. Response: Yes, it is likely that previous research has invoked parametric statistics because of the ease of interpretation. We have undertaken some rewording to hopefully aid readers in following our discussion (see also response to point 5).

(5) As a consequence of the item mentioned before, no clear new value is found which could replace the doubted “6 %” value. What would be the new IAV to be applied in future (at least over the contiguous US)? Response: This is a very important comment. We have added some text to section 4 that is a tentative recommendation but it is of course offered subject to the caveats we also provide in that section.

Reference Larsén, X.G., S.E. Larsen, E.L. Petersen, 2016: Full-Scale Spectrum of Boundary Layer Winds. *Boundary-Layer Meteorol.*, 159, 349–371. DOI 10.1007/s10546-016-0129-x

Please also note the supplement to this comment:

<https://www.wind-energ-sci-discuss.net/wes-2018-48/wes-2018-48-AC1-supplement.pdf>

Interactive comment on Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2018-48>, 2018.