Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2022-71

Anonymous Referee #2

Referee comment on "Investigations of Correlation and Coherence in Turbulence from a Large-Eddy Simulation" by Regis Thedin et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2022-71-RC2, 2022

This manuscript examines the wind field characteristics based on a mesoscale driven LES over a relatively stationary period of time. The topic and the manuscript are interesting and provide relevant insights for further development of wind field models for wind turbine analysis.

Line 27: is the description of "exponential-based equations" really applicable for Mann's model?

Line 43: The IEC standards give the 90th percentile TI, which will naturally be quite conservative when compared to more commonly observed conditions.

You might also find some additional studies of the effects of coherence on dynamic wake meandering for floating wind turbines interesting (example: Wise and Bachynski 2020).

Line 61-62: Although the Mann and Kaimal models don't capture the effect of atmospheric stability on shear and turbulence levels, do they capture the effects of shear and turbulence on the coherent structures?

The difference in the mean wind speed is almost 2 m/s at 80 m, which is described as slight. How large of a difference would you consider to be large?

Line 126: little realizations – do you mean "few realizations"?

Are the streamwise and crosswise directions defined for each 15 min window, or instantaneously? Could the results in Fig. 3 and 4 alternatively be shown such that x corresponds to the mean wind direction in each 15 min window? I'm not sure that I completely understand whether the black and magenta arrows are indicating an average over the full time period or if the fields have been aligned to these directions in each time interval.

Line 192: In order to see the effect of mesoscale transients, it would be useful to compare to a case without transients.

Line 247: It would be good to specify the lowest frequency of interest (not just the highest). I would also suggest replacing "about" with "approximately" in this sentence.

It would be good to be careful with the descriptions of the models, as "Kaimal" usually refers to the spectrum, while the coherence model is exponential.

Line 278: 80 m seems low as a typical hub height offshore.

Line 310: awkward phrasing as it becomes unclear what is reported in the literature.

Line 331: Isn't the coherence in TIMESR based on the Davenport model?

Line 365: I think it would be more accurate to say that the IEC standard does not include information about coherence in the v and w directions, rather than the model ignores them. Exponential coherence in these directions can also be applied, as shown by i.e. Shaler et al.

Similarly, in the discussion, it would be good to distinguish between how models have been applied and how they can be applied – and also keep in mind that design standards are generally intended to introduce some conservatism.

References:

Wise, A. S. & Bachynski, E. E. Wake meandering effects on floating wind turbines. Wind Energy, 2020, 23

Shaler K, Jonkman J, Doubrawa P, Hamilton N. FAST.Farm response to varying wind inflow techniques. In: American Institute of Aeronautics and Astronautics; 2019; San Diego, California.