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Comment on wes-2021-75

Anonymous Referee #2

Referee comment on "Turbulence in a coastal environment: the case of Vindeby" by Rieska Mawarni Putri et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-75-RC2, 2021

The paper “Turbulence in a coastal environment: the case of Vindeby” by Putri et al., provides measurements of turbulence from a field campaign conducted offshore surrounded by complex terrain at Vindeby. The measurements of non-dimensional shear were compared to similarity theory estimates and show reasonably good agreement. Other estimates of co-coherence and turbulence characteristics relevant to offshore wind turbines is also provided. The paper is well structured but there are some aspects of the paper that are not clearly mentioned and could change the result. Reviewing the other comments received for this paper, the two other reviewers have clearly stated some of my concerns as well (regarding flow distortion, computation of the shear, averaging time periods are not clear etc.). In addition to the previous reviewer comments, some additional comments are provided below which would be helpful if clarified in upcoming version. The topic is of interest to the wind energy community and relevant to wind energy science journal.

Comments:

- Maybe some text related to the initial spectral formulations can be moved to an Appendix. There is nothing new in here, but still relevant to the paper and would reduce the length of the paper.
- Why is friction velocity averaged within the two levels, if you feel the measurements at 6 m are affected by the wave boundary layer? You should revisit this part or provide more justification.
- Figure 6 shows good agreement in non-dimensional shear when using 6 m measurements with similarity theory. This is confusing and I was under the impression that the friction velocity and z/L were estimated from 18 m and not 45 m. Some consistency/clarification is required here.
- With average significant wave heights (Hs) below 1 m (line 64), and the wave boundary

layer is typically ~5*Hs, so it would mean **most of the time** the wave boundary layer is below the lowest measurement height (6 m). There may be instances when the waves can affect the measurements, but this would be very small for such low Hs. Please refer to Hristov et al., 1998 (Wave-Coherent Fields in Air Flow over Ocean Waves: Identification of Cooperative Behavior Buried in Turbulence) for more details on how to assess the impact of the wave boundary layer on measurements. After filtering for nonstationary etc., what is average Hs in Figure 5? Small set of measurements affecting the average shear is somewhat surprising. The deviations observed in MOST are probably not due to the presence of the wave boundary layer impacting measurements, but probably flow distortion. This needs to be investigated further.