

Realistic turbulent inflow conditions for estimating the performances of a floating wind turbine

C. Raibaudo, J.-C. Gilloteaux, L. Perret

We thank the reviewers for their valuable comments and suggestions. We have addressed all comments and incorporated most suggestions, except when these conflicted between reviewers. Major modifications and additions to the text have been highlighted in blue in the manuscript for better readability.

A rebuttal to the individual reviewer is included below. The number used to identify the reviewer is as provide to us by WES.

Reviewer #2

1. A grammatical review would improve the clarity of the paper, with particular emphasis on consistency (RMS and rms are employed variously throughout the manuscript, for example) and employment of past versus present tense.

R1: Sentences have been rephrased, in particular verbs in past.

2. Line 189: The sentence beginning “Compared with typical bluff-body flows, the eigenvalues convergence is slow...” would benefit from the inclusion of numbers to support the comparison.

R2: a sentence and the reference of Leite et al. [2] of the POD performed on the wake of a square cylinder have been added. For this reference, the first two modes corresponds to 53 % of the energy of the velocity fluctuations.

3. The paragraph beginning on Line 214 is interesting and could benefit from additional reasoning and speculation from the authors about the correlations for various modes. The authors provide speculation for the correlations noted for modes 1 and 2 for the spanwise coordinates, but it would be helpful to provide some discussion of the correlations for the wall-normal coordinates.

R3: sentences have been added on the vertical meandering, which could be also the signature of the vertical motion of the wake, and the global decrease of correlation of the amplitude.

Higher modes are usually the combination of multiple motions and therefore difficult to interpret. However, an additional sentence has been added to discuss on these vertical modes (modes 2, 4 and 8) and suggest an interpretation.

4. Line 223: The word “velocities” appears to be missing from the sentence beginning “RMS profiles of the reconstructed along z...”

R4: the typo has been corrected, thanks.

5. Line 230: “loses” instead of “looses”

R5: this typo has been corrected, thank you.

6. Why was 6.6 selected as the tip-speed ratio?

R6: this non-optimal value of TSR has been chosen for consistency with previous (unpublished) work performed in our group. It was originally based on the link between the thrust coefficient and the tip-speed-ratio (expressed for example by Eltayesh et al. [1]) .

R6:

7. Figure 10: To improve comparison, it would be helpful to have the same y-axis range for a-2 and b-2.

R7: for all the figures, when the y-range is not the same for subfigures on a same figure, it means their readabilities were not guaranteed, which is the case here.

8. In the Conclusions section, it would be helpful to include a discussion on the authors' speculation on the applicability, potential challenges, and uncertainty of this technique, which is based upon wind tunnel measurements, to a real world operating floating offshore wind farm.

R8: the following paragraph has been added on the perspectives and possible improvements of the technique for floating wind turbines.

The present study focuses on a limited range of frequencies of motion in the streamwise direction. A possible improvement of the experimental set-up is the consideration of all 6 degrees-of-freedom for the motion and to increase the frequency range for better representativity. For the stochastic tool, classical regularization techniques could help to improve the reconstruction quality. For FAST simulations, it could be interesting to consider floating wind turbines for the model to understand the interaction between the experimental inputs and the FOWT performances simulated by FAST.

9. Line 333: "allow" instead of "allows"

R9: this has been corrected, thanks.

10. Given that the appendix is quite short, it could easily be incorporated into the main body of the manuscript.

R10: the appendix has been included in the main text.

References

- [1] Abdelgalil Eltayesh, Magdy Bassily Hanna, Francesco Castellani, A. S. Huzayyin, Hesham M. El-Batsh, Massimiliano Burlando, and Matteo Becchetti. Effect of wind tunnel blockage on the performance of a horizontal axis wind turbine with different blade number. *Energies*, 12(10):1–15, 2019. ISSN 19961073. doi: 10.3390/en12101988.
- [2] Henrique Fanini Leite, Ana Cristina Avelar, Leandra de Abreu, Daniel Schuch, and André Cavalieri. Proper orthogonal decomposition and spectral analysis of a wall-mounted square cylinder wake. *Journal of Aerospace Technology and Management*, 10:1–15, 2018. ISSN 21759146. doi: 10.5028/jatm.v10.867.