General response to the Reviewers

Dear Reviewers,
We would like to sincerely thank you for your interesting observations that have made improvements in the paper possible. Based on your comments, we tried our best to improve the paper by clarifying some sections and adding new data and analyses. Modifications have been highlighted in blue-colored text both in the revised version of the paper and in the point-to-point response provided in this document.
We really hope that this revised version can be now worthy of publication in *Wind Energy Science*.

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Reviewer #1

Overall, this is an excellent paper, and I would like to sincerely congratulate you on your work. I really enjoyed reading it and have just a few minor comments.
Dear Reviewer, thank you for your appreciation of our study. We did our best to further improve it based on your comments.

- Can you highlight how often/realistic the conditions are offshore that are being studied?
Thank you for the right comment. The amplitude and frequency of the studied pitch motion translates to a full-scale oscillation of 1.3° amplitude and 25s period. Full-scale to model-scale conversions can be done by imposing the conservation of the reduced frequency $f_r = f * \frac{D}{U}$. The oscillation corresponds to a relevant oscillation close to the design natural frequency of many floaters, and is thus considered quite realistic. A comment has been added to section 2.
Regarding the inflow, a turbulence intensity of 1.5% can instead be considered a low value inside the atmospheric boundary layer. Despite the low value, turbulence is found to affect wake characteristics very significantly. We assume this effect to be even more pronounced at higher turbulence intensities. This discussion was reflected with an additional comment in the conclusions.

- Abbreviations are not always explained, for instance NETTUNO (line 14), URANS (line 22), BEM & CFD (line 56), ALM (line 126), HAWT (line 196)
The Reviewer is right. We have gone through the paper and defined all acronyms. However, since they are well-known, we preferred to define them within the text rather than in the abstract for conciseness. LES only is defined also in the abstract as it used gain therein.

- Line 40: The word 'the' missing before 'system'
Corrected.

- Line 68: 'Turbulence in (typo?) not explicitly solved' - can you please explain what this means in an extra sentence?
The Reviewer is right. Beyond the typo, while this concept is probably easily arguable by experts in the topic, a better explanation was due to make the discussion clearer to all readers. We have expanded the sentence.

- Line 94: 'Share' not 'shares'
Corrected.

- Line 139: Please explain 'law of the wall'
Done.

- Line 156: Please explain 'bottom shear layer'
The term refers to the lower part of the wake's edge, where the faster surrounding flow mixes with the slower-moving rotor wake. We have clarified this better by specifying "the bottom shear layer of the wake"

- Line 229: 'LES_t' indexing not explained until the next page
Right. The definition of the different simulations has been concentrated at the beginning of Section 4.

- Table 6: Please explain what the +/- values are (standard deviation?)

The reported values represent the maximum and minimum deviations from the mean value of the phase-averaged variations of rotor thrust and torque. The phase-averaging process refers to averaging multiple pitching cycles in order to obtain the "mean" cycle. An explanation for this was added to section 3.5.

- Equation 2: Please explain all the variables
Explained

- Very small and partially covered coordinate system axis description in Figures: 9,10,12,15,16,19,20,B1
Also in response to the comments by Reviewer #2, coordinates were added in terms of distance from the rotor center, in rotor diameters.

- Line 354: 'But then' grammar mistake
The Reviewer is perfectly right. The sentence has been rephrased.

- Equation 3: Typo in U_0 numerator
Corrected.

- Figure 15: Please explain the dotted line at the top
Added.

- Equation 4: Please explain u'x
u'x is the standard deviation of the velocity fluctuations: $u'_x = std(U - \bar{U})$. The clarification has been added to the text.

- Line 493: An Equation to show the velocity gradient tensor would be nice
The sentence was indeed misleading here. We have rephrased the comment to Figure 19. With this formulation, we think no equation is needed anymore.

- Line 514: The word 'with' is missing before 'respect'
Added.

- Line 547: Please explain why the pitching case is the most effective test case to be considered
This line was somewhat confusing. We have tested the pitching case only as we are most interested in the ability of the proposed method to resolve the wake structures typical of a floating wind turbine. We have changed the text to reflect this.

- Equation 5: Please explain N (I am assuming it is the number of sections the blade is discretized into?). Is U0 the same here as U_0 in Eq. 3?
U0 is the same as U:0, this was a typo and has been corrected. The index i:1:N refers to the measurement points along the horizontal line at hub height at 3D and 5D from the rotor. This has been better clarified in the paper.

- Line 627: Please add units for the frequency (Hz)
The value is reported in terms of reduced frequency, so no unit is needed.

- Appendix A, line 814: Please explain in more detail why there is a peak at 1Hz.
The velocity spectrum reported in Fig. A1 was measured in the empty wind tunnel. The measurement was then repeated with the presence of the turbine with neither rotation nor platform motion. In the latter case the anemometer was offset with respect to the turbine, i.e. not placed directly behind it. The reason a 1Hz peak is visible in the spectrum is not fully understood but is most likely a result of the turbulent structures that naturally tend to form in the wind tunnel. The text was amended to better explain the nature of the spectrum.