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Interactive comment on "Characterization of the unsteady aerodynamic response of a floating offshore wind turbine" *by* Simone Mancini et al.

Anonymous Referee #2

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In the paper the response of a 1:75 scaled version of the DTU 10MW RWT to platform surge motion is investigated. Numerical predictions obtained using different fidelity tools are compared to experimental results. The large amount of resources and work involved with this result is apparent. The non-dimensional approach proposed in the final part of the paper is a valuable contribution, although the robustness of the approach should be verified with other wind turbine rotors. I suggest that the article is accepted with minor revisions. I hope that the authors will address the "Major comments" in particular.

General Major Comments:

Figure 7a: In the raw WT timeseries a frequency double the surge frequency can be clearly seen. Please explain where this frequency originates and why it was filtered

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out. This is quite important as the good agreement between numerical codes and experiments would not be achieved otherwise. Furthermore, this is crucial to justify the implicit assumption that thrust variations due to surge have the same frequency of the surge variation made in section 4.2.2. The filtering procedure should also be explained in further detail as the signal was filtered quite significantly.

Conclusions: "The codes have all confirmed the aerodynamic response to be dominated by the component at the surge frequency. Hence, considering only that harmonic, it has been possible to clean the experimental measurements that were characterized by significant disturbances due to the unsteady tests' complexity." – Could it be possible that the numerical models are not able to capture phenomena observed in the experiments? Please elaborate on this point.

English should be checked thoroughly. For instance, the preposition "a" and the article "the" are often missing or used inappropriately.

Specific Comments:

Introduction: The authors mention that the developed test rig has 2 degrees of freedom: pitch and surge. This study seems to be focused only on surge however, can you expain this choice in more detail? Furthermore, since the work focuses on basic understanding of the aerodynamic phenomena & code performance, it would be useful to the uninitiated if an explanation of the most aerodynamically relevant platform motions are and perhaps a diagram refencing those motions. At the very least authors should provide references for the mentioned information.

The introduction also mentions the lack of the influence of floating dynamics on WT control. In this paper however pitch control is disabled. I suggest shortening the paragraph and only mentioning that the results are presented in the frequency domain as well that is useful for controller design.

Section 2.2: I find the names RATED1 and RATED2 confusing. Although they both

refer to design TSR conditions, one refers to below-rated wind speeds. Controller behavior can be very different at rated and below rated. In accordance with the paper, I suggest the names to be changed to BELOW and RATED. I am open to other reasonable explanations.

Line 175: Please revise the phrase “Both models are lifting line codes, i.e. they make use of aerodynamic look-up tables to evaluate airfoil performance.” The fact that a code uses aerodynamic look-up tables does not necessarily mean that it is a lifting-line code, actually BEM codes are typically not LL codes. If the specific code includes a lifting-line formulation for the blades and momentum modelling for the wake it should be clarified.

Section 3.1 Please clarify the effects that are being modelled with engineering models in BEM. This is crucial for a fair comparison.

Section 3.1.3 Have the values discussed here been validated by means of a sensitivity analysis? Other authors have suggested much shorter timesteps and longer wakes to obtain independent results.

Section 3.2 The authors mention that a LES simulation was performed. Was the Pope criterion or similar criteria to verify that an adequate percentage of the turbulent spectrum was resolved verified?

Section 3.3 How is the surge motion modelled in the CFD code? Please specify if automatic remeshing or grid deformation is applied or if there are rotating interfaces as sometimes seen when simulating rotors.

Figure 5: The authors might already be aware of this but it would be useful to include curves for the “full CFD” model a swell, to better highlight which model over-under estimates power & torque.

Table 4: Please clarify the parameters fs and As in the description

Figure 7: QS timeseries is had to make out, please choose another color

Section 4.2.2 It seems to me that in the formulas 6 and 7 the dependency from eˆ(2*pi*fs) was omitted. Please clarify this point. The same considerations apply to eq. 19.

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