

Wind Energ. Sci. Discuss., author comment AC2
<https://doi.org/10.5194/wes-2021-148-AC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on RC2

Felipe Vittori et al.

Author comment on "Model tests of a 10 MW semi-submersible floating wind turbine under waves and wind using hybrid method to integrate the rotor thrust and moments" by Felipe Vittori et al., Wind Energ. Sci. Discuss.,
<https://doi.org/10.5194/wes-2021-148-AC2>, 2022

Dear Referee RC2,

On behalf the authors, we thank you for your time and dedication for reading our article.

We will update and prepare a new version of the documents considering your review.

The inclusion of a load cell, to measure force and moment, in the force actuator is an improvement that we are working on. For this tank test we could not fit the load cell in the force actuator. However, we run calibration tests on the actuator before send the device to the tank, to check the response of the motors and also we apply signal filtering to avoid interruptions casued by noise in the signal.

The equilibrium pitch for this floating platform was below -1deg, from the numeric estimation. The RNA mass of the scaled model was adjusted taking care of not exceeding this value. The COG location and the moments of inertia were calculated based on numerical mass distribution calculations. We added significant amounts of lead to the heave plate, the transition piece and the nacelle to achieve the correct distribution. The difference in the MOI is below 1% and the CoG position is below 5mm in any of the 3 directions.

The linear stiffness matrix that represent the mooring system was initially defined analytically according the mooring lines tension, fairlead positions and the scaled model geometry. The coefficient of the matrix were later adjusted to match the experimental results.

We have performed decay tests with wind during the setup of the SiL system to ensure the correct performance of the hybrid system. Nevertheless, for the paper we have focused on the turbulent wind only case that is another form of observe the aerodynamic damping from the wind turbine and the controller actions but under a more complex wind field.

Comment on Figure 7. We do not consider that the pitch peak from experiments is related with a resonance because its amplitude would be much larger than the one obtained. Instead we see that the difference in PSD curves around pitch natural frequencies are related with changes in the water plane area of the scaled model that varies the pitch

natural frequency. The Hydrodyn numeric model uses constant hydrostatic coefficients that are limiting the numeric response of the platform.

Comment on Figure 8. The F_y from the rotor is included in the numeric model. The rotor is fully simulated in OpenFast producing the respective aerodynamic 3 forces and 3 moment. The multi-propeller actuator only can generate forces in the direction showed in Figure 3. It cannot produce forces in the perpendicular directions " F_y " and " F_z ". The sway motion is relatively small compared with the surge motion and could be produced by the difference between experimental and numerical model. The yaw motion could be due to a coupling of the sway-surge degrees of freedom with yaw through the seakeeping system.

The bundle cable was not constrained to move in any direction. We have accounted it effect during the decay test but for this cases is difficult to determine its influence. Certainly, it should not be discarded.

We are working in the reduction of number of cables to control the actuator and reduce any other bias in the experiment.

Comments related with Figure 9 and 10. After considering the differences between the simulations with second order effects and just linear, we believe that the differences are small due to the low height of the wave. We have updated the text accordingly.

Comment on Figure 11. This is a very interesting comment and we will study it to get a better understanding of the experimental results for future analysis and publications. Nevertheless, the deadline for the revision of the paper are tight and we do not have time enough to include this analysis with the required background analysis in time.