

Interactive comment on “Performance study of the QuLAF pre-design model for a 10MW floating wind turbine” by Freddy J. Madsen et al.

Maurizio Collu (Referee)

maurizio.collu@strath.ac.uk

Received and published: 11 June 2019

GENERAL COMMENTS First of all I would like the authors for the interesting paper – there is indeed an urgent need for coupled model of dynamics at different level of fidelity, especially when considering optimisation of support structures for FOWT at the early design stages. The authors present a clear and systematic analysis of the potential and limitations of the low fidelity-low computational cost coupled model of dynamics QuLAF. Its performance are assessed against the state-of-the-art time-domain, aero-hydro-servo-elastic model FAST by NREL (USA), considering some of the key design load cases for FOWT. Limitations are discussed in depth.

The only main comment I have is the following: precise quantitative differences be-

C1

tween the results obtained in FAST and QuLAF are presented, but they are qualitatively classified as “good”, “acceptable”, and so on. It is not clear to me what is the criterion utilised to judge the goodness of the results, i.e. what would be the “unsuitable/acceptable/good/very good” thresholds (i.e. 30%/25%/10%/5% ? Different for different parameters?), based on state-of-the-art industry experience. I can appreciate that it is always difficult to have some precise numbers, but since this work has been carried out as part of the EU project Lifes50+ I wonder if the authors could add a discussion regarding this aspect, taking advantage of the close collaboration with some of the main FOWT support structure designers during the project.

SPECIFIC COMMENTS Pag. 6, line 19: “Six different wind and wave seeds were simulated for each environmental condition” and, later “a simulation time of 5400s with the same length of turbulent wind field was used for all the load cases including 1800s run-in-time to remove any transient response in the time-domain model”. Does it mean that transient (1800) + 6 x 10 minutes simulations (each one with a different wind and wave seeds) have been adopted?

Pag.14, line 11: “The deviation levels in Table 8 are of the same magnitude and the reason for this is that only maximum values have been considered in the table. This might not be representative for this transient load case, where also the negative values have high influence, as can be seen in the left column of Figure 6.” Would it be possible to add a table relative to the max (in module) negative values, and discuss these as done for the max (in module) positive values?

TECHNICAL CORRECTIONS Pag.2, line 7: “especially if they are carried out with time-domain numerical tools simulating at real-time CPU speed” Please clarify what it is meant by “at real-time CPU speed”, indicating the simulated-to-simulation time ratio.

Pag.2, line 10: “when the concept design is more converged”, please re-phrase, not very clear.

Pag.10, caption of Table 5, please re-phrase expanding it (at the moment a bit difficult

C2

to understand)

Pag.15: “The simulations consists of 18 realizations (i.e. six seeds)” How long each simulation? Would it be possible to summarise the info below, adding them as additional columns on the right in Table 5? - Length of simulation - Timestep of integration - Number of seeds (and how many minutes for each seed)

Fig.9 The names of the load cases seem to be the names of the files used – i.e. not very clear. Furthermore, some of them are cut, and in general very small to be read. It is more important to highlight the fact that FAST and QuLAF agree or disagree on the load case ranking, than the specific name of the load case.

Interactive comment on Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2019-20>, 2019.