An efficient frequency-domain model for quick load analysis of floating offshore wind turbines by Antonio Pegalajar-Jurado, Michael Borg, and Henrik Bredmose

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General comments

I enjoyed reading this article. It is easy to read, has a complete set of equations, and explains the results very well.

This work is **relevant**. Floating wind turbine evaluations with State-of-the-Art (SoA) time-domain integrated models require significant resources in terms of computations and post-processing of the results. The load case matrix is large, and usually each load case is computed with several realizations of irregular waves and turbulent wind.

In floating wind turbine research, the focus has mostly been on time-domain models, due to concern about large motions, nonlinearities and coupling. As these models mature, and experience is gained with different floating platforms, it seems like many cases can be properly linearized and solved in the frequency domain. The **impact** of this work could be extension of time-domain integrated models to allow efficient computations of some of the load cases in the frequency domain. I think the key to application of methods like the one presented in this article (QuLAF) is automation of the input. If a SoA model is set up for input preparation to QuLAF, the choice is then to just run the SoA model for all the load cases by cloud computing, or invest in some additional work setting up QuLAF, which hopefully then will be recovered by the very fast execution of QuLAF.

The **quality** of the article is very good. In my opinion, it lacks only a few clarifications to be ready for publication.

Specific comments

The description of QuLAF, section 5 is quite complete, but I think it would benefit from a few statements right away, on the forcing term on the right-hand-side (RHS) of eq. 5. This information is given later in the paper, but it would be easier to understand the mass matrix, eq. 4, with this information upfront. From eq. 15, we can see that the external forces are transformed to forces and moments at the water line, component 1 -3 in the RHS **F**. The physical interpretation of component 4 is not mentioned in the article; to me it looks like it represents the part of the external force/moment (component 1 -3) performing work on tower deflection.

Instead of just defining the mass matrix, I suggest a few sentences on how it is derived (energy method?). All components of the mass matrix except (4,4) can be understood directly by looking at which forces are required to produce unit accelerations along DOF 1 -3. For example, column 1 (and row 1) is the forcing required to produce a unit horizontal acceleration, with no tower bending. Column 4 represents the external (component 1 -3, already known from symmetry) and internal (component 4) forcing required to obtain a tower top acceleration of phi_hub.

Consider moving the sections 5.4, dynamic response vector and 5.5, dynamic load vector to the beginning of section 5; this would probably solve the issues mentioned above.

For a floating wind turbine with a catenary mooring system, mean drift and current can be important for the mooring line characteristics at the mean platform position. The way I understand the model, this can be taken into account when evaluating mooring line and other mean position characteristics with the SoA model. If this is the case, I suggest mentioning explicitly that mean drift (along the wave direction) and current from any direction can be taken into account in QuLAF.

Misalignment of wind, waves and current can be important for fatigue calculations. I think the article would benefit from a few comments on extension of QuLAF to include sway and roll. Do the authors think this would be straightforward, or are there issues with coupling terms etc.?

Technical corrections

A separate file contains the article, with highlights in yellow and sticky notes with minor questions/comments and edits for consideration.