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Interactive comment

Interactive comment on "System-level design studies for large rotors" *by* Daniel S. Zalkind et al.

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Overall the idea of reducing the complexity of design load case simulations using the harmonic model proposed has merit. I agree with the authors that it is very useful to examine how the effect of design parameters such as cone angle, blade length, and axial induction have on loads all with reduced computational cost. I have a few questions for the authors that I would like to see addressed in the final version of the journal article.

1. By considering the rotors bending motion only a function of azimuthal angle, are you ignoring the fact that resonance of the structure may be uncorrelated with azimuth? In other words, the structures flapping due to resonance may sometimes align with a specific azimuthal angle on one revolution, but not another? I think this is a source of confusion for me since I am not as familiar with this harmonic analysis. But maybe

this is the key simplification to reduce computational cost, as opposed to letting random blade motion and turbulence appear with long timeseries like in FAST. A further explanation would be useful.

2. In Section 4, when discussing the closed loop controller, it would be good to describe what pitch rate was the outcome of the gains for the PI controller to make sure the maximum blade pitch rate is physically possible. For a 13 m blade 5-10 deg/s is reasonable, but for a 13 MW blade 1-3 deg/sec would be realistic. This can drastically change the 50 year DLC 1.1 result.

3. In equation 11, is m_ss for steady state amplitude equivalent to the 0th order amplitude, m_0?

4. For Figure 6, I think a further explanation of interpreting the turbulence factor and std error/mean would be helpful. Is f_turb indicative of the mean error between the harmonic model and the FAST simulations? And is std error/mean indicative of the average dynamic error?

5. In equation 13, does this mean you need two calibration constants for each of the 3 azimuthal modes you are considering?

Figure 9 seems to be showing a lot of interesting trends. It might be useful to inform the reader which design load cases were the driving cases. For example, increasing damage equivalent load but decreasing maximum peak load might be ok if tip deflection is the driving DLC.

Most of my questions are just about helping the reader and me better understand the implications of the harmonic analysis described. Thank you for consideration of my questions and comments and your interesting work to improve blade design.

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