

Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-9

Farid Khazaeli Moghadam (Referee)

Referee comment on "Model-based design of a wave-feedforward control strategy in floating wind turbines" by Alessandro Fontanella et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-9-RC2>, 2021

1- The paper proposes an adaptive feedback-feedforward controller to mitigate the effect of wave disturbance on rotor speed. In general, the approach is sound, and the results show clear improvements. The paper is well-written, and the proposed approach is novel and has the potential for publication in WES. I have some comments that are needed to be addressed to improve the presentations of the paper:

2- The proposed feedforward approach seems to be very sensitive to the wave elevation prediction and wave disturbance model. Have you checked the influence of uncertainties in the wave elevation prediction and wave disturbance model on the proposed controller performance?

3- The methodology employed for damage equivalent load estimation in Section 7.4 needs to be explained in more detail. How are the equivalent loads and stresses estimated?

4- Please provide more details about the simulation studies in Section 7.4. How long is the time duration of the data set associated to the results in fig. 14? Is it enough to capture the wave and wind dynamics? Are the estimated DEL and standard deviation only based on a single data block of each operating speed?

5- Why are the platform motions increased in case of using FBFF with scheduling compared to FB? have you also been looking into the platform rolling?

6- The gain scheduling algorithm is tuned based on different intervals of wind speed as one of the system exogenous inputs, but what about wave elevation as the other disturbance input?

7- Could you please use labels for the curves in fig. 6?

8- If the support substructure type is changed, how can it influence the control design? Which control parameters should be adapted? Please explain about it in the paper text.

9- Authors' statement "Reducing rotor speed oscillations also results into a lower fatigue damage for the wind turbine shaft and tower"

Comment> Could you elaborate more on this statement in the paper text? How is rotor speed oscillation connected to fatigue damage for the wind turbine shaft and tower?

10- Authors' statement "The proposed FB-FF controller, that keeps into account the above-mentioned movement of the LIDAR, can reduce power and rotor speed fluctuations up to 80% and tower, rotor-shaft, and blades fatigue loads of 20%, 7% and 9%, respectively"

Comment> I cannot find the results that confirm these numbers in Section Results. These numbers should match the simulation results presented in the paper.

Authors should also explain in simulation studies about those quantified results and how they are obtained.

11- Authors' statement "Wave disturbance is responsible of a large fraction of the fatigue loads experienced by a floating wind turbine"

Comment> could you please provide reference for this statement? Which failure modes are you specifically focusing on?

e.g. Nejad, A. R., Bachynski, E. E., Kvittem, M. I., Luan, C., Gao, Z., and Moan, T.: Stochastic dynamic load effect and fatigue damage analysis of drivetrains in land-based and TLP, spar and semi-submersible floating wind turbines, *Marine Structures*, 42, 137–153, 2015.

12- Authors' statement "The platform motion caused by waves, turns out into a variation of the apparent wind speed, which affects rotor torque, and then speed."

Comment> Could platform motions like rolling directly influence the rotor speed. Could you explain it in the text to complement the above statement?