Review of the paper: “One-to-one aeroservoelastic validation of operational loads and performance of a 2.8 MW wind turbine model in OpenFAST” by K. Brown et al.

Comments

The paper is extremely interesting and important for the wind energy community. It presents a comparison between the output of an aeroservoelastic simulator and the measurements taken on a 2.8MW wind turbine. The comparison is mainly focused on blade root and tower base loads and considers different methodologies to generate a full inflow field from a few point-wise measurements provided by a met-mast. The amount of analyzed data is significant, and this represents in my opinion the most important value of the present work.

The paper is well-written. Clearly, the model and the measurements cannot be shared and, hence, the results cannot be reproduced. Still the paper serves as a guideline in case other researchers need to perform a similar validation for different turbines.

I recommend accepting the manuscript with some minor modifications, which I listed here below.

Minor comments:

1. Pag. 4, section 2.1: Nothing is written concerning the aerodynamics of tower and nacelle. Please, write just a couple of sentences to if these are taken into account for completeness.
2. Figure 1: it is clear why the Author cannot display the y-axis values, but it could be important to provide numerical data related to the comparison. For example in Fig. 1, one can show the relative errors between prediction and measurements at least for the outer 60% of the blade, where displacements and rotations are significant.
3. Page 5-6, lines 134-136: Is it possible to provide the percentage increment of the blade structural damping that was necessary to use?
4. Page 5-6, lines 134-136: structural damping does not affect only the onset of instability, but, more in general, has an important impact on the vibratory level of the blades. Are the authors sure that the increase in the structural damping did not significantly impact the load estimation? From this point of view, one could use the structural damping as a tuning parameter that may adjust the load and even DEL prediction. Please, comment.
5. Page 7, line 147. How is the shaft and drive-train system modeled? Did you use beam-like or lumped elements? Moreover, why wasn’t the torsion of the tower modeled? I assume that it was done because the tower is sufficiently rigid in torsion. If so, it should be written.
6. Pag. 7, line 157: “without the influence of the wind”-> isn’t it more correct to say “in a standstill condition”? The wind probably is still blowing but the system does not rotate.
7. Pag 7, line 158: “The normal operation data were binned by rotor speed between cut-in and rated”: it seems that full power region, between rated and cut-out was not considered.

This is unusual as load and DEL are typically significant in that operational region. Please, clarify.

8. Page 7, line165: “It was particularly difficult to find the first and second blade-root flap frequencies during normal operation”, I think this is normal as blade flap (and in general out-of-plane modes, including whirling modes) is typically strongly damped by the aerodynamics, hence one does not see “the peak” in the spectrum. Moreover, how are the frequencies extracted from the data? Did you just peak-pick the mode from the PSD plot? If so, one should consider that the highest point in the PSD does not correspond to the frequency of the mode if the damping factor is high (>0.2). The maximum value of the PSD moves to a lower frequency as the damping factor increases. This may also be the reason for the poor matching observed for the out-of-plane frequencies.
9. Pag. 9. Section 2.4: Nothing is said about the dynamics of the actuators. Was this included?
10. Pag 9-10: section 3.1: Is it possible to extract from the comparison of cup and sonic anemometers some indication of the horizontal shear layer, that may have, if persistent, a huge impact on the periodic loads of the turbine?
11. Pag 17, line 340: Mismatches in the controller behavior are here excluded as possible sources of the errors between predicted data and measurements. Please, explain.
12. Section 4.3: fig. 14. While the mismatch in the mean value can be explained by the lower power, it is still difficult to understand the actual impact of the IPC on the DEL. Does it make sense to make an analysis removing the data affected by the IPC?
13. Section 5.2: In my opinion, also vibration data in standstill can be useful, to verify the modal content of the machine excluding the periodicity entailed by the rotation.