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Interactive comment on "Wind tunnel tests with combined pitch and free-floating flap control: Data-driven iterative feedforward controller tuning" *by* S. T. Navalkar et al.

Anonymous Referee #1

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General comments

The paper presents, in the first part, a wind tunnel setup equipped with a combined pitch and free-floating flap control. In the following part of the paper the authors present an iterative feedforward controller tuning used to optimize the control law online an automated manner in order to maximize the load reduction. The topic is very important for the wind energy community and the tools/techniques represent the state of the art, so that the publication on a journal is recommended, even if some modifications are required.

Specific comments

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Discussion paper

+ Page 1, line 7. “The inertia of the flaps was tuned . . .”. Nowhere in the paper the authors present this inertia tuning. Pleas comments this. + Section 2. The authors write they have scaled the INNWIND.EU rotor, but the scaling laws are not reported (time ratio, length ratio, Lock, Reynolds, etc.). Moreover, the scaled model is a 2-bladed rotor, the INNWIND.EU a 3-bladed. The only information provided is (page 3, line 24-25) is on the first blade freq. wrt the 1P (>3.5) which is a standard value for all 3-bladed rotor (to avoid intersections in the Campbell diagram between the blades and the 1/2/3P). It looks like the scaled model is a proof of concept of technology more than a scaled model of a full scale wind turbine, so that the table 1 and the reference to the INNWIND rotor should be removed. Otherwise the authors must give more info about the scaling. + Section 2.1. No information is provided about the aerodynamic design: how the authors have chosen airfoils, chord and twist distribution? May the authors include some more info about this and some more data about the overall performances (power coefficients VS TSR, for instance). + Page 5, lines 5-10. The authors present a mismatch between the measured and calculated structural behavior. The reason of this has been identified in the anisotropic behavior of the real blade not modeled in the isotropic FEM model. The authors should comment why they have not tried to identified this anisotropic behavior on some specimens (as done for Figure 1. . .) and then used an anisotropic FEM model. + Page 7, line 10. ”. . .adds an additional rigid-body degree of freedom”: this comments is unnecessary because this is well known; moreover this comment does not need to be supported by two (auto)citations. + Page 7, lines 18-22. The discrepancy (about 20%) between the two mathematical models is an error in the modeling: a correct FEM model and a correct cross-sectional code + beam model can give the same (correct) results. In a journal paper this should be correct. Moreover, both the models return huge error wrt the real one (see previous point. . .). + Page 9, lines 1-2. This is not clear. The airspeed 36m/s refers to the scaled or the full scale model (it looks the full one. . .)? 340rpm is the scaled one. Probably the authors should present a regulation trajectory of the (scaled) wind turbine (i.e. rotor speed VS wind) + Page 9, figures 13-14. The flutter analysis presented here looks more the one used

for fixed wing (i.e. uniform airflow on the blade, constant AoA, no rotation). Is it also applicable on a rotation blade? Please add some comments in the paper about this flutter analysis. The wind speed on the x-axis refers to the scaled model? + Page 16, lines 4-7. Again more information about the operation of the model is necessary: if the rated speed is 4.5m/s at 230rpm, at 6m/s the rotor speed of a classical variable-speed pitch-regulated wind turbine is again 230rpm (i.e. in the above-rated region the rotor speed is kept constant). The authors must better define the regulation of the model.

Technical corrections/comments + Some figures may be more readable if different line styles are used (i.e. solid, dash-dotted, dotted, etc..). This helps if read on black/white copies or by color-blind person.... + Page 6, line 19. Add extra space: “Finally,an” + Page 8, fig 9-10. Please check these figures, because they look inverted (Fig. 9 looks the first edgewise mode...) + Page 12, line 7, correct “currrent” + Sections 6.2, 6.3, 6.4. In the titles the word “tuning” should be removed since already included in the acronym “IFT” + Figures 21-24: why the words PRE-POST FLUTTER are uppercase?

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