

Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-122

Anonymous Referee #2

Referee comment on "Mid-fidelity simulations and comparisons of five techniques for axial induction control of a wind turbine" by Dan Houck et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-122-RC2>, 2022

Mid-fidelity simulations and comparisons of five techniques for axial induction control of a wind turbine

Review notes

General

- Agree that this is a topic area in need of a thorough dive such as this as the literature is sometimes contradictory.
- Overall I think paper is well done, it is nicely organized, the figures are clear and instructive, the argument is good, and especially appreciate the way this paper informs on the sometimes contradictory results of past papers and provides a framework to see a harmonized set of results through considering multiple means of implementing axial control
- I think the main opportunity for improvement is to have some consideration, maybe

just in the final discussion/conclusions where the authors consider how well these results, which seek to explain static axial induction control, fit with findings on new methods of dynamic axial induction control. I suspect they will fit together well.

Specific

Introduction

- Page 1
 - Could it be useful to from the start differentiate AIC from dynamic induction control?
I found myself starting out wondering if certain statements applied to both static and dynamic methods
- Page 2
 - "This is exemplary of the second shortcoming of previous studies" – This paragraph makes a very good point

Methods

- Page 4
 - Sorry if I missed it, has CACTUS been validated against other codes or field data?
(*note continued reading brings me to this, maybe just mention that is will come later*)
- Page 6
 - A 27m rotor is small for modern standards, is there a concern these results might

not scale to 100m+ rotors? Wake steering for example has been shown to have dependence on rotor size (cf

- Ciri, U., Rotea, M. A., & Leonardi, S. (2018). Effect of the turbine scale on yaw control. *Wind Energy*, 21(12), 1395–1405. <https://doi.org/10.1002/we.2262>
- Do you expect AIC to not have this dependence on scale?
- Page 8
 - Table 1: Agree that this is an interesting set of options to compare

Results

- Figure 8 is very instructive and nicely done, feel free to ignore, but was wondering if:
 - The figure was transposed to be taller and less wide, each subfigure could be larger
 - Further, rather than the coded label of each subfigure the columns/rows could be labeled with more meaningful “20% derate” // maximum Ct, etc
 - (Now I see this is the case in Fig 9, I think it is easier to read like this)
- Page 17
 - This sentence is vague: “In particular, we see that vorticity in the maxCt cases decays the fastest and that the maxRR method appears to have the predicted effect.”
- Figure 14: Recommend a solid black line at 0
- In general the results section is well argued and the plots are well done

Discussion

- Page 27
 - “The mechanism by which this improvement...” this paragraph provides some helpful contextualization of the results of this paper and more generally.
- A paragraph here considering how the results of this study compare to results from dynamic axial control would fit well. I think the physical explanations of which of these simulations work best will accord well with the studies of how different axial methods (such as cyclic thrust variations or the helix method) are able to increase overall power.