Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-48 - Reviewer

Anonymous Referee #2

Referee comment on "Wind tunnel testing of a swept tip shape and comparison with multi-fidelity aerodynamic simulations" by Thanasis Barlas et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-48-RC2, 2021

General comment:

The paper deals with a simulation and wind tunnel campaign of a swept blade tip. Different simulation codes of different complexity and fidelity level are compared against the wind tunnel results.

The employed simulation tools are all at the state of the art. The experimental tests were designed in a proper way, and the experimental rig was equipped with a sensor suite adequate for the scope of the investigation.

The amount of work done is huge, and the Authors did a great job in summarizing the approach and the results in less than 20 pages, without penalizing the informative content of the paper. The quality of the paper is high but the question on the possible usage of the results (given the fact that the blade tip is fixed and does not rotate)

The paper is worth publishing. I recommended the acceptance with “minor revisions”, but I still have some “important comments”, which, as I hope, could be addressed by the Authors in the amended manuscript. “Minor comments” are also reported at the end of the review.

Important comments:

- In the introduction, the Authors referred to the literature belonging to the wind energy field and assessed the innovative content of the work according to that. However, I believe that experiments and simulations for wing tips were performed in the past to study the aerodynamics of aircraft wings with different tip shapes. Since the experiments of the present paper consider a fixed (non-rotating) blade, the comparison with the "aircraft world" may be appropriate.
- In the introduction and the conclusions (in general, in the whole paper) a possible extension of the present results to the case of rotating blades is missing. I understand that performing such tests is extremely difficult, but the question is important. Do we expect a similar agreement also for rotating blade tips? This question is even more important for BEM codes, which are typically used for the design and certifications of new machines.
- Often, the swept blades or swept blade tips are responsible for an aeroelastic coupling with blade torsion. In practice, the lift of the swept tip, being behind the shear center of the root, entails a torsional moment which tends to reduce the angles of attack of the blade sections. Since this is an important aspect for load computations (even for mitigation of turbulence loads), if relevant and possible, I encourage the Authors to extract from the experimental data also the total torsional moment at the root of the blade tip and compare it with simulation results.

Minor comments:

- Section 2: "The wind tunnel speed is tuned accordingly in order to achieve the same range of Reynolds numbers compared to operation on the RTR (0.8e6-1.5e6)". Please add if relevant the details (e.g. real and experimented relative airflow velocity, errors between the wind tunnel and the real Reynolds). It could be even interesting to give an indication on Mach number, even though I believe that the flow will be uncompressible with excellent approximation.
- Figure 4: the paper could benefit from the addition in this figure of the points where the pressure taps are located.
- Pag. 6, line 100 and subsequent ones. It seems that there is a modeling issue with HAWC2 NW and the swept blade. This might jeopardize the goodness of the results. Please comment thoroughly.
- Is there a reference for LLTunnel?
- Pag. 12, line 195: Please, rephrase in order to avoid the repetition of "caused".
- Pag. 12, line 198: Check: "Based on this result is is seen"
- Fig. 11: It is not clear the meaning of the longitudinal line ranging from root to tip in the visualization of EllipSys3D results. Even looking at the experimental flow visualization (consider for simplicity the 0 deg case), it seems that the flow should be mainly characterized by a chordwise direction, but EllipSys seems to predict a significant spanwise flow component at about half chord location in the 0 deg case, and 40% chord location in the 10 deg case. Maybe, I did some mistakes in interpreting the picture, but, if possible, clarify.
- Pag. 16, line 263: I may suggest that the impact of Reynolds number variation is more important at the stall in the CL-alpha curve. Typically, the higher the Reynolds, the higher the stall angle. Maybe, this consideration could be useful to have an improved

interpretation of the results.