Review of paper WES-2021-23:

Local Correlation-based Transition Models for High-Reynolds-Number Wind Turbine Airfoils

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General remarks.

The authors compare results from the Spalart-Allmaras RANS turbulence model coupled with a one-equation and two-equation transition model with other CFD codes and experiments for wind turbine airfoil characteristics at high Reynolds numbers. This may give valuable results since the trend in turbine design is towards increasingly higher blade chord based Reynolds numbers, at present already as high as 15 million. Quite some efforts has been spent on computations for various configurations. However, the manuscript suffers from a number of inconsistencies in the use of experimental data. Also the manuscript structure and elaboration on /analysis of differences between results of different codes may be improved. The following will concentrate mainly on the use of the experimental data.

Details

The chapter names Validation and Results seem a bit strange without a proper clarification in the name. What is being validated? Isn't the comparison under the chapter Results with all the comparisons with different airfoil computations and experiments not also a validation?

The paper shows quite some comparisons of calculations, while the reason for the differences sometimes remains unclear. In the paper not a single pressure distribution is shown, while this also may shed some light on the source of the differences. I would opt for less examples and a more thorough investigation of the ins-and outs of the calculations.

Figure 2 and 10 and chapter 4.2

There is no such airfoil as DU21-A17, nor do any of the other DU-airfoils mentioned in chapter 4.2 exist. I'm afraid the authors confuse the aero-data file names with the airfoil data of the NREL 5MW turbine with the actual airfoil names. DU21-A17 is actually the file with airfoil characteristics of airfoil DU 93-W-210LM for a blade aspect ratio of 17. The addition LM stands for a small reduction in the trailing edge thickness done in the framework of the Dutch DOWEC study [1], where this modification originates from. NACA 64-A17 is simply the file with data for the original NACA 64_3-618 corrected for aspect ratio. The lift, drag and moment coefficients given in the files are synthesized data on the basis of calculations and experiments (at lower Reynolds numbers). They are not the direct result of measurements in a wind tunnel for a Reynolds number of $7x10^6$. The differences between experiment and computations in figure 10e, however, will still be big, as the maximum lift coefficient for the NACA 64-618 at $Re=6x10^6$ is only slightly higher than 1.5
Instead maybe some older NACA airfoils can be used, for which characteristics up to $Re=9x10^6$ are available. If specifically wind turbine airfoils are needed, ref. 2 may be of help.

Figure 9:
The authors might wish to check the post-stall drag data of DU 00 the data set. The wake rake had a fixed span position, so in stall that might give values either too high or too low because of 3D stall patterns. Using the pressure drag post stall instead of wake rake data may give at least less dramatic differences.

Recommendation: major revision

[1] Kooijman, H.J.T., Lindenburg, C., Winkelaar, D., van der Hooft, E.I. Dowec 6 MW pre-design. Aero-elastic modelling of the Dowec 6 MW pre-design in PHATAS. DOWEC-F1W2-HJK-01-046/9 public version.

[2] Somers, D.M. Design and Experimental Results for the S827 Airfoil. NREL/SR-500-36345 January 2005