Review of paper WES-2020-54 by

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With title

Laminar-turbulent transition characteristics of a 3-D wind turbine rotor blade based on experiments and computations

General:

The paper is about a comparison of results from the DAN-Aero measurement campaign with 3D-RANS-CFD regarding laminar to turbulent transition. This is important work, but the paper discusses many effects influencing the location of transition maybe not separated clearly enough to facilitate easy understanding and emphasising the main finding. The authors should think about "less is more".

Specifics

Page 3

line 4: how does it benefit?

Lines 20/21: "Moreover, determining the relevant …" If you are able to answer this question, please state.

Line 28: are you able to quantify these differences?

Page 5

Line 6 ff: Please explain, why you used this specific approach and it accuracy

Line 25: "identical" is impossible. Please state the accuracy (within xx micro-meters RMS or comparable)

Page 6

Line 5: please state an equation how you calculated PSD from time series

Eq (1): "PSD" is not a suitable symbol. Use S or comparable.

Page 7:

Line 4: "transition locations" It seems that several different and not entirely equal definition of a "transition location" is used. Typically, you have a quantity which you relate to transition with a minimum (end of laminar part) and a following maximum (start of fully developed turbulent state). A lot of people take the maximum of slop in between as the "transition point". The authors should state if the use this terminology throughout the paper, and if it would not more consistent to talk about a "transition region".

Page 8:

First paragraph: please explain why you did nor made a mesh refinement study. 14 M cells seems to be very coarse.

Line 8: it may be helpful, to state the bypass mod el used already here.

Eq. please explain what the z_i and z_j are menaing

Page 9

Line 9 “should be know …” do you mean: are calculated to determine ?

Eqs 6 and 7: Cf -> c_f ?

Eq 8: t_w -> \tau_w ?

Page 10

Line 9/10: Pleas explain why you think that Mack’s empirical relation is valid in these cases ?

Page 11:

Lines 2/3: please state an equation, how TI enters here

Line 4. “0” is probably not possible (as it gives an N -> \infty). Please state the minimum N corresponding to TI = 2%.

In addition, a clear definition of TI (and the frequency range include) would be helpful before using this quantity.

Line 16/17: this is not clear for me. How do get an intermittency factor from N (TS-scenario)?

Do you mean: the location closer/farer from the nose is used then ?

Lines 25 (and at other places in the text): State the difference between TI and “turbulence levels” and give an equation for the last one, if possible.

Line 30 ff: see above

Page 12

First line: \gamma > 0.025. please give an explanation why this criteria is used and not \gamma = 0.5

(see my remarks above)

Line 20 ff

Please give reasons why 2 kHz is uses (why are frequency lower not important ?)

Line 22/23: I do not understand these two sentences at all. Please reformulate.

Is the sentence “Therefore, the PSD …) simply incomplete ?

Page 13

Fig 4: the L_p level are not equal (110 … 125, left and 65 … 115 right). Either adjust them or give reasons why this is not necessary.

Right: Please indicate Reynolds Number and AOA (ranges).

Line 14: Lp -> L_p and Xtr -> {x/c}_tr ?

Page 16:

Subsection title: Locations of laminar to turbulent calculated by CFD ?

Line 15: Pleas explain why N=3 was chosen

Page 17:

Line 3: FX -> F_x and FZ -> F_z ?

Page 18:

Fig 9: To me this graph is overloaded. Obviously there two levels, so it seems to me if only the relevant CFD results related to those should be included. If possible reduce the number of data set in any case considerably.

Line 9/10 and

Page 19

Fig 10:

Is it possible to increase line thickness with importance/degree of agreement?

By the way: Fig 10 to 12: Do you mean (x/c)_tr instead of Xtr ?

Page 21:

Fig 12: The acceptance and understanding of this graph would be greatly enlarged, if you make the graph clearer: make the dots from CFD larger (on as a suggestion take the range (x/c)_tr_onset = gamma=0 to (x/c)_ft = gamma = 1 as an “error bar”. Try to reduce to measured point to value +/- std as well.

Page 22

Line 11: typo “more more”

Page 23:

Fig 14: try to include a fitted line (+/- std) for both CFD and measurements

Page 24

Lines 2 to 4 (and earlier on several pages)

Try to correlate TI from pure wind (measured in earth-fixed frame of reference) and “apparent” wind (measured in blade’s rotating frame of reference)

Page 26 ff

References

Add:

doi :10.1088/1742-6596/1037/2/022012

Schaffarczyk et al.

Comparison of 3D transitional CFD simulations for rotating wind turbine wings with measurements