

Interactive comment on “The flow past a flatback airfoil with flow control devices: Benchmarking numerical simulations against wind tunnel data” by George Papadakis and Marinos Manolesos

Anonymous Referee #1

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Manuscript focuses on the CFD-based analysis of a flatback airfoil with various trailing edge treatments and comparison of the numerically obtained results using RANS, URANS, and DES with wind-tunnel measured results. The manuscript addresses the important topic of design and analysis of unconventional airfoils for wind turbine rotors. It is well written although the ratio of number of illustrations to number of lines of text is high and this negatively impacts the readability of the manuscript.

Specific comments:

One issue is the focus on 2D airfoils where it is important to note that on 3D blades, the flow unsteadiness and particularly the Von Karman vortex shedding encountered

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in 2D may well be mitigated by spanwise pressure gradients and geometry changes. This brings up the question if the trailing edge treatment studied in this manuscript are effective and/or are needed on a wind turbine blade? Especially in the inboard region of the blade, where the flatback airfoils are being applied, spanwise pressure gradients and geometry changes are significant causing the flow to be very three dimensional.

Line 104. These trailing edge treatments may affect the high angle of attack characteristics including maximum lift coefficient and stall angle. By limiting the analysis to an angle of attack of zero degrees, the impact of these treatments on this important part of the operating envelope of airfoils is not assessed. Based on this, I would be careful recommending any of the trailing-edge treatments.

Line 188. Concern is that because of the deflection, the flap configuration is not constant in the spanwise direction and that this spanwise variation, not captured in the numerical simulations, causes the discrepancies between experiment and CFD.

Line 273. Delta-criterion is used for the streamwise vorticity. However, in the corresponding figures, Ω_x is listed. In Fig. 13, Delta is listed in caption but Ω_x in the figure. Consistently use Ω_x or, if this causes any issues, more clearly explain the Delta-criterion.

Technical corrections:

Line 118. $0.62 h$. Should this be $0.62 h_{TE}$?

Line 120. Forces non-dimensionalized using the chord of the baseline airfoil? Want to be precise because in line 118 the chord of the flap is mentioned.

Line 121. “misalignment of the model has been aligned of the model has been allowed for”. Please reword.

Lines 137&138. Please reword.

Line 200. Fig. 6 is very unclear. As is this figure is less than useful.

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