

Review of the manuscript was-2026-155 “Influence of inflow turbulence intensity on static and dynamic stall of NACA 0021 at $Re= 5.5 \times 10^6$ using DDES method” by Kim and Wein

The manuscript compares Unsteady Reynolds-Averaged Navier-Stokes (URANS) simulations with the eddy-resolving simulation technique DDES for static and dynamic stall predictions of the symmetric NACA 0021 airfoil for two aspect ratios, a range of turbulence intensity (TI) levels and two Reynolds numbers. The topic of dynamic stall and understanding benefits (and costs) of employing eddy-resolving techniques instead of URANS to study the phenomenon are of practical interest for wind energy. However, there are significant concerns with the numerical setup such that the conclusions are not convincing as presented. The key concerns are provided in the following.

- Wind turbine (tip) airfoils are not symmetric. Also, the Reynolds number in this study reaches 5.5 million, while significantly higher than most of the cited numerical studies and of the order of onshore wind turbines deployed, it still falls short of the 10-15 million of the IEA reference turbines referred to in the introduction. Adding results for a wind energy airfoil, such as the FFA-W3-211 studied by the same authors, and for a higher Reynolds number would therefore strengthen the generality of any conclusions. Otherwise, a word of caution would be in order.
- For simulations with two aspect ratios, it seems that the number of cells in the span remained constant. As a consequence, the resolution coarsened as the span was widened. It is necessary to at least provide also a simulation of the wider span with the fine spanwise resolution. This way differences due to resolution and domain size could be discerned. However, more cases may be necessary for a robust conclusion.
- With a chosen CFL of ten, significant numerical damping due to the time discretization is to be expected, in particular for the time-resolving DDES. A simulation with a CFL of the order of one could help to increase confidence in temporally resolved or spectral results but also in any conclusions regarding the impact of turbulence intensity and whether the flow is expected to be transitional or fully turbulent.
- It was not clear to this reviewer where and how TI was imposed. Is it only in form of turbulent kinetic energy at a given location or are also resolved fluctuations added? For a study of the impact of TI using an eddy-resolved simulation, I would have expected an explicit generation of resolved turbulence somewhere. Due to numerical and modelling damping, the decay of any turbulence from the inflow to the airfoil would likely be stronger than in experiments or in the field, hence reporting trends and comparing values closer to the airfoil would be important. Moreover, the DDES seemed to have a Large Eddy Simulation (LES) mode ahead of the airfoil. This seems a bit odd as no turbulence is resolved whereas TI variations are studied.

- For Xfoil calculations with transition, a value of $N_{crit}=1$ is chosen. Where is this coming from? Doesn't such a low value effectively assume a fully turbulent flow?
- The statement in the conclusion that "at a Reynolds number of 5.5×10^6 , flow over an airfoil can be assumed to be fully turbulent." is bold and not sufficiently substantiated as only one airfoil was analyzed and the experimental data show substantial deviations to the calculations.