Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Dynamic stall and its post-stall lift decay[1] SABRINA HENNE, KAREN MULLENERS, EPFL — Dynamic stall occurs when an airfoil undergoes dynamic changes in the angle of attack beyond its static stall angle. It can be observed for example on helicopter or wind turbine blades. Dynamic stall is associated with an increase in maximum lift, but this initial peak is followed by strong load fluctuations. These fluctuations can cause vibrations, structural damage, and failure. To identify the origin of the decay of post-stall lift fluctuations, the flow around a flat plate undergoing a ramp-up motion from an angle of attack of zero to an angle beyond the static stall limit was investigated using time-resolved flow field and load measurements. Immediately following the ramp-up motion, multiple subsequently shed leading edge vortices are observed and their separation coincides with local maxima in lift. The magnitude of these local lift maxima decays in time. A detailed analysis of the size and trajectory of the dominant leading edge vortices using Eulerian and Lagrangian methods helped to characterise the decay of post-stall lift peaks and quantify the importance of variations in the development of the leading edge vortices and changes in the wake topology on the airfoil's post-stall performance.

[1]SNSF grant number PYAPP2_173652

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Date submitted: 26 Jul 2019 Electronic form version 1.4