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Static versus dynamic stall development KAREN MULLENERS, Leibniz Universitaet Hannover, MARKUS RAFFEL, German Aerospace Center, Goettingen, Germany — Stall on lifting surfaces is commonly encountered, mostly undesired, and occurs when a critical angle of attack is exceeded. Depending on the unsteady rate of change of the airfoil's angle of attack, static and dynamic stall are distinguished. To design efficient flow control measures, a fundamental understanding of the flow and vortex dynamics during stall development is desirable. Detailed information about the spatial and temporal evolution of the dominant flow features is obtained by time-resolved velocity field measurements combined with an extensive coherent structure analysis. Time-resolved flow field investigations during static and dynamic stall reveal flow reversal near the airfoil's surface at the beginning of stall development. At the interface between the region of reversed and free stream flow, a shear layer develops which plays the key role in the subsequent stall development. During dynamic stall, the shear layer rolls up into a large scale dynamic stall vortex which grows locally and temporally until vortex induced separation occurs. During static stall on the other hand, the shear layer rolls up continuously into large-scale structures that grow spatially.

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