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Large Eddy Simulation of Surface Pressure Fluctuations on a Stalled Airfoil SANJIVA LELE, Stanford University, JOSEPH KOCHEEMOOLAYIL, STC Corp. in NASA Ames Research Center — The surface pressure fluctuations beneath the separated flow over a turbine blade are believed to be responsible for a phenomenon known as Other Amplitude Modulation (OAM) of wind turbine noise. Developing the capability to predict stall noise from first-principles is a pacing item within the context of critically evaluating this conjecture. We summarize the progress made towards using large eddy simulations to predict stall noise. Successful prediction of pressure fluctuations on the airfoil surface beneath the suction side boundary layer is demonstrated in the near-stall and post-stall regimes. Previously unavailable two-point statistics necessary for characterizing the surface pressure fluctuations more completely are documented. The simulation results indicate that the space-time characteristics of pressure fluctuations on the airfoil surface change drastically in the near-stall and post-stall regimes. The changes are not simple enough to be accounted for by straight-forward scaling laws. The eddies responsible for surface pressure fluctuations and hence far-field noise are significantly more coherent across the span of the airfoil in the post-stall regime relative to the more canonical attached configurations.

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