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Constrained Large Eddy Simulation of Wall-bounded Turbulent Flows with Massive Separations ZHENHUA XIA, YIPENG SHI, ZUOLI XIAO, SHIYI CHEN, State Key Laboratory for Turbulence and Complex System, College of Engineering, Peking University — Constrained Large-eddy Simulation (CLES) has been recently developed to simulate turbulent flows with massive separations. Different from traditional large eddy simulation (LES) and hybrid RANS/LES approaches, the CLES simulates the whole flow domain by large eddy simulation while enforcing a Reynolds stress constraint on the subgrid-scale (SGS) stress models in the near-wall region. In this paper, we use the CLES method to simulate two separated flows, i.e. flow over periodic-hills and flow around NACA0021 airfoil at 60 degrees angle of attack. The results are compared with those from DES and other traditional simulation methods using the same grid resolution. In flow over periodic-hills, the results show that CLES can capture the mean separation location and reattachment location more accurately. In flow around NACA0021 airfoil at 60° angle of attack, CLES can estimate the pressure coefficients after separations more precisely. Furthermore, the computational cost of the CLES is almost the same as that of DES. We will also discuss the application of CLES for aerodynamic.

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