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Compressible Flow Simulation of Separation Control over a Wall-Mounted Hump JENNIFER FRANCK, TIM COLONIUS, California Institute of Technology — We investigate compressible, turbulent, separating flow over a wall-mounted hump using large eddy simulation (LES). The geometry is identical to the benchmark experiments of Seifert and Pack (2003). The flow is characterized by a turbulent, unsteady flow separation, recirculation bubble, and reattachment. Various LES models including an implicit LES, a constant coefficient Smagorinsky model and a dynamic coefficient Smagorinsky model are employed and compared against one another. The LES results compare favorably with the experimental data for compressible subsonic Mach numbers. Zero net-mass flux control modeled after the experiments is also included in the simulations, and parameters such as forcing frequency and coefficient of momentum are investigated. Results are also compared with two-dimensional low Reynolds number simulations. Spectral analysis of the unforced turbulent flow indicates the same dominant frequency as the large coherent vortices shed in the two-dimensional flow. The two-dimensional simulations are faster to compute and are used to examine closed-loop control strategies that will ultimately be validated using LES.

Jennifer Franck
California Institute of Technology

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