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Large-Eddy Simulation (LES) of the NASA Hump Flow Using Dynamic Sub-Grid-Scale (SGS) Model SUBHADEEP GAN, URMILA GHIA[1], K.N. GHIA[2], University of Cincinnati — LES using dynamic SGS models is employed to investigate turbulent flow over the NASA Hump flow. This has a simple geometry, but, nevertheless, is rich in many complex flow phenomena such as shear layer instability, separation, reattachment, and vortex interactions. The flow is first simulated using the dynamic SGS model (Germano *et al.*, 1991) with freestream Reynolds number of approximately 936,000 and standard atmospheric conditions. Next, LES with an integral-type localization two-parameter dynamic SGS model (Wang and Bergstrom, 2004) is employed. A multi-block structured 3D computational grid is used for the simulation. Mean-velocity contours, turbulent kinetic energy contours, and streamlines will be examined. Detailed comparisons will be made of mean and turbulence statistics such as the pressure coefficient, skin-friction coefficient, Reynolds stress profiles, and wall shear stress, with experimental results. The location of the reattachment behind the hump will be compared with previously published numerical simulations and experimental results. The correlation between the large-scale coherent structures and the SGS events is expected to be predicted more accurately by the integral-type localization two-parameter dynamic SGS model in comparison to eddy viscosity models.

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