Abstract Submitted for the DFD06 Meeting of The American Physical Society

Numerical Simulations of the flow past a two-dimensional bump¹ SENTHIL RADHAKRISHNAN, UGO PIOMELLI, ANTHONY KEATING, University of Maryland — The flow past a two-dimensional bump at momentum Reynolds number 12170 has been computed using Wall-modeled Large-Eddy Simulation (WM-LES). The bump geometry consists of long convex region joined by two short concave region at its two ends. The flow experiences both concave and convex curvature effects and also favorable and adverse pressure gradient effects. The wall-layer model employed is based on the Detached Eddy Simulation (DES) technique, in which the Spalart-Allmaras model is modified to represent all the scales of motion in the RANS region near the wall, but only the subgrid eddies in the LES zone in the outer region. First, DES alone was used as a wall-layer model; in a second simulation stochastic forcing was applied in the RANS/LES interface region to aid the generation of eddies. The mean velocity is predicted reasonably well by both the simulations, but the simulation with the stochastic forcing predicts the Reynolds stresses better. The use of a DES based wall-model has enabled to perform simulations at a fraction of the cost of the wall-resolved calculation.

¹Research supported by ONR

Senthil Radhakrishnan

Date submitted: 24 Jul 2006

Electronic form version 1.4