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Turbulent channel flow with random roughness on one wall[1] JORGE BAILON-CUBA, Rensselaer Polytechnic Institute, STEFANO LEONARDI, University of Puerto Rico at Mayaguez, LUCIANO CASTILLO —
A direct numerical simulation for a turbulent channel flow with a two-dimensional *large scale random roughness* distribution at its lower wall has been performed. The roughness elements are wedges of random height. The Navier-Stokes equations are discretized using staggered central second-order finite-differences, and the roughness is treated by the immersed boundary technique. The roughness geometry has been modified removing the small wedges. Also, a profile of uniformly spaced wedges with the same longitudinal area as the original case has been considered for comparison. Results show that by increasing the width of the cavity the pressure at the stagnation point increases. Also this is considerably affected only when the higher wedges are removed. Suppression of the small wedges also produces a decrease of the skin friction coefficient, $C_f(x)$, if the separated region around these increases its length. However, if the flow reattaches to the smooth wall the effect is an increase. The two modified geometries allow a more complete development of the mean stream-wise velocity profile, $U^+(y^+)$, in the log-law and viscous regions. Also these two configurations, allow (until $y/h \approx 0.5$) a higher increase of the RMS-fluctuations u, v, and w.

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