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Effect of synthetic roughness on a turbulent channel flow JAVIER COMBARIZA, JESUS RAMIREZ-PASTRAN, CARLOS DUQUE-DAZA, Department of Mechanical & Mechatronics Engineering, Universidad Nacional de Colombia, Bogota, Colombia — A turbulent channel flow featuring single step synthetic roughness at the bottom wall was examined using numerical experiments. An incompressible flow solver using LES as turbulence model was employed to study some turbulence variables as well as Q-criterion coherent structures. Roughness was attained by inserting a small step, stretching along the channel spanwise direction in the bottom wall. Three different values for the step width were used. Correlations between the steps width and skin-friction coefficients are calculated. Coherent structures using the Q-Criterion are constructed using different threshold values. By examining the evolution of the Q-structures, the effect of the perturbation is characterized in the near-wall region. Consistency between skin-friction coefficients and Q-structures evolution trends is observed in each case. Comparison between some of the TKE terms in the modified channel flow and those in a smooth channel flow, allow to identify the effect of the the synthetic roughness on the turbulent behaviour. Finally, a simple description of the overall effect of the presence of the perturbation on the turbulent flow is brought about by associating the Q-structures with the strong recirculation zones formed in the near-wall region close to the steps.

Jesus Ramirez-Pastran
Department of Mechanical & Mechatronics Engineering,
Universidad Nacional de Colombia, Bogota, Colombia

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