

Abstract Submitted
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Perturbation of a Turbulent Boundary Layer by Spatially Impulsive Dynamic Roughness¹ I. JACOBI, Graduate Aerospace Laboratories, California Institute of Technology, C. GONZALEZ, California Polytechnic University, Pomona, M. GUALA, B.J. MCKEON, Graduate Aerospace Laboratories, California Institute of Technology — The effect of a spatially impulsive patch of dynamic roughness on a zero pressure gradient, turbulent boundary layer is experimentally studied. The roughness patch is mechanically actuated at a range of frequencies on the order of the boundary layer burst frequency. The downstream evolution of the perturbed boundary layer is then measured by hot-wire anemometry and particle image velocimetry. Velocity profiles and spectral characteristics of the dynamic roughness case are compared with those in the spatially impulsive static roughness case, over a range of roughness amplitudes in the inner region of the boundary layer. The impact of the dynamic roughness on the near-wall turbulence in close proximity to the roughness as well as the recovery of the outer layer farther from the impulse are explored. The additional timescale introduced by the dynamic roughness provides a potential tool for the manipulation of the structure of boundary layers and, by extension, flow control.

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