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The response of turbulent boundary layers to dynamic roughness perturbations JACOB GEORGE, JEFFREY LEHEW, BEVERLEY MCKEON, GRADUATE AERONAUTICAL LABORATORIES, CALIFORNIA INSTITUTE OF TECHNOLOGY TEAM — We describe a fundamental experimental study into the effects of spatially sudden, temporally-varying wall roughness on a canonical turbulent boundary layer at moderate Reynolds number. Results for dynamic disturbances are compared with boundary layer structure, development and return to equilibrium in the presence of constant amplitude “static” roughness. The “dynamic roughness” can be described as a perturbation to the wall morphology with a variable ratio of peak amplitude, k , to boundary layer thickness, δ , and frequencies from d.c. to the order of the burst frequency (limited here by the mechanical drive mechanism). The input wall boundary condition is characterized with the aid of image velocimetry techniques and the response of the zero pressure gradient turbulent boundary layer is obtained using Pitot probes and hot-wire anemometry.

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