

Abstract Submitted
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Effects of Sudden Change in Surface Roughness on Turbulent Boundary Layers RONALD HANSON, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — In almost all practical applications the Reynolds number of the turbulent boundary layer is high and the separation between the inner and outer layer scales become appreciable. Interaction between these scales has profound consequences for the control of turbulent wall flows. In this experimental study we consider the response of the turbulent boundary layer occurring over a surface which transitions from a rough to smooth boundary condition. The transition in surface condition leads to the formation of an internal layer. Above this layer the flow is characteristic of the upstream condition. Within the internal layer the near-wall turbulence establishes itself under the influence of the outer region that remains from the incoming rough-wall. We examine the interaction between the newly established near-wall region and the outer region that persists from upstream conditions. Single and two-component hot-wire measurements are performed simultaneously; the single wire is used to improve the spatial resolution of the measurement of u and to acquire near-wall data. Wide-field Particle Image Velocimetry measurements capture the entire development of the boundary layer over the smooth wall downstream of the roughness.

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