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Internal Structure and Interaction Within Turbulent Boundary Layers Following a Change in Surface Roughness RONALD HANSON, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — In this experimental study we consider the turbulent boundary layer developing past a surface that abruptly changes from rough to smooth. The change 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 under the influence of the outer region remaining from the incoming rough-wall boundary layer. Wide-field Particle Image Velocimetry measurements were used to capture the development of the boundary layer over the smooth wall downstream of the rough surface. These measurement enable investigation of key features such as the structure inclination angle, which are considered to be invariant in equilibrium boundary layers. However, the structure within the internal layer resembles a smooth wall boundary layer and above the internal layer the structure resembles the upstream rough wall flow. Using the simultaneously monitored temporal streamwise velocity from two hotwires, one located within the peak energetic region of the near wall and the other within the outer region of the boundary layer, interaction occurring across the internal layer will be examined with respect to the development of the evolving boundary layer.

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