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Large-Scale Secondary Flows in a Turbulent Boundary Layer Caused by Highly Ordered and Directional Surface Roughness BAGUS NUGROHO, NICK HUTCHINS, JASON MONTY, The University of Melbourne — The effects of highly-ordered and directional surface roughness on zero-pressure-gradient turbulent boundary layers has been investigated experimentally. The surface roughness geometry is a converging-diverging riblet-type, which is shown to induce large-scale secondary flows within the boundary layer. Detailed studies using a single-normal hot-wire indicate that the surface roughness promotes large-scale spanwise modifications of the boundary layer characteristics on the wavelength of the converging-diverging pattern. The data reveals that the local mean velocity above the diverging region increases, while the turbulent intensity and boundary layer thickness decreases. The opposite phenomena occurs over the converging region. Parametric studies reveal that the magnitude of the induced spanwise modifications is determined by the viscous scaled riblet height and spacing (h^+ and s^+), the converging / diverging angle (α), and the streamwise fetch of the boundary layer flow over the surface roughness.

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