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Investigation of Turbulent Wedge Spreading Mechanism and How to Reduce Spreading Using Surface Textures[1] JEFF CHU, DAVID GOLDSTEIN, University of Texas at Austin, GARRY BROWN, Princeton University — We investigate the physics of turbulent wedge spreading in a nominally zero pressure gradient laminar boundary layer over a flat wall using incompressible spectral DNS and an immersed boundary method. Turbulent wedges are simulated over both physical and unphysical surfaces to identify the important factors leading to wedge spreading and turbulence regeneration. Vortex mechanics are examined in detail to elucidate the details of vorticity generation. We find that turbulent wedge spreading appears to rely on tilting spanwise vorticity into the streamwise direction. In particular, dw/dx appears to be an integral part of the tilting process. Low-speed streaks also appear to be important. We examine surface textures that could interfere with the spreading process including riblets and fins to interfere with the tilting process and dimples on the surface to lock in the spacing of low-speed streaks.

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Jeff Chu
University of Texas at Austin

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