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**Complex dynamics of a boundary layer with free stream turbulence** NICOLE SHARP, STEPHANIE NEUSCAMMAN, ZELLMAN WARHAFT, Cornell University — Boundary layers in nature and in engineering applications often occur with turbulent free streams above them. Previous work by Hancock and Bradshaw (JFM, **205**, 1989), Thole and Bogard (J. Fluids Eng., **118**, 1996), and others has shown that free stream turbulence affects the statistics of a boundary layer significantly. In the present wind tunnel study using hot wire anemometry, a flat plate generates a boundary layer that is subjected to a variety of free stream turbulence conditions using active and passive grids. The free stream varies in turbulence intensity from 0.25% to 11% and in free stream turbulent Taylor- scale Reynolds number from 20 to 550. The ratio of the free stream length scale to the boundary layer thickness is also varied. Spectral data reveal a double-peaked energy spectrum, indicating the interaction of two different, major length scales. The double peak develops as the plate is approached from the free stream, and, though the feature is most pronounced at higher free stream Reynolds numbers, it is also evident at very low free stream turbulence intensities. This work was supported by the US NSF.

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