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Distributed Roughness and Transient Growth in a Flat Plate Boundary Layer[1] MATTHEW KUESTER, EDWARD WHITE, Texas A&M University — Very few experiments or numerical simulations have deliberately studied how distributed surface roughness affects boundary layer transition through the transient-growth mechanism. In this experimental work, transient growth initiated by randomly distributed, streamwise-extended surface roughness is experimentally studied in the Klebanoff–Saric Wind Tunnel at Texas A&M University. Two distributed roughness surfaces with the same surface topography, but different amplitudes, were manufactured and mounted flush with the wall in a flat-plate boundary layer. Detailed measurements of the roughness wake were made using hotwire anemometry at three sub-critical Reynolds numbers. Transient growth was observed at multiple spanwise wavelengths. Multiple wavelengths underwent robust growth but only weak growth was observed near the so-called "optimal" wavelength. Comparing cases with different Reynolds numbers and roughness heights reveals how the steady velocity disturbance scales and gives futher insight into the receptivity mechanisms of distributed surface roughness.

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