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Interpretations of Incompressible Continuous Spectrum Receptivity Curves for Transient Growth[1] JASON MONSCHKE, EDWARD WHITE, Texas A&M University — Receptivity of transient disturbances to distributed surface roughness is not representable as a single value but is instead a complex-valued function with a different value for each continuous spectrum mode of the Orr–Sommerfeld/Squire equations. Specific characteristics of the curves give rise to streamwise vorticity of varying strength and at different locations within the boundary layer. The various combinations of streamwise vorticity and the initial streamwise velocity disturbance result in the many types of energy evolution seen in experiments and DNS. Following the work of Tumin [Phys. Fluids 15, 2525 (2003)], Denissen & White [Phys. Fluids 21, 114105 (2009)] developed a technique to decompose experimental measurements made downstream of a roughness array into the constituent continuous spectrum modes. These techniques provide for significant data reduction because receptivity curves encode the complete downstream evolution of the laminar boundary layer. Even though the decomposition uniquely characterizes receptivity to roughness, the small set of measured curves has hindered a systematic understanding of the physical meaning of roughness receptivity curves. Our findings help to associate specific receptivity-curve shapes with physically observable behavior.

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