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Investigation of Turbulence Modification by Momentum Injection Into Turbulent Flow Over a Rough Surface[1] MARK MILLER, ALEXANDRE MARTIN, SEAN BAILEY, University of Kentucky — We present an experimental study conducted in a turbulent channel flow wind tunnel to determine the modifications made to the turbulent velocity spectrum by a sinusoidally rough, microperforated surface, both with and without flow injection through the surface. Preliminary results at moderate Reynolds numbers demonstrate that Townsend's hypotheseis is approximately valid at low momentum injection ratios. Whereas the magnitude and location of a near-wall peak in turbulence intensity remains largely unaffected by increasing flow injection, turbulence intensity in the logarithmic and outer layers increases and Townsend's hypothesis becomes invalid. Spectral analysis indicates that this increase in turbulence intensity reflects significant modifications made to the turbulence structure within these layers, even for very small injected momentum ratios. At high blowing rates, although the signature of very long wavelength motions persisted, the largest proportion of turbulent kinetic energy in the outer layer was found to be increasingly contained within turbulent scales corresponding to the thickness of the wall layer.

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Sean Bailey
University of Kentucky

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