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Space filling attributes of the turbulent motions responsible for the generation of the Reynolds stress[1] CALEB MORRILL-WINTER, University of Melbourne, JOSEPH KLEWICKI, University of Melbourne, University of New Hampshire, JIMMY PHILIP, IVAN MARUSIC, University of Melbourne
— The self-similar inertial layer in wall-bounded turbulence is most commonly associated with the mean velocity profile exhibiting logarithmic behavior. Recent evidence indicates that the value the leading order coefficient describing this logarithmic region (von Karman constant) is intimately related to the space-filling properties of the turbulent motions responsible for the generation of the Reynolds stress. In the present experiments, a compact hot-wire probe employed a temporally optimized processing scheme to obtain well-resolved uv time series over the range $2,000 \leq \delta^+ = \delta_{99} u_\tau/\nu \leq 12,700$. Over the entire Reynolds number range good spatial and temporal resolution was maintained by utilizing the low speed, large scale attributes of the MWT and the FPF, at the University of Melbourne and University of New Hampshire, respectively. The present study examines statistical properties associated with the fraction of time, and associated length scale, that the uv time series is negative. These statistics have connection to the area coverage of the motions responsible for the wall-ward transport of momentum. Results are described and interpreted in a context consistent with the structure of the mean momentum equation.

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