

Abstract Submitted
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Spatial Characteristics of Large-Scale Motions in Smooth and Rough Turbulent Boundary Layers J.M. BARROS, K.T. CHRISTENSEN, MechSE Dept., Univ. of Illinois — Wide field of view stereo PIV measurements were conducted in the wall-normal–spanwise plane of smooth and rough zero-pressure-gradient turbulent boundary layers. The roughness under consideration was replicated from a turbine blade damaged by deposition of foreign materials and contained a broad range of scales arranged in an irregular manner. Inspection of smooth- and rough-wall instantaneous velocity fields in this cross plane uncovered the spatial signatures of low- and high-momentum regions, the former of which have been previously linked to hairpin vortex packets in the outer layer of wall turbulence. Proper orthogonal decomposition was employed to study the spatial characteristics of the large-scale motions in smooth- wall flow and revealed a significant spanwise coherence in the form of alternating low- and high-momentum regions well beyond that reflected in two-point velocity correlations. In contrast, the rough-wall results revealed weaker coherence of these large- scale motions.

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