Abstract Submitted
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**Topographic effect on the inclination angle of ramp like structures in rough wall, turbulent channel flow**[1] ANKIT AWASTHI, WILLIAM ANDERSON, UT Dallas — We have studied variation in structural inclination angle of coherent structures responding to a topography with abrupt spanwise heterogeneity. Recent results have shown that such a topography induces a turbulent secondary flow due to spanwise-wall normal heterogeneity of the Reynolds stresses (Anderson et al., 2015: J. Fluid Mech.). The presence of these spanwise alternating low and high momentum pathways (which are flanked by counter rotating, domain-scale vortices, Willingham et al., 2014: Phys. Fluids; Barros and Christensen, 2014: J. Fluid Mech.) are primarily due to the spanwise heterogeneity of the complex roughness under consideration. Results from the present research have been used to explore structural attributes of the hairpin packet paradigm in the presence of a turbulent secondary flow. Vortex visualization in the streamwise-wall normal plane above the crest (high drag) and trough (low drag) demonstrate variation in the inclination angle of coherent structures. The inclination angle of structures above the crest was approximately 45 degrees, much larger than the "canonical" value of 15 degrees. Thus, we present evidence that the hairpin packet concept is preserved - but modified - when a turbulent secondary flow is present.

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