

Abstract Submitted
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Investigation of wall-bounded turbulence over regularly distributed roughness MARCO PLACIDI, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — The effects of regularly distributed roughness elements on the structure of a turbulent boundary layer are examined by performing a series of Planar (high resolution $l^+ \approx 30$) and Stereoscopic Particle Image Velocimetry (PIV) experiments in a wind tunnel. An adequate description of how to best characterise a rough wall, especially one where the density of roughness elements is sparse, is yet to be developed. In this study, rough surfaces consisting of regularly and uniformly distributed LEGO[®] blocks are used. Twelve different patterns are adopted in order to systematically examine the effects of frontal solidity (λ_f , frontal area of the roughness elements per unit wall-parallel area) and plan solidity (λ_p , plan area of roughness elements per unit wall-parallel area), on the turbulence structure. The Karman number, Re_τ , is approximately 4000 across the different cases. Spanwise 3D vector fields at two different wall-normal locations (top of the canopy and within the log-region) are also compared to examine the spanwise homogeneity of the flow across different surfaces. In the talk, a detailed analysis of mean and rms velocity profiles, Reynolds stresses, and quadrant decomposition for the different patterns will be presented.

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