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Experimental Investigation of Flow Structures in the Boundary Layer over a Moving Rough Wall KYUNG-HOON SHIN, JIAN SHENG, U. Minnesota — Understanding turbulent flows over a moving surface has overarching implications in understanding rotary machinery and buffer-layer dynamics. We investigate effects imposed by such a boundary on flow structures and further elucidate its role to near wall dynamics. The wind-tunnel experiments are conducted over a 1.5x0.9m belt moving in the spanwise direction to impose crossflow wall stresses to a flat-plate turbulent boundary layer. Stream-wise roughness stripes (h=1mm) are patterned over the entire surface at the spacing of 1cm to imitate transverse waveform. The belt rotates at 10-50 rpm to generate effective wave speeds of 0.25-1.27 m/s. The free stream velocities are 5-20 m/s resulting in $Re_x = (0.5 - 2)\text{x}10^6$, and Re_h=*500-2000* based on the roughness height. PIV is used to measure mean velocity profiles and fluctuation fields in three $x - y$ planes located at leading, mid, and trailing edges of the belt. Measurements on two $x - z$ planes located at $y = h$ and $50\delta_v$ are also performed to assess effects of moving roughness on near wall structures. Turbulence statistics, i.e. distributions of Reynolds stress, turbulent kinetic energy, budgets and dissipation, are provided.

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