Abstract Submitted
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Effect of wall-mounted cylinders on a turbulent boundary layer: V3V measurements[1] MITCHELL RYAN, CECILIA ORTIZ-DUEÑAS, ELLEN LONGMIRE, Department of Aerospace Engineering and Mechanics, University of Minnesota, DAN TROOLIN, TSI Incorporated — Volumetric 3-Component Velocimetry (V3V) was used to examine the flow structure downstream of arrays of wall mounted-cylinders in a turbulent boundary layer with Re_τ=2460. The cylinders, which had height-to-diameter ratio H/D = 4 and H^+= 455, extended through the logarithmic region. Measurements were acquired in fields that extended over a range 16 to 34 cylinder-diameters downstream of spanwise arrays of cylinders with a spacing of four and eight cylinder diameters (0.2δ and 0.4δ). The cylinder array with 4D spacing yielded significant wake interactions: the streamwise velocity deficit was greater at the mid-spacing than directly behind a cylinder; the distinction between the downwash regions (behind a cylinder) and the upwash regions (at the mid-spacing) diminishes with increasing downstream distance; and the rms velocity in all components is highest at the half-cylinder-height. These effects occur to a much lesser degree in the case of the array with 8D spacing. Details on parametric effects as well as the instantaneous three-dimensional structure will be provided in the talk.

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