Abstract Submitted
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Effect of wall-mounted cylinders on a turbulent boundary layer: hot wire measurements[1] CECILIA ORTIZ-DUEÑAS, Institute for Mathematics and its Applications, University of Minnesota, MITCHELL RYAN, ELLEN LONGMIRE, Department of Aerospace Engineering and Mechanics, University of Minnesota — Wall-mounted cylinders with height-to-diameter ratio H/D = 2 and large enough to protrude into the logarithmic region, $H^+ = 200$, are used to alter a turbulent boundary layer with $Re_\tau = 1150$ in an attempt to affect the organization of the coherent vortical structures. Hot-wire measurements, including velocity profiles and frequency spectra, were acquired downstream of a single cylinder and spanwise arrays of cylinders. The single cylinder yielded a momentum deficit that extended from $z^+ = 20$ to 200, and a redistribution of the streamwise rms velocity towards the half cylinder height with a corresponding increase in the power spectral density over a broad frequency range. Cylinder arrays with 3D spanwise spacing yielded significant wake interactions. The largest mean streamwise velocity deficits and rms values occurred in the log region at mid-span between cylinders. More detail on the effect of cylinder spacing will be provided in the talk. The results suggest that turbulence within the boundary layer leads to broader spanwise interactions than those occurring in wakes of cylinder arrays in uniform cross flow.

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