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Effect of Immersed Wall-Bounded Cylinders on Turbulent Boundary Layer Structure[1] SHAOKAI ZHENG, ELLEN LONGMIRE, MICHAEL HALLBERG, MITCHELL RYAN, Aerospace Engineering and Mechanics, University of Minnesota — Single spanwise arrays of wall-mounted cylinders with $H/\delta \leq 0.2$, where H is the cylinder height and δ is the boundary layer thickness, were used to modify turbulent boundary layers (Re_τ=2500) in an attempt to affect the organization of the coherent structures in the logarithmic and outer regions. Flow downstream of several array spacings was investigated and compared against an unperturbed case. Instantaneous and averaged velocity fields in streamwise-spanwise planes were obtained by stereo PIV. The PIV cameras and laser sheet optics could be traversed at the local mean flow speed in order to track the evolution of larger structures in the flow. The results are analyzed to determine the streamwise evolution of dominant spanwise modes. Different array spacings are shown to either inhibit or reinforce the organization of vortex packet structures over streamwise distances up to 8δ. The flying stereo PIV measurements suggest also that dominant structures upstream of the arrays can strongly affect the organization and location of structures downstream.

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