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Study of turbulent boundary layer structures using Tomographic PIV[1] QI GAO, ELLEN LONGMIRE, CECILIA ORTIZ-DUENAS, Aerospace Engineering and Mechanics, University of Minnesota — Tomographic-PIV was applied to investigate vortical structures in the logarithmic region of turbulent boundary layers. Measurements were performed in a water channel facility with $\delta \approx$110 mm for $\mathrm{Re}_\tau \approx$2400 and 2900. Laser sheets with thickness up to 7mm were aligned parallel to the bounding surface. Four cameras with 2k x 2k pixels were placed in a rectangular array facing the measurement volume with tilt angle $\sim 30^\circ$ to the wall normal direction. Magnification was $\sim$0.05 mm/pixel. The resulting measurement volumes were 0.8δ x 0.8δ in the streamwise and spanwise directions and 0.065δ or 120 viscous units in the wall-normal direction. Correlations were performed on 64^3 voxel volumes with 75% overlap yielding a vector spacing of 25^3 viscous units. The data were probed using swirl strength and direction as well as convection velocity to identify and characterize relatively large scale eddies and structures within the volumes. The results will be discussed and compared with results at similar wall-normal locations in lower Reynolds number DNS channel (Re_τ=590, 934 of Moser et al., 1999 and del Álamo et al., 2004) and wind tunnel (Re_τ=1160) flows.

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