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Evolution of Reynolds stresses in a turbulent boundary layer ROELAND DE KAT, University of Southampton, LIAN GAN, JAMES DAWSON, University of Cambridge, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — Understanding Reynolds shear-stress events in a turbulent boundary layer is of crucial importance for modelling and controlling turbulent wall-flows. In this study, we examine the evolution in time and space of these shear-stress events by performing time-resolved PIV measurements in a stream-wise wall-normal plane of a turbulent boundary layer at $Re_\tau \approx 2500$. The conditions are similar to the experiment by Dennis & Nickels (J. Fluid Mech. 2011, vol. 673), who performed measurements at $Re_\theta = 4700$. Four high-speed cameras positioned next to each other, 4-5 m downstream of a glass rod trip, captured a region of flow spanning approximately 2δ in stream-wise and 0.5δ in wall-normal direction. This zoomed-in field-of-view enables high spatial, $l^+ \approx 20$, and temporal resolution, $\Delta t^+ \approx 1$ which will allow us to describe the evolution of shear-stress events in time and space. In the talk, detailed analyses including instantaneous tracking of Reynolds shear-stress events, quadrant decomposition and spectra of the stream-wise, wall-normal and Reynolds shear-stress fluctuations will be presented.

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