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Conditional structure of large- and small-scales in high Reynolds number turbulent boundary layers[1] B. GANAPATHISUBRAMANI, Imperial College London, N. HUTCHINS, J.P. MONTY, I. MARUSIC, University of Melbourne — A spanwise array of surface hot-film shear-stress sensors and a traversing hot-wire located directly above one of these sensors are used to identify the conditional structure of a high Reynolds number turbulent boundary layer. The shear-stress data is low-pass filtered and is used to detect large-scale low and high skin-friction events. The velocity fluctuations from the hot-wire are decomposed in to large-scale and small-scale components and used to compute conditional large-scale mean velocity and small-scale turbulence intensities conditioned on the presence of large-scale low and high skin-friction events (detected by the skin-friction sensors). The conditional mean based on the large-scales show a forward-leaning low- and high-speed structure for low and high skin-friction events. The conditional small-scale turbulence intensity is weak near the wall and intense farther away from the wall for a low skin-friction event and vice-versa for a high skin-friction event. The changes in the velocity gradient of the conditional large-scale structure is used to explain the trends in the small-scale activity.

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