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Fluctuating wall shear stress and velocity measurements in a turbulent boundary layer ROMMEL PABON, LAWRENCE UKEILEY, CASEY BARNARD, MARK SHEPLAK, University of Florida — Knowledge of mean wall shear stress on a surface can shed light on important performance parameters, but the fluctuating shear, even in simple flows, has not been as easily measured, and can be of interest in fundamental boundary layer research. Experiments on a flat plate model were performed to investigate the relationship between the wall shear stress and large scale events in the turbulent boundary layer. A MEMS based differential capacitance shear stress system with 1mm $\times$ 1mm floating element which can measure the fluctuating and static components of shear simultaneously, coupled with a hot wire anemometer were used for characterizing the turbulent boundary layer. Velocity profiles and turbulence statistics approaching the wall characterized the two dimensionality of the flat plate, and a trailing edge flap was used to impose a zero pressure gradient. The mean streamwise velocity profile was scaled by the friction velocity using the measured shear stress and independently compared to classical fits. Correlations between the fluctuating shear and measured velocities were used to elucidate the large scale events and to compare with previous fluctuating shear measurements for validation.

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