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PIV and LIF measurements of a turbulent boundary layer with injected drag-reducing polymers at high Reynolds numbers GHANEM OWEIS, ERIC WINKEL, DAVID DOWLING, MARC PERLIN, STEVEN CECCIO, University of Michigan, Ann Arbor, MI 48109 — The injection of aqueous solutions of large molecular weight polymers into the near wall region of turbulent boundary layers (TBL's) has been known to produce significant reductions in friction drag. The goal of this study has been to make unique experimental measurements that illuminate the behavior of TBL's modified by slot injected polymers, and to assist with predictive code development efforts by producing experimental data sets at scales emulating prototype applications. For the present experiments, the model is a hydrodynamically smooth flat plate that measures approximately 13 m in length, and is 3 m wide. Free stream water speeds as high as 20 m/s were investigated, resulting in length-based Reynolds numbers above 200 million, and boundary layer thickness of $\sim$10 cm. Polyethylene oxide (PEO) based polymers were chosen for this study. We discuss near wall (y $<$ 0.2 cm) velocity measurements of the TBL produced by particle image velocimetry and polymer concentration measurements produced by non-simultaneous laser induced fluorescence. [Sponsored by DARPA]

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