

Abstract Submitted
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Modification of a Turbulent Boundary Layer within a Homogeneous Concentration of Drag reducing Polymer Solution.¹ YASAMAN FARSIANI, BRIAN ELBING, Oklahoma State University — High molecular weight polymer solutions in wall-bounded flows can reduce the local skin friction by as much as 80%. External flow studies have typically focused on injection of polymer within a developing turbulent boundary layer (TBL), allowing the concentration and drag reduction level to evolve with downstream distance. Modification of the log-law region of the TBL is directly related to drag reduction, but recent results suggest that the exact behavior is dependent on flow and polymer properties. Weissenberg number and the viscosity ratio (ratio of solvent viscosity to the zero-shear viscosity) are concentration dependent, thus the current study uses a polymer ocean (i.e. a homogeneous concentration of polymer solution) with a developing TBL to eliminate uncertainty related to polymer properties. The near-wall modified TBL velocity profiles are acquired with particle image velocimetry. In the current presentation the mean velocity profiles and the corresponding flow (Reynolds number) and polymer (Weissenberg number, viscosity ratio, and length ratio) properties are reported. Note that the impact of polymer degradation on molecular weight will also be quantified and accounted for when estimating polymer properties

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