

Abstract Submitted
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Modification of Turbulent Boundary Layer in the Homogeneous Polymeric Drag Reduced Flow¹ YASAMAN FARSIANI, ZEESHAN SAEED, BRIAN ELBING, Oklahoma state university — Polymer induced drag reduction in turbulent flows has drawn significant scientific attention, not only due to their potential to improve relevant economies, but also because recent findings have challenged the classical views on how they modify the near-wall mean velocity profiles in the high DR regime ($>40\%$). Observed modifications suggest that they are dependant on polymer and flow properties, but being based on mean statistics, they cannot reveal details of the intermittency of the near-wall events and coherent structures. The momentum exchange processes in a TBL depend on the turbulence structure and this is also true in drag reduced flows, making the changes in the instantaneous velocity fluctuations and their correlations with polymeric flows important for understanding the DR mechanism. In this presentation, mean and fluctuating velocity profiles, with controlled polymer and flow properties are compared with their Newtonian counterparts. Furthermore, two-point correlations of the fluctuating velocities are used in elaborating on the dominate coherent structure configurations such as inclination angles, length scales and frequencies within the given region of the TBL. This can potentially explain the modification in mean velocity profiles.

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Yasaman Farsiani
Oklahoma state university

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