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Maximum Drag Reduction Asymptote in Turbulent Channel Flow of Polymer Solutions CHANG-FENG LI, Jiangsu University, P.R. China, RADHAKRISHNA SURESHKUMAR, Syracuse University, BAMIN KHOMAMI, University of Tennessee, Knoxville — It is well known that the addition of a small amount of soluble high molecular weight polymers to wall bounded turbulent flows can lead to dramatic drag reduction (DR). Salient features of this phenomenon include: (1) existence of threshold for the onset of DR, and (2) an upper bound referred to as the maximum drag reduction (MDR) or the Virk asymptote. Computational studies including DNS and viscoelastic exact coherent structures have provided significant insight into the mechanism by which polymers alter turbulence and give rise to DR. Despite the significant progress in understanding polymer induced drag reduction in the low (DR<40%) and high (40%<DR<60%) DR regimes, fundamental understanding of existence of a universal upper limit of drag reduction and the nature of the flow at this limit is still lacking. In this study, we have developed new mechanistic insight at MDR both in terms of the existence of a universal upper limit and the nature of the flow in this regime by analyzing extensive hi-fidelity direct numerical simulation data of turbulent channel flows of dilute polymeric solutions.

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