Abstract Submitted
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**Elasto-Inertial Turbulence: From Subcritical Turbulence to Maximum Drag Reduction**[1] YVES DUBIEF, School of Engineering, University of Vermont, Burlington VT, SAMIR SID, RAPHAEL EGAN, VINCENT TERRAPON, Dept. of Aerospace and Mechanical Engineering, University of Liege, Liege, Belgium — Elasto Inertial Turbulence (EIT) is a turbulence state found so far in polymer solutions. Upon the appropriate initial perturbation, an autonomous regeneration cycle emerges between polymer dynamics, pressure and velocity fluctuations. This cycle is best explained by the Poisson equation derived from viscoelastic flow models such as FENE-P (used in this study). This presentation provides an overview of the structure of EIT in 2D channel flows for Reynolds numbers ranging from $Re_\tau = 10$ to 100 and for 3D simulations up to $Re_tau = 300$. For flows below the Newtonian critical Reynolds number, EIT increases the drag. For higher Reynolds numbers, EIT is surmised to be the energetic bound of Maximum Drag Reduction (MDR), the asymptotic state of drag reduction in polymer solutions. The very existence of EIT at low Reynolds numbers ($Re_\tau < 60$) highlights a backward energy transfer from the small scale polymer dynamics to larger flow scales. Similar dynamics is identified at higher Reynolds numbers, which could explain why polymer flows never become fully laminar.

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