Abstract Submitted
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Chaotic and steady regimes of elasto inertial turbulence in 2D channel flows[1] FUQIAN YIN, University of Vermony, USA, JACOB PAGE, RICH KERSWELL, Cambridge University, UK, VINCENT TERRAPON, University of Liege, VICTOR STEINBERG, Weizmann Institue, Israel — Elasto inertial turbulence (EIT) is a non-laminar state of flow occurring in polymer flows in subcritical and supercritical flows. In 2D subcritical channel flows, the drag increases owing organized polymer dynamics which create flow structures through a backward energy transfer between polymer and the flow. Using viscoelastic direct numerical simulation based on the FENE-P model, we find two main regimes of flow: Chaotic and steady regimes with various variations in between these two bounds. Chaotic flows consist of elongated thin sheets of first normal stress with no particularly defined spacing between the sheets. In steady flow, a peculiar structure, dubbed the super core structure (SCS), emerges. Its existence is controlled by the polymer length and its shape varies with the Weissenberg number. The SCS has exceptional persistence and is speculated to be an exact solution of the flow, as well as a possible connection between EIT and elastic turbulence occurring in inertial-less flows.

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