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Elastic turbulence in Taylor-Couette Flow of Dilute Polymeric Solutions: A Direct Numerical Simulation Study[1] NANSHENG LIU, BAMIN KHOMAMI, Department of Chemical and Biomolecular Engineering University of Tennessee, Knoxville — Despite tremendous progress in development of numerical techniques and constitutive theories for polymeric fluids in the past decade, Direct Numerical Simulation (DNS) of elastic turbulence has posed tremendous challenges to researchers engaged in developing first principles models and simulations that can accurately and robustly predict the dynamical behavior of polymeric flows. In this presentation, we report the first DNS of elastic turbulence in the Taylor-Couette (TC) flow. Specifically, our computations with prototypical constitutive equations for dilute polymeric solutions, such as the FENE-P model are capable of reproducing the essential features of the experimentally observed elastic turbulence in TC flow of this class of fluids, namely, randomly fluctuating fluid motion excited in a broad range of spatial and temporal scales, and a significant increase of the flow resistance. Moreover, the experimentally measured Power Spectral Density of radial velocity fluctuations, i.e., two contiguous regions of power-law decay, -1.1 at lower frequencies and -2.2 at high-frequencies is accurately computed.

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