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Stability of viscoelastic wakes LUCA BIANCOFIORE, Imperial College London, LUCA BRANDT, KTH, TAMER ZAKI, Imperial College London — Theoretical and computational studies of synthetic wakes have explained the dynamics of several industrial and technological flows, for example mixing in fuel injection and papermaking, and the flow behind bluff bodies. Despite the industrial importance of complex non-Newtonian flow, previous work has focused on Newtonian fluids. Nonlinear simulations of viscoelastic, spatially-developing wakes are performed in order to analyze the influence of polymer additives on the behavior of the flow. Viscoelasticity is modeled using the FENE-P closure. A canonical wake profile (Monkewitz, Phys. Fluids, 88) is prescribed as an inflow condition, and the downstream evolution is computed using the full Navier-Stokes equations for a range of Reynolds and Weissenberg numbers. The simulations demonstrate that the influence of the polymer can be stabilizing or destabilizing, depending on the inlet velocity profile. Smooth profiles are stabilized by elasticity while sharp profiles are destabilized. The disturbance kinetic energy budget is examined in order to explain the difference in behavior and in particular the influence of the polymeric stresses on flow stability.

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