Eulerian-Lagrangian simulations for viscoelastic turbulence

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The turbulent flow in dilute polymer solution, so called the viscoelastic turbulence, is investigated using the large-scale simulations of incompressible Navier-Stokes equations coupled with a huge number of long-chain polymers modeled by the two particles connected by the nonlinear spring (dumbbell model). We briefly review our Eulerian-Lagrangian approach and show some examples for analyzing the effect of polymer additives on decaying turbulence in 3D and 2D. We also discuss how the polymers modify the cascade dynamics and the scaling behavior of kinetic energy spectrum by comparing our results with those recently obtained by the direct numerical simulation of constitutive models for viscoelastic fluid.