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The effects of pressure, inter-scale interaction and viscosity on the Lagrangian evolution of velocity increments[1] YI LI, CHARLES MENEVEAU, Johns Hopkins University — A simple system of two ordinary differential equations (the advected delta-vee system)has been derived from the Navier-Stokes equations to describe the short-time Lagrangian evolution of velocity increments (Li and Meneveau, PRL, 2005 and Li and Meneveau JFM, 2006). It was shown that many important intermittency trends ubiquitous in turbulent flows are reproduced from the system even when the effects of part of the isotropic pressure, the anisotropic pressure Hessian, inter-scale interaction and viscosity are neglected. The truncated system thus provides simple dynamical explanations to many intermittency trends in turbulence. In this talk, the effects of those neglected terms are investigated based on direct numerical simulations, using conditional statistics. The results show that the neglected terms tend to reduce the probability of large fluctuations in velocity increments, consistent with the fact that they are needed to regularize the truncated system. Different terms behave distinctly in different regions of the phase space of the advected delta-vee system. The results suggest that different models are required to model the pressure Hessian, interscale and viscous effects.

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