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Velocity and Scalar intermittency in restricted Euler dynamics YI LI, CHARLES MENEVEAU, Johns Hopkins University — A long standing problem in turbulence is to predict the intermittency from Navier-Stokes equation. Recently, by adopting a Lagrangian point of view and using the restricted Euler dynamics, we derived a simple nonlinear dynamical system, called advected delta-vee system, for the time evolution of longitudinal and transverse velocity increments, from which we showed that the non-Gaussian tails in turbulence originate from the inherent self-amplification of longitudinal velocity increments, and cross amplification of transverse velocity increments. Here, after reviewing previous results, the analysis is generalized to the increments of a passive scalar. A simple nonlinear equation is derived for the time evolution of scalar increments. The equation is coupled to the advected delta-vee system through the squeezing effect of the longitudinal velocity increment. Numerical integration of the equations starting from Gaussian initial conditions shows rapid development of non-Gaussian tails in the PDF of scalar increments, suggesting the system captures important trends in the original Navier-Stokes and scalar transport dynamics.

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