Abstract Submitted
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Material deformations and scalar intermittency in restricted Euler dynamics[1] YI LI, CHARLES MENEVEAU, Johns Hopkins University — We explore the implications of Restricted Euler dynamics on the intermittency of the velocity and passive scalar fields, and on the geometry of material deformations. Following the pioneering work of Cantwell (1992), we find a number of exact solutions for the Lagrangian evolution of material elements, velocity increments, and passive scalar increments. For the latter, the probability density functions calculated from the model system display a rapid evolution from Gaussian to exponential, to stretched exponential distributions. This is in good qualitative agreement with the intermittent statistics of scalar increments in turbulent flows. We show how the analysis can be generalized to include linear viscous damping. The analytical predictions for material deformations based on restricted Euler are compared with results obtained from filtered direct numerical simulations, in which geometry of deforming material elements is tracked in a Lagrangian frame.

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