Abstract Submitted
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Public-database enabled analysis of Lagrangian dynamics of isotropic turbulence near the Vieillefosse tail[1] HUIDAN YU, CHARLES MENEVEAU, Johns Hopkins University, Baltimore, MD — We study the Lagrangian time evolution of velocity gradient dynamics near the Vieillefosse tail. The data are obtained from fluid particle tracking through the 1024^4 space-time DNS of forced isotropic turbulence at $Re_\lambda = 433$, using a web-based public database (http://turbulence.pha.jhu.edu). Examination of individual time-series of velocity gradient invariants R and Q show that they are punctuated by strong peaks of negative Q and positive R. Most of these occur very close to the Viellefosse tail along $Q = -(3/2^{2/3})R^{2/3}$. It is found there that the magnitude of pressure Hessian has positive Lagrangian time-derivative, meaning that it increases in order to resist the rapid growth. We also observe a "phase delay" of the pressure Hessian signals compared to those of R and Q, indicative of an "overshoot" of the controlling mechanism. We also examine the trajectories in the recently proposed 3-D extension of the $R - Q$ plane (see Lüthi B, Holzner M, Tsinober A. 2009, J. Fluid Mech. **641**, 497-507). Finally, Lagrangian models of the velocity gradient tensor are examined in the same light to identify similarities and differences with the observed dynamics. Such comparisons supply informative guidance to model improvements.

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