

Abstract Submitted
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How long do particles spend in vortical regions in turbulent flows?¹ AKSHAY BHATNAGAR, NORDITA, Stockholm, ANUPAM GUPTA, University of Rome "Tor Vergata", Rome, Italy., DHRUBADITYA MITRA, NORDITA, Stockholm, RAHUL PANDIT, Centre for Condensed Matter Theory, Department of Physics, Indian Institute of Science, Bangalore, PRASAD PERLEKAR, TIFR Centre for Interdisciplinary Sciences, 21 Brundavan Colony, Narsingi, Hyderabad — We consider passive, heavy, inertial, particles (HIP) in three-dimensional, homogeneous, and isotropic turbulence. Whether a particle is in a vortical region or not is determined by the two invariants of the (flow) velocity gradient matrix, Q and R , at the position of the particle. Using direct numerical simulations, we calculate the probability distribution functions (PDFs) of the first-passage-time of a tracer or a HIP in a vortical region. The corresponding PDF in two dimensions is known to show power-law tail. In three dimensions we find that the PDF possesses exponential tail with a characteristic time of the order of large-eddy-turnover-time of the flow.

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