

Abstract:

One may think that since viscous friction is responsible for flow irreversibility, the latter must disappear in the inviscid limit. On the contrary, there exists a dimensionless measure of irreversibility that actually grows unbounded as the viscosity goes to zero. Inspired by work by Xu et al. [PNAS 111.21 (2014) 7558], the evolution of the kinetic energy for fluid tracers is analyzed and the fluctuations of the instantaneous power are used as a measure of time-irreversibility from the point of view of a single particle. Both the case of incompressible and compressible turbulence are considered. The measured scalings are explainable as a consequence of rare *flight-crash* events related to particles rapidly decelerating in the incompressible setup and particles being absorbed by shocks as well as shock collisions in the compressible setup.