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**Scale-by-scale contributions to Lagrangian particle acceleration**

CRISTIAN C LALESCU, MICHAEL WILCZEK, Max Planck Institute for Dynamics and Self-Organization — Fluctuations on a wide range of scales in both space and time are characteristic of turbulence. Lagrangian particles, advected by the flow, probe these fluctuations along their trajectories. In an effort to isolate the influence of the different scales on Lagrangian statistics, we employ direct numerical simulations (DNS) combined with a filtering approach. Specifically, we study the acceleration statistics of tracers advected in filtered fields to characterize the smallest temporal scales of the flow. Emphasis is put on the acceleration variance as a function of filter scale, along with the scaling properties of the relevant terms of the Navier-Stokes equations. We furthermore discuss scaling ranges for higher-order moments of the tracer acceleration, as well as the influence of the choice of filter on the results. Starting from the Lagrangian tracer acceleration as the short time limit of the Lagrangian velocity increment, we also quantify the influence of filtering on Lagrangian intermittency. Our work complements existing experimental results on intermittency and accelerations of finite-sized, neutrally-buoyant particles: for the passive tracers used in our DNS, feedback effects are neglected such that the spatial averaging effect is cleanly isolated.

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