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Life and death of inertial particle clusters in homogeneous turbulence YUANQING LIU, LIAN SHEN, University of Minnesota, Twin Cities, REMI ZAMANSKY, University of Toulouse, FILIPPO COLETTI, University of Minnesota, Twin Cities — Although clustering is a widely observed phenomenon in particle-laden turbulence, our understanding of the formation, evolution, and destruction of particle clusters is still incomplete. Virtually all existing definitions of a cluster rely on the spatial coherence of the particle concentration field, neglecting its temporal persistence. The latter is in fact essential to the ability of the particles to interact with each other, and to modify the carrier fluid flow. Here we leverage simulations of homogeneous isotropic turbulence laden with small heavy particles, and develop a Lagrangian framework to follow them before, during, and after their time as part of a coherent cluster. We define a criterion to establish whether a cluster survives over successive time steps, and use it to characterize its lifetime. Moreover, we investigate the recurring features of the turbulence associated to the formation and destruction of a cluster. The impact of the lifetime definition on the results is also discussed.

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