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Inertial particle clustering in local linear flow: Novel satellite particle simulations BAIDURJA RAY, LANCE COLLINS, Cornell University — At spatial scales below the Kolmogorov length-scale, a turbulent flow around an inertial particle can be adequately approximated by a locally linear flow field, with the velocity at any point being determined solely by the velocity gradient at the particle location. Here, we describe novel satellite particle simulations, where inertial particle clustering is studied at length-scales below the Kolmogorov scale (η). Such simulations allow us to isolate the effect of the sub-Kolmogorov scales on particle statistics. We show that such simulations capture the correct qualitative behavior of the radial distribution function (RDF, a measure of particle clustering) with Stokes number (St) and separation distance (r/η) and accurately predict the power (c_1) in the power-law behavior of the RDF ($g(r/\eta) = c_0(r/\eta)^{-c_1}$) for $St \leq 0.4$. We also test a drift-diffusion model for particle motion and show that it correctly predicts the power-law for $St \leq 0.4$. We also investigate the effect of velocity filtering and show that the satellite simulations are able to capture the effect of filtering on the slope c_1 of the RDF. Our results provide insight on the effect of small-scales on inertial particle statistics and guide us towards modeling the role of sub-Kolmogorov scales on particle motion.

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