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Effect of filtering on inertial particle clustering in homogeneous isotropic turbulence BAIDURJA RAY, LANCE COLLINS, Cornell University — The use of large-eddy simulation (LES) to represent inertial particles in a turbulent flow field requires a model for the effect of the subfilter eddies on the particle motion. A particularly challenging aspect of this modeling is correctly capturing particle clustering, which is driven principally by the small-scale eddies that have been filtered in a LES. In this paper, we investigate this problem by performing direct numerical simulations of homogeneous isotropic turbulence with inertial particles and compare the results to particles moving through a low-pass filtered velocity field. The filtering is done in wavenumber space and is akin to a 'perfect' LES in that there is no subgrid model. We look at the two-particle radial distribution function (RDF) and the relative velocity probability density function (PDF) at different separation distances. We find that both the RDF and relative velocity PDF change substantially in response to the filtering. In particular, the level of clustering can be suppressed or enhanced depending on the value of the Stokes number. The spatial scales of the clustering are also affected. The results suggest requirements that a subfilter model should satisfy to correctly reproduce the RDF and relative velocity PDF. Such information will assist the future development of a LES model for inertial particles.

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