Abstract Submitted
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**Wavelet investigation of preferential concentration in particle-laden turbulence**[1] MAXIME BASSENNE, JAVIER URZAY, Center for Turbulence Research, Stanford University, KAI SCHNEIDER, Aix-Marseille Universite, PARVIZ MOIN, Center for Turbulence Research, Stanford University — Direct numerical simulations of particle-laden homogeneous-isotropic turbulence are employed in conjunction with wavelet multi-resolution analyses to study preferential concentration in both physical and spectral spaces. Spatially-localized energy spectra for velocity, vorticity and particle-number density are computed, along with their spatial fluctuations that enable the quantification of scale-dependent probability density functions, intermittency and inter-phase conditional statistics. The main result is that particles are found in regions of lower turbulence spectral energy than the corresponding mean. This suggests that modeling the subgrid-scale turbulence intermittency is required for capturing the small-scale statistics of preferential concentration in large-eddy simulations. Additionally, a method is defined that decomposes a particle number-density field into the sum of a coherent and an incoherent components. The coherent component representing the clusters can be sparsely described by at most 1.6% of the total number of wavelet coefficients. An application of the method, motivated by radiative-heat-transfer simulations, is illustrated in the form of a grid-adaptation algorithm that results in non-uniform meshes refined around particle clusters. It leads to a reduction of the number of control volumes by one to two orders of magnitude.

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