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Direct Numerical Simulation of Multiphase Isotropic Turbulence with O(100) Embedded Spheres[1] LIN ZHANG, S. BALACHANDAR, University of Illinois, Urbana-Champaign, PAUL FISCHER, Argonne National Laboratory — The problem of particle turbulence interaction is of fundamental importance. However its theoretical and computational studies have been generally limited to dilute dispersion of very small particles. Our understanding of this problem in the regime where the particles are of *finite-size*, of the order of Taylor microscale, has been quite limited. In particular, effect of turbulence on the lift and drag forces on the particles, back effect of particles on carrier phase turbulence, and the inter particle effect within a distribution, are all open questions in the context of finite-sized particles. A novel technique is used to generate high quality body-fitted hexahedral mesh around a distribution of O(100) spheres in an automated way. This mesh along with a higher-order accurate Spectral-Element-Methodology (SEM) is used in the *fully resolved* simulations of forced isotropic turbulence with the distribution of embedded spheres. We employ a very fine discretization and the quality of results parallel those of fully spectral simulations of single phase isotropic turbulence. We perform simulations with and without the distribution of embedded spheres and employ the same random forcing in both. By comparing results the modification of the turbulence field due to the spheres, forces on the particles, and vortex structures around particles will be addressed.

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