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Study of Aerosol Particle Clustering in Isotropic Turbulence Using DNS and Holographic PIV LUJIE CAO, SCOTT WOODWARD, HUI MENG, Dept. of Mechanical Engineering, SUNY at Buffalo, Buffalo, NY 14260, JUAN PABLO DE LIMA COSTA SALAZAR, LANCE R. COLLINS, Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY 14853 — DNS shows that aerosol particles, owing to their inertial mismatch with the lighter surrounding gas, will cluster in regions of high strain in turbulent flows. Particle radial distribution function (RDF) has been identified as a key variable used in the clustering theory. Due to the difficulties in 3D measurement of particulate flows and DNS at high Reynolds numbers, the dependence of RDF on the turbulence and particle parameters are not fully quantified. Our aim is to test the particle preferential concentration in an isotropic turbulent flow field using digital holographic PIV technique (DHPIV) and DNS at comparable conditions. The dependence of RDF on system parameters (e.g. particle size and response time) is explored using DNS. With the DHPIV, Particle 3D positions and velocities are measured directly via reconstructions from digital holographic recording. Good agreement between the experimentally obtained RDF and the simulations confirmed the existence of particle clustering, and quantified the dependence of RDF on the Stokes number. The results also confirm the capability to extend the exploration to a broader range of Reynolds number.

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