Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Clustering of Inertial Particles in Turbulent Flow Through a Face-Centered Cubic Cell XIAOLIANG HE, Pacific Northwest Natl Lab, THIBAULT OUJIA, Aix-Marseille University, CNRS, I2M, Marseille, France, BENJAMIN KADOCH, Aix-Marseille University, CNRS, IUSTI, Marseille, France, KEIGO MATSUDA, Japan Agency for Marine-Earth Science and Technology, Yokohama, Japan, KAI SCHNEIDER, Aix-Marseille University, CNRS, I2M, Marseille, France, SOURABH APTE, Mechanical Engineering, Oregon State University, Corvallis, USA — Fine inertial particle migration, transport and deposition is of importance in several applications such as hyporheic exchange of river beds, gravel packs in enhanced oil recovery, among others. Specifically, how turbulence within confined geometries of a porous bed affects migration, clustering, and deposition of fine particles is of importance. Direct numerical simulation is performed to investigate effect of turbulent flow in a face centered cubic porous unit cell on the transport of inertial particles at different Stokes numbers ($St_p = 0.01, 0.1, 0.5, 1$, and 2) and at a pore Reynolds number of 500. Particles are advanced using one-way coupling and collision of particles with pore walls is modeled as perfectly elastic specular reflection. The pattern of clustering is investigated using multiscale wavelet analysis and area of Voronoi tessellation cells. The results are compared with preferential concentration in forced isotropic turbulence to investigate the effect of geometric confinement on particle clustering. It is shown that the general features of cluster and void formation and higher order statistics of number density of particles are modified by the wall collision creating very fine scale clusters.

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Date submitted: 10 Aug 2020 Electronic form version 1.4