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Divergence and convergence of inertial particles in high Reynolds number turbulence[1] THIBAULT OUJIA, Aix Marseille Univ, CNRS, Centrale Marseille, I2M, Marseille, France, KEIGO MATSUDA, Center for Earth Information Science and Technology, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokohama, Japan, KAI SCHNEIDER, Aix Marseille Univ, CNRS, Centrale Marseille, I2M, Marseille, France — We analyze data from 3D direct numerical simulations of particle-laden homogeneous isotropic turbulence at high Reynolds number using Voronoi tessellation of the particle positions, considering different Stokes numbers (St). The divergence of the particle velocity can be quantified by determining the volume change rate of the Voronoi cells. We show theoretically that for random particles in random flow the divergence satisfies a PDF of the ratio X/Y, where X and Y follow normal and Γ distributions, respectively. For inertial particles we find that the PDF of the divergence deviates from the theoretical prediction. Joint PDFs of the divergence and the Voronoi cell volume illustrate that the divergence is most prominent in cluster regions and less pronounced in void regions. Moreover, the mean value of the divergence becomes negative inside the cluster regions for St ¡=2, corresponding to convergence of inertial particles, while for large St the mean value turns to positive values as the Voronoi cell volume becomes smaller. Finally, we show that the divergence of the inertial particle velocity exhibits no correlation with the second invariant of the fluid velocity gradient tensor, which has some impact for modeling particle laden turbulence.

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