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Heavy particles in compressible homogeneous isotropic turbulence[1] YANTAO YANG, JIANCHUN WANG, YIPENG SHI, ZUOLI XIAO, State Key Laboratory of Turbulence and Complex System, Center for Applied Physics and Technology and HEDPS, College of Engineering, Peking University, XIANTU HE, Center for Applied Physics and Technology and HEDPS, College of Engineering, Peking University, SHIYI CHEN, State Key Laboratory of Turbulence and Complex System, Center for Applied Physics and Technology and HEDPS, College of Engineering, Peking University — In this talk we study the problem of heavy particles advected by compressible homogeneous isotropic turbulence. We simulate the Eulerian field by a novel WENO-Compact hybrid scheme and track a million heavy particles simultaneously. The heavy particle obeys the dynamic equations $d\mathbf{r}/\mathbf{dt} = \mathbf{v}$ and $d\mathbf{v}/\mathbf{dt} = -(\mathbf{v} - \mathbf{u})/\tau$, where $\mathbf{r}$ is the location vector, $\mathbf{u}$ and $\mathbf{v}$ are the Eulerian velocity and the particle velocity, respectively. The Stokes number is defined by the relax time τ and Kolmogorov time scale τ_η as $St = \tau/\tau_\eta$. Our study is focused on the effects of the Stokes number on the statistical behaviors of the particles with fixed turbulent Reynolds and Mach numbers. Simulation results reveal that as the Stokes number increases, the intermittency of the particle acceleration weakens. For larger Stokes number, the particle trajectories become smoother, as evidenced by the PDF of trajectory curvature shifting towards smaller value. The particle concentration distribution will also be discussed by investigating the number density and the pair dispersion.

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