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Modulation to the compressible homogenous turbulence by heavy point particles: Effect of particles' density[1] ZHENHUA XIA, YIPENG SHI, SHIYI CHEN, Peking University — In this paper, two-way interactions between heavy point particles and forced compressible homogenous turbulence are simulated by using a localized artificial diffusivity scheme and an Eulerian-Lagrangian approach. The initial turbulent Mach number is around 1.0 and the Taylor Reynolds number is around 110. Seven different simulations of 10^6 particles with different particle densities (or Stokes number) are considered. The statistics of the compressible turbulence, such as the turbulence Mach number, kinetic energy, dilatation, and the kinetic energy spectra, from different simulations are compared with each other, and with the one-way undisturbed case. Our results show that the turbulence is suppressed if the two-way coupling backward interactions are considered, and the effect is more obvious if the density of particles is higher. The kinetic energy spectrum at larger Stokes number (higher density) exhibits a reduction at low wave numbers and an augmentation at high wave numbers, which is similar to those obtained in incompressible cases. The probability density functions of dilatation, and normal upstream Mach number of shocklets also show that the modulation to the shocklet statistics is more apparent for particles with higher density.

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