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Small-scale dynamics of settling, bidisperse particles in turbulence ROHIT DHARIWAL, ANDREW D. BRAGG, Duke Univ — We use DNS to investigate the dynamics of settling, bidisperse particles in isotropic turbulence. In agreement with previous studies, we find that without gravity (i.e. $Fr = \infty$, where Fr is the Froude number), bidispersity leads to an enhancement of the relative velocities, and a suppression of their spatial clustering. For $Fr < 1$, the relative velocities in the direction of gravity can be dominated by the large differential settling velocities of the bidisperse particles, as expected. However, we also find that gravity can strongly enhance the relative velocities in the "horizontal" directions (the plane normal to gravity). This non-trivial behavior occurs because fast settling particles experience rapid fluctuations in the fluid velocity field along their trajectory, leading to enhanced particle accelerations and relative velocities. We also find that gravity drastically reduces the clustering of bidisperse particles. These results are strikingly different to the monodisperse case, for which recent results have shown that when $Fr < 1$, gravity strongly suppresses the relative velocities in all directions, and can enhance clustering. Finally, we consider the implications of these results for the collision rates of settling, bidisperse particles in turbulence.

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