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Settling dynamics of a non-neutrally buoyant particle in stratified fluids AMIN DOOSTMOHAMMADI, SADEGH DABIRI, AREZOO ARDEKANI, University of Notre Dame — Sedimentation is considered as one of the most important phenomena in characterizing the geochemistry of atmosphere and upper ocean. The vertical variations of temperature and salinity in these environmental systems can have a large impact on settling dynamics of suspended particles. Although the drag increase of the settling particles has been well documented in the recent decade, the fundamental fluid dynamics of unsteady particle-fluid interaction in the presence of density gradients is yet to be explored. Most of the experimental studies have focused on settling in sharp stratified fluids and the numerical works have been limited to steady state flows around axisymmetric neutrally buoyant particles in a linear stratified fluid. We implement a direct numerical simulation of the particle descent in both continuous and sharp stratified fluids to unveil the time dependent response of a non-neutrally buoyant particle. The relative importance of inertia, buoyancy, viscosity and diffusivity is characterized for a wide range of pertinent parameters. Moreover, the quantified investigation of the stratification effects on partial drift volume and time dependent added-mass force will shed light on recent arguments about the importance of drift mechanism in biogenic ocean mixing.

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