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Rising motion of a suspension of drops in a linearly stratified fluid
SADEGH DABIRI, Purdue University, AMIN DOOSTMOHAMMADI, MORTEZA BAYAREH, University of Notre Dame, AREZOO ARDEKANI, Purdue University
— Vertical variation of water temperature or salinity results in the generation of vertical density stratification in the water column in oceans and lakes and can affect the motion of particles, drops, and bubbles. Despite the broad body of research on the vertical motion of rigid particles in stratified fluids, the hydrodynamics of the vertical motion of deformable particles and drops in stratified fluids is currently poorly understood. In this manuscript, we report on the direct numerical simulations of a suspension of rising drops in a linearly stratified fluid. Our results show that density stratification suppresses both average rise velocity and velocity fluctuations of drops and results in an enhanced isotropy of velocity fluctuations. The combined effects of stratification, void fraction and deformability of drops on the motion of the suspension of drops are characterized. The results show that density stratification leads to an enhanced horizontal cluster formation.

Sadegh Dabiri
Purdue University

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