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Numerical simulations of oil droplets rising in a sharply stratified fluid[1] ADAM BINSWANGER, DE ZHEN ZHOU, JOSHUA ROE, University of California, Merced, TRACY MANDEL, University of New Hampshire, DUSTIN KLECKNER, MAXIME THEILLARD, SHILPA KHATRI, University of California, Merced — Rising droplets and bubbles in stratified fluids are a physical feature of many atmospheric and oceanic systems. For example, the Deepwater Horizon oil spill in 2010 resulted in large plumes of oil droplets being trapped as they rose in stratified layers in the Gulf of Mexico. To better understand how and why these plumes of oil droplets remained trapped, we produced high fidelity numerical simulations of a single oil droplet rising in a stratified flow, using a modified pressure correction projection method on adaptive non-graded octree grids and a coupled level set-reference map method to capture the moving interface. These simulations are compared against recent experimental results, which characterized the velocity and dynamics of the retention of a droplet rising in stratification. Through simulations, we provide a detailed analysis of the forces acting on the droplet.

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