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Inertial effects on sphere settling through a liquid-liquid interface ANCHAL SAREEN, University of Minnesota, LUUK ALTENBURG, Delft University of Technology, Netherlands, DIOGO BARROS, Aix-Marseille Universit, Marseille, France, ELLEN LONGMIRE, University of Minnesota — Settling of a spherical particle toward an interface separating two liquids is encountered in many fields, from geophysics to engineering applications, where it is pivotal to understand, characterize and predict the floating/sinking outcome. In this study, we characterize the outcome of sphere settling for varying sphere size, density and drop height in the Reynolds number range of 40-180 based on sphere approach velocity and radius. The sphere motion and interface deformation are tracked by high-speed imaging. It has been shown previously that a theoretical model based on static conditions could predict critical conditions for floating/sinking transition of a sphere under dynamic conditions; except when the lower fluid was more viscous than the upper fluid and the sphere's Reynolds number (based on sphere velocity and radius) in the upper fluid was ≥ 1. In such cases, a downward 'history' force from a collapsing sphere wake aided sinking. However, in this study, we found that the sphere inertia could significantly alter the floating-sinking transition condition also when the lower fluid is less viscous than the upper one and the Bond number (based on density difference between fluids and sphere radius) is $\geq$1.

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