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Sedimentation of spheroidal particles in density stratified fluid RISHABH MORE, School of Mechanical Engineering, Purdue University, West Lafayette, Indiana 47907, USA, MEHDI ARDEKANI, Department of Chemical Engineering, Stanford University, Stanford, California 94305-5025, USA, LUCA BRANDT, Linn Flow Centre and SeRC (Swedish e-Science Research Centre), KTH Mechanics, S-100 44 Stockholm, Sweden, AREZOO ARDEKANI, School of Mechanical Engineering, Purdue University, West Lafayette, Indiana 47907, USA — The effect of fluid density stratification on the sedimentation of a rigid object is more complex compared to its homogeneous counterpart. Previous studies have provided a better understanding of the physics behind the settling of a spherical body, but we know little about the effect of object shape anisotropy on its sedimentation in a stratified fluid. To this end, we consider the sedimentation of spheroidal isolated particle in a viscous density stratified fluid via numerical simulations using the Immersed Boundary Method. In a homogeneous fluid, the spheroidal particle attains a terminal velocity with a broadside on (broadside horizontal) orientation. However, the fluid stratification leads to velocity deceleration with broadside on orientation until a threshold in the settling velocity, at which the particle changes its orientation from broadside on to edgewise (broadside vertical). In addition, stratification leads to the elimination of the path instabilities which are otherwise present for spheroidal particles settling in a homogeneous fluid for the same Reynolds number. We analyze the flow and density fields to explain these results. These findings can help in understanding the settling of marine snow or anisotropic phytoplankton in oceanic environments.

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