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Dynamics of rising bubble inside a viscosity-stratified medium
MANOJ TRIPATHI, PREMLATA A. R. , KIRTI SAHU, Indian Institute of Technology Hyderabad, India — The rising bubble dynamics in an unconfined quiescent viscosity-stratified medium has been numerically investigated. This is frequently encountered in industrial as well as natural phenomena. In spite of the large number of studies carried out on bubbles and drops, very few studies have examined the influence of viscosity stratification on bubble rise dynamics. To the best of our knowledge, none of them have isolated the effects of viscosity-stratification alone, even though it is known to influence the dynamics extensively, which is the main objective of the present study. By conducting time-dependent simulations, we present a library of bubble shapes in the Gallilei and the Eötvös numbers plane. Our results demonstrate some counter-intuitive phenomena for certain range of parameters due to the presence of viscosity stratification in the surrounding fluid. We found that in a linearly increasing viscosity medium, for certain values of parameters, bubble undergoes large deformation by forming an elongated skirt, while the skirt tends to physically separate the wake region from the rest of the surrounding fluid. This peculiar dynamics is attributed to the migration of less viscous fluid that is carried in the wake of the bubble as it rises, and thereby creating an increa

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