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Deformation-induced lateral migration of a bubble slowly rising near a vertical plane wall[1] KAZUYASU SUGIYAMA, The Univ. of Tokyo, FUMIO TAKEMURA, AIST — A deformation-induced lateral migration of a nearly spherical bubble rising near a vertical plane wall in a stagnant creeping liquid flow is numerically studied by means of a boundary-fitted finite-difference approach (Sugiyama & Takemura (2010) J. Fluid Mech. accepted). The migration velocity is obtained using Lorentz's reciprocal theorem as a function of ε, corresponding to a ratio of a bubble-wall gap to the bubble radius. For $\varepsilon \gg 1$, the simulated migration velocities are consistent with an available analytical solution for the wide-gap case (Magnaudet *et al.* (2003) J. Fluid Mech. **476**, 115). With decreasing ε, the lift force is found to be more affected by the high-order deformation modes. The simulation and the lubrication analysis (Hodges *et al.* (2004) J. Fluid Mech. **512**, 95) consistently demonstrate that when $\varepsilon \leq 1$, the lubrication effect makes the migration velocity asymptotically $\mu V_{B1}^2/(25\varepsilon\gamma)$ (here, V_{B1}, μ, and γ denote the rising velocity, the liquid viscosity, and the surface tension, respectively). However, the experimentally measured migration velocity is considerably higher by a factor of about 3 than the simulated one, implying that unexplored factors may be involved in the system.

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