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Slow gravity-driven migration and interaction of a bubble and a solid particle near a free surface FRANCK PIGEONNEAU, Surface du Verre et Interfaces, UMR 125 CNRS/Saint-Gobain, MARINE GUÉMAS, ANTOINE SELLIER, Laboratoire d'hydrodynamique de l'école polytechnique, UMR 7646, SURFACE DU VERRE ET INTERFACES, UMR 125 CNRS/SAINT-GOBAIN TEAM, LABORATOIRE D'HYDRODYNAMIQUE DE L'ÉCOLE POLYTECHNIQUE, UMR 7646 COLLABORATION — The interaction between a bubble and a free surface occurs in many industrial processes. This is the case for the glass melting process involving a high viscous fluid. Moreover, the bubble migration towards the free surface interacts with unmelted solid particles (sand grain). With this application in mind, the axi-symmetric gravity-driven migration of interacting bubble and solid particles near a free surface is examined. The solid particle locations and the bubble and free surface shapes are numerically tracked in time by solving the steady Stokes equations written under the boundary integral formulation. The theoretical material and the relevant numerical implementation, valid for bubbles and a free surface with either equal or unequal uniform surface tensions, are briefly described. Numerical results for a nearly-neutrally buoyant solid spherical particles interacting with a bubble and a free surface are investigated. We show that the solid particles decrease the bubble drainage dynamics. The effect of bubble size is also studied by changing the Bond number, ratio of buoyancy force to surface tension force.

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