Abstract Submitted
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Taylor bubbles at high viscosity ratios: experiments and numerical simulations[1] BUDDHIKA HEWAKANDAMBY, ABBAS HASAN, BARRY AZZOPARDI, University of Nottingham, ZHIHUA XIE, CHRIS PAIN, OMAR MATAR, Imperial College London — The Taylor bubble is a single long bubble which nearly fills the entire cross section of a liquid-filled circular tube, often occurring in gas-liquid slug flows in many industrial applications, particularly oil and gas production. The objective of this study is to investigate the fluid dynamics of three-dimensional Taylor bubble rising in highly viscous silicone oil in a vertical pipe. An adaptive unstructured mesh modelling framework is adopted here which can modify and adapt anisotropic unstructured meshes to better represent the underlying physics of bubble rising and reduce computational effort without sacrificing accuracy. The numerical framework consists of a mixed control volume and finite element formulation, a volume of fluid-type method for the interface-capturing based on a compressive control volume advection method, and a force-balanced algorithm for the surface tension implementation. Experimental results for the Taylor bubble shape and rise velocity are presented, together with numerical results for the dynamics of the bubbles. A comparison of the simulation predictions with experimental data available in the literature is also presented to demonstrate the capabilities of our numerical method.

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