Abstract Submitted
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Numerical study of Taylor bubbles with adaptive unstructured meshes[1] ZHIHUA XIE, DIMITRIOS PAVLIDIS, JAMES PERCIVAL, CHRIS PAIN, OMAR MATAR, Imperial College London, ABBAS HASAN, BARRY AZZOPARDI, University of Nottingham — The Taylor bubble is a single long bubble which nearly fills the entire cross section of a liquid-filled circular tube. This type of bubble flow regime often occurs in gas-liquid slug flows in many industrial applications, including oil-and-gas production, chemical and nuclear reactors, and heat exchangers. The objective of this study is to investigate the fluid dynamics of Taylor bubbles rising in a vertical pipe filled with oils of extremely high viscosity (mimicking the "heavy oils" found in the oil-and-gas industry). A modelling and simulation framework is presented here which can modify and adapt anisotropic unstructured meshes to better represent the underlying physics of bubble rise and reduce the 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. Numerical examples of some benchmark tests and the dynamics of Taylor bubbles are presented to show the capability of this method.

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