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Numerical simulations of the rise and stability of Taylor bubbles in vertical tubes using the diffuse-interface method[1] HABIB ABUBAKAR, Imperial College London, ARNOLDO BADILLO, Paul Scherrer Institute, Switzerland, OMAR MATAR, Imperial College London — Taylor bubbles are characteristic features of the slug flow regime in gas-liquid flows in vertical pipes. Experimental observations have shown that at sufficiently large pipe diameters (>0.1 m), the slug flow regime, and hence Taylor bubbles, are no longer observed. Numerical simulations of a Taylor bubble rising in a quiescent liquid have also shown that the turbulent bubble wake in such large-diameter tubes has great impact on the stability of the subsequent trailing bubbles. In view of these observations, large-scale numerical simulations of Taylor bubbles are carried out using the diffuse-interface method over a range of experimentally relevant conditions. The results of these simulations (including benchmark cases) are discussed with a view to providing insight into the mechanisms underlying Taylor bubble instability.

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