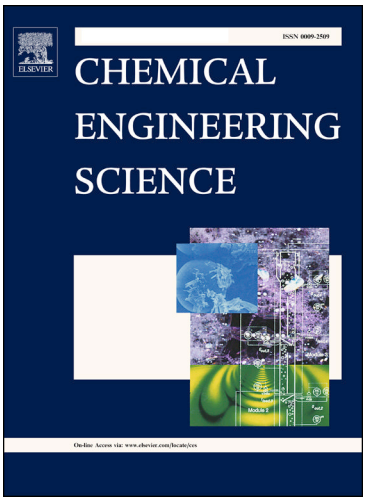

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Corrective interface tracking approach to simulate finite-size bubbly flows

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Abstract

This work reports on the development and application of a new approach, corrective interface tracking, to simulate finite size bubbles. Finite-size bubbles, which are by definition bigger than the grid cell size but not well resolved, are not capable of being modeled with any standard two-phase flow approaches, such as interface tracking (IT), Euler-Euler (EE), or Lagrangian particle tracking (LPT). This poses a problem when simulating bubbly flows with different bubble sizes on the same computational grid. The Finite-size Lagrangian particle tracking (FSL) approach (Badreddine et al. [2015]), aimed at simulating finite-size bubbly flows by inheriting features of IT and LPT approaches, simulated a single bubble with good accuracy. However, deficiencies with the FSL approach led to a newly developed approach based on interface tracking with the addition of a correcting force. The correcting force, derived from modeling the hydrodynamic forces on a bubble, attempts to correct for errors introduced when a coarse grid is used and the flow and pressure fields around the bubble are under-resolved. Therefore, as a finer grid is used the correcting force decreases. The corrective interface tracking approach is validated against a single bubble rising in stagnant and linear flow, and then results are compared to FSL and to finely resolved IT simulations.

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