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TWO-PHASE FLOWS IN SINUSOIDALLY CONSTRICTED CHANNEL USING MOVING MESH/BOUNDARY TECHNIQUE

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Bubbles and drops dynamics through capillaries of variable cross-section still remains of considerable importantce in two-phase flows through porous media. Experimental studies are found in the literature where the motion of immiscible bubbles in different fluids is investigated. Recovery of oil by chemical flooding, biological processes and crude oil transportation in through pipelines are exemples of industry-related applications.

We seek to study numerically the effects of the surface tension, bubble dynamics and channel geometry for two-phase flows in sinusoidally constricted channels using a moving boundary domain scheme, which dramatically shortens the domain length. Such a scheme moves the computational boundary nodes periodically according to the flow field or bubble centroid's velocity. The set of equations is written in a generalized form namely the Arbitrary Lagrangian-Eulerian (ALE) description, which combines the best aspects of both Lagrangian and Eulerian framework. The two-phase inteface position moves according to the flow field and it is explicity described by a set of interconnected nodes, segments and elements which ensures a sharp representation of the front, not requiring the use of any additional equation of motion [**?**],[**?**]. Unlike the traditional numerical approach where the domain's boundary is fixed in space and time, the boundary nodes are in constant motion, thus simulating the relative velocity between the bubble and the wall. Such a technique allows one to decrease considerable the domain length and, therefore, decrease the computational processing time.

The new methodology proposed to simulate two-phase flows in sinusoidally constricted channels is compared to experimental results found in the literature [**?**],[**?**] showing good accuracy to describe interfacial forces and bubble dynamics in different complex geometries with moving boundaries.

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