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Modelling dynamic liquid-gas systems: Extensions to the volume-of-fluid solver

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Abstract

This study presents the extension of the volume-of-fluid solver, interFoam, for improved accuracy and efficiency when modelling dynamic liquid-gas systems. Examples of these include the transportation of liquids, such as in the case of fuel carried onboard air- and spacecraft or liquid natural gas on tankers. As part of the development three extensions are considered: Firstly, a revised surface capturing formulation is proposed; secondly, a new weakly compressible volume-of-fluid formulation is presented; and lastly, a piecewise-linear interpolation of the pressure derivative is implemented. For the evaluation of this solver, a number of test cases with dynamic liquid-gas flows are considered where the results are compared with experimental measurements as well as numerical predictions from the current interFoam solver .