Abstract Submitted
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A volume of fluid method for interface-resolved simulations of evaporating flows[1] NICOLÒ SCAPIN, PEDRO COSTA, LUCA BRANDT, Kungliga Tekniska högskolan — We developed a numerical framework to study the evaporation process of a liquid in an inert gas using the volume of fluid method. The proposed methodology successfully addresses the two main challenges in performing direct numerical simulation of phase-changing flows when a whole-domain formulation is adopted: the interface-normal velocity jump and the accurate calculation of the interfacial mass-flux exchanged between the two phases. The former is handled by constructing a continuous and divergence-free liquid velocity field, which is used to compute the interface velocity, while the latter is accomplished by reconstructing a level-set function. The resulting approach is built on top of an efficient, FFT-based two-fluid Navier-Stokes solver coupled with an algebraic volume of fluid method (MTHINC), and extended with the corresponding transport equations for the vaporized liquid mass and thermal energy. The method was thoroughly tested against benchmarks of increasing complexity, which show its excellent mass conservation properties and good overall performance.

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Nicolò Scapin
Kungliga Tekniska högskolan

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