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Towards a sharp-interface volume-of-fluid methodology for modeling evaporation[1] ASHISH PATHAK, MEHDI RAESSI, University of Massachusetts Dartmouth — In modeling evaporation, the diffuse-interface (one-domain) formulation yields inaccurate results. Recent efforts approaching the problem via a sharp-interface (two-domain) formulation have shown significant improvements. The reasons behind their better performance are discussed in the present work. All available sharp-interface methods, however, exclusively employ the level-set. In the present work, we develop a sharp-interface evaporation model in a volume-of-fluid (VOF) framework in order to leverage its mass-conserving property as well as its ability to handle large topographical changes. We start with a critical review of the assumptions underlying the mathematical equations governing evaporation. For example, it is shown that the assumption of incompressibility can only be applied in special circumstances. The famous D^2 law used for benchmarking is valid exclusively to steady-state test problems. Transient is present over significant lifetime of a micron-size droplet. Therefore, a 1D spherical fully transient model is developed to provide a benchmark transient solution. Finally, a 3D Cartesian Navier-Stokes evaporation solver is developed. Some preliminary validation test-cases are presented for static and moving drop evaporation.

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