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Direct Numerical Simulation of the Leidenfrost Effect SEBASTIEN TANGUY, LUCIA RUEDA VILLEGAS, University of Toulouse, FLUID MECHANICS INSTITUTE OF TOULOUSE TEAM — The development of numerical methods for the direct numerical simulation of two-phase flows with phase changes, is the main topic of this study. We propose a novel numerical method which allows dealing with both evaporation and boiling at the interface between a liquid and a gas. For instance it can occur for a Leidenfrost droplet; a water drop levitating above a hot plate which temperature is much higher than the boiling temperature. In this case, boiling occurs in the film of saturated vapor which is entrapped between the bottom of the drop and the plate, whereas the top of the water droplet evaporates in contact of ambient air. Thus, boiling and evaporation can occur simultaneously on different regions of the same liquid interface or occur successively at different times of the history of an evaporating droplet. Usual numerical methods are not able to perform computations in these transient regimes, therefore, we propose in this paper a novel numerical method to achieve this challenging task. Finally, we present several accurate validations against experimental results on Leidenfrost Droplets to strengthen the relevance of this new method.

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