Abstract Submitted
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Hydrothermal waves in evaporating annular pools and sessile drops using DNS[1] PEDRO SAENZ, PRASHANT VALLURI, University of Edinburgh, GEORGE KARAPETSAS, Imperial College London, KHELLIL SEFIANE, University of Edinburgh, OMAR MATAR, Imperial College London — Thermocapillary effects generated due to thermal gradients in annular liquid pools and resulting in hydrothermal waves under inert, saturated and evaporating atmospheres are investigated using two-phase direct numerical simulations in 3D. For annular pools under inert environments, the volume-of-fluid method is used to capture the interface, with special attention towards the grid resolution near the vapour-liquid interface. The results show that the interface temperature distribution follows a regular azimuthal pattern, representative of hydrothermal wave structures, along with small-amplitude interfacial waves. The effects of evaporation fluxes and the interfacial depths on the linear (early-time) and non-linear (late-time) development of hydrothermal temperature and interfacial waves will be presented. Under inert environments, the azimuthal structures qualitatively agree with experimental and numerical studies (with a single-phase model and a non-deformable free surface) of Schwabe et. al. (2003). Evaporating sessile droplets simulated using diffuse-interface method will be presented and compared against analytical integral balance models.

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