Abstract Submitted
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Two-phase investigation of hydrothermal waves in saturated atmospheres[1] KHELLIL SEFIANE, PEDRO SAENZ, PRASHANT VALLURI, University of Edinburgh, GEORGE KARAPETSAS, University of Thessaly, OMAR MATAR, Imperial College London — A liquid layer subject to a sufficiently large thermal gradient along its interface is prone to depart from its equilibrium state and to develop into an oscillatory regime whose features may differ notably from the original state. In shallow liquid pools, the preferred instability mode is obliquely-travelling hydrothermal waves (HTWs). We investigate this Marangoni-driven flow by means of two-phase direct numerical simulations in 3D with the interface captured via the volume-of-fluid method. Validated against experiments (Riley et al. 1998) and linear theory (Smith & Davis 1983), the results reveal the highly-intricate spatio-temporal evolution of the instabilities and the presence of interfacial waves tightly coupled with the HTWs. The instability's development and the interdependencies amongst HTWs, interface deformations and bulk flows (liquid and gas phases) are thoroughly investigated for the linear (early times) and non-linear (late times) stages. We also elucidate the heat-transfer mechanism across the interface which is significantly affected by the propagating disturbances.

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