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3D unsteady computations of evaporative instabilities in a sessile drop of ethanol on a heated substrate DAVID BRUTIN, SERGEY SEMENOV, Aix-Marseille University, FLORIAN CARLE, Yale University, MARC MEDALE, Aix-Marseille University — Droplets are ubiquitous and have been studied for century. However, the flow pattern and instabilities occurring during evaporation are still under investigations and their origin is still debated. In this letter, we are comparing an ethanol drop evaporating onto a heated substrate under weightlessness conditions and with pinned contact line with a 3D unsteady computation of thermo-convective instabilities to determine with accuracy the type of instabilities. Our one-sided model, devoid of fitting parameters, demonstrates quantitative agreement with experimental data and confirms that experimentally observed instabilities are driven by thermocapillary stress, and not by the gas convection. By creating creating a numerical infrared image, we can conclude with certitude that the experimentally observed thermo-convective instabilities in evaporating sessile drops of volatile liquids, which in infrared spectrum look similar to hydrothermal waves, are actually nothing else than unsteady Bénard-Marangoni instability.

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