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Non-adiabatic Rayleigh-Taylor instability[1] JESSE CANFIELD, NICHOLAS DENISSEN, JON REISNER, Los Alamos National Laboratory — Onset of Rayleigh-Taylor instability (RTI) in a non-adiabatic environment is investigated with the multi-physics numerical model, FLAG. This work was inspired by laboratory experiments of non-adiabatic RTI, where a glass vessel with a layer of tetrahyrdofuran (THF) below a layer of toluene was placed inside a microwave. THF, a polar solvent, readily absorbs electromagnetic energy from microwaves. Toluene, a non-polar solvent, is nearly transparent to microwave heating. The presence of a heat source in the THF layer produced convection and a time-dependent Atwood number (A_t). The system, initially in stable hydrostatic equilibrium $A_t < 0$, was set into motion by microwave induced, volumetric heating of the THF. The point when $A_t > 0$, indicates that the system is RTI unstable. The observed dominant mode at the onset of RTI was the horizontal length scale of the vessel. This scale is contrary to classical RTI, where the modes start small and increases in scale with time. It is shown that the dominant RTI mode observed in the experiments was determined by the THF length scale prior to RTI. The dominant length scale transitions from the THF to the toluene via the updrafts and downdrafts in the convective cells. This happens when A_t passes from negative to positive.

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