Abstract Submitted
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Marangoni-buoyancy convection in binary fluids under varying noncondensable concentrations[1] YAOFA LI, MINAMI YODA, Georgia Institute of Technology — Marangoni-buoyancy convection in binary fluids in the presence of phase change is a complex and poorly understood problem. Nevertheless, this flow is of interest in evaporative cooling because solutocapillary stresses could reduce film dryout. Convection was therefore studied in methanol-water (MeOH-H_2O) layers of depth $h \approx 1-3$ mm confined in a sealed rectangular cell driven by horizontal temperature differences of $\sim 6°C$ applied over ~ 5 cm. Particle-image velocimetry (PIV) was used to study how varying the fraction of noncondensables (*i.e.*, air) c_a from ~ 7 mol% to ambient conditions in the vapor space affects soluto- and thermocapillary stresses in this flow. Although solutocapillary stresses can be used to drive the flow towards hot regions, solutocapillarity appears to have the greatest effect on the flow at small c_a, because noncondensables suppress phase change and hence the gradient in the liquid-phase composition at the interface. Surprisingly, convection at $c_a \approx 50\%$ leads to a very weak flow and significant condensation in the central portion of the layer *i.e.*, away from the heated and cooled walls).

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