

Abstract Submitted
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Convection, evaporation, and condensation of binary fluids in confined geometries¹ ROMAN GRIGORIEV, TONGRAN QIN, YAOFA LI, BENJAMIN CHAN, MINAMI YODA, Georgia Tech — Phase change has a major effect on convection in liquid layers with a free surface. Significant latent heat generated at the free surface as a result of phase change can dramatically alter the interfacial temperature, inducing thermocapillary stresses. For binary fluids, differential evaporation leads to a variation in the concentration, and hence, induces solutocapillary stresses. This talk describes numerical and experimental studies of convection in alcohol-water mixtures due to a horizontal temperature gradient in the presence of phase change. Evaporation and condensation is known to be a notoriously difficult problem to model due to a poorly defined vapor transport problem which is strongly influenced by the presence/absence and flows of non-condensable gases (e.g., air). This issue is addressed by using a sealed cuvette heated at one end and cooled at the other. Both numerics and experiments show that, by adding or removing air from the cuvette, the direction of flow in a liquid layer covering the bottom of the cell can be reversed by emphasizing either thermocapillary or solutocapillary stresses.

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