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A flow map of Buoyancy-Marangoni convection in binary fluids driven by a horizontal temperature gradient[1] YAOFA LI, University of Notre Dame, MINAMI YODA, Georgia Institute of Technology — This talk discusses an experimental study of convection in a layer of volatile liquid subject to a horizontal temperature gradient, driven by thermocapillarity, solutocapillarity and buoyancy. We investigated a $\sim$ 0.3 cm-deep layer of a methanol(MeOH)-water mixture in a sealed rectangular cuvette driven by a temperature difference $\Delta T \approx 6$ °C for a range of pressures (and therefore different concentrations of air in the vapor space above the liquid c_a). Solutocapillarity was found to be strong enough to drive the liquid near the free surface towards the heated end over the entire horizontal 4.9 cm extent of the liquid layer when $c_a < 6\%$ and the MeOH molar fraction $C_M > 20\%$, suggesting that binary-fluid coolants could reduce film dryout in two-phase thermal management devices. At lower C_M, the flow reverses near the heated end, however, suggesting that thermocapillarity is dominant at low (local) MeOH concentration. The maximum flow speed is found to be in reasonable agreement with that predicted by lubrication theory at low c_a. At $c_a > 80\%$, thermocapillarity drives the flow near the free surface away from the heated end. Finally, the flow becomes unsteady at intermediate values of c_a.

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