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Buoyancy-Marangoni convection in confined volatile binary fluids subject to a horizontal temperature gradient[1] TONGRAN QIN, ROMAN GRIGORIEV, Georgia Institute of Technology — We consider convection in a layer of binary fluid with free surface subject to a horizontal temperature gradient in the presence of noncondensable gases, which is driven by a combination of three different forces: buoyancy, thermocapillarity, and solutocapillarity. Unlike buoyancy, both thermo- and solutocapillary stresses depend sensitively on the local phase equilibrium at the liquid-gas interface. In particular, thermocapillarity associated with the interfacial temperature gradient is controlled by the vapors' concentration along the interface, and solutocapillarity associated with the interfacial concentration gradient is controlled by differential phase change of two components of the liquid, which is strongly influenced by the presence of noncondensables. Therefore, flows in both phases, phase change,and effect of noncondensables all have to be considered. Numerical simulations based on a comprehensive model taking these effects into account show qualitative agreement with recent experiments which identified a number of flow regimes at various compositions of both phases. In particular,we find that the composition of both the gas and liquid phase have a significant effect on the observed convection patterns; this dependence can be understood using a simple analytical model.

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