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Confined two-phase flows in the presence of evaporation and condensation[1] ROMAN GRIGORIEV, TONGRAN QIN, Georgia Tech — While Rayleigh-Bénard and Marangoni convection in liquid layers with a free surface has been studied quite extensively in the absence of phase change, convection in the presence of evaporation/condensation, especially in confined geometries, is not as well understood. In this talk we discuss a transient finite-volume numerical model of a confined liquid film in local equilibrium with its vapor subject to a termperature gradient where the solutions for both the position of the liquid-vapor interface and the interfacial temperature are consistent with the mass and heat transport in the bulk. One important result of this model is that interfacial temperature develops extremely sharp gradients near the solid-liquid-vapor contact lines at arbitrary contact angles. This result has dramatic consequences for the locations where both phase change and thermocapillary effects are significant at the free surface. We conjecture that accurate description of the problem requires the use of a local model (such as the similarity solutions of Morris [J. Fluid Mech. 411:59 (2000)]) near the contact line.

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Roman Grigoriev
Georgia Tech

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