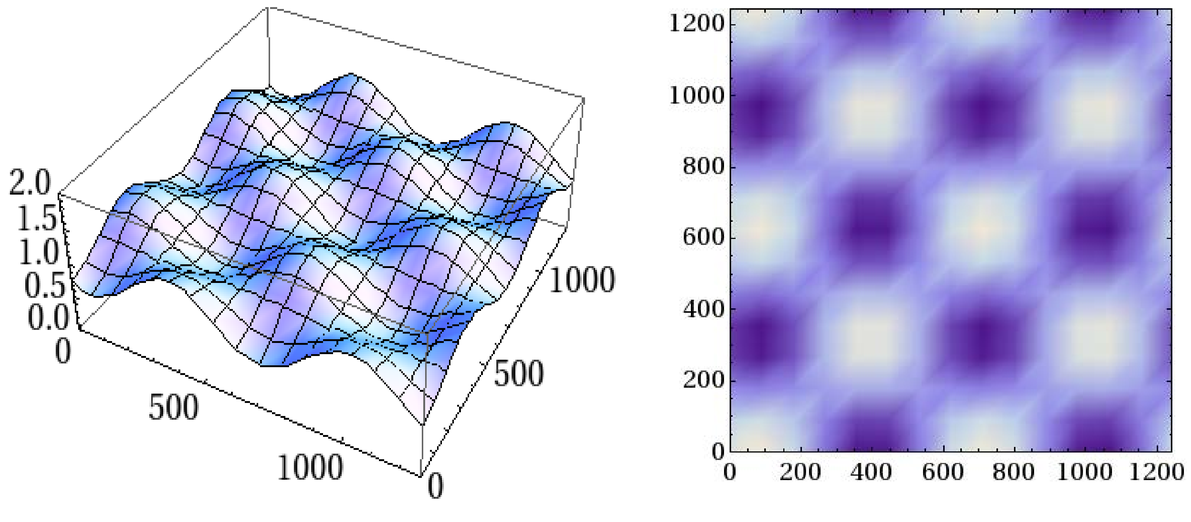
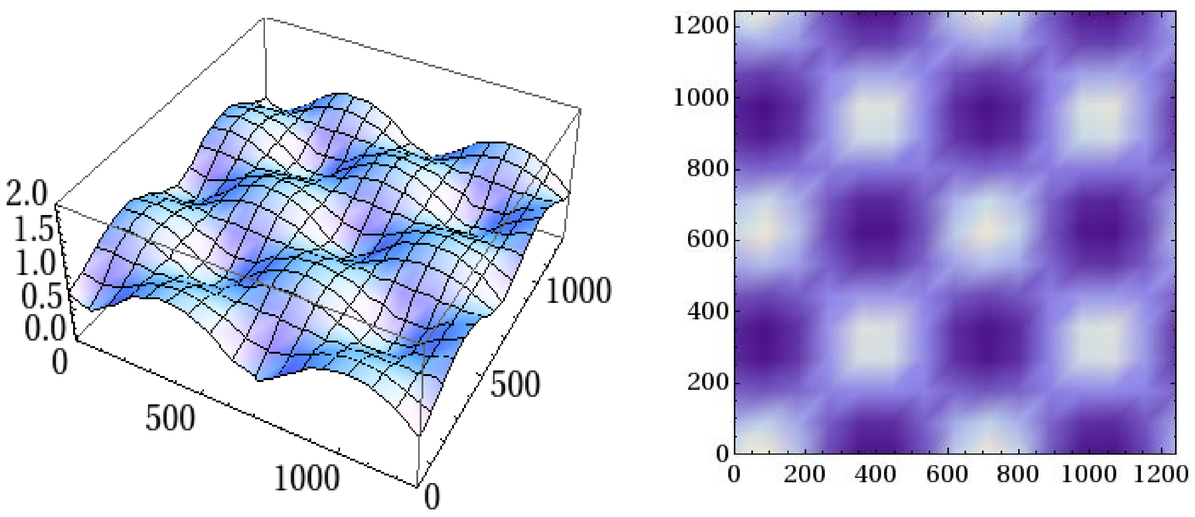
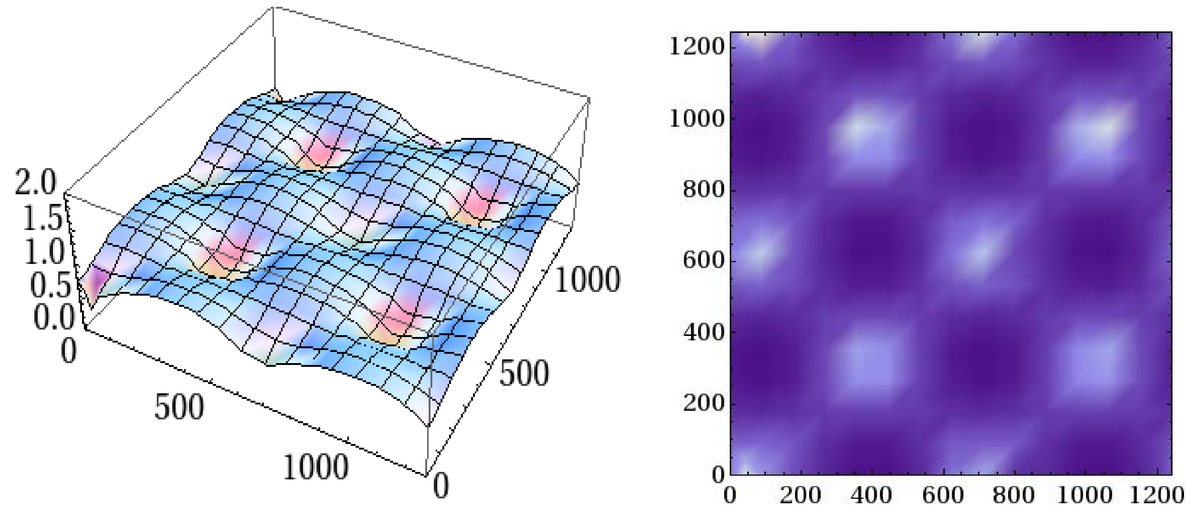
Normal Gravity Evolution of a 0.1mm dichloromethane evaporating film.
Domain size is 127mm (5 inches).
Gravity is a strong stabilizer of long wave modes.



t=0.0 ms



t=0.22 s

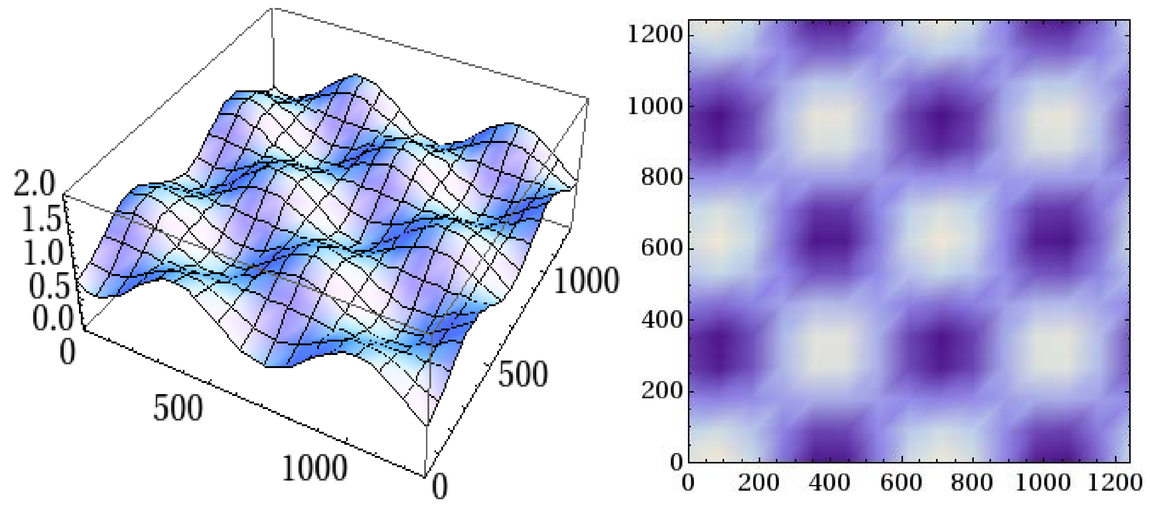


t=0.77 s (film rupture)

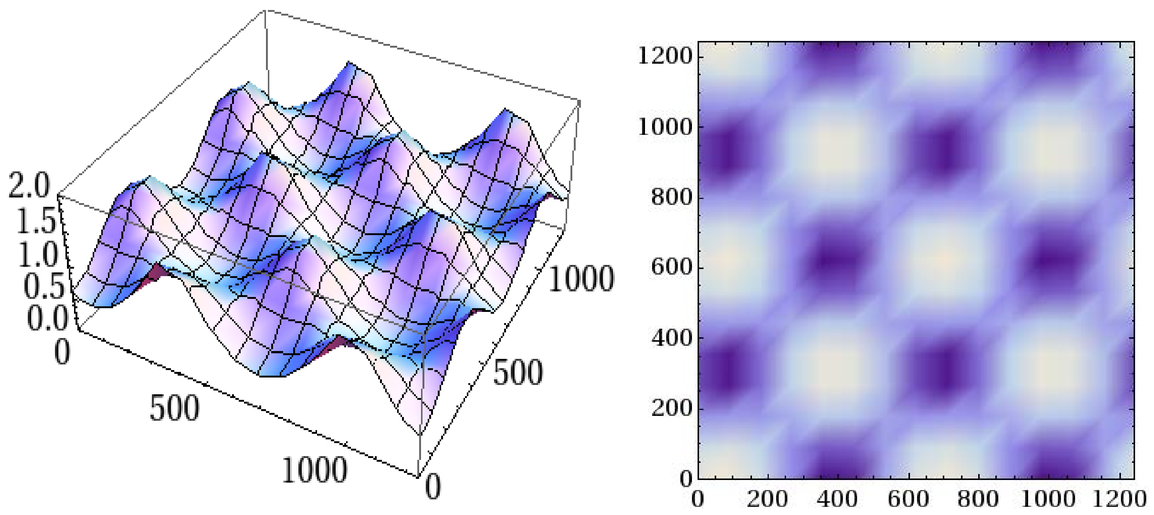
Film evolution

Density variation of liquid at the surface

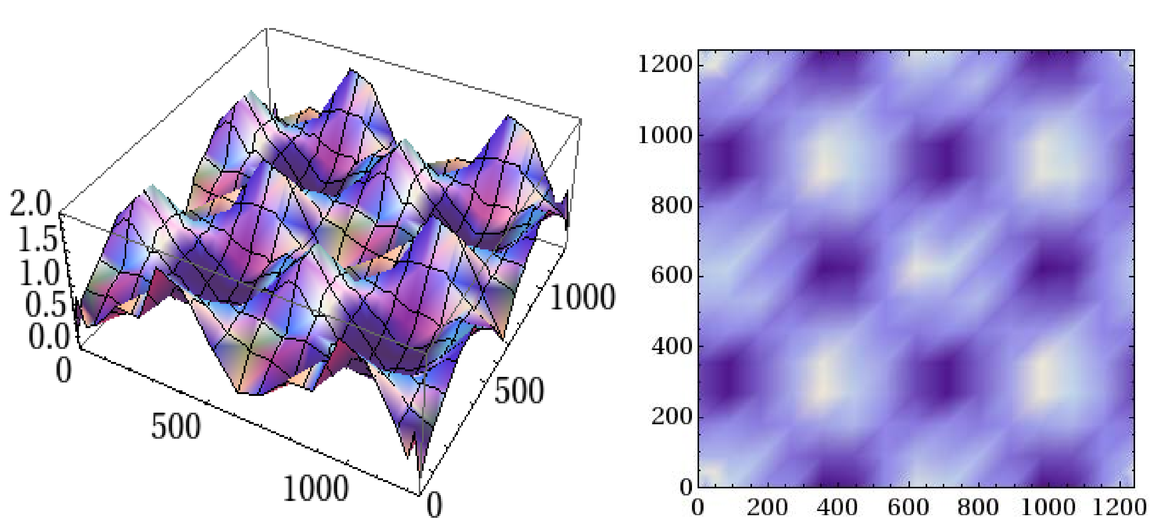
Zero Gravity Evolution of a 0.1 mm dichloromethane evaporating film.
Domain size is 127 mm (5 inches).
Thermocapillarity destabilizes the film and forms fingers.



t=0.0 ms



t=0.30 s



t=0.41 s (film rupture)

Film evolution

Density variation of liquid at the surface

Visualization of Gravitational Effects on Instabilities In an Evaporating Dichloromethane Film Subject to Long-Wave Theory

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An evolution equation describing the dynamics of an evaporating liquid film [1] is used to visualize instabilities in evaporating liquid films through interface contours and density variation. The rate of evaporation is very slow and the film thickness changes by less than 5% during the simulation. Gravity is a strong stabilizer of thermocapillary effects. Thermocapillarity causes rupture due to the formation of instability structures in a zero gravity environment. Secondary instability structures also appear when gravity is zero. The density variation plots describe a potential for internal convective cells. It is observed from the density variation plots that the film is less dense (and hence hotter) in zero gravity.

[1] A.D.Narendranath, J.C.Hermanson, R.W.Kolkka, A.Struthers, J.S Allen, "**Stability of an evaporating liquid film under non-equilibrium conditions under variable gravity**", ASME FEDSM, Puerto Rico, July 2012

Michigan Technological University