Radially forced liquid drops

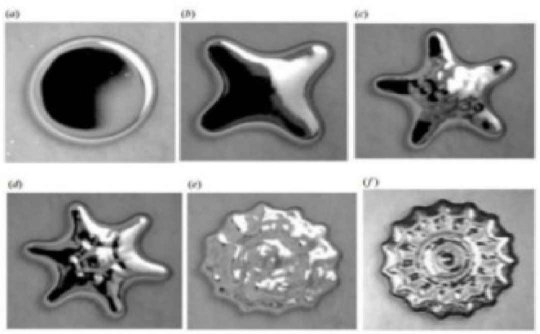
A. Ebo Adou[1,2], *L. S. Tuckerman*[1], *J. Chergui*[2], *S. Shin*[3], *D. Juric*[2]

[1]PMMH (UMR 7636 CNRS-ESPCI-UPMC Paris 6-UPD Paris7), 10 rue Vauquelin, 75005 Paris, France

[2]LIMSI-CNRS, Bât 508, rue John von Neumann - 91405 Orsay, France

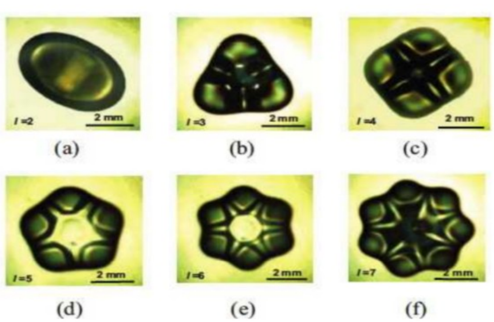
[3]Department of Mechanical and System Design Engineering, Hongik University, Seoul, 121-791 Korea

Magnetically oscillated quicksilver drops



From Fautrelle *et al.* J. Fluid Mech. 527, (2005) 285-301.

Acoustically levitated water drops



From Shen *et al.* Phys. Rev. E 81, (2010) 046305.

Equations of motion

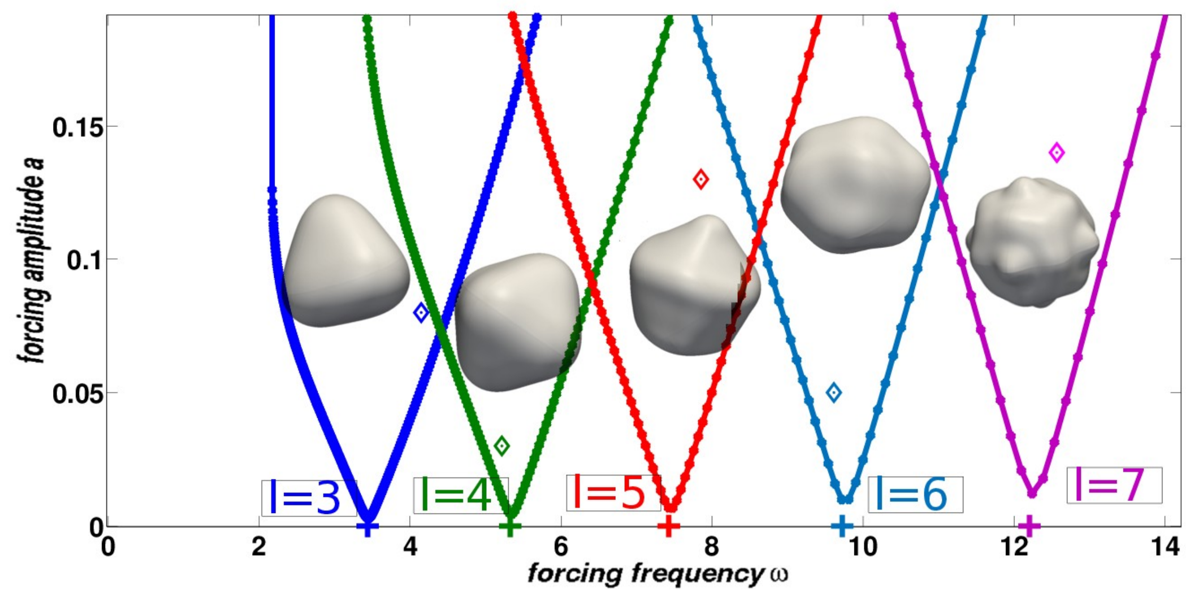
$$\begin{cases} \rho\left[\partial_t + (\mathbf{U}\cdot\nabla)\right]\mathbf{U} = -\nabla P + \eta\nabla^2\mathbf{U} - \rho G\vec{e}_r \\ \nabla\cdot\mathbf{U} = 0 \end{cases}$$

where the radial forcing is given by

$$G(r,t) = (g - a\cos(\omega t))$$

Linear Stability Analysis gives :

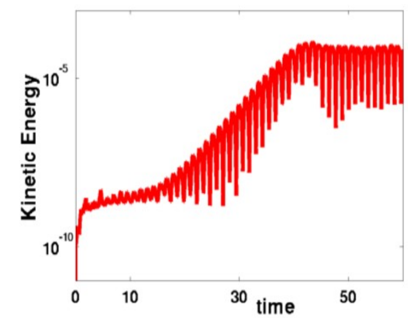
Instability tongues from Floquet analysis



FULL NONLINEAR 3D NUMERICAL SIMULATION WITH BLUE

Faraday Instability for $\ell = 4$

$t = 30$ s $t = 30 + 2\frac{\pi}{\omega}$ s $t = 30 + 4\frac{\pi}{\omega}$ s



Preliminary results for the Rayleigh-Taylor problem

Forcing parameters: $g = 90\mathrm{m.s}^{-2}$ & $\Delta\rho = 1940\mathrm{Kg.m}^{-3}$ & $R = 0.04\mathrm{m}$ & $\sigma = 2.10^{-2}\mathrm{N.m}^{-1}$.