When Marangoni meets Savart

The distant interaction of a drop with a liquid sheet

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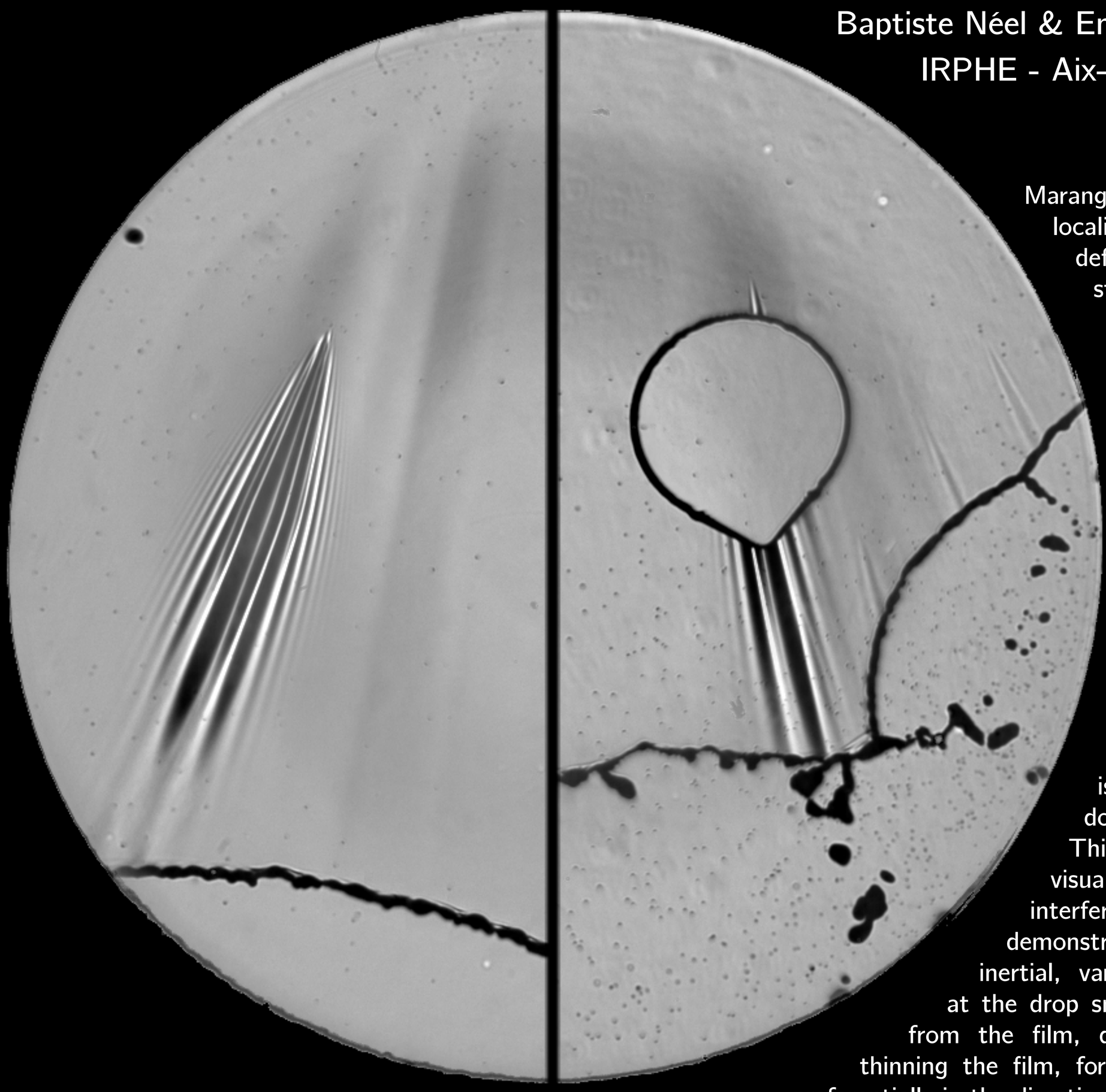

Marangoni discovered that a localized surface tension deficit causes a surface stress which induces a flow in the liquid bulk. When implemented on a thin liquid film (tens of microns), as the one formed by a water Savart sheet, it has a dramatic consequence for the integrity of the film. The introduction in the liquid of a few molecules of ethanol vapor evaporating from a distant drop (not touching the liquid) is enough to dig the film down to its rupture. Thickness modulations visualized by Schlieren and interferometric techniques demonstrate the existence of inertial, varicose waves originating at the drop smallest distance location from the film, dragging the liquid and thinning the film, forming holes, which open preferentially in the direction of weakest thicknesses.