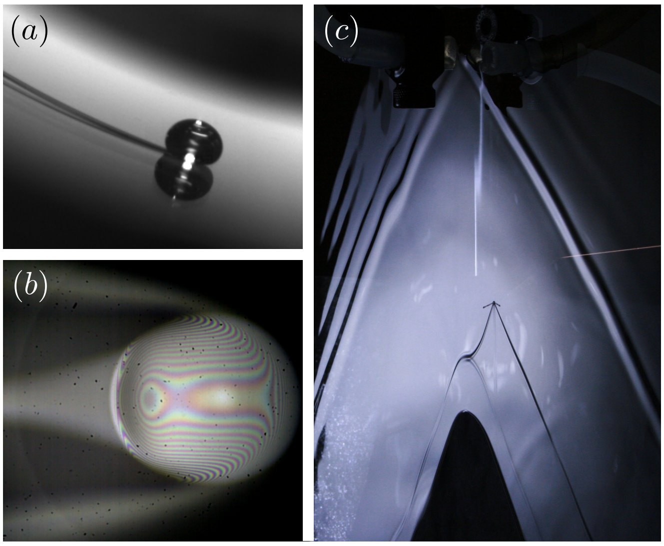
Two liquid films

Henri LHUISSIER[a]
[a]*IUSTI - CNRS & Aix-Marseille Université*

Yoshiyuki TAGAWA[b] *Tuan* TRAN[b] *Chao* SUN[b]
[b]*POF - University of Twente, Netherlands*

Philippe BRUNET[c] *Stéphane* DORBOLO[d]
[c]*MSC - Université Paris Diderot* [d]*GRASP - Université de Liège*



Liquid films, i.e. thin liquid phases separating two other phases, are ubiquitous. I will discuss their persistency and 'fragility' on two situations.

1. A drop falling onto a surface at rest, like a raindrop falling on a wall or a puddle, usually touches the surface readily. However, when a drop is dropped in a rotating drum the thin air film beneath the drop persists and prevents contact. The drop steadily levitates and reaches a stable position in the drum, where the drag and lift balance its weight. Interferometric measurements yield the film thickness field and reveal its forward/backward asymmetry. A uni-dimensional model explains how the levitation results from the film shape self-adaptation to the flow and predicts the asymptotic film thickness for small and large drops.

2. When a liquid curtain, i.e. a vertical liquid film free-falling in the air, is punctured it usually either advects the hole, or entirely disrupts. The localized perturbation induced by two facing air jets that squeeze the curtain symmetrically offers an alternative: opening a steady hole in the wake. The hole results from the thinning of the curtain in the wake, which depends on the curtain flow rate and the jets parameters. A simple inertia-dominated model for the curtain thickness and the hole location accounts for the experimental observations providing the perturbation is small enough (jet stagnation pressure smaller than curtain stagnation pressure) and the liquid viscosity is negligible