Séminaire

INSTITUT Charles SADRON
CNRS - UNISTRA - STRASBOURG

Jeudi 14 décembre 2023 à 14h30

Amphithéâtre Henri Benoît

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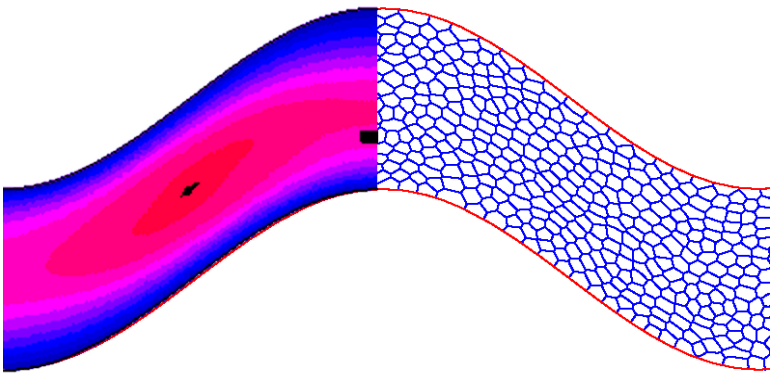
Predicting the Efficacy of Foams in Sclerotherapy

In varicose vein sclerotherapy, a liquid foam containing sclerosant is injected into the vein to displace blood and to trigger vein collapse. The choice of parameters such as liquid fraction and bubble size are critical in ensuring that the blood is displaced and that the foam then disperses quickly.

Foams exhibit a yield stress at high strain, which depends upon liquid fraction and bubble size. By modelling foams as Bingham fluids we can formulate predictions of optimal parameter values for sclerotherapy. Finite Element calculations in Freefem++ allow more realistic vein geometries to be investigated: for example, how does channel curvature affect the displacement process.

To extend this approach we would like to have bubble-scale information. For example, does the discrete nature of the bubbles in a foam suppress or enhance “dead” zones, where static fluid collects? How do variations in bubble size affect the yield stress, and how might local variations in yield stress affect sclerotherapy? A kinetic model based on a balance of forces at the film scale, currently only implemented in two dimensions in the Surface Evolver, allows us to predict bubble motion, bubble shape, and local stresses.



Foam flow in a sinusoidal channel. On the left, colours show contours of fluid speed, with unyielded fluid in black, from a simulation of a Bingham fluid in Freefem++. On the right, a bubble scale simulation in the Surface Evolver software.

This is joint work with Denny Vitasari (Surakarta) and Tirion Roberts (Bangor)

Les personnes souhaitant rencontrer Simon Cox sont priées de prendre contact avec Aurélie Hourlier-Fargette.