Applied Mathematics Seminar
INSCC 110, 3:30pm Monday
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Optimal Transport, Diffuse Fluid Interfaces, and the Hele-Shaw Problem

by

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Abstract

There is a remarkable connection between the problem of finding an optimal way of moving mass from one configuration to another (the so called Monge-Kantorovich problem) and fluid dynamical motions. The cost associated with the transport can be characterized as the "Wasserstein" distance between two configurations. This metric turns out to be a natural one to describe the motion of a viscous bubble in the Hele-Shaw cell.

A increasingly popular way of describing fluid interfaces is by using a diffuse approach where the the fluid density varies rapidly but continuously at the interface. This approach is used in connection with the Wasserstein metric to yield a PDE for the evolution of the fluid density. The relation of this model to the usual sharp interface description of Hele-Shaw dynamics will be explained and some computational examples will be shown.