



Departamento
de Matemática
Aplicada



Seminario de Matemática Aplicada

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ICMAT

The Mathematical Models of Rotating Droplets with Charge or subject to Electric Fields - Analysis and Numerical Simulation

Abstract:

The problem of determining the evolution of a liquid droplet subject to different forces has provided the scientific community, for more than three centuries, with an endless source of challenges. Since the pioneering works by the Belgian physicist Plateau, drops have been used to model astrophysical and nuclear fission systems and to discover important industrial applications such as electrospray or FIDI mass spectrometry.

In this seminar we will study the evolution, stability and equilibrium shapes of a viscous drop, contained in another viscous fluid, that rotates about a fixed axis at constant angular speed or angular momentum. We also give an answer to how rotation influences the evolution of a charged or neutral droplet that could also be subject to an external electric field. This is done by implementing an adaptive Boundary Element Method (BEM) for Stokes flow that describes with precision the formation of singularities on the drop's surface, allowing us to analyze the behaviour of Taylor cones, their opening semiangle and the finite-time breakup mechanism that droplets undergo when necks develop and pinch-off. Numerical simulations are also combined with analytical techniques to approximate stationary shapes (asymptotic expansion methods and self-similar arguments) in order to give a detailed picture of all feasible families of solutions.

Organizado por el Departamento de Matemática Aplicada con la colaboración del Grupo MOMAT y el Instituto de Matemática Interdisciplinar (IMI).

Fecha y hora: Miércoles 22 de enero de 2014, 12h.
Lugar: Seminario 225
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