LadHyX Seminar – June 6th, 10:45

Elisabeth Guazzelli
(MSC, Université Paris Cité)

Orientation of bodies of revolution in shear flows

Suspensions of axisymmetric (or quasi-axisymmetric) particles are ubiquitous in natural and industrial applications, including the formation of snow crystals in clouds, the dynamics of plankton in the ocean, the contamination of marine environments by microplastics, the dynamics of red blood cells, the production of paper, and the reinforcement of composites with particles. We experimentally investigate the rotational dynamics of neutrally buoyant bodies of revolution (spheroids, fibers, disks, rings with different cross-sectional shapes) in shear flows. In Stokes flows, the axis of revolution of these rigid particles moves in one of a family of closed periodic Jeffery orbits. Inertia is able to lift this degeneracy and induces drift among several rotations toward limiting stable orbits. Permanent alignment can also be achieved for disks and rings of triangular cross-sectional shape at large enough inertia. The bifurcations between the different dynamics are examined and compared to those predicted by small-inertia asymptotic theories and numerical simulations.

Collaborators: Davide Di Giusto(1,2), Laurence Bergougnoux(1), Cristian Marchioli(2)
(1) Aix Marseille Université, CNRS, IUSTI, Marseille, France
(2) Dipartimento Politecnico di Ingegneria e Architettura, University of Udine, Italy