Università degli Studi di Udine

Dottorato di Ricerca in Scienze dell'Ingegneria Energetica e Ambientale

Seminari del Corso di Dottorato

Fast simulations of particle-laden interfaces with the FIPI method

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Abstract: In Pickering emulsions, bijels and particle-stabilised foams, the stabilisation mechanism rests on the formation of a semi-solid skin of particles on the fluid-fluid interface. Understanding the link between the rheological properties of this skin and the surface particle microstructure is a key challenge of modern multiphase flow science. In this talk we present FIPI, a new method for the fast simulation of particle-interface interaction problems involving bubbles, droplets and complex interfacial structures (e.g. bi-continuous phases) interacting with particulate materials. The method enables to simulate a large - $O(10^6)$ - number of particles in a reasonable time on a common PC, and to reach the length scale separation and time scales of realistic experimental systems. After describing the working principle of the method, I will illustrate the application of FIPI to two problems: a pendant drop covered by a monolayer of purely repulsive spherical particles and a deflating particle-covered drop that undergoes buckling.

CV: Lorenzo Botto is an Associate Professor at Queen Mary University of London, where he leads the Fluids, Particles and Interfaces research group. Lorenzo obtained his PhD in fluid mechanics at the Johns Hopkins University under the supervision of Prof. Andrea Prosperetti. Prof. Botto's research group focuses on particle/fluid interface interaction problems in multiphase fluids, wetting phenomena in textiles, and colloidal hydrodynamics. The emphasis of his research is on topics at the interface between classical fluid mechanics and modern materials science. In 2017 Prof. Botto was awarded an ERC Starting Grant to develop a theoretical framework to understand the micro-hydrodynamics of graphene and 2D nano-materials in sheared liquids.