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Particle-enhanced, finite element simulations of multiphase flows

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ABSTRACT

In this talk, we show the ability of a particle-enhanced, finite element method to perform simulations of complex, multiphase flows.

A collection of *marker particles*, advected by the flow using the "method of the characteristics", provides an error-correction mechanism for the level set function defining the interface between the fluids. Ensembles of *polymer particles* help in modeling viscoelastic fluids by means of variance-reduced, Brownian Dynamics simulations in a "micro-macro" approach. Compactly-Supported Radial Basis Functions (CSRBFs) allow us to reconstruct, in a mesh-independent way, the polymer stress tensor at every finite element node.

Buoyancy-driven simulations of droplets and bubbles, with high density and viscosity ratio and dramatic shape deformation, highlight the capabilities of the method.