

Lagrangian scheme for fluids mechanics based on Semi discrete Optimal Transport

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In this talk we will explain how based on Brenier's ideas, it is possible to construct particle methods for a large class of fluids mechanics problems such that Wasserstein gradient flows of an internal Energy or Euler flows/Hamiltonian flows for the same energy. This class contains incompressible Euler equations, compressible (barotropic) fluids, fluid-structure interactions,...

In order to build these scheme the internal energy is replaced by its Moreau-Yosida regularization in the L^2 sense, which can be efficiently computed as a semi-discrete optimal transport problem. Using a modulated energy argument which exploits the convexity of the problem in Eulerian variables, one can prove quantitative convergence estimates towards smooth solutions of the considered system of PDE.