Abstract Submitted
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Fluctuating Hydrodynamics of Electrolytes Solutions[1] JEAN-PHILIPPE PERAUD, ANDY NONAKA, Lawrence Berkeley National Laboratory, ANUJ CHAUDHRI, Jawaharlal Nehru Centre for Advanced Scientific Research, JOHN B. BELL, Lawrence Berkeley National Laboratory, ALEKSANDAR DONEV, Courant Institute of Mathematical Sciences, New York University, ALEJANDRO L. GARCIA, Department of Physics and Astronomy, San Jose State University — In this work, we develop a numerical method for multicomponent solutions featuring electrolytes, in the context of fluctuating hydrodynamics as modeled by the Landau-Lifshitz Navier Stokes equations. Starting from a previously developed numerical scheme for multicomponent low Mach number fluctuating hydrodynamics [1], we study the effect of the additional forcing terms induced by charged species. We validate our numerical approach with additional theoretical considerations and with examples involving sodium-chloride solutions, with length scales close to Debye length. In particular, we show how charged species modify the structure factors of the fluctuations, both in equilibrium and non-equilibrium (giant fluctuations) systems, and show that the former is consistent with Debye-Huckel theory. We also discuss the consistency of this approach with the electroneutral approximation in regimes where characteristic length scales are significantly larger than the Debye length. Finally, we use this method to explore a type of electrokinetic instability.
[1] A. Donev & al.,"Low Mach Number Fluctuating Hydrodynamics of Multispecies Liquid Mixtures", *Phys. Fluids*, 27, 3, 2015

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