Ion acoustic waves in Ultracold Plasmas DANIEL VRINCEANU, Texas Southern University — Acoustic waves can be induced by modulating the initial density of ions created from photoionization of cold atoms. A complete modeling of this system requires long Molecular Dynamics Simulations (milliseconds) for a large number of particles (billions). Such extraordinary computational power is still not available. This paper proposes a kinetic model, in which the evolution of the ion distribution function is obtained by numerically solving the Vlasov equation. At every time step, the average electric field is obtained by solving a quasi-equilibrium problem for the electrons. Because of fast equilibration times, the electron gas assumes its stationary distributions in times much shorter than the typical ion time scale. A special distribution, similar to the King distribution used to model globular clusters of stars, is used to derive the equilibrium distribution of electrons before each ion time step. Numerical examples are presented.

Daniel Vrinceanu
Texas Southern University

Date submitted: 04 Feb 2011   Electronic form version 1.4