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Molecular Dynamics Simulations of Ion Equilibration in Ultracold Neutral Plasmas NIKOLA MAKSIMOVIC, THOMAS LANGIN, TREVOR STRICKLER, THOMAS KILLIAN, Department of Physics and Astronomy, Rice University — Understanding transport and equilibration in strongly coupled plasmas is important for modeling plasmas found in extreme environments like inertial confinement fusion plasmas and interiors of gas-giant planets. We use molecular dynamics simulations of Yukawa one component plasmas under periodic boundary conditions to study the evolution of strongly coupled ultracold neutral plasmas (UNPs) at early times. Simulations provide access to observable quantities in strongly coupled plasmas, namely correlation functions. Experimentally, the average velocity of an ion subset with a skewed velocity profile has been used to measure velocity autocorrelation functions and provide access to diffusion coefficients and other transport processes in UNPs. Using the simulation, we verify the experimental measurements of average velocities of ion subsets in UNPs and confirm their agreement with the velocity autocorrelation function. Finally, we examine the collective mode behavior of the ions during their equilibration phase by calculating the longitudinal current correlation function at various times during equilibration. This allows us to study the collective mode coupling behavior of the equilibration of ions in UNPs and its dependence on screening parameter.

Nikola Maksimovic
Univ of Colorado - Boulder

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