

Abstract Submitted
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Adiabatic Cooling and Electron-Ion Collisions during Self-Similar Expansion in Ultracold Neutral Plasmas JOSE CASTRO, HONG GAO, THOMAS KILLIAN, Rice University — Plasma expansion dynamics are discussed for Ultracold Neutral Plasmas (UNP). Previous measurements of the ion kinetic energy and plasma size of UNP's have shown that the expansion is self-similar. This self-similar expansion follows an analytic solution of the Vlasov equations, the central equations in the kinetic theory of plasmas. As the plasma expands, both ion and electron species undergo adiabatic cooling. Spatially resolved fluorescence spectroscopy of the UNP shows that at early times the plasma undergoes electron-ion collisions resulting in initial heating of the ions. This effect is combined with adiabatic cooling which dominates at later times in the expansion.

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