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Expansion of an Ultracold Neutral Plasma with an Exponential Density Distribution[1] MACKENZIE WARRENS, GRANT GORMAN, THOMAS KILLIAN, Rice University — Plasma expansion is an important process in solar and astrophysical plasmas and plasmas created from laser-matter interactions. It can also present complex fundamental phenomena that reveal both kinetic and hydrodynamic effects. This poster examines the expansion of an ultracold neutral plasma (UNP) with an initially exponentially decaying density distribution. This density distribution arises for UNPs created by ionizing atoms trapped in a quadrupole magnetic field. We compare the dynamics of an exponential plasma to the well-studied expansion of a plasma with a Gaussian density distribution, focusing on the velocity field and ion temperature evolution. For the same initial electron temperature and characteristic size, the expansion velocity is faster for an exponential plasma than a Gaussian plasma. As the exponential plasma expands, the ions heat then cool, whereas the ions only cool as a Gaussian plasma expands.

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