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The long time dynamics of a molecular ultracold plasma HOSSEIN SADEGHI ESFAHANI, JONATHAN MORRISON, NICOLAS SAQUET, MARKUS SCHULZ-WEILING, EDWARD GRANT, University of British Columbia — Higher-order charged-particle interactions play a significant role in the creation and decay of a molecular ultracold plasma. Describing the forces at work requires the simultaneous consideration of plasma hydrodynamics and coupled collisional rate processes. Accordingly, we present model calculations that account for the effects of inelastic and reactive collisions on the spatial distribution of plasma density and associated hydrodynamic forces. As the plasma shape evolves to depart from a Gaussian sphere, the expanding electron gas exerts non-linear radial force on the ions, which creates a non-uniform radial hydrodynamic velocity field and causes further changes to plasma shape over time. Experimental data and simulation results show good agreement in decay parameters, but differ on expansion rate and thus electron temperature.

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