

Abstract Submitted
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Viscosity Quantified in a 2D Dusty Plasma Experiment¹ YAN FENG, J. GOREE, BIN LIU, The University of Iowa — Experiments were performed in a low-temperature dusty plasma that was a four-component mixture of negatively-charged polymer microspheres, positive argon ions, electrons, and neutral argon gas. The microspheres were electrically suspended in a single layer in the sheath above a lower electrode. Due to their large electric charge, the microspheres were strongly coupled, and self-organized in a crystalline lattice. Laser heating was used to melt the lattice, so that the collection of charged microspheres was a liquid-phase strongly coupled plasma. The viscosity η of this liquid was determined using a variant of the fluctuation-dissipation theorem called the Green-Kubo (GK) relation, which relies on the fluctuating random motion of microspheres. Video microscopy allowed the tracking of individual microspheres, yielding time series for their positions and velocities, which are inputs for the GK calculation. The resulting viscosity, for our experiment without macroscopic flow of the microspheres, is in agreement with a previous experiment with a steady macroscopic shear flow.

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