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Dynamics and stability of electron plasma vortices under external strain[1] N. C. HURST, J. R. DANIELSON, D. H. E. DUBIN, C. M. SURKO, University of California - San Diego — The behavior of an initially axisymmetric 2D ideal vortex under an externally imposed strain flow is studied experimentally [1]. The experiments are carried out using pure electron plasmas confined in a Penning-Malmberg trap; here, the dynamics of the plasma density transverse to the field are directly analogous to the dynamics of vorticity in a 2D ideal fluid. An external strain flow is applied using boundary conditions in a way that is consistent with 2D fluid dynamics. Primarily, elliptical distortions of the vortex core are studied, including dynamical orbits, equilibria, and stability properties. In the case of a quasi-flat vorticity profile, the results are in good agreement with a simple theory of a piecewise elliptical vorticity distribution [2]. For smooth vorticity profiles, deviations from this theory are discussed. Results for time-dependent strain and tests of adiabatic behavior will also be discussed. These experiments may be relevant to many types of quasi-2D fluid behavior, including the dynamics of geophysical fluids, other types of strongly magnetized plasma, and various astrophysical scenarios. [1] N. C. Hurst, et. al., Phys. Rev. Lett. 117, 235001 (2016). [2] S. Kida, J. Phys. Soc. Japan 50, 3517 (1981).

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