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First Experiments with e^-/H^- Plasmas: Enhanced Mode Damping and Transport[1] A.A. KABANTSEV, K.A. THOMPSON, C.F. DRISCOLL, University of California San Diego — Negative Hydrogen ions are produced and confined in a room-temperature electron plasma, causing enhanced mode damping and particle transport effects. We accumulate an H^- charge fraction $n_{H^-}/n_e \sim 20\%$ in about 200 seconds, as externally excited H_2 molecules undergo dissociative electron attachment in the plasma. The accumulated H^- fraction causes a novel *algebraic* damping of diocotron mode amplitude $A(t)$, and the damping is coincident with an *enhanced* outward drift v_r of the H^- ions. That is, $dA/dt = -\alpha$, with $\alpha \propto n_{H^-} * v_r$. We observe that heating the e^-/H^- plasma terminates the enhanced damping and enhanced centrifugal separation, both of which resume when plasma re-cools by cyclotron radiation at B =1.2T. Other interesting observations include: (1) enhanced e^- cooling from collisions with H^- cooled by neutrals; (2) enhanced damping of plasma waves due to e^-/H^- collisional drag; (3) strong exponential damping of diocotron modes in a "floppy" nearly-pure H^- plasma, created by rapid axial ejection of the electrons. Additional novel drift modes and instabilities are predicted theoretically in such a plasma [1]. [1] D.H.E. Dubin, Phys. Plasmas 17, 112115 (2010).

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