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Two Fluid Dynamo in Reversed Field Pinch V.V. MIRNOV, C.C. HEGNA, S.C. PRAGER, C.R. SOVINEC, University of Wisconsin - Madison and the Center for Magnetic Self Organization in Laboratory and Astrophysical Plasmas — In the Madison Symmetric Torus reversed field pinch experiments, tearing instabilities are observed to generate magnetic field, flow velocity and current density fluctuations that follow a temporally cyclic sawtooth behavior. One of the consequences of these instabilities is the production of dynamos, fluctuation-induced mean electromotive forces in the generalized Ohm's law, that surge during sawtooth crashes. In two-fluid theories, the dynamo is produced from the combination of the MHD ($\mathbf{v}\times\mathbf{B}$) and Hall ($\mathbf{j}\times\mathbf{B}$) contributions to Ohm's law. We report new results on the physics of two-fluid dynamos with particular focus on edge-resonant m=0 tearing modes. The two fluid quasilinear theory that was originally derived for a sheared slab [1] is generalized to cylindrical geometry and illuminates the effects of current gradient and field line curvature. The key results are: **(1)** two fluid effects are important for dynamo through their influence on the phase between the fluctuations; **(2)** two-fluid theory yields a non-zero flux surface averaged Hall dynamo that is absent in resistive MHD; **(3)** the two fluid version of the NIMROD code confirms analytic results during the linear stage of the instability but exhibits significant broadening of the Hall dynamo profile on the longer time scales of nonlinear evolution. *Work supported by the USDoE and NSF. [1]V.V.Mirnov, C.C.Hegna, and S.C.Prager, Plasma Physics Report **29**, 612 (2003)

V.V. Mirnov
University of Wisconsin-Madison

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