Abstract Submitted
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Scaling of magnetic reconnection processes from MRX to astrophysical plasmas[1] M. YAMADA, R. KULSRUD, H. JI, PPPL, Princeton U, D. UZDENSKY, Princeton U, E. ZWEIBEL, U. Wisconsin, CMSO TEAM — We discuss how the MRX (Magnetic Reconnection Experiment) physics results scale to space astrophysical plasmas. When the collisionality is reduced to satisfy the relationship $c/\omega_{pi} > \delta_{SP}$ between the ion skin depth (c/ω_{pi}) and the Sweet-Parker width δ_{SP}, a fast reconnection rate is observed in MRX [1], and the results are verified by numerical simulations. Since $(c/\omega_{pi})/\delta_{SP}$ is roughly equal to $5(\lambda_{mfp}/L)^{1/2}$, this relationship suggests that two-fluid effects become dominant even when the electron mean free path is one order of magnitude smaller than the system size [1]. The reconnection rate is found to increase rapidly as the ratio of the electron mean free path to the scale length increases. This result is attributed primarily to the large Hall electric field in the reconnection layer except near the X point where dissipative processes caused by electron pressure gradients and high frequency turbulence take place. Finally, a fast local reconnection generally leads to an impulsive global topology change or global magnetic self-organization phenomena. We also discuss how our local analysis can be applied to variety of magnetic reconnection phenomena in space astrophysical plasmas [2]. [1]M. Yamada, Phys. Plasmas, v. 14, 058102 (2007)[2]D. Uzdensky, Ap. J v.671, 2139 (2007)

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