Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Effects of Guide Field on Plasmoid-Instability-Mediated Turbulent Reconnection YI-MIN HUANG, A. BHATTACHARJEE, Department of Astrophysical Sciences, Princeton University — It has been established that the Sweet-Parker current layer in high Lundquist number reconnection is unstable to the super-Alfvenic plasmoid instability. Past two-dimensional magnetohydrodynamic simulations have demonstrated that the plasmoid instability leads to a new regime where the averaged reconnection rate becomes nearly independent of the Lundquist number. Three-dimensional simulations show that the plasmoid instability can mediate self-generated turbulent reconnection, with energy fluctuations forming elongated eddies along the direction of local magnetic field. In this work we examine the effects of the guide field strength on the self-generated turbulent state and reconnection of the large scale magnetic field. The presence of a guide field provides magnetic shear across the reconnection layer and coupling between different reconnecting planes, which cause elongated turbulent eddies to change direction across the reconnection layer and significantly influence the energy cascade process. In contrast, a complete lack of guide field and coupling allows energy cascade to smaller scales along the out-of-plane direction. While the characteristics of turbulence vary, reconnection rate remains a robust feature which is not significantly affected by the guide field strength.

Yi-Min Huang
Department of Astrophysical Sciences, Princeton University

Date submitted: 24 Jul 2015 Electronic form version 1.4