Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Onset of magnetic reconnection in a weakly collisional, high-β plasma[1] ANDREW ALT, MATTHEW KUNZ, Princeton University — In a magnetized, weakly collisional plasma, the magnetic moment of the constituent particles is an adiabatic invariant. An increase of the magnetic-field strength in such a plasma thus leads to an increase in the thermal pressure perpendicular to the field lines. Above a β-dependent threshold, this pressure anisotropy drives the mirror instability, which produces strong distortions in the field lines and traps particles on ion-Larmor scales. The impact of this instability on magnetic reconnection is investigated using simple analytical and numerical models for the formation of a current sheet and the associated production of pressure anisotropy. The difficulty in maintaining an isotropic, Maxwellian particle distribution during the formation and subsequent thinning of a current sheet in a weakly collisional plasma, coupled with the low threshold for the mirror instability in a high-β plasma, imply that the topology of reconnecting magnetic fields can radically differ from the standard Harris-sheet profile often used in kinetic simulations of collisionless reconnection. Depending on the rate of current-sheet formation, this mirror-induced disruption may occur before standard tearing modes are able to develop.

[1]This work was supported by U.S. DOE contract DE-AC02-09CH11466.

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Date submitted: 14 Jul 2017 Electronic form version 1.4