Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Fast ion generation and runaway through magnetic reconnection events in MST[1] JUNGHA KIM, JAY ANDERSON, WILLIAM CAPECCHI, PHILLIP BONOFIGLO, STEPHANIE SEARS, University of Wisconsin-Madison — Fokker-Planck and full orbit modeling are used to investigate how global reconnection events in MST plasmas generate an anisotropic fast ion distribution. A multi-step process is hypothesized. First, thermal ions are heated by a perpendicular heating mechanism, possibly a stochastic process that relies on turbulent diffusion and strong radial electric fields, or ion cyclotron damping in the tearing-driven turbulent cascade. Second, a small fraction of the heated ions have sufficient speed to develop substantial guiding center drifts that are relatively immune to stochastic magnetic transport. In the RFP, these fast ion drift orbits are favorable to confinement. Finally, these fast ions are accelerated by a parallel inductive electric field (up to ~80 V/m) associated with the abruptly changing magnetic equilibrium. This strong impulsive field does not include any magnetic-fluctuation-based contribution as experienced by thermal particles or electrons, which do not run away like fast ions. CQL3D, a Fokker-Planck solver, and RIO, a full orbit tracing code, are used to model this multi-step process that is responsible for anisotropy in fast ion distribution in MST. Work supported by US DOE.

[1]Supported by US DOE

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Date submitted: 14 Jul 2016 Electronic form version 1.4