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Anisotropic and asymmetric fast ion distribution generated by magnetic reconnection in MST plasmas JUNGHA KIM, JAY ANDERSON, PHILLIP BONOFIGLO, Univ of Wisconsin, Madison, ROBERT HARVEY, CompX, JOHN SARFF, Univ of Wisconsin, Madison — Magnetic reconnection is important in particle transport and energization in both astrophysical and laboratory plasmas. Global reconnection events in MST spontaneously generate an anisotropic ion distribution with a high energy tail extending up to 30x thermal energy, likely through a multi-step process that involves multiple physical scale lengths. First, thermal ions are heated by a mechanism that operates preferentially perpendicular to the magnetic field. Second, the higher energy portion of the thermal ion distribution moves into orbits that drift off the stochastic background magnetic field. In the reversed field pinch (RFP) configuration, these drift velocities contribute to stable fast ion orbits that are low in diffusivity and favorable to confinement. These fast ions, separated from the background magnetic field, are unaffected by fluctuation-based, dynamo-like emfs that reduce the total electric field to 0.5 V/m. Finally, a parallel electric field (~80 V/m), induced by the fast change in the equilibrium during magnetic relaxation, accelerates these fast ions, resulting in an ion distribution that favors high energy, parallel-streaming ions. Work is underway to model the time evolution of the fast ion distribution using CQL3D (Fokker-Planck equation solver) and RIO (full orbit tracer). Work supported by US DOE.

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