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A Fermi mechanism for the production of energetic electrons during magnetic reconnection J.F. DRAKE, University of Maryland, M. SWISDAK, Naval Research Laboratory, H. CHE, University of Maryland, M.A. SHAY, University of Delaware — The production of energetic electrons has been documented in observations of solar flares, magnetic reconnection in the Earth's magnetosphere and in laboratory fusion experiments yet the understanding of these widespread observations remains poor. Simulations reveal that magnetic reconnection with a guide field leads to the growth and dynamics of multiple magnetic islands rather than a single large x-line. Above a critical energy electron acceleration is dominated by the Fermi-like reflection of electrons within the resulting magnetic islands rather than by the parallel electric fields. Particles trapped within islands gain energy as they reflect from ends of contracting magnetic islands. A Fokker-Planck equation for the distribution of energetic particles similar to that developed in shock accelertion theory is obtained by averaging over the particle interaction with many islands. Steady state solutions in reconnection geometry result from convective losses balancing the Fermi drive. Distribution functions take the form of a powerlaw whose spectral index depends on the mean aspect-ratio of the islands. We show that the energy transfered to energetic electrons is linked to the magnetic energy released during reconnection. The model is consistent with several key solar and magnetospheric observations: the production of large numbers of energetic electrons and powerlaw distributions.

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