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Mechanisms for Electron Acceleration and Heating in Multi-island Magnetic Reconnection JAMES DRAKE, JOEL DAHLIN, MARC SWISDAK, Univ of Maryland-College Park — Magnetic reconnection is a significant driver of energetic particles in flares both on the sun and beyond. Single x-line models fail to explain the large number of energetic electrons seen in flares. Reconnection in systems with weak collisions multi-island reconnection spontaneously develops and dominates energy release. There are three basic mechanisms for particle energy gain in multi-island reconnection: motion along parallel electric fields; and the magnetic curvature and gradient B drifts along perpendicular fields. The latter two produce the classical Fermi and betatron acceleration, respectively. Observations in the magnetosphere and solar wind suggest that Fermi reflection drives most ion heating. The observational evidence on the physics of electron heating is not as clear. PIC simulations reveal that Fermi reflection dominates the energy gain of the most energetic electrons. The rate of production of energetic electrons in 3-D systems, where reconnecting fields become stochastic, dramatically increases compared with 2-D reconnection. A challenge is to extend small-scale kinetic simulations to the energy release in large-scale magnetic fields. Extensions of the Parker transport model to describe reconnection-driven particle acceleration are a promising approach.

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