



***In-Situ* Observations of Energetic Electrons During Magnetic Reconnection in the Earth's Magnetotail**

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Magnetic reconnection is a fundamental energy conversion mechanism occurring in space plasmas such as the solar corona, the solar wind and planetary magnetospheres. A fundamental but yet open issue is if and how high-energy charged particles are produced during reconnection. Remote observations during solar flares strongly suggest that magnetic reconnection plays a major role in accelerating particles to high energies. However direct measurements are needed to confirm this possibility. The Earth's magnetotail is an excellent laboratory to study particle acceleration since high-resolution spacecraft measurements are available *in-situ*. Previous observations in the magnetotail as well as numerical simulations indicate that electrons with energies $E \gg k_B T$ (up to several 100 keV) are produced during reconnection. In particular recent results suggest that small-scale magnetic islands are important for accelerating such suprathermal electrons. Here we present detailed *in-situ* Cluster spacecraft observations of electric fields and energetic electrons in two thin reconnecting current sheets. The current sheets have a size of a few ion inertial lengths and are observed within a few ion gyroperiods one from each other. One current sheet shows the typical signatures of a tailward moving magnetic island namely a +/- perturbation of the normal magnetic field B_Z and an increase of the out-of-plane magnetic field B_Y near the

center of the current sheet. We find that energetic electrons up to about 100 keV are accelerated in both current sheets but the highest fluxes are observed within the magnetic island. We also find that the energetic electrons in the island are mainly accelerated in the direction perpendicular to the magnetic field. We discuss possible mechanisms to explain the observed energy and direction of the accelerated electrons. We also compare our observations with a particle-in-cell simulation. The comparison suggests that Cluster may have crossed the current sheet right after coalescence of smaller islands. Our observations indicate that energetic electrons are accelerated within thin reconnecting current sheets and that small-scale magnetic islands can provide further acceleration to higher energies.