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Energetic electrons and magnetic islands during reconnection[1]
L.-J. CHEN, N. BESSHO, University of New Hampshire, W. DAUGHTON, LANL, A. BHATTACHARJEE, UNH — Magnetic reconnection is widely thought to be a mechanism for electron acceleration, but exactly where and how the acceleration occurs remains an open question. Here we report case studies of magnetotail reconnection where energetic electrons and signatures of magnetic islands are observed. We found that each clearly identifiable magnetic island has a corresponding burst of energetic electrons, but strong energetic electron bursts can appear without the association with well-defined single islands. Energetic electrons are also observed at the electron current sheet, but with a much lower energy and flux that is one order of magnitude lower than those within islands. The fluxes of energetic electrons peak at sites of compressed density within magnetic islands, a feature not explained by existing theories. Strong core magnetic fields are observed within islands even for cases when the background guide field is less than 1% of the asymptotic field. The existence of strong core fields indicate that energetic electrons are either being actively produced within or introduced into the islands. because otherwise the electrons will be guided away within $\ll 1$ second. The strong density sub-structures within islands suggest that the islands may have gone through coalescence. The observation will be compared with PIC simulations of reconnection to better understand acceleration mechanisms.

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