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# Asymmetric current sheet and multiple secondary magnetic islands during magnetic reconnection with a guide field

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A magnetic reconnection event with a moderate guide field encountered by Cluster in the near-Earth tail is reported. The quadrupolar structure of the Hall magnetic field within the ion diffusion region is distorted toward the northern hemisphere in the earthward part while toward the southern hemisphere tailward part of the X-line. Observations of electron current density and electron pitch angle distribution indicate that the distorted quadrupolar structure is formed due to a deformed Hall electron current system. Cluster crossed the ion diffusion region from south to north at the earthward of X-line. An electron density cavity is confirmed in the northern separatrix layer while a thin current sheet (TCS) is measured in the southern separatrix layer. In both, southern and northern separatrix layers, electron flowing into the X-line along the magnetic field are measured. The TCS is formed due to electrons injected into the X-line along the magnetic field. These observations are different from simulation results where the cavity is produced associated with inflow electrons along one separatrix while the strong current sheet appears with the outflow electron beam along the other separatrix [Pritchett and Coroniti, 2004; Pritchett, 2005 and 2006]. The energy of the inflowing electron in the separatrix layer could extend up to 10 keV. The length of the separatrix layer is estimated to be at least 65 ion inertial length. These observations suggest that a large portion of the energy conversion could occur in the separatrix layer during magnetic reconnection. Multiple secondary magnetic islands are observed within the diffusion region for the first time. The secondary magnetic islands are all observed downstream of the observed TCS. These observations further suggest there are numerous small scale structures within the diffusion region; the gross X-line scenario is only an approximate description for magnetic reconnection.