



## **In situ observation of a secondary magnetic island near the center of the ion diffusion region**

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An anti-parallel magnetic reconnection event observed by Cluster on 4th OCT. 2003 in the magnetotail is studied. In this event we identify a secondary magnetic island (an island type signature in a thin ion current sheet) with a strong core magnetic field near the center of the ion diffusion region. The island is squashed in the  $z$  direction and the aspect ratio is about 2. Within the magnetic island, the electron density peaks in the outer region while dips in the core region where the strong core magnetic field is measured. An intense electron beam parallel to the local magnetic field as well as a powerful electric current anti-parallel to the local magnetic field with the density up to  $\sim 40$  nA/m<sup>2</sup> are found in the outer region of the island. These measurements indicate that the electric current which results from the electron beam in the outer region can form the core magnetic field. The electron density dip in the core region is formed due to the existing strong core magnetic field which expels the electrons out of the core region. The electrons show the flat-top distribution in the ion diffusion region except the core region of the island, and the shoulder energy range of the flat-top distribution is from  $\sim 100$ eV to  $\sim 4$  keV. An enhancement of the energetic electron fluxes up to 200keV is measured in the ion diffusion region, and a further increase of energetic electron fluxes is detected within the island.