Geophysical Research Abstracts
Vol. 15, EGU2013-9758, 2013
EGU General Assembly 2013

In situ observations of the plasma sheet at high latitudes in conjunction with a transpolar arc

Robert Fear (1), Steve Milan (1), and Romain Maggiolo (2)

(1) University of Leicester, Department of Physics and Astronomy, Leicester, United Kingdom (r.fear@ion.le.ac.uk, +44 116 252 3555), (2) Belgian Institute for Space Aeronomy, Brussels, Belgium

Transpolar arcs are auroral features which extend from the night side of the Earth's main auroral oval into the polar cap. Recent statistical studies have shown that they are formed by the closure of magnetic flux in the magnetotail during intervals when the IMF is northward and there is a cross-tail (B_Y) component of the lobe magnetic field (due to the earlier IMF conditions). Under these circumstances, newly closed flux in the midnight sector has northern and southern hemisphere footprints that straddle the midnight meridian; this prevents the closed flux from returning to the day side in a simple manner. As tail reconnection continues, the footprints of closed field lines protrude into the polar cap, and the auroral emissions on these footprints form the transpolar arc. This mechanism predicts that closed flux should build up on the night side, embedded within the lobe. We present in situ observations of this phenomenon, taken by the Cluster spacecraft on 15th September 2005. Cluster was located at high latitudes in the southern hemisphere lobe (far from the typical location of the plasma sheet), and a transpolar arc was observed by the FUV cameras on the IMAGE satellite. Cluster periodically observed plasma similar to a typical plasma sheet distribution, but at much higher latitudes - indicative of closed flux embedded within the high latitude lobe. Each time that this plasma distribution was observed, the footprint of the spacecraft mapped to the transpolar arc (significantly poleward of the main auroral oval). These observations are consistent with closed flux being trapped in the magnetotail and embedded within the lobe, and provide further evidence for transpolar arcs being formed by magnetotail reconnection.