

'Evolution of a field aligned electron beam in the plasma sheet boundary layer observed by CLUSTER'

Taylor, M. G. G. T.(1), R. C. Elphic (1), R. H. W. Friedel (1), G. D. Reeves (1), M. F. Thomsen (1), M. G. Henderson (1), J. Birn (1), J. Slavin (2), B. Lavraud, (3), H. Laakso (4), W.K. Peterson, (5), T.A. Fritz(6), P.W. Daly(7), A. N. Fazakerley (8), A. Balogh (9) and H. Reme (3)

(1) Los Alamos National Laboratory, Los Alamos, NM, 87545, U.S.A

(2) NASA/GSFC, Greenbelt, MD 20771, U.S.A

(3) CESR, 31028 Toulouse Cedex 4, France.

(4) ESA/ESTEC, Noordwijk, The Netherlands

(5) LASP, University of Colorado, Boulder, Colorado, 80303, U.S.A

(6) Centre of Space Physics, Boston University, MA, 02215, U.S.A

(7) Max-Planck-Institut für Aeronomie, D-37191 Katlenburg-Lindau, Germany

(8) Mullard Space Science Laboratory, University College London,

(9) Imperial College of Science, Technology and Medicine, London, SW7 U.K

In this paper we study a plasma sheet thinning event which took place on 11th August 2002 near 1420 UT, while CLUSTER was located in the northern, post-midnight plasma sheet/plasma sheet boundary layer. CLUSTER was at a radial distance of about $18 R_E$. The event took place during a period of quite low DST~ 25 nT. At the same time, evidence of plasma sheet thinning followed by substorm particle injections were observed by Los Alamos instruments aboard geosynchronous spacecraft. The POLAR spacecraft was in the same local time sector, but closer to the Earth. It also observed plasma sheet thinning and expansion. Just prior to crossing into the lobe, the CLUSTER tetrahedron observed a tailward moving traveling compression region, as identified by magnetic field measurements from the FGM (Flux Gate Magnetometer) instrument. At this time electron measurements by the IES (Imaging Electron Spectrometer) from the RAPID (Research with Adaptive Particle Imaging Detectors) instrument and also by the PEACE (Plasma Electron and Current Experiment) aboard CLUSTER 3, observed a highly collimated field aligned electron beam traveling tailward. This electron beam was not seen by the other three CLUSTER spacecraft which were located further from the plasma sheet equatorial plane. Thus the beam must have been localized in space or time, or both. If due to a near-Earth neutral line, the electron beam characteristics suggest a rapidly evolving configuration within the closed plasma sheet field line region. We present initial results of this multi-instrument CLUSTER investigation, which demonstrates the value of four spacecraft measurements.