Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

PEM30-P08 Room:Convention Hall Time:May 24 10:45-12:15

Streamline reconstruction of the front part of magnetotail reconnection jets

HASEGAWA, Hiroshi[1*], SAITO (HASEGAWA), Miho[2], Kyoung-Joo Hwang[3]

[1]Institute of Space and Astronautical Science, JAXA, [2]STE lab, Nagoya University, [3]NASA Goddard Space Flight Center

We present an in-depth analysis of multiple plasma jet fronts observed on 15 August 2001 by the Cluster spacecraft (at geocentric distance of about 19 Re) in a post-midnight current sheet of Earth's magnetotail, first reported by Hwang et al. (2011). Such jet fronts, accompanied by an increase in the northward magnetic field component (Bz), are suggested to be a key ingredient for earthward injection of plasma and magnetic flux. In part of fast earthward jets where the field is directed earthward (Bx $>$ 0), ion velocity distributions consist of two populations, Alfvenic field-aligned beam and cooler ions convected toward the sheet center, supporting that the jets resulted from magnetic reconnection tailward of Cluster. Four-spacecraft timing method and deHoffmann-Teller analysis both show that the entire structure traveled earthward and dawnward. Based on reconstruction of streamlines using a Grad-Shafranov-like equation for flow transverse to a unidirectional field (Hasegawa et al., 2007), it is suggested that a vortex with a diameter of several Re existed near the dawnside edge of each jet front. The results are suggestive of an MHD-scale interchange type instability developed at the front of a two-dimensional (broad) reconnection jet (e.g., Nakamura et al., 2002), although the possibility of multiple bursts of transient and three-dimensional (localized) reconnection cannot be ruled out.

References:

Hasegawa, H., B. U. O. Sonnerup, M. Fujimoto, Y. Saito, and T. Mukai (2007), Recovery of streamlines in the flank low-latitude boundary layer, J. Geophys. Res., 112, A04213, doi:10.1029/2006JA012101.

Hwang, K.-J., M. L. Goldstein, E. Lee, and J. S. Pickett (2011), Cluster observations of multiple dipolarization fronts, J. Geophys. Res., 116, A00I32, doi:10.1029/2010JA015742.

Nakamura, M. S., H. Matsumoto, and M. Fujimoto (2002), Interchange instability at the leading part of reconnection jets, Geophys. Res. Lett., 29(8), 1247, doi:10.1029/2001GL013780.

Keywords: magnetotail, magnetic reconnection, interchange-type instability, Grad-Shafranov equation, jet front