Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM09-24 Room:302 Time:May 28 11:30-11:45

Kink-type oscillations of the magnetotail current sheet with a quasi-continuous magnetic reconnection jet

HASEGAWA, Hiroshi[1*] ; SHINOHARA, Iku[1] ; NAGAI, Tsugunobu[2] ; SAITO, Yoshifumi[1]

[1]Institute of Space and Astronautical Science, JAXA, [2]Tokyo Institute of Technology

We present and analyze quasi-periodic crossings of the magnetotail current sheet observed by the Geotail spacecraft at (-26, 9, 0) Re in GSM on 11 October 2014. The event occurred when the magnetosphere was moderately driven by the solar wind and southward interplanetary magnetic field, i.e., during a period of so-called steady magnetospheric convection. Reconnection jets with an earthward velocity ∼700 km/s, comparable to the lobe Alfven speed, were observed almost continuously in the plasma sheet for an interval 0900-1100 UT. In order to reveal the orientation and structure of the observed current sheet, whose crossings occurred with a period of 2-3 minutes, we applied the Grad-Shafranov reconstruction technique [Hau and Sonnerup, 1999; Hu and Sonnerup, 2002] assuming 2-D structures. The results indicate that kink-type waves were propagating approximately earthward in the plasma sheet, with a wavelength of ∼15 Re and amplitude of order 1 Re. To the best of our knowledge, this is the first identification of sunward-propagating MHD-scale kink-mode waves in the magnetotail. The generation mechanism of the observed oscillations is discussed based on the nature of the reconstructed current sheet structures, ion velocity distributions observed in the current sheet, and results from other single-spacecraft methods such as minimum variance analysis and minimum Faraday residue method [Terasawa et al., 1996; Khrabrov and Sonnerup, 1998].

References:

Hau, L.-N., and B. U. O. Sonnerup (1999), Two-dimensional coherent structures in the magnetopause: Recovery of static equilibria from single-spacecraft data, J. Geophys. Res., 104, 6899-6917.

Hu, Q., and B. U. O. Sonnerup (2002), Reconstruction of magnetic clouds in the solar wind: Orientation and configuration, J. Geophys. Res., 107(A7), 1142, doi:10.1029/2001JA000293.

Khrabrov, A. V., and B. U. O. Sonnerup (1998), Orientation and motion of current layers: Minimization of the Faraday residue, Geophys. Res. Lett., 25, 2372-2376.

Terasawa, T., H. Kawano, I. Shinohara, et al. (1996), On the determination of a moving MHD structure: Minimization of the residue of integrated Faraday's equation, J. Geomagn. Geoelectr., 48, 603-614.

Keywords: magnetic reconnection, magnetotail, current sheet, kink-mode, Grad-Shafranov equation, steady magnetospheric convection