Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

PEM37-17 Room:414 Time:April 30 16:45-17:00

Two-spacecraft reconstruction of a three-dimensional magnetic flux rope at the Earth's magnetopause

HASEGAWA, Hiroshi[1*] ; SONNERUP, Bengt[2] ; ERIKSSON, Stefan[3] ; NAKAMURA, Takuma[4]

[1]Institute of Space and Astronautical Science, JAXA, [2]Dartmouth College, [3]University of Colorado, [4]Los Alamos National Laboratory

We present first results of a data analysis method, developed by Sonnerup and Hasegawa [2011], for reconstructing three-dimensional (3-D), magnetohydrostatic structures from data taken as two closely spaced satellites traverse the structures. The method is applied to a flux transfer event (FTE), which was encountered on 27 June 2007 by at least three (TH-C, TH-D, and TH-E) of the five THEMIS probes and was situated between two oppositely directed reconnection jets near the subsolar magnetopause under a southward interplanetary magnetic field condition. The recovered 3-D field indicates that a magnetic flux rope with a diameter of about 3000 km was embedded in the magnetopause. The FTE flux rope obviously had a significantly 3-D structure, because the 3-D field reconstructed from the data from TH-C and TH-D (separated by 390 km) better predicts magnetic field variations actually measured along the TH-E path than does the 2-D Grad-Shafranov reconstruction [Hau and Sonnerup, 1999] using the data from TH-C (which was closer to TH-E than TH-D and was at about 1000 km from TH-E). Such a 3-D nature suggests that reconnected field lines from the two reconnection sites may have been entangled in a complicated way through their interaction with each other. The generation process of the observed 3-D flux rope is discussed on the basis of the reconstruction results and anisotropy of observed electron pitch-angle distributions.

Reference:
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. Space Physics, 104, 6899-6917.
Sonnerup, B. U. O., and H. Hasegawa (2011), Reconstruction of steady, three-dimensional, magnetohydrostatic field and plasma structures in space: Theory and benchmarking, J. Geophys. Res. Space Physics, 116, A09230, doi:10.1029/2011JA016675.

Keywords: magnetopause, magnetic flux rope, magnetic reconnection, magnetohydrostatic equilibrium, formation-flying observations