Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM027-P05 会場:コンベンションホール 時間:5 月 25 日 10:30-13:00

その場観測から準静的プラズマ構造の時空発展を再現する
Reconstruction of quasi-static plasma structures in spacetime from in-situ measurements

長谷川 洋 [1*], ソネラップ ベングト [2], 中村 琢磨 [1]
Hiroshi Hasegawa[1*], Bengt Sonnerup[2], Takuma Nakamura[1]

[1] 宇宙航空研究開発機構宇宙科学研究所, [2] ダートマス大学
[1]Inst of Space & Astronautical Sci, JAXA, [2]Dartmouth College

Even after the advent of multi-spacecraft missions such as Cluster and THEMIS, it has been difficult to distinguish between spatial and temporal variations from in situ measurements. This is partly because most data analysis methods do not accommodate both features. For example, the original version of Grad-Shafranov (GS) reconstruction (Sonnerup and Guo, 1996; Hau and Sonnerup, 1999), the method for recovering two-dimensional magnetohydrostatic structures from in situ measurements, assumes that the structures are time independent (as seen in a proper frame of reference) over the interval to which the method is applied. However, actual structures may be evolving, even if slowly, during that interval. We present a novel method for reconstructing such slow evolution of quasi-static structures (Hasegawa et al., 2010), which is an extension of the original GS method. The method is tested by use of synthetic data from numerical simulations of time-dependent magnetic reconnection, and the results from application to Cluster observations of a flux transfer event at the dayside magnetopause are presented. We also show that multipoint information allows for the size of the reconstruction domain to be increased, and for proper estimation of the orientation of the invariant axis, along which gradients are assumed to be negligible.

References:
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Hau, L.-N., and B. U. O. Sonnerup (1999), J. Geophys. Res., 104, 6899-6917.
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キーワード: グラッド・シャフラノフ方程式, 磁気圏界面, 電磁流体平衡, 磁気リコネクション, データ解析手法
Keywords: Grad-Shafranov equation, magnetopause, magnetohydrostatic equilibrium, magnetic reconnection, data analysis method