

Shift of the magnetopause reconnection line to the winter hemisphere under southward IMF conditions: Geotail and MMS observations

Shift of the magnetopause reconnection line to the winter hemisphere under southward IMF conditions: Geotail and MMS observations

*北村 成寿¹、長谷川 洋¹、斎藤 義文¹、篠原 育¹、横田 勝一郎¹、長井 嗣信²、Pollock Craig^{3,4}、Giles Barbara³、Moore Thomas³、Torbert Roy⁵、Russell Christopher⁶、Strangeway Robert⁶、Burch James⁷

*Naritoshi Kitamura¹、Hiroshi Hasegawa¹、Yoshifumi Saito¹、Iku Shinohara¹、Shoichiro Yokota¹、Tsugunobu Nagai²、Craig J Pollock^{3,4}、Barbara L Giles³、Thomas E Moore³、Roy B Torbert⁵、Christopher T Russell⁶、Robert J Strangeway⁶、James L Burch⁷

1.宇宙航空研究開発機構 宇宙科学研究所、2.東京工業大学、3.NASA ゴダード宇宙センター、4.Denali Scientific、5.ニューハンプシャー大学、6.カリフォルニア大学ロサンゼルス校、7.サウスウエスト研究所
1.Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 2.Tokyo Institute of Technology, 3.NASA Goddard Space Flight Center, 4.Denali Scientific, 5.University of New Hampshire, 6.University of California, Los Angeles, 7.Southwest Research Institute

Recent global modeling studies and remote observations have indicated that the location of the dayside magnetopause reconnection line under southward interplanetary magnetic field (IMF) conditions tend to shift toward the winter hemisphere from the subsolar point owing to the effect of geomagnetic dipole tilt. We examined this idea using the data obtained by the Geotail and MMS (Magnetospheric Multi Scale mission) spacecraft near the GSM $Z = 0$ plane under southward IMF conditions. Around 0213 UT on 18 November 2015, the MMS spacecraft observed southward reconnection jets at the subsolar magnetopause (GSM $Z = -0.33 R_E$) under southward and dawnward IMF conditions. We estimated the plane of the magnetopause current sheet using the minimum variance analysis of current densities that were derived by the curlmeter technique. The N axis of the LMN coordinates was defined as the normal to this plane. The L axis was defined as the nearest direction in this plane from the maximum variance direction of magnetic fields. Using the ratio between the N and L components of the magnetic field, the reconnection rate was estimated to be 0.03. The distance between the ion edge and the center of the current sheet (weakest magnitude of the magnetic field) was estimated as ~ 540 km, using the N component of the deHoffmann-Teller velocity and the time period between the two. On the basis of the estimated distance and reconnection rate, the reconnection line was $\sim 2.8 R_E$ northward from the MMS. This corresponds to GSM $Z \sim 2.5 R_E$. About 30 minutes later, the Geotail spacecraft also observed southward reconnection jets at the dawnside magnetopause even though Geotail was in the northern hemisphere (GSM $Z = 1.3 R_E$). The effect of IMF B_y was very small around this time, since the MMS spacecraft observed purely southward directed magnetic fields in the magnetosheath. These observations are consistent with the idea that the dayside magnetopause reconnection line shifts toward the winter hemisphere under southward IMF conditions.

キーワード：MMS衛星群、磁気リコネクション、磁気圏界面、Geotail衛星

Keywords: MMS spacecraft, magnetic reconnection, magnetopause, Geotail spacecraft