

PEM005-32

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サブストーム onset は磁気圏・電離圏結合域から始まる Substorm ignition in the M-I coupling region

森岡 昭^{1*}, 三好 由純², 宮下 幸長², 笠羽 康正³, 三澤 浩昭¹, 土屋 史紀¹, 片岡 龍峰⁴, 門倉 昭⁵, 湯元 清文⁶, 向井 利典⁷
Akira Morioka^{1*}, Yoshizumi Miyoshi², Yukinaga Miyashita², Yasumasa Kasaba³, Hiroaki Misawa¹, Fuminori Tsuchiya¹,
Ryuhō Kataoka⁴, Akira Kadokura⁵, Kiyohumi Yumoto⁶, Toshifumi Mukai⁷

¹ 東北大学惑星プラズマ・大気研究センター, ² 名古屋大学太陽地球環境研究所, ³ 東北大学理学研究科地球物理学専攻, ⁴ 東京工業大学理学研究流動機構, ⁵ 国立極地研究所, ⁶ 九州大学宙空環境研究センター, ⁷ 宇宙航空研究開発機構

¹PPARC, Tohoku IUniversity, ²STEL, Nagoya University, ³Graduate School of Science, Tohoku Univ., ⁴IRC, Tokyo Institute of Technology, ⁵National Institute of Polar Research, ⁶SERC, Kyushu University, ⁷JAXA

The sudden formation of parallel electric fields in the magnetosphere-ionosphere (M-I) coupling system is essential to complete substorm onset. From this standpoint, we focus substorm ignition on field-aligned acceleration, by studying the dynamical behavior of auroral kilometric radiation (AKR). Field-aligned auroral acceleration shows distinct two-step evolution at substorm onset: the activation of low-altitude acceleration (h~4000-5000 km) which corresponds to auroral initial brightening, and subsequent abrupt breakout of high-altitude acceleration (h~6000-12000 km) which corresponds to auroral breakup. Cases when only low-altitude acceleration (first step evolution) is activated are pseudo-substorms. This indicates that the second evolution of field-aligned acceleration divides full-substorm from pseudo-substorm. The statistical relationship between the plasma-flow burst in the plasma sheet and its response to the M-I coupling region shows that about 65 % of flow bursts cause pseudo-breakup/initial-brightening and one third of them develops into full-substorm, while the magnitude of flow velocity does not necessarily determine the substorm intensity. This suggests that some plasma flow bursts originate field-aligned current (FAC) which first enhance low-altitude acceleration, and the increasing field-aligned current induces second acceleration above the pre-existing low-altitude acceleration as a consequence of current/current-driven instabilities. In this sense, substorm is finally ignited in the auroral M-I coupling region.

キーワード: サブストーム, オーロラ粒子加速域, 電離圏・磁気圏結合領域

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