

サブストーム回復相の初期における脈動オーロラ微細構造 Fine scale structures of pulsating auroras in early recovery phase of substorm

西山 尚典^{1*}, 坂野井 健¹, 三好 由純², 片岡 龍峰³, 加藤 雄人⁴, 浅村 和史⁵, ドナルド ハンプトン⁶, 岡野 章一¹
NISHIYAMA, Takanori^{1*}, SAKANOI, Takeshi¹, MIYOSHI, Yoshizumi², KATAOKA, Ryuho³, KATOH, Yuto⁴, ASAMURA, Kazushi⁵, Donald Hampton⁶, OKANO, Shoichi¹

¹ 東北大学大学院理学研究科惑星プラズマ・大気研究センター, ² 名古屋大学太陽地球環境研究所, ³ 東京工業大学, ⁴ 東北大学大学院理学研究科地球物理学専攻, ⁵ 宇宙航空開発機構宇宙科学研究本部, ⁶ アラスカ大学フェアバンクス校

¹Planetary Plasma and Atmospheric Research Center, Graduate School of Science, Tohoku University, ²Solar-Terrestrial Environment Laboratory, Nagoya University, ³Tokyo Institute of Technology, ⁴Department of Geophysics, Graduate School of Science, Tohoku University, ⁵Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, ⁶Geophysical Institute, University of Alaska Fairbanks, Fairbanks, Alaska, USA

We have carried out ground-based observations optimized to temporal and spatial characteristics of pulsating auroras (PAs) in micro-meso scale, using an Electron Multiplying Charge Coupled Device (EMCCD) camera with a narrow field of view corresponding to 100km x 100km at altitude of 110 km and high sampling rate up to 100 frames per second. Transient pulsating auroras propagating southward around 1100 UT, in early recovery phase of the substorm, on 4 March 2011 are focused on in this paper. Three independent PAs (PA1-3) with each different periods between 4 and 7s were observed by our EMCCD camera, which means that the periodicity was not bounce motion and strongly depended on local plasma conditions in the magnetosphere, corresponding to 2300 km x 2300 km, or the ionosphere. One more insight is that only PA1 had also a sharp peak of modulations around 1.5 Hz, with a narrow frequency width of 0.30 Hz. In addition, the strong modulations existed as a small spot in the center of PA1, and the spatial distributions of modulations were presented for the first time in this work. We also conducted cross spectrum analysis and obtained coherence and phase maps for auroral variations between 0.1 and 3.0 Hz in order to investigate and quantify the dynamics inside pulsating auroras. The results indicated that low frequency variations from 0.2 to 0.5 Hz inside PA1-3 propagated as a group of flows in the particular directions. The estimated flow velocities were ranged from 80 to 150 km/s at the auroral altitude, corresponding to between 1800 and 3500 km/s at the magnetic equator.

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