

Ground-based and magnetospheric observation of auroral finger-like structures using the RBSP-A satellite in the inner magnetosphere

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Auroral emissions are caused by electron precipitation from the magnetosphere along Earth's magnetic field, and project the magnetospheric plasma dynamics onto the ionosphere. The knowledge of plasma dynamics acquired from investigation of auroral structures is important for future space developments. In our previous research, we reported first conjugate observation event of auroral finger-like structures using the THEMIS GBO cameras and the THEMIS satellites, which was located at radial distance of $\sim 9 R_e$ in the dawnside plasma sheet. The auroral finger-like structures appears in the equatorward side of the auroral oval in diffuse auroral region, and contribute to the auroral fragmentation into patches mainly during substorm recovery phase. In this study, we searched simultaneous observation events of auroral finger-like structures using the RBSP satellites which has an apogee of $5.8 R_e$ in the inner magnetosphere. The best event which we found is that observed at Gillam, Canada, at ~ 0900 UT on 14 Nov. 2014. In this event, the footprints of the RBSP-A satellite passed across the auroral finger-like structures several times according to the field-line mapping using the Tsyganenko-01 magnetic field model. We obtained observational facts from this simultaneous observation event as: 1) both electron and ion OMNI fluxes measured by HOPE increase at ~ 0900 UT as the satellite footprint was getting into the auroral region; 2) electron cyclotron harmonics (Ech) wave activities at ~ 1 kHz measured by EMFSIS enhanced after 0900 UT; 3) electric field in GSM-Y direction measured by EFW decreases during northward development of the finger-like structures; 4) absolute value of magnetic pressure is almost ten times larger than that of ion thermal pressure; 5) variation of magnetic pressure and ion thermal pressure are seen in various time scales, including ~ 5 min which is the time scale of crossing of finger-like structures. In the presentation, we will discuss these observations in the context of magnetospheric instabilities that can cause auroral finger-like structures.

Keywords: auroral finger-like structure, RBSP, inner magnetosphere