Electron flux and field-aligned current associated with Pc5 auroral arc pulsations observed onboard THEMIS and DMSP satellites

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Pc5 poleward moving auroral arc (PMAA) pulsations observed on the ground in the post-midnight sector exhibit east-west-aligned auroral arcs elongated ~ 1000-3000 km and behave poleward moving form with a recurrence period of ~ 2-10 minutes (Pc5 range). They appear just poleward side of common type pulsating auroras. We examined the space-ground coordinated observations with the THEMIS-A, D, and E spacecraft whose footprints were located near the PMAA observed with the all-sky imager on the ground. The latitudinal wave amplitudes and phase structures are consistent with the field-line resonance (FLR) model, while the period of oscillation was longer at the higher latitude side (not a monochromatic wave). The electron flux in the higher energy range of ~ 2–20 keV showed decreasing modulation in conjunction with the FLR oscillations. The intensity of the electric field and the velocity showed a spatial gradient that suggests the existence of a field-aligned current flow around the region of the satellites. The period of FLR oscillations in the magnetosphere was ~ 15–25% longer than that of the auroral pulsations in the ionosphere, and the enhancement of FLR oscillations was ~ 3–4 minutes ahead of the auroral pulsations. These signals imply that the FLR oscillations could not directly enhance the luminosity oscillation but needed some other process that could enhance the luminosity pulsation. We will examine the mechanism of how to produce the field-aligned electric field in association with the PMAA. In this study we focus on the characteristics of the electron flux variations observed onboard the THEMIS and DMSP satellites. The THEMIS satellites were located near the equatorial plane in the magnetosphere, and the DMSP satellites traversed in the ionosphere and crossed over the field of view of all-sky imager at observatories in Canada and Alaska and Syowa Station in Antarctica. It is found that the DMSP satellites observed the precipitating electron flux that behaved the feature of field-aligned acceleration and also observed the field-aligned currents when the DMSP satellite crossed the region of the PMAA.

Keywords: auroral arc pulsation, Pc 5 pulsation, pulsating aurora, field-line resonance, THEMIS spacecraft, DMSP satellite

