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降下電子・電離圏加熱イオンと沿磁力線電流の相関：れいめい観測
Reimei observations on correlation of field-alinged current to precipitating electrons and accelerated ionospheric ions

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High-time and -spatial resolution data obtained by the low-altitude polar-orbiting micro satellite, Reimei, provide us with remarkable opportunities for revealing the characteristics of electrons and auroras based on the perfectly simultaneous and conjunction measurements of auroral emissions and particles.

The Reimei satellite has been making numerous notable observations in the nightside southern polar ionosphere during the winter seasons during 2005-2008. The first case shown in this paper is a comprehensive set of various fine-scale auroral activities, which shows four types of auroral forms and their variations taken by the multispectral auroral imaging camera (MAC): faint bands, streaming multiple arcs, shearing pair of arcs, and vortices/curls. The electron energy spectrum analyzer (ESA) covering a full pitch angle range observed various properties of electron energy-pitch angle distributions and their time variations, each of which is distinctive of the correspondent auroral activity. It is evident that the main energy fluxes responsible for the arc-type emissions are carried by the inverted-V electrons accelerated by (quasi-)electrostatic parallel potential structures above the satellite orbit. On the other hand, the rapidly rotating vortices are associated with the significant fluxes of spiky electron components with energy-time dispersions produced by dispersive Alfven waves. The field-aligned current signatures are also affected by these relations between auroras and precipitating electrons, which are controlled by difference of the upward and downward electron fluxes.

Another case presents unique correlative features between streaming fireball-type auroral globs at the poleward edge of the auroral bands and sharply field-aligned sporadic electron precipitations with clear energy-time dispersions embedded in the inverted-V electrons. The peak energies of the dispersive electron signatures at the start are almost equal to the characteristic energies of the inverted-V components. This correlation obviously designate the fine modification of the auroral forms/emissions in the larger structure driven by the strong dispersive Alfven waves at the similar altitudes with the parallel potential drop.

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