Repeated intensifications of the mesoscale low-energy electron precipitation in the nightside polar cap boundary during substorms: Estimation from 630-nm auroral images

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Satellite observations have reported high fluxes of precipitating suprathermal electrons with energies of less than a few hundred eV near the nightside polar cap boundary. This type of electron precipitation is thought to be caused by the acceleration associated with dispersive Alfvén waves, producing strong 630-nm auroral emissions. Previous studies using satellite data have revealed the energy distribution and spatial characteristics of the low-energy electron precipitation. However, the temporal variations of the low-energy electron precipitation remain unclear because based on direct satellite observations, it is difficult to distinguish between temporal and spatial variations. To understand the characteristics of the temporal variation of the low-energy electron precipitation, we have developed a methodology for deriving the two-dimensional distribution of the differential energy flux of low-energy electron precipitation from the 630-nm auroral images taken with a ground-based all-sky imager. When this method was applied to the auroral images obtained near midnight during several substorms, it was found that mesoscale intensifications of the low-energy differential energy flux (lasting tens of seconds) occur repeatedly in the polar cap boundary near midnight.

Keywords: Aurora, polar cap boundary, electron precipitation, substorm

