Spatial Distribution of Particle Precipitation in Terms of Energy Channels under Different Geomagnetic Conditions

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The geomagnetic activity can modulate the number and energy fluxes of precipitation and their spatial distributions. Most previous studies examined precipitation in terms of energy spectrum types associated with quasi-static potential structures (QSPS) acceleration, Alfvénic acceleration, and wave scattering under various geomagnetic conditions. In this study, we instead categorize precipitation according to energy channels of particles. The spatial distribution of the precipitation for various energy channels is also derived under different geomagnetic conditions. Our results indicate that regardless of active and quiet times, low-energy (high-energy) precipitation is mostly distributed on the dayside (nightside). By comparing with past results, we infer that electron precipitation is mainly caused by QSPS and Alfvénic acceleration for most cases; however, the high-energy electrons during quiet times are predominantly created by wave scattering. For high-energy precipitation, the dawn-dusk asymmetry of the spatial distribution during active times is found to be opposite of that during quiet times. Based on their spatial distributions, we suggest that the high-energy precipitation during quiet times is dominated by the curvature and gradient drifts, while that during active times is mainly affected by physical processes related to substorms in the magnetotail.