

Poleward expansion of high-altitude acceleration region at substorm

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It is well established, since the first phenomenological study of auroral substorm by Akasofu [1964], that auroral bulge expands poleward after breakup. Fujii et al. [1994] showed that the poleward edge of the auroral bulge is characterized by dense upward FAC and intense electron precipitation. On the other hand, the behavior of field-aligned acceleration during the bulge development has not been well understood. In this paper we examine the evolution of field-aligned acceleration during the substorm expansion phase invoking spatial development of high latitude Pi pulsations.

Figure shows that the start time of the negative excursion of DC-ULF at GILL (blue arrow) corresponds to that of the low-altitude AKR enhancement (vertical blue line), and the commencement of large amplitude Pi 2 (yellow arrow) corresponds to that of the high-altitude AKR breakout (vertical yellow line). This means that GILL station was almost the foot print of the magnetospheric substorm onset. Wave forms of Pi 2 at higher latitudes indicated the poleward motion of bulge front, and high-altitude AKR (manifestation of high- altitude acceleration) was active during the poleward motion of the bulge front. This indicates an important consequence that the bulge front accompanied the high-altitude acceleration throughout the poleward expansion, resulting in the continuous emanation of active high- altitude AKR.

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