

磁気圏電場による磁気嵐時の赤道磁場準周期変動

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Equatorial quasi-periodic geomagnetic fluctuations caused by magnetospheric electric fields during geomagnetic storms

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At the beginning of the geomagnetic storm on December 14, 2006, DP2 magnetic fluctuations with a period of 30 min occurred at the dayside geomagnetic equator in close correlation with fluctuations in the IMF Bz component. By subtracting the quiet time diurnal variation, we found that the DP2 fluctuations were caused by eastward and westward equatorial electrojets (e-EJ and w-EJ) in correspondence to the southward and northward IMF, respectively. This observational fact suggests that the overshielding electric field became dominant when the convection electric field decreased every 30 min. To evaluate this hypothesis, we examined the SuperDARN convection map, and calculated electric potentials of the Region-1 and Region-2 field-aligned currents using the CRCM (Comprehensive Ring Current Model). It is found that the e-EJ corresponded to the large scale two-cell convection, while the w-EJ occurred for a period of distorted two-cell or three-cell convection pattern. The results of the CRCM indicate that the electric potential of the R1 FACs dominated for the period of the e-EJ, but the electric potential of the R2 FACs dominated for the period of the w-EJ. The drastic change in the convection pattern from the two-cell to the distorted pattern may have decreased the penetrated convection electric field at low latitude, and therefore, the shielding electric field due to the R2 FACs became dominant as inferred from the results of the CRCM. Consequently, the low latitude ionosphere is under a strong influence of the overshielding electric field even for the short-term fluctuations of period of 30 min.