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Equatorial DP2/CEJ During the Main/Recovery Phases of Geomagnetic Storms

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The convection electric field penetrates deep into the low latitude ionosphere, causing DP2 currents in the dayside equatorial ionosphere as well as in high latitudes. We show that the DP2 currents cause an enhancement of the geomagnetic storm at the dayside equator. The penetrated electric field also drives motion of the ionospheric plasma, which results in an anomalous enhancement of the total electron content at low latitude as reported by several authors. The electric field further propagates into the inner magnetosphere possibly from the ionosphere, and causes development of the ring current during a geomagnetic storm. Thus, the penetrated electric field plays a crucial role in the development of geomagnetic disturbances and ionospheric plasma motion in the low latitude and in the inner magnetosphere. The convection electric field is often canceled at low latitudes by the shielding electric field, and a reversed electric field is observed as a counter-electrojet at the equator, when the convection electric field is reduced abruptly due to the northward turning of the IMF. The counter-electrojet seems to have initiated the recovery phase of the storm. The CEJ together with the enhanced DP2 causes an amplification of the geomagnetic storm at the equator. In this talk we show some examples of the enhanced DP2 and CEJ at the dayside geomagnetic equator during the geomagnetic storm, which are caused by the southward and northward turning of the IMF, respectively. We find that the penetrated electric field remains reversed during the recovery phase of the storm, even when the IMF is southward. Finally we emphasize a role of the Region-1 and Region-2 field-aligned currents in determining the electric field at low latitude during the main and recovery phases of the storm.