

The equivalent ionospheric currents associated with DP 2 fluctuations at middle and low latitudes

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In May 1996, two types of DP 2 fluctuations were observed at the Circum-pan Pacific Magnetometer Network (CPMN) stations. One correlates with changes of the IMF-Bz component, and the other correlates with variations of the Solar Wind Dynamic Pressure (SW Pd). For each type, the equivalent current system is obtained by using the ground magnetometer data from the CPMN and WDC stations.

The equivalent current systems show almost the same current pattern in both cases of DP 2. At high latitudes, current vortices appear in the morning and afternoon sectors. On the other hand, a zonal ionospheric current is dominant at middle and low latitudes.

We can interpret the above results as follows:

- (1) At high latitudes, the twin vortices are caused by the dawn-dusk electric field imposed on the polar ionosphere.
- (2) In the case of the DP 2 associated with the SW Pd, the zonal ionospheric current at middle and low latitudes may be caused by the Chapman-Ferraro current variation. As is consistent with this interpretation, the GOES9, which was located near 16LT, detected the same fluctuations as that on the ground.
- (3) In the case of the DP 2 associated with the IMF-Bz, the zonal ionospheric current at middle and low latitude cannot be interpreted by the penetration of polar ionospheric electric fields. The ionospheric current in the nighttime and daytime sectors should be westward and eastward, respectively, if the polar dawn-dusk electric fields drive an ionospheric current at low latitudes. The expected, magnetic variations are not consistent with these observed at YAP(day) and BLM(night), showing in-phase relationship.

These indicate that new mechanisms for the two-type DP 2 magnetic variations are needed in consideration of different sources in the solar wind.