

Concurrent observations of upper thermospheric neutral wind and plasma convection at high latitudes of both hemispheres

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Recent observations have shown that the ionospheric/thermospheric response to solar wind and IMF dependent processes in the magnetosphere can be very dissimilar in the Northern and Southern Hemisphere. In this paper we present statistical studies of both the high-latitude ionospheric convection and the upper thermospheric circulation patterns obtained from almost a decade of measurements starting in 2001 of the electron drift instrument (EDI) on board the Cluster satellites and an accelerometer on board the CHAMP spacecraft, respectively.

The spatially distributed Cluster/EDI plasma drift measurements were mapped to a common reference level at F-region height (~400 km) in a magnetic latitude/MLT grid by use of the Tsyganenko geomagnetic field model [1,2]. The CHAMP cross-track accelerometers measurements have been successfully analysed to derive the neutral thermospheric wind component nearly perpendicular to the flight direction at about the same height [3,4]. We obtained both regular upper thermospheric wind vorticity [5] and ionospheric plasma drift pattern [1,2] according to the various IMF conditions in a statistical average sense. The same procedure of data binning and of sorting for specified IMF directions has been used for both quantities.

The results show some prominent asymmetries between the two hemispheres, which are likely due to the different geographic-geomagnetic offset, or even due to different patterns of geomagnetic flux densities. Plasma drift differences can partly be attributed to differing ionospheric conductivities. The results also show that magnetospheric convection is not simply the result of processes in the magnetospheric boundaries and magnetotail, but that it is modified and partly controlled by ionospheric/thermospheric effects.

References

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