R005-24
Zoom meeting C ：11/1 PM2 (15:45-18:15)
17:15〜17:30

Dependence of the occurrence of storm-time plasma bubbles extending to the mid-latitudes on solar wind dynamic pressure

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We performed a superposed epoch analysis of solar wind, interplanetary magnetic field,

geomagnetic index, and the rate of total electron content (TEC) index (ROTI) derived from global navigation satellite system (GNSS)-TEC data during geomagnetic storms from 2000 to 2018 (616 events) in order to clarify the dependence of latitudinal extension of plasma bubbles on solar wind dynamic pressure and interplanetary electric field. In this analysis, we defined the time of the SYM-H minimum as the zero epoch time. The 616 events were classified according to whether the integrated value of the dawn-dusk (Ey) component of interplanetary electric field (IEF) for 12 hours before the zero epoch time exceeded 1000 mV/m・min (high IEF Ey: 308 events) or not (low IEF Ey: 308 events). As a result, it is found that the ROTI enhancement in the dusk sector extended to more than 30^o in geomagnetic latitude (GMLAT) for the high IEF Ey subset during the main phase of geomagnetic storms. On the other hand, the ROTI enhancement in the dusk sector for the low IEF Ey subset extended to only 20-25^o in GMLAT during the main phase of geomagnetic storms. This result suggests that the ROTI enhancement associated with plasma bubbles can extend to higher latitudes for high IEF Ey subset than for low IEF Ey, indicating that penetration electric field during geomagnetic storms in the equatorial region increases with IEF Ey.

Furthermore, the 308 events showing the integrated IEF Ey value of more than 1000 mV/m・min (high IEF Ey) were also classified according to whether the integrated value of solar wind dynamic pressure for 12 hours before the zero epoch time exceeded 2350 nPa・min (high pressure: 154 events) or not (low pressure: 154 events). The ROTI enhancement in the dusk sector extended more than 30^o in GMLAT for the high pressure subset during the main phase of geomagnetic storms while that for the low pressure subset extended up to only 25^o in GMLAT. The time-integrated values of IEF Ey for 12 hours before the zero epoch time were 1777 mV/m・min for the high pressure and 1722 mV/m・min for the low pressure. This observational fact implies that the ROTI enhancement associated with plasma bubbles can extend to higher latitudes for high pressure subset than for low pressure although the time-integrated values of IEF Ey for two subsets were comparable. It is suggested that the intensity of penetration electric field during geomagnetic storms can be stronger as the solar wind dynamic pressure becomes large. Therefore, not only IEF Ey but also solar wind dynamic pressure play an important role in the plasma bubble extension to middle latitudes.