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低軌道衛星 GPS 受信機と地上 GPS 受信機網の TEC データで観測された SED の高度構造
The Altitudinal Structure of Storm Enhanced Density observed by Space-borne and Ground-based GPS Receivers

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The altitudinal structure of Storm Enhanced Density(SED) was studied using TEC data of the GPS reveiver on GRACE satellite and the ground-based GPS receivers. SED is the high plasma density phenomenon which extend toward north-west direction from the equatorial ionization anomaly during geomagnetic disturbed times. The westward ExB plasma drift, which is driven by the poleward electric field in the sub-auroral region during the geomagnetic storm, causes the extended structure toward the west direction.

It is still not clear that the physical process of the transport the plasma from low-latitudes to high-latitudes. This carrying process could be attributed to the upward and polarward ExB drift, which derived from the eastward electric field in low-latitude, and the diffusion along the geomagnetic line. The resultant velocity of two vectors, the ExB drift velocity and the diffusion velocisty, would decide the extension of SED from low-latitude to high-latitude. When the ExB drift effect is stronger than the diffusion effect, the plasma of SED is lifted up by the ExB drift, after that the lifted plasma diffuses along the geomagnetic line at the altitude where the ExB drift velocity is zero. To clarify the physical process of the carrying out the plasma from low-latitude to high-latitude, we focus on the altitudinal distribution of the density strucutre of SED. GRACE-TEC data is the TEC data, which was derived from the GPS receiver on GRACE satellite, between GRACE satellite altitude and GPS satellite altitude.Two events of SED were observed simultaneously by MIT-TEC, which is the ground-TEC data on North-America continent, and GRACE-TEC during May in 2003. The amplitude of TEC enhancement was compared between GRACE-TEC and MIT-TEC.

In the first case, SED was observed in three orbital path of GRACE satellite around 15LT on 21 May. The TEC enhacement of 20 TEC unit, which derived from SED, was observed in MIT-TEC in the first orbital path around 21UT. the TEC enhancement of 13 TEC unit was observed in GRACE-TEC at the same time and at the same location. In the second case, SED was observed in two orbital path of GRACE satellite around 15LT on 29 May. The TEC enhancement of 30 TEC unit was observed in MIT-TEC in the first orbital path around 21UT. Similar results were obtained by the comparison using the other orbital path. These results indicates that more than 30 percent of TEC enhancement was occurred above GRACE satellite. We will compare the amplitude of TEC enhancement using GRACE-TEC and MIT-TEC in 2003 so that the averaged altitudinal structure of SED would be obtained at the every latitude. The balance between the upward and poleward ExB drift velocity, which was derived from the eastward electric field, and the downward diffusion velocity along the geomagnetic line would decide the altitudinal structure of SED.

キーワード: GPS 受信機網, TEC データ, 電離圏, SED
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