R005-28
Zoom meeting C ：11/2 AM1 (9:00-10:30)
9:15〜9:30

20 年間の GNSS-TEC データに見られる CIR/CME 駆動型磁気嵐時の大規模電離圏擾乱の統計的振る舞い

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Statistical behavior of large-scale ionospheric disturbances during CIR/CME-driven storms as seen in 20-year GNSS-TEC data

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To investigate the differences of statistical behavior of global electron density in the ionosphere during geomagnetic storms driven by different solar wind structures of corotating interaction region (CIR) and coronal mass ejection (CME), we conducted a super epoch analysis of interplanetary magnetic field (IMF), solar wind, geomagnetic indices (AE and SYM-H), and global navigation satellite system (GNSS) - total electron content (TEC) data for 20 years (2000-2019). In this study, we analyzed the ratio of the TEC difference (rTEC) for 663 geomagnetic storms with the minimum SYM-H value of less than -40 nT. The rTEC is defined as a difference between the storm-time TEC and averaged quiet-day TEC normalized by the quiet-day one. Further, we identified 318 and 345 geomagnetic storms driven by CIR and CME, respectively. As a result, the characteristics of global rTEC variations did not show a significant difference between CIR-driven storms and CME-driven storms, but the magnitude of the rTEC variations and their duration time were different. Specifically, the rTEC enhancement related to the mid-latitude storm-enhanced density (SED) base and plume was much smaller for CIR-driven storms than that for CME-driven storms. The amplitude of the rTEC depletion at mid-latitudes and high latitudes also was larger for CME-driven storms. The main reason is that the large amount of electromagnetic energy inputs to the high-latitude ionosphere during CME-driven storms because the magnitude of the Bz component of the IMF and SYM-H index is larger for CME-driven storms than for CIR-driven storms. On the other hand, the duration time of the rTEC enhancements in the nighttime auroral zone and equatorial region was much longer for CIR-driven storms than for CME-driven storms. The mid-latitude trough also continued to appear equatorward of auroral oval for a long time for CIR-driven storms. However, the duration time of the rTEC enhancements related to the SED base and plume in the daytime mid-latitude ionosphere was shorter for CIR-driven storms than for CME-driven storms. The main reason is that high-speed stream with the Alfvenic oscillation of the Bz component of the IMF after the passage of CIR persists for several days and electromagnetic energy continues to input to the magnetosphere and ionosphere, which causes the consecutive occurrence of substorms during the recovery phase of CME-driven storms. This implies that the condition of negative storms persists for a long time and it takes longer time to recover the pre-storm condition for CME-driven storm events.