Ionospheric electron density variations in association with geomagnetic storms deduced from EISCAT observations

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Energetic electron precipitations from the magnetosphere significantly affect the ionospheric density profiles during geomagnetically active periods. We have statistically investigated how the occurrence of geomagnetic storms modifies the ionospheric electron density profile using the data from the European Incoherent Scatter (EISCAT) UHF/VHF radars in Tormsoe, Norway, obtained from 2001 to 2015. We first performed a superposed epoch analysis of the effect of geomagnetic storms driven by corotating interaction regions (CIRs) on the ionospheric electron density in several altitude ranges, and the ionospheric electron density as a function of the epoch time and magnetic local time (MLT) in each altitude range was derived. The initial investigation reveals that the enhanced ionospheric electron density below 100 km after the CIR-storm onset is predominantly observed on the dawn to dayside. It is also found that the ionospheric electron density above 120 km is mainly enhanced on the night side after the storm onset. This MLT dependence suggests that higher energy electrons (more than 10 keV) tend to preferentially precipitate on the dawn and dayside. It is consistent with the fact that diffuse and pulsating auroras, which often accompanied by high energy electron precipitations, are frequently observed on that MLT range. We will investigate the response of the ionospheric electron density to geomagnetic storms driven by Coronal Mass Ejections (CME), to discuss the effects of storms driven by different solar wind drivers on the ionospheric electron density profiles.