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Session 3B Paper 2
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Ionosphere/plasmasphere response to the 22-23 June 2015 geomagnetic storm: comparison of observations and SAMI3/RCM model results

A giant coronal mass ejection arrived at Earth on 22 June 2015 and caused a major geomagnetic storm. The storm lasted for over 24 hours and became the second largest storm in the current 24th solar cycle (minimum SYM/H excursion of -207 nT). One of the main features of this storm is multiple polarity changes of the IMF Bz during the main phase, which led to penetration of enhanced magnetospheric electric fields to the ionosphere and to extreme intensification of the equatorial electrojet current.

In this work, we study ionospheric and plasmaspheric response to the 22-23 June 2015 geomagnetic storm. For this purpose, we analyze vertical total electron content (VTEC) data from ground-based GNSS-receivers along with the VTEC and the in-situ electron density data from the constellation of the three Swarm satellites. Our observations show that the storm provoked significant effects in the ionosphere on both day and night-sides. The largest storm-time changes were observed in the night-time low-latitude topside ionosphere caused by the prompt penetration electric field (PPEF). We compare our ground-based and satellite observations with simulations by the coupled SAMI3/RCM model of the global ionosphere and inner magnetosphere, with self-consistent electrodynamics. We find good agreement between the data and the model for the first phase of the storm, when the PPEF was the principal driver. At the end of the storm main phase, when the ionospheric effects where driven by a combination of the PPEF and the disturbance dynamo, the modeling results agreed less with the observations. We also discuss the impact of the storm on the plasmasphere.