Ionospheric storms in GAIA under lower atmospheric and magnetospheric inputs

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Upper atmosphere shows variations reflecting complex interactions under inputs from lower and upper regions. These interactions have been an important target of the upper atmosphere physics and space weather purpose. GAIA, Ground-to-Topside Model of Atmosphere and Ionosphere for Aeronomy, is the whole atmosphere model including interaction with ionized plasma under solar EUV variation and a various waves input using a meteorological reanalysis data. We input magnetospheric variation into GAIA via electric field deposition at polar region and auroral electron precipitation using empirical models. We input polar electric potential map based on Weimer model driven by solar wind and interplanetary magnetic field with saturation effect of cross-polar-cap potential for large potential case. Variable auroral precipitation driven by Kp index is considered. Enhancement of total electron content (TEC) up to mid-to-low latitude during the magnetospheric storm event is produced due to the consideration of penetration electric field.
Ionospheric storms, i.e., significant variations of ionospheric plasma, are detected using a scale called “I-scale”, which represents the relative levels of the ionospheric plasma deviations from their 27-day median among their statistical distribution over long-time. As a result, GAIA simulation over January 2019—March 2020 showed increased detection ability of ionospheric storms compared to the high latitude constant case.
We will discuss the effect of high latitude setting on the penetration of electric field and plasma distributions in this presentation.

Keywords: ionospheric storm, GAIA, simulation

