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Global plasma distribution during a moderate magnetic storm using a model GAIA under atmospheric and magnetospheric inputs

Chihiro Tao *(1), Hidekatsu Jin(1), Atsuki Shinbori(2),
Hiroyuki Shinagawa(3), Yasunobu Miyoshi(3), and Hitoshi Fujiwara(4)
(1) National Institute of Information and Communications Technology, Tokyo, Japan
e-mail: chihiro.tao@nict.go.jp
(2) Nagoya University, Aichi, Japan (3) Kyushu University, Fukuoka, Japan (4) Seikei University, Tokyo, Japan

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.

We are developing the model GAIA (Ground-to-Topside Model of Atmosphere and Ionosphere for Aeronomy) to include the magnetospheric variation via electric field deposition and auroral electron precipitation at the polar region and penetration of the electric field toward mid-to-low latitude. Model results applying to a moderate geomagnetic storm event with minimum SYM-H of -75 nT occurred on September 27-28, 2017 showed plasma density variation at the mid-to-low latitude due to penetrating electric field and that at equatorial region comparable with observations. GAIA simulation suggests two broad plasma enhancements in the south hemisphere in addition to two enhancements detected by GNSS observations in the north hemisphere, corresponding to frequent enhancements of auroral current. These plasma enhancements are associated with equatorward neutral wind and followed by equatorward expansions of low O/N_2 region. In addition, the electron density depletion structure appears in the morning polar region at the maximum development of the geomagnetic storm. We will discuss the generation mechanism and development of the depletion structure in this presentation.