Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM005-26 Room:303 Time:May 27 11:50-12:05

A study of ionospheric storms using an atmosphere-ionosphere coupled model (GAIA)

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The ionosphere is controlled by the solar EUV and X-rays, and energy influx from the solar wind and the magnetosphere. In addition to the energy inputs from space, recent observations suggest that atmospheric waves from the lower atmosphere significantly affect the ionosphere. During magnetic storms, ionospheric disturbances are generated by electromagnetic energy and particle precipitation from the magnetosphere. Even if the same magnetospheric input is given to the ionosphere, the response of the ionosphere depends on ionospheric and thermospheric conditions. In the mid-latitude region, thermospheric winds driven by energy inputs from the magnetosphere might interact with atmospheric waves propagated from the lower atmosphere. Penetration electric fields from the polar region and dynamo electric fields generated by thermospheric winds might also overlap. In order to self-consistently includes the effects of the magnetosphere as well as the lower atmosphere on the ionosphere, we developed an atmosphere-ionosphere coupled model ”GAIA” (Ground-to-topside model of Atmosphere and Ionosphere for Aeronomy), which includes the whole atmosphere and ionospheric dynamo processes. We will present simulation results of ionospheric storms using GAIA.

Keywords: ionosphere, thermosphere, atmosphere, disturbance, model, simulation