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

PEM030-P20 Room:Convention Hall Time:May 26 10:30-13:00

Development of a 2-D ionospheric global potential solver: GEMSIS-POT

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As part of the GEMSIS project, we have developed a two-dimensional ionospheric global potential solver. There has been considerable research on the mid-and low-latitude ionospheric system driven by neutral wind [e.g., Richmond, 1973]. However, there are few researches on the relationship between the high-latitude system and mid-and low-latitude system, which is important for the integrated studies of the magnetosphere-inner magnetosphere system coupled through the ionosphere.

Our model basically follows a methodology provided by Tsunomura [1999]; it solves the Ohm's law under the thin-shell approximated 2-D ionosphere, with FACs in the polar region and height-integrated ionospheric conductivities. The most important extension from previous studies is that our model covers both hemispheres without a boundary at the equator. The values of Pedersen and Hall conductivities are calculated as exactly as possible with the MSIS-2000, IRI-2007, and IGRF-2005 reference models. In addition, we consider the effect of auroral particle precipitation on conductivities with the Hardy model.

In this talk, we report the progress of our model toward the practical studies of Magnetosphere-Ionosphere coupling system during storms and substorms. We will discuss the effect of the equatorial conductivity on the pole-to-pole distribution of the electric potential.