Simulation of traveling and damping LSTIDs using a high-resolution thermosphere-ionosphere model

Kazutoshi Iwamasa[1]; Hiroyuki Shinagawa[2]; Takuya Tsugawa[3]

[1] STE, Nagoya Univ; [2] STEL, Nagoya Univ.; [3] Dept. of Geophysics, Kyoto Univ.

Large-scale traveling ionospheric disturbances (LSTIDs) have been studied by many authors, and it is recognized that they are atmospheric gravity waves (AGWs) caused by energy input at polar regions associated with geomagnetic storms. However, mechanisms of generation, propagation, and damping of LSTIDs have not been fully understood.

Based on GPS observations, Tsugawa et al. [2003] suggested that damping of LSTIDs is caused mainly by the ion-neutral drag effect. On the other hand, molecular viscosity, thermal conductivity, and other processes may also contribute to the dumping of LSTIDs.

In order to study the dynamics of the thermosphere-ionosphere, we have developed a high-resolution thermosphere-ionosphere model. This model is two-dimensional (altitude-latitude), and solves non-hydrostatic equations for the neutral atmosphere [Shinagawa et al., 2003]. In the ionospheric model, the dipole magnetic field is assumed, and ions move along magnetic field lines.

In this paper, we will discuss the behavior of LSTIDs obtained by our simulation model. The result is compared with the GPS observations, and dumping mechanisms of the LSTIDs are discussed.