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Temporal variation of electron density in the vicinity of the ionospheric trough

ISHIDA, Tetsuro[1*] ; OGAWA, Yasunobu[2] ; KADOKURA, Akira[2] ; HOSOKAWA, Keisuke[3] ; OTSUKA, Yuichi[4]

[1]The Graduate University for Advanced Studies, [2]National Institute of Polar Research, [3]The University of Electro-Communications, [4]Nagoya University

The purpose of this study is to examine temporal variation of electron density in the vicinity of the ionospheric trough, and to understand its physical mechanisms on different geomagnetic activities.

Basu et al. [2008] showed that Subauroal Polarization Stream (SAPS) enhances in the south of the trough during storm main phase. At the same time, GPS-TEC map showed that the trough also extends longitudinally throughout the Northern American continent. In addition, they pointed out that the plasma density irregularities in the trough/SAPS region impact the GPS-based navigation systems.

So far, it remains unclear how the trough and such irregularities develop in a shorter time scale and what determines their spatial structure because adequate observation with sufficient temporal resolution has not been operated. Therefore, we had conducted EISCAT SP experiment (high speed meridional scans which take only 60-80 seconds to scan elevation angles from 25 to 89 degrees) in duskside-nightside (1630-2030 MLT) on Oct. 2013 - Dec. 2013, and obtained totally 9 events including 7 quiet-moderate events and 2 disturbed events.

We have been investigating on the following topics: (1) the difference of temporal variation of electron density between inside and outside the trough, (2) the characteristic of temporal variation of electron density in the vicinity of the trough. We have obtained the following results so far.

1. The quasi-periodic variations in electron density, on the time scale of 5-40 minutes, have been found outside the trough, which varies with time and altitude. Oh the other hand, such structures less occurs within the trough. This tendency is independent on geomagnetic activity.

2. The quasi-periodic variations in electron density, on the time scale of 5-10 minutes, have been found within the trough boundary, which is nearly consistent toward altitude in magnetically quiet-moderate condition. However, this cyclic pattern is inconsistent toward altitude in magnetically disturbed condition.

Keywords: ionosphere, trough