

Statistical analysis of Medium-Scale Traveling Ionospheric Disturbances using a GPS network at high-latitudes

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In our previous study, using global positioning system (GPS) data taken from more than 100 GPS receivers in Alaska in 2012, we investigated two-dimensional maps of total electron content (TEC) perturbations with a time resolution of 30s and a spatial resolution of $0.15^\circ \times 0.15^\circ$ in longitude and latitude to examine statistical characteristics of Medium-Scale Traveling Ionospheric Disturbances (MSTIDs) for the first time. From the statistical analysis of the TEC maps obtained in 2012, we have revealed some of the characteristics of MSTIDs in Alaska. MSTIDs over Alaska frequently occur in winter from 8 to 20 LT. Maximum occurrence rate of the MSTIDs in monthly and hourly bins exceeds 50%. Propagation direction of MSTIDs is dominantly southward or southeastward from 8 to 14 LT and southwestward from 14 to 20 LT.

In this study, we focus on the statistical result of propagation direction. Southward or southeastward propagating MSTIDs is consistent with that of MSTIDs at mid-latitudes and could be caused by atmospheric gravity waves (AGW) in the thermosphere. The southwestward propagating MSTIDs have been observed with all-sky airglow imager in Alaska, and are considered to be attributed to AGW generated by auroral activity. The present study shows that the southwestward propagating MSTIDs appear before sunset when the airglow observations can be carried out.

In this presentation, we show that statistical characteristics of parameters of MSTIDs, such as period, horizontal wave length, and propagation velocity, and discuss possibility of TEC perturbation caused by AGW propagation excited by auroral activity. Also, we investigate propagation direction of MSTIDs more detail using GPS data taken from GPS receiver networks in northern Europe in 2008 and discuss whether southwestward propagating MSTID is common phenomenon at high-latitudes.

Keywords: Medium-Scale Traveling Ionospheric Disturbances, GPS, auroral activity