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Study of mid-latitude ionosphere convection during super quiet period with the SuperDARN Hokkaido radar

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Characteristics of the ionospheric convection in the mid-latitude and subauroral regions have been studied by various kinds of observation instrument and computer experiments in the last few decades. A presence of westward flow around midnight at mid-latitude has been extensively discussed. This kind of flow can be generated by so-called disturbance dynamo mechanisms working at mid-latitudes (Blanc et al., JGR, 1980). We tested the disturbance dynamo theory by using ionospheric echo data obtained by the SuperDARN Hokkaido radar for 4 years. The SuperDARN Hokkaido radar has been measuring line-of-sight velocities of ionospheric irregularities, which can be regarded as line-of-sight velocities of ionospheric convection. The radar can monitor ionospheric convection at mid-latitude (geomagnetic latitude: 40 to 60 degrees), which could not be monitored by using preexisting SuperDARN radars. In the previous study we found the presence of westward flows around midnight at about 40 to 55 degrees geomagnetic latitude, which intensified with increasing geomagnetic activity. On the other hand, Gonzales et al. (1978, JGR) showed that the ionospheric convection flow just before midnight becomes eastward when the geomagnetic activity level is very quiet (1-day sum of Kp index less than or equal to 14) using the Millstone Hill radar data. This tendency was not found from our previous study using SuperDARN Hokkaido radar.

Kumar et al. (2010, JGR) reported using the data from Digisonde drift measurements made at Bundoora (145.1 degrees E, 37.7 degrees S geographic, 49 degrees S magnetic), Australia, that the effects of major storms (minimum Dst $<$ -60nT) in the nighttime mid-latitude ionosphere were observed to last up to 50 hrs after storm onset. In order to understand the effects of the disturbance dynamo on the mid-latitude nighttime ionosphere, we reanalyzed the SuperDARN Hokkaido radar data using only the data under very quiet geomagnetic condition for preceding 48 hours. However, the tendency reported by Gonzalez et al. (1978) was not found even when geomagnetism index Kp was less than or equal to 0+ and the influence from previous geomagnetic storms has been removed. More detailed analysis result will be presented.

We are studding the of the character of mid-latitude ionosphere convection observed by radar that influenced by the Dst index defined storm, using Superposed Epoch Anaysis (SEA). A more detailed analytical result is scheduled to be reported in the lecture.

Keywords: SuperDARN, SuperDARN Hokkaido radar, mid-latitude ionosphere, disturbance dynamo, westward flow, Geomagnetic kp Indices