Localtime Dependence of Pc5 during Relativistic Electron Flux Enhancement during CIR magnetic storms

Kentarou Kitamura[1]; Satoko Saita[2]; Yoshimasa Tanaka[3]; Akira Kadokura[3]; Hisao Yamagishi[4]
[1] Tokuyama CT.; [2] ROIS; [3] NIPR; [4] National Inst. Polar Res.

In this study, we analyzed the magnetic data observed at the high-latitude magnetic stations in Antarctica, H057 (-66.42, L=6.25), and Skallen (-66.42) to compare with the >2Mev electron flux observed by GOES 10 satellite. The pair of stations is located at the same latitude and within 1.7 degrees in longitude, which are quite suitable to estimate the azimuthal wave number.

We statistically analyzed the wave characteristics of the Pc5 pulsations by the superposed epoch (SPE) analysis for 14 magnetic storm events caused by the CIR (Corotating Interaction Region). In the present SPE analysis, the epoch time is defined as days from the passage of the stream interface (SI) of the CIR. The period from 0 to 1day corresponds to the main phase of the moderate magnetic storm. The Pc5 power suddenly increases at 3-6 MLT sector during 0-1 day which is much stronger than that at dusk sectors. During 1-2 days, which is correspond to the recovery phase of the storms, the Pc5 power at the afternoon sectors (12-21 MLT) increases with the peak frequency of 2.5-3 mHz, whereas the Pc5 power at the morning sector does not become stronger.

On the other hand, the phase delay between the Pc5s at H057 and SKAL also shows the local time dependence especially during the epoch time of 1-2 day. At the noon and afternoon sectors, the Pc5 shows the eastward propagation and the phase lags between H057 and SKAL are less than 5 seconds. In contrast, at the morning sector, the Pc5 shows westward propagation with small azimuthal wave numbers.

These features indicate that the sources and generation mechanisms of Pc5 in the two periods (0-1 day and 1-2 day) are quite different. The premiere intensification of the Pc5 during the main phase of the moderate magnetic storm can thought to be the forced oscillation caused by the strong disturbance of the solarwind dynamic pressure. In this case, the local time dependence of the phase structure does not show the obvious regularities. In the latter intensification of the Pc5 during the recovery phase of the storm (1-2 days), the westward (eastward) propagation at the morning (afternoon) sector and localtime distribution of the Pc5 power could well correspond with the previous perception which could explain the Pc5 pulsations caused by the KH instability on the magnetopause.

As a result, the present study suggests that the relativistic electron flux enhancement (REE) through the drift bounce resonance by the Pc5 might occur effectively at the afternoon sectors. The source of the Pc5 which contribute the REE might be related with the KH instability caused by the high speed solarwind rather than the compressional Pc5 caused by the dynamic pressure disturbance of the solarwind.