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Relationship between Phase Difference of the Ground Pc5 and Enhancement of Relativistic Electron Flux at the GEO

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Pc 5 pulsations observed at the ground stations are analyzed to investigate the relationship with enhancement of the relativistic ($>MeV$) electron flux (REF) at the geosynchronous orbit. It is frequently reported in the previous studies that the REF increases during the recovery phase of the magnetic storms. The enhancement of REF sometimes causes the serious troubles of the electric circuit onboard the satellites due to the internal charging, so that it is recognized the physical process of the REF enhancement is one of the most important subject of the space weather study. In this study, we use the magnetic data observed at the high-latitude magnetic stations in both the northern and the southern hemispheres, TJOR (Mag. Lat = 66.51), TRO (66.44), Showa (-66.08), H057 (-66.42), and Skallen (-66.42) to compare the REF enhancement observed by GOES 10 satellite and DRTS satellite. In 12 July, 2008, the high speed ($< 700km/s$) solarwind with Corotating Interaction Region (CIR) causes the small magnetic storms with Dst of -40 nT. At the timing of the main phase of the magnetic storms, the Pc 5 power increased at all the stations and continued the strong PSD during the recovery phase of the storm. For this event, we estimated the phase difference of the Pc 5 between H057 and Skallen which are located exactly same magnetic latitude. The phase difference in the pre-storm period shows the 7-8 degrees and obviously decreased after the onset of storm. In particular, the phase difference discontinuously changed to the small corresponding to the start of the REF enhancement. However, the increasing of the Pc5 power starts 12 hours earlier than the start of REF enhancement. The same characteristics were shown in the Pc5 in the northern hemisphere stations (TJOR, TRO). The present result indicates that the increasing of Pc5 power started at the onset of the main phase of the storm prior to the REF enhance, then the phase structure of the Pc5 changed corresponding to the REF enhancement. These characteristics of the Pc5 and the REF enhancement could be explained by the drift resonance model the REF enhancement.

Keywords: ULF Pulsation, Relativistic Electron, inner magnetosphere