Characteristics of Pc5 Wave Observed by two GOES Satellites during MeV Electron Flux Enhancement

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It is well known that MeV electron flux efficiently increases during the recovery phase of magnetic storms. ULF wave propagating in the magnetosphere is recognized as one of the possible candidates which can accelerate the electron in the radiation belt while various acceleration processes have been widely proposed by many investigators.

In this study, total 20 electron flux enhancement events associated with the CIR (Corotating Interaction Region) driven storms in 2008 have been analyzed using the magnetic field vector data obtained by GOES 10 and 11 satellites. The GOES 10 and 11 were located at 60 deg. and 75 deg. West in geographical longitude, respectively, which corresponds to 1 hour separation in local time. We used the bandpass filtered (150-1000 sec) magnetic data in the ENP coordinate system to investigate the oscillation mode of the field line and the propagation characteristics of Pc5 pulsations in the GEO orbit (6.6 Re).

The Pc5 power in the P (northward) component is predominant in the dusk sectors during main phase of the magnetic storms. The time lag of the Pc5 observed by GOES 10 and 11 satellites was analyzed to estimate the azimuthal wave number (m) of Pc5. As the result, both compressional and transverse modes of Pc5 show the anti-sunward propagation on the frank side of the GEO orbit with small m number of ˜1.5. On the other hand, the temporal variation of peak frequency of Pc5 shows the obvious local-time dependence during the early recovery phase of the storm. The peak frequency decreases to 2.2-2.5 mHz during the early recovery phase. This feature is predominant at the evening to night sectors in the P component and at the morning and evening sectors in the E (earthward) and N (eastward) components.

The latter result suggests that the Pc5 wave associated with the MeV electron flux enhancement seems to be related to the plasma injection in the night side during the early recovery phase of the storm, whereas the anti-sunward propagation of the Pc5 is also suggested in the former result. Both results imply that the Pc5 wave during the MeV electron flux enhancement seems to be generated simultaneously by several sources associated with the passage of high speed solar wind such as Kelvin Helmholtz Instability, dynamic pressure disturbances in the solar wind and particle injection in the night side magnetosphere related to the substorm.