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Longitudinal phase structures of Pc5 observed during the Relativistic Electron Enhancement (REE) at the outer radiation

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In this study, we analyzed the magnetic data observed at the high-latitude magnetic stations in both the northern and the southern hemispheres, TJOR (Mag. Lat = 66.51), TRO (66.53), H057 (-66.42), and Skallen (-66.42) to compare with the >2Mev electron flux observed by GOES 10 satellite. Each pair of stations is located at the same latitude and within 1.7 and 30 degrees in longitude, respectively. The pairs of the stations are quite suitable to estimate the azimuthal wave number.

For selected 24 Relativistic Electron Flux Enhancement (REE) events, the superposed epoch analysis is conducted for the horizontal component of the magnetic field data. The power spectrum density (PSD) of the Pc5 pulsations increases corresponding to the increase of the solarwind velocity, also the H/D ratio of the Pc5 power shows obvious change after 0.5 days from enhancement of the PSD, which corresponds to the apparent start time of REE events. This indicates that the toroidal oscillation of Pc5 becomes predominant in the inner magnetosphere at the start time of the REE. Second, although the phase difference between two stations largely fluctuates before the start of REE, it shows certain values with small variances during the REE events. The azimuthal wave numbers (m) of the H and D components estimated from the pair stations in the southern hemisphere are 1.62+/10.99 and -2.25+/-2.86, respectively. In the northern hemisphere, the estimated m number of H and D components are 0.29+/-0.62 and 0.20+/-0.81. Although the error of the m number in the northern hemisphere is much larger than that in the southern hemisphere, the basic characteristics of the variations of the phase structure well correspond to that in the northern hemisphere. The present results suggests that the relativistic electrons in the inner magnetosphere are accelerated by the drift resonance with the toroidal Pc5 pulsations.

Keywords: Pc5 pulsation, Relativistic Electron, Radiation belt