

Statistical study on impulsive plasma waves observed with EFD onboard GEOTAIL spacecraft

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We are analyzing waveform data observed with Electric Field Detector (EFD) onboard GEOTAIL spacecraft, and found low frequency impulsive solitary plasma waves are frequently observed. We made a statistical analysis on these impulsive plasma waves, especially their characteristics and spatial distributions in GSM X-Y plane.

These low frequency impulsive plasma waves have two types of waveforms, one is a mono-polar waveform and the other is a bi-polar one. To make a statistical analysis of these waves, we developed an auto-detecting program of low frequency impulsive plasma waves, and analyze EFD waveform data observed during Dec. 8th 1994 to Jun. 30th 1995.

According to the statistical analysis, mono-polar pulses are much more frequently observed than bi-polar pulses, and the electric intensities of these two types are not different. In addition, the distribution characteristics of these two types are very similar. The distributions of electric intensities of both mono-polar pulses and bi-polar pulses are almost uniform in GSM X-Y plane. On the other hand, these pulses, mono-polar as well as bi-polar, are much more frequently observed in the dawn side region. These results indicate that the amplitudes of these pulses have no relation to their waveforms, but the generation conditions of them are affected by the electromagnetic environment around the spacecraft.

Next, we investigated about the polarization characteristics of these low frequency impulsive plasma waves. According to the analysis, these pulses are observed independently of the direction of the ambient magnetic fields.

Consequently, the low frequency impulsive plasma waves are observed independently of the direction of the ambient magnetic fields in the almost all region, with almost the same electric intensities. The bias in their distributions in GSM X-Y plane, on the other hand, indicates that the generation conditions of these pulses are affected by the electromagnetic environment around the spacecraft.