Statistical analysis of generation and propagation of chorus emissions observed by GEOTAIL

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Many chorus emissions have been observed by GEOTAIL in the morning to dayside magnetosphere. The Wave Form Capture of the Plasma Wave Instrument onboard GEOTAIL measures five electromagnetic components from which we can analyze not only detailed spectral structures but also propagation characteristics of the chorus emissions, to discuss their generation mechanisms. We have analyzed a large number of chorus emissions bserved by GEOTAIL on the basis of their frequency-time (f-t) diagrams in order to clarify their generation and propagation mechanisms. Statistical analysis of propagation characteristics of each type of chorus emissions has shown that their source regions exist in the vicinity of the magnetic equator. However, it has been difficult to analyze particularly the propagation characteristics of individual wave packets included in each element of the chorus emissions, because of limited time and frequency resolutions in the f-t analyses. On the basis of the waveforms of the chorus emissions, we investigate detailed amplitude and frequency variation of the chorus wave packets. The wave packets have been used for the detailed analysis, as they may play an important role in the generation, nonlinear growth and frequency variation of chorus emissions. We analyze the relation between the frequency variation of risers and other parameters. We perform the statistical analysis of chorus emissions observed by WFC from October, 1992 to December, 2007. The result shows that the frequency variation becomes smaller as L-value becomes larger and depends on the magnetic latitude. We also find that the frequency variation becomes large as wave amplitude grows, which is consistent with a reported simulation result. We also analyze dual-band chorus emissions by using the waveform analysis. It founds that both the upper-band and lower-band chorus emissions propagate in the same direction implying that these chorus emissions would generate in the same region.