Instantaneous Frequency Analysis on Nonlinear EMIC Emissions: Arase Observation

Masafumi Shoji[1]; Yoshizumi Miyoshi[1]; Yoshiharu Omura[2]; Yasumasa Kasaba[3]; Keigo Ishisaka[4]; Shoya Matsuda[1]; Yoshiya Kasahara[5]; Satoshi Yagitani[5]; Ayako Matsuoka[6]; Mariko Teramoto[7]; Takeshi Takashima[8]; Iku Shinohara[9]
[1] ISEE, Nagoya Univ.; [2] RISH, Kyoto Univ.; [3] Tohoku Univ.; [4] Toyama Pref. Univ.; [5] Kanazawa Univ.; [6] ISAS/JAXA; [7] ISEE, Nagoya University; [8] ISAS, JAXA; [9] ISAS/JAXA

In the inner magnetosphere, electromagnetic ion cyclotron (EMIC) waves cause nonlinear interactions with energetic protons. The waves drastically modify the proton distribution function, resulting in the particle loss in the radiation belt. Arase spacecraft, launched in late 2016, observed a nonlinear EMIC falling tone emission in the high magnetic latitude (MLAT) region of the inner magnetosphere. The wave growth with sub-packet structures of the falling tone emission is found by waveform data from PWE/EFD instrument. The evolution of the instantaneous frequency of the electric field of the EMIC falling tone emission is analyzed by Hilbert-Huang transform (HHT). We find several sub-packets with rising frequency in the falling tone wave. A self-consistent hybrid simulation suggested the complicate frequency evolution of the EMIC sub-packet emissions in the generation region. The intrinsic mode functions of Arase data derived from HHT are compared with the simulation data. The origin of the falling tone emission in the high MLAT region is also discussed.