EMIC (ElectroMagnetic Ion Cyclotron) waves during the Van Allen Probes and ERG era: EMIC wave properties depending on geomagnetic conditions

*Chae-Woo Jun[1], Yoshizumi Miyoshi[1], Chao Yue[2], Jacob Bortnik[3], Larry Lyons[3], Toshi Nishimura[5], Craig Kletzing[4], Satoshi Kasahara[6], Yasumasa Kasaba[7], Shoya Matsuda[8], Masafumi Shoji[1], Fuminori Tsuchiya[6], Atsushi Kumamoto[6], Ayako Matsuoka[8], Iku Shinohara[8]

1. Institute for Space-Earth Environmental Research, Nagoya University, Nagoya, Japan, 2. Department of Earth and Space Science, Peking University, Beijing, China, 3. Atmospheric and Oceanic Sciences, University of California Los Angeles, Los Angeles, USA, 4. Department of Physics and Astronomy, University of Iowa, Iowa City, USA, 5. Boston University, Boston, USA, 6. Kanazawa University, Kakuma, Japan., 7. Tohoku University, Sendai, Japan. , 8. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagamihara, Japan.

To understand the global characteristics of electromagnetic ion cyclotron (EMIC) waves in the magnetosphere, we performed a statistical study of EMIC wave properties waves based on the Van Allen Probes (RBSP) and Exploration of energization and Radiation in Geospace (ERG) observations in 2017-2018. Our previous study found significant dependencies of EMIC wave distributions on geomagnetic conditions. H-band EMIC waves outside the plasmasphere had two peak occurrence regions at 10-14 MLT at L˜7-8 during the recovery phase and at 4-8 MLT at L>8 during the non-storm intervals. He-band EMIC waves inside the plasmasphere were dominantly observed at 10-20 MLT during the main phase. In this study, we focus on EMIC wave properties and discuss possible drivers of EMIC wave excitation depending on geomagnetic conditions. In preliminary results by RBSP, we found that the wave powers of He-band EMIC waves are strongly enhanced during the disturbed intervals, while H-band EMIC waves have no significant wave power variations under different conditions. The other two properties (polarization and wave normal angle) showed no clear tendencies among geomagnetic activities. He-band EMIC waves were predominantly observed with left-hand polarization and higher wave normal angles, while H-band EMIC waves showed a mixture of left-hand and linear polarizations with lower wave normal angles. From these observations, we suggest that energetic particle input is the major free energy source of intense He-band EMIC waves at which the cold and dense plasma dominates. Under this condition, the growth rate of EMIC waves can have a maximum at lower frequency regions and they easily excite with strong wave power. We will combine ERG observations to extend spatial coverage up to L=12 and higher magnetic latitudes, in order to understand the generation and propagation effects on EMIC wave properties in the magnetosphere.

Keywords: Wave properties of EMIC waves, Geomagnetic conditions, Multi-space missions

