A statistical study of structured Electromagnetic Ion Cyclotron (EMIC) waves in the inner magnetosphere using Arase observations

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EMIC waves are known to be generated near the magnetic equator due to ion cyclotron instability driven by temperature anisotropy of energetic protons. EMIC waves are often observed with a series of sub-packets showing frequency-varying structures such as rising or falling-tone emissions in dynamic spectra of the magnetic and electric fields. These special features are called structured (or pearl-structured) EMIC waves. In this study, we made a statistical study on the basis of Arase observations to investigate the characteristics of structured EMIC waves in the inner magnetosphere. The Arase satellite has provided unprecedented observations covering from the magnetic equator through higher magnetic latitudes (MLAT<50 deg) in the inner magnetosphere since March 2017, suitable for studying the characteristics of structured EMIC waves. In this presentation, we show distinct characteristics of structured EMIC waves as compared to typical waves. Structured EMIC waves are predominantly observed on the dayside of the magnetosphere at higher magnetic latitudes (MLAT>20 deg) where curvature force is stronger than other types of forces. Structured EMIC waves show an increasing tendency of solar wind dynamic pressure before the EMIC wave onset. Examining energetic ion variations associated with structured EMIC waves, we cannot find any significant relationship between structured and typical EMIC waves. On the basis of our observations, we suggest that inhomogeneity of the dayside magnetic field configuration caused by increasing solar wind dynamic pressure drives the preferred conditions to trigger non-linear wave growth, resulting in more frequent occurrence of structured EMIC waves at higher latitudes on the dayside of the magnetosphere.

Keywords: Structured Electromagnetic Ion Cyclotron (EMIC) waves in the inner magnetosphere, In-situ observations using the Arase satellite

