The influence of EMIC (ElectroMagnetic Ion Cyclotron) wave-interaction on energetic protons in the magnetosphere using Arase observations

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Electromagnetic ion cyclotron (EMIC) waves have been driven by temperature anisotropy of energetic ions near the magnetic equator. These waves constitute a significant loss process of energetic protons and sub-relativistic electrons through pitch-angle scattering by wave-particle interactions. In our previous study, we found that EMIC waves show significantly different characteristics at the different peak occurrence regions depending on geomagnetic environments. In this study, we performed a statistical study to demonstrate the influence of EMIC wave-particle interaction on energetic protons in the magnetosphere using in-situ observations by Exploration of energization and Radiation in Geospace (Arase) satellite. For this study, we identified EMIC waves by visual inspection and separated them into two wave-bands (H+ and He+ bands) in 2017-2020. We also measured energetic proton pitch angle distributions with an energy range of 30 eV to 25 keV. In this presentation, we show spatial distributions of EMIC waves in the magnetosphere and comparisons of energetic proton pitch angle distributions between with and without EMIC wave activities, discuss possible free energy sources causing EMIC waves at different regions. We will demonstrate the influence of different generation processes of EMIC waves on energetic proton distributions using in-situ satellite observations and theoretical model calculations.

Keywords: Electromagnetic ion cyclotron (EMIC) waves, Exploration of energization and Radiation in Geospace (Arase) satellite mission, EMIC wave-particle interaction

