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Energization of the Ions by EMIC Waves using MMS Observation

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Abstract : Electromagnetic ion cyclotron waves have been playing a significant role in inner magnetosphere, and their proton band has been detected using the Magnetospheric-Multiscale (MMS) satellite observations in the inner magnetosphere. It has been examined that the intensity of EMIC waves gradually increases by decreasing the L shell. Thermal anisotropy of hot protons initiates the waves. The low-energy cold protons (ions) can be activated by the EMIC waves when the EMIC wave intensity is high. As a result, these formerly invisible protons are now visible. The EMIC waves, whose frequency ranges from 0.001 Hz to 5 Hz in the inner magnetosphere and received considerable attention for energy transport across the magnetosphere. Since these waves act as a mechanism for the loss of energetic electrons from the Van Allen radiation belt to the atmosphere, therefore, it is necessary to understand how and where they can be produced, as well as the direction of waves along the magnetic field lines. It is demonstrated that throughout the energy range of 1 eV to 100 eV, the number density and temperature anisotropy of the protons likewise rise as the intensity of the EMIC waves increases.

Keywords : electromagnetic ion cyclotron waves, magnetospheric-multiscale (MMS) satellite, cold protons, inner magnetosphere
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