R006-32
Zoom meeting B ：11/2 AM2 (10:45-12:30)
12:00-12:15

Estimation of inhomogeneity factor for the interaction between the protons and EMIC wave

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Nonlinear theory for wave-particle interactions (e.g., Omura et al., 2010) indicate that the magnitude of inhomogeneity factor (S) is the important factor for particle trapping in the nonlinear wave-particle interactions. If the magnitude of S is smaller than 1, particles can be trapped, and efficient interaction can occur due to the formation of a hole (or hill) in the phase space distribution of the particle. We applied the Wave-Particle Interaction Analyzer (WPIA) method to the data obtained by the MMS spacecraft for one of the EMIC wave events. The energy transfer rate by cyclotron resonance was calculated as the dot product of the wave component of the perpendicular electric fields and ion current perpendicular to the magnetic field around the resonance velocity which is called the resonant current. The distribution of the energy transfer rate indicates that the energy transfer from hot protons (about 18-30 keV) to the EMIC wave occurred around the cyclotron resonance velocity. Temporal variations of the wave frequency and the gradient of the magnetic field intensity along the field line are the important factor for S. In the event, there were no clear temporal variation of wave frequency and the effect of temporal variations of wave frequency is negligible. Taking advantage of the fact that the gradient of the magnetic field intensity can be calculated from the four spacecraft measurements by MMS, we show that S can become smaller than 1 for the hot resonant protons within the limit of accuracy of the measurements of the magnetic field intensity.