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Hybrid simulations of electromagnetic ion cyclotron chorus emissions in a dipole geometry

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By the recent observations, the electromagnetic ion cyclotron (EMIC) chorus emissions are found in the inner magnetosphere. We performed hybrid simulations to analyze the EMIC chorus emissions. We developed a one-dimensional hybrid code which has open boundaries. In this code, we set a parabolic dipole background magnetic field to model the curvature of the magnetic field in the magnetosphere. The EMIC chorus emissions are triggered by L-mode waves which are driven by external currents. The cold protons, helium ions, oxygen ions, which create branches of the dispersion relations of the EMIC wave, are uniformly distributed in the simulation space. Hot protons, which have loss cone distribution functions, are also assumed as resonant particles. We duplicated the spectra of chorus emissions in the simulation space. We also compared the simulation results with the nonlinear wave growth theory.

Keywords: EMIC wave, chorus emission, inner magnetosphere, hybrid simulation