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コーラス放射発生過程の高エネルギー電子の温度異方性に対する依存性について
Dependencies of the generation process of whistler-mode emissions on temperature anisotropy of energetic electrons

加藤 雄人 [1*] ; 大村 善治 [2] ; 三宅 洋平 [3] ; 臼井 英之 [3] ; 中島 浩 [4]
KATOH, Yuto[1*] ; OMURA, Yoshiharu[2] ; MIYAKE, Yohei[3] ; USUI, Hideyuki[3] ; NAKASHIMA, Hiroshi[4]

[1] 東北大学大学院理学研究科, [2] 京都大学生存圏研究所, [3] 神戸大学大学院システム情報学研究科, [4] 京都大学学術情報メディアセンター
[1]Graduate School of Science, Tohoku University, [2]Research Institute for Sustainable Humanosphere, Kyoto University, [3]Graduate School of System Informatics, Kobe University, [4]Academic Center for Computing and Media Studies, Kyoto University

By a series of electron hybrid simulations, we study dependencies of the generation process of whistler-mode chorus and hiss-like emissions on temperature anisotropy of energetic electrons.

Whistler-mode chorus emissions are electromagnetic plasma waves commonly observed in planetary magnetospheres. In the Earth's inner magnetosphere, chorus emissions are observed mostly on the dawn side and are enhanced during geomagnetically disturbed periods. Chorus emissions appear in the typical frequency range from 0.2 to 0.8 f_{ce0} with a gap at the half f_{ce0}, where f_{ce0} represents the electron gyrofrequency at the magnetic equator. Recent in situ observation in the magnetosphere revealed the presence of whistler-mode hiss-like emissions, whose wave amplitude is comparable to those of chorus emissions.

The generation process of chorus has been reproduced in electron hybrid simulations and has been explained by the nonlinear wave growth theory [see review by Omura et al., in AGU Monograph "Dynamics of the Earth's Radiation Belts and Inner Magnetosphere, 2012]. The generation mechanism of hiss-like emissions is also explained by the nonlinear wave growth theory and has been reproduced by simulations [Katoh and Omura, JGR 2013]. In the present study, by an improved electron hybrid code with OhHelp library [Nakashima et al., 2009], we conduct a series of electron hybrid simulations for different temperature anisotropy (A_T) of the initial velocity distribution function of energetic electrons. We vary A_T in the range from 3 to 9 with changing the number density of energetic electrons (N_h) so as to study whether distinct rising-tone chorus emissions are reproduced or not in the assumed initial condition. Based on the simulation results, we reveal properties of the chorus generation for the assumed A_T parameter range.
Keywords: whistler-mode chorus, the Earth's inner magnetosphere, numerical experiments