R010-02
C 会場 ：11/4　PM1 （13:45-15:30）
14:00〜14:15

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Dependence of nonlinear wave growth of hiss emissions on the gradient of the magnetic field and thermal fluctuation

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Dependence of nonlinear wave growth of whistler-mode hiss emissions on the gradient of the magnetic field and thermal fluctuation in the plasmasphere

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We perform a series of electromagnetic particle simulations in the magnetospheric plasma for studying the nonlinear wave growth of the generation of hiss emissions. We examin two parameters, which are the number of hot and cold super-particles and the gradient of the background magnetic field. Firstly we vary the gradient of the background magnetic field from zero and increase it. We find that in the case of the zero gradient the wave amplitude attains the smallest value compared with other cases of finite gradients. There is an optimum value with which wave amplitudes grow to the largest value. The amplitude starts to decrease with a gradient greater than the optimum value. With a gradient less than the optimum value, the nonlinear wave growth process is promoted, while the gradient is greater than the optimum value the nonlinear wave growth is suppressed. We also studied cases of different magnetic field gradients and different numbers of super-particles. We find that wave amplitudes take larger values with a smaller number of super-particles. Many wave packets are generated, which looks like hiss emissions.

When we increase the number of super-particles keeping the hot plasma frequency constant, the charge q of a super-particle is decreased which results in a decreased level of thermal fluctuation. Starting from the smaller wave amplitude, the number of growing wave packets are decreased, while the growth rates of wave packets become larger, resulting in discrete waves like chorus emissions.

References:

[1] Hikishima, M., Omura, Y., Summers, D. (2020), Particle simulation of the generation of plasmaspheric hiss. Journal of Geophysical Research: Space Physics, 125, e2020JA027973, https://doi.org/10.1029/2020JA027973.

[2] Liu, Y., Omura, Y., Hikishima, M. (2021), Simulation study on parametric dependence of whistler - mode hiss generation in the plasmasphere, Earth, Planets and Space 73, 230.

[3] Liu, Y., & Omura, Y. (2022). Nonlinear wave growth of whistler-mode hiss emissions in a uniform magnetic field. Journal of Geophysical Research: Space Physics, 127, e2022JA030428.