R006-46
Zoom meeting B ：11/3 AM1 (9:00-10:30)
09:30-09:45

Computer simulations of precipitating electrons through chorus-wave particle interactions

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Whistler mode chorus waves cause scattering and acceleration of energetic electrons in the inner magnetosphere, and recent studies identified that chorus waves cause the pulsating aurora. The interaction processes have been modeled as diffusions in the velocity space, and the scattering rate increases with increasing the wave amplitude. However, the wave-particle interactions with chorus waves are non-linear process, so that it is expected that the scattering rate does not show a simple correlation with wave amplitude. In this study, we investigate chorus wave amplitude dependence of electron scattering using the GEMSIS-RBW simulation code. The GEMSIS-RBW simulation calculates variations of local pitch angle and energy by the imposed chorus waves. In this simulation, chorus bursts that consist of multiple rising tone elements are imposed at the equatorial plane, and these bursts propagate along the field line with L= 4. We calculate the trajectory of a number of electrons with initial energy of 50 keV. We calculated the number of precipitating electrons with various wave amplitudes. The number of precipitating electrons increase when the wave amplitude increases from 10 pT to ~200 pT. However, as the wave amplitude increases more than 200 pT, the number of precipitating electrons decreases. From this simulation, the simple relationship between the wave amplitudes and precipitating flux is not always satisfied due to the non-linear wave particle interactions, and the depression of the precipitating flux is expected with the wave amplitude of more than a few hundred pT. From the analysis on the electron motion in the phase space as well as the parameter ρ that is a proxy of the ratio of the wave-induced and the background inhomogeneity effects for the momentum change of the resonant electron, the phase trapping effect suppress the precipitating flux in the large amplitudes. During the multiple interactions with chorus elements, subsequent interactions with chorus waves changes electron motions from diffusive interactions and diffusive interactions, i.e., non-linear phase trapping and dislocation occur for electrons whose initial ρ are small enough to be diffusion. As a result, the number of precipitating electrons decrease even though the initial conditions for interactions between electrons and chorus waves are categorized in the diffusion.