R006-36
A 会場 ：9/27　AM2 （10:45-12:30）
11:15〜11:30

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Excitation of internally driven ULF waves of a weakly magnetized planet based on the magnetosphere-ionosphere coupled model

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The inner magnetosphere is the region where the dipole magnetic field is dominant and strong. Since the footprint of the magnetic field is connected to the ionosphere, the environment of the inner magnetosphere is affected by the condition of the ionosphere. During geomagnetic storms, energetic particles are injected from the plasma sheet and form the ring current. Southwood [1976] proposed that ring current ions can excite ULF waves through the drift-bounce resonance, which are called as internally driven ULF waves. ULF waves are important to understand the energy input from the magnetosphere to the ionosphere, since ULF waves are associated with the FAC. Recently, Yamakawa et al. [2022] could reproduce two types of internally driven ULF waves on the dayside and the duskside based on the magnetosphere-ionosphere coupled model. Yamakawa et al. [2023, submitted] developed the simulation code for updating the density of cold plasma and investigated the effects of the dynamics of cold plasma on the excitation of ULF waves. Simulation results showed the excitation of Pc4-5 ULF waves near the plasmapause in addition to two types of ULF waves in the case of constant density [Yamakawa et al., 2022]. These studies suggest that the excitation of ULF waves and formation of ring current are affected by the condition of the ionosphere and the plasma sheet. It is important to investigate the formation of ring current and the excitation of ULF waves of weakly magnetized planets in order to understand the magnetosphere of exoplanets and future Earth. However, the structure of ring current and the plasmasphere and the excitation of ULF waves of weakly magnetized planets are far from understood.

We investigated the formation of ring current and the excitation of internally driven ULF waves based on the magnetosphere-ionosphere coupled model between GEMSIS-RC [Amano et al., 2011] and GEMSIS-POT [Nakamizo et al., 2012]. GEMSIS-RC model solves 5-D drift-kinetic equation for ion PSD and Maxwell equations self-consistently. GEMSIS-POT is a 2-D potential solver in the ionosphere. In this study, we report on internally driven ULF waves in the case of a weakly magnetized planet, whose magnetic field strength is about one-third as strong as the present Earth (10000 nT at the surface). We changed the distribution of Region 1 FAC and conductivity because of the decrease of the intrinsic magnetic field.

Simulation results showed the excitation of Pc5 waves on the dayside and nightside. The Pc5 waves on the dayside were generated by the drift resonance. By comparing with the case of the present Earth, the change of ion drift frequency resulted in the change of the wave excitation region. We will also report on global distribution of ULF waves and growth rate.