R006-05
A 会場 ：9/25　PM1 （13:45-15:30）
14:45〜15:00

脈動オーロラに伴う幅広いエネルギー帯の電子の降りこみ：あらせ衛星-EISCAT の共同観測及びシミュレーション

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Wide energy electron precipitation associated with pulsating aurorae: Arase-EISCAT conjugate observations and simulations

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Wave-particle interactions with lower-band whistler-mode chorus (LBC) waves near the magnetic equator result in electron precipitation with energies from a few to a few tens of keV, leading to the diffuse and pulsating aurora (PsA). In addition to the low-energy electrons, recent studies have shown that relativistic electrons with energies from several hundreds of keV to several MeV are scattered by LBC waves propagating towards higher latitudes along field lines, and these electrons precipitate into the thermosphere as well as the mesosphere in association with PsA (Miyoshi et al., 2015, 2020, 2021). To understand electron precipitation over a wide energy range associated with PsA, we investigate an energetic electron precipitation event observed at Tromsoe, Norway, from 02:00 to 06:00 UT on March 12, 2022, using data from the Arase satellite and the European Incoherent Scatter (EISCAT) radar. First, we use the inversion method to estimate an energy spectrum of precipitating electrons from the height profile of electron density obtained by the EISCAT radar. The result shows precipitation of electrons over a wide energy range, and particularly strong precipitation is observed for low-energy (<several tens of keV) electrons. Next, we estimate the electron lifetimes using the quasi-linear pitch angle diffusion coefficient derived from the plasma wave and the ambient magnetic field data obtained from the Arase satellite. The result is that the estimated lifetimes are shorter than the strong diffusion limit especially for low-energy electrons, which is consistent with the EISCAT observations. We estimate the lifetimes as a function of the magnetic latitudes, and we find that the chorus waves observed at the Arase satellite position do not contribute to causing precipitation of hundreds of keV electrons, and propagation of LBC waves to the higher magnetic latitudes is important to cause wide energy electron precipitation. Finally, we conduct a data-driven simulation (GEMSIS-RBW, Saito et al., 2012) including non-linear wave-particle interactions. As similar to the quasi-linear analysis, strong precipitation of low-energy electrons has been reproduced in the simulation. Our integrated study combining with the data analysis and data-driven simulations strongly suggest that chorus waves propagating to high latitudes cause precipitation of electrons over a wide energy range.