# コーラス放射生成過程の計算機実験と pulsating aurora に関わる地上・衛星観測研究について

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# Study of whistler-mode chorus generation and related topics of ground/satellite observations of pulsating aurora

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We study properties of the generation process of whistler-mode chorus emissions based on results of self-consistent particle simulations and briefly review related topics of ground/satellite observations of pulsating aurora.

Whistler-mode chorus emissions are intermittent electromagnetic emissions observed mostly on the dawn side of the Earth's magnetosphere as a series of coherent wave elements often consisting of rising tones. For the generation process of chorus emissions, recent studies have revealed the importance of nonlinear wave-particle interactions occurring in the equatorial region of the inner magnetosphere [1-4]. The nonlinear wave growth theory has been proposed for the generation mechanism of chorus emissions based on the theoretical consideration and the analyses of the simulation result [2-3]. The nonlinear growth theory suggests that the frequency sweep-rate of a chorus element is related to the wave amplitude of coherent chorus elements in the region close to the magnetic equator. We have confirmed this prediction by performing simulations with different initial number densities of energetic electrons and have shown that the frequency sweep-rates of reproduced chorus vary depending on the variation of the wave amplitude of each chorus element [4].

It has been recognized that chorus emissions play an important role in the study of pulsating aurora. Pulsating aurora is caused by energetic electrons precipitating from the magnetosphere, while chorus emissions can resonate with energetic electrons satisfying the cyclotron resonance condition in the magnetosphere. The resonant electrons undergo the effective pitch angle scattering and precipitation into the atmosphere, and it is expected that the flux of precipitating electrons is associated with the wave characteristics of chorus emissions. Since chorus emissions have characteristic time periods related to the repetition period of each chorus element (~100 msec) and a group of chorus elements (a few sec), previous studies suggested that the periodicities of pulsating aurora are related to the repetition periods of chorus emissions. Recently we have revealed based on the Reimei observations that the energy spectra of precipitating electrons showing energy dispersion are consistent with the model assuming the pitch angle scattering of energetic electrons by chorus emissions originating from the magnetic equator [5-6]. These results suggested that each energy dispersion of electron precipitation during the analyzed events is related to the interaction with each chorus element generated in the equatorial magnetosphere. Unfortunately, plasma wave observations are not available in the region of pulsating aurora during the period of the analysis. Synergetic investigation of theoretical and ground/satellite observational studies is necessary for the thorough understanding of pulsating aurora related to chorus emissions.

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