Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM027-01 Room:103 Time:May 25 16:30-16:45

Initial results of auroral observations using an EMCCD camera in 2010/2011 winter campaign at Poker Flat Research Range

Takanori Nishiyama[1*], Takeshi Sakanoi[1], Yoshizumi Miyoshi[2], Ryuho Kataoka[3], Kazushi Asamura[4], Ayumi Yaegashi[1], Shoichi Okano[1]

[1]Planet. Plasma Atmos. Res. Cent., Tohoku, [2]STEL, Nagoya Univ., [3]Tokyo Institute of Technology, [4]ISAS/JAXA

Pulsating aurora is a phenomenon which shows periodic changes of emission intensity in the diffuse aurora. The emission is characterized by not sinusoidal change but pulsation, and its typical period is from a few seconds to a few tens of seconds [e.g., *Oguti et al*., 1981; *Yamamoto*, 1988]. Precipitating electrons which generate pulsating aurora were observed with 3 Hz modulations by rockets and low-altitude satellites, and the energy ranges from a few keV to a few tens keV [e.g., *Sandahl et al*., 1980]. Since pulsating aurora appears in diffuse aurora, electrons are thought to undergo cyclotron resonance with whistler mode waves in the equatorial region of the magnetosphere and to precipitate into the Earth's upper atmosphere by pitch angle scattering. Some simultaneous optical and VLF whistler mode wave observations have been carried out to demonstrate this idea [*Hansen and Scourfield*, 1990; *Tagirov et al*., 1998]. These studies suggested that appearance of auroral pulsations were related to VLF emission activity, however, one-to-one correspondence of order of a few hundred ms between auroral fine-scale structures with high temporal fluctuations and each element of VLF emission were not shown yet. In addition, recent simultaneous ground-satellite observations of pulsating auroras suggests not only mechanism associated with whistler mode waves but also one associated with Electron Cyclotron Harmonics (ECH), especially in high latitude regions ($L > 6$) [*Liang et al*., 2010]. Therefore, continuous ground-based observations including optical and ELF-VLF measurements are still needed to reveal what drives pulsating auroras.

The purpose of this study is to investigate the characteristic of temporal variations in pulsating auroras using a high-speed camera equipped with an Electron Multiplying CCD (EMCCD). We are planning a new observation that addresses especially pulsating auroras. The plan is to carry out simultaneous observations with three cameras (two EMCCD cameras and another camera for guiding), a photometer, a VLF receive system (100 kHz sampling) for short term campaign and an ELF magnetometer (1 kHz sampling). EMCCD camera takes an image at mainly 670.0 nm (N_2 1st Positive Band) wavelength at intervals of 10 ms. The field of view is 48.9 x 48.9 degrees and the spatial resolutions equals to 1.6 km at an altitude of 110 km (8 x 8 binning). The photometer consists of a Schmidt-Cassegrain telescope (F10.0, f2000mm), an interference filter at 670.0 nm, a photo counting head and a photo counting unit. Its field of view is 0.22 x 0.22 degrees and corresponding to 840 x 840 m at an altitude of 110 km. It is designed to detect 10% fluctuations of intensity of pulsating auroras with a few kR by 1 kHz sampling.

The observation began to be operated at Poker Flat Research Range (MLAT 66.77 deg. MLON 262.97 deg.) in Alaska on November, 2010. Our instruments are working without fatal errors and many data of pulsating auroras have been acquired. Initial results of our observations will be reported in this presentation.

Keywords: aurora, pulsating aurora, optical observations, wave-particle interaction, substorm