Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

PEM28-P02 Room:Poster Time:April 29 18:15-19:30

Development of polarization photometer and observation of OI 630 nm auroral polarization

MONJI, Hiroyuki[1*] ; KAGITANI, Masato[1] ; SAKANOI, Takeshi[1]

[1]PPARC, TOHOKU Univ.

Auroral O630 nm emission is theoretically expected to be polarized due to the velocity anisotropy of precipitating electrons. On the other hand, auroral O557.7 nm emission should not be polarized because it is quadrupole transition [Lilensten et al., 2006].

Recent ground-based measurement data showed that auroral emission at OI 630 nm probably polarized with a degree of 1-4%, and the polarization is maximized in the magnetic perpendicular direction [Lilensten et al., 2008, Barthelemy et al., 2011]. This fact suggest that it would be possible to investigate auroral physical processes, like electron anisotropy, by remote-sensing the auroral polarization.

In this study, we aim to establish the procedures of polarimetry observation of aurora, and obtain its polarization degree by developing a new polarization photometer.

We developed the polarization photometer which measures the polarization parameters (Stokes vector) using a quartz waveplate mounted on rotation stage and a polarization beam splitter. We adopt a narrow band 630 nm for wavelength selection. The field-of-view of this photometer is 3 deg. Observation of OI 630 nm auroral polarimetry was performed at Poker Flat Research Range in Alaska for three weeks in January 2013. We rotated the waveplate and took data at nine positions in one rotation. The time resolution for one rotation is 30 s. In addition, we carried out the calibration at Polar Flat with a linear polarizer and LED lamp. Using the auroral polarization data set and calibration data, we estimated the linear polarization degree and circular polarization simultaneously for the world first time.

On January 17, aurora appeared in the whole sky around 14:00 UT. During this period, we estimated the auroral polarization degree at various points along geomagnetic meridian. The estimated polarization degree maximized at the point parallel to the local geomagnetic field, which is inconsistent with the past result. On January 18, the auroral linear polarization degree increased correlated with auroral enhancement at 11:30 UT. This fact suggest that auroral polarization may increase due to the change in anisotropy in precipitating electrons.

Keywords: aurora ground observation, polarization