

Observation of 630 nm auroral polarization with a newly-developed imaging spectrograph

TAKASAKI, Shimpei^{1*} ; SAKANNOI, Takeshi¹ ; KAGITANI, Masato¹

¹PPARC, Tohoku University

From the recent result of observation of OI 630nm auroral emission related to polar rain at high-latitudes using a polarization photometer, linear polarization parallel to geomagnetic field with 2-7% was reported [Lilensten et al., 2013]. From a theoretical approach, OI 630nm emission can be polarized up to 17% [Bommier et al., 2011]. However, these past measurements were limited in the polar cap region and its polarimetry characteristics is not clear. Therefore, we developed an imaging spectrograph which can measure auroral polarization in the wide field-of-view of 130 deg. from 420 nm to 680 nm with a accuracy of 1% polarization degree, which enable us to obtain polarization degrees at 557.7 nm aurora and 630 nm auroral emission simultaneously at various geomagnetic angle configuration. Here we consider that 557.7nm aurora is useful as a standard light source because a theory predicts 557.7nm emission does not produce polarization. We installed it in the middle of auroral region at Poker Flat Research range in November 2013and carried out precise calibration to extract artificial polarization which may be produce inside the optical system using an LED light source with a linear polarizer. From the calibration, we found the acrylic dome does not produce serious artificial polarization. Since then, automatic operation is continuously going on till the beginning of April 2014.

From the result on January 1st 2014, we obtain the polarization of 630 nm aurora with degree of 10%. Then, there was elevation angle dependence in both degree and direction. But, we also observed the polarization of no polarized 557.7nm emission. It has same elevation angle dependence as former. So, it is indicated that they are polarized by same processes like atmospheric scattering on the path from emission region to instrument. In this presentation, we report these results.

Keywords: aurora, polarimetry