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Simultaneous measurement of auroral O I 630.0nm polarization using an all-sky polarimeter and a scanning polarimeter

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Auroral O I 630.0nm emission is expected to be polarized at a maximum polarization degree of 15% when it is collisionally excited by directive electron (Percival and Seaton 1958; Bommier et al., 2011). Because observed maximum polarization degree is mainly a function of pitch angle distribution of impact electrons, a polarimetry of aurora could be a new remote-sensing technique to derive impact electron information, especially for its pitch angle distribution. In this study, we aimed to establish procedures of all-sky polarimetry and to derive all-sky distribution of polarization.

Observation of auroral polarimetry was made at Poker Flat Research Range in Alaska from 6 through 19 February 2013 using a all-sky polarimeter and a scanning polarimeter. The all-sky polarimeter which consists of an all-sky imaging optics, two liquid-crystal variable retarder, a polarization beam-splitter and two CCD cameras enables to measure Stokes four parameters (IQUV). The scanning polarimeter which consists of a quarter-wave retarder with a rotation stage, a polarization beam splitter, and two photon multipliers enables to measure Stokes four parameters as well.

Based on a preliminary result from all-sky polarimeter, degree of linear polarization increases from 0 to 2% with increase of angle between line-of-sight and local magnetic field. The result indicates that the measured distribution of polarization would be made by precipitating electron impact. In the presentation, we will introduce a typical substorm event on 10 January to see some relationship between degree of polarization and pitch angle distribution of precipitating electron.

Keywords: polarimeter, auroral, O I, 6300