# Derivation of the energy spectrum of precipitating electrons using EISCAT and multi-wavelengths photometer observations

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Research on precipitating electrons, which are source of the aurora, is of vital importance for understanding the coupling process between the magnetosphere and the ionosphere. These electrons carry the upward field-aligned-current, which is a part of the 3 dimensional (3D) current systems between the magnetosphere and the ionosphere.

We have been examining the physical process of the 3D current system by using data obtained with

EISCAT radars as well as other tools like satellites and HF radars. To understand the process more deeply, we plan to install optical instruments such as photometers and TV cameras at several sites in the northern Scandinavia. We believe optical technique is one of the most efficient techniques for the 3D current system, because it enables us to obtain temporal and spatial distributions of electric conductance in the ionosphere.

By taking ratios of each auroral emission obtained by photometer, the average energy of precipitating electrons can be derived [Ono, 1993]. However, this method has not yet been ascertained by other techniques. Therefore, as a first step, we evaluate the method. The EISCAT UHF radar also enables us to derive those parameters, and Fujii et al. [1995] confirmed the validity of the method using data of simultaneous observations with the DMSP satellite.

For simultaneous observations with EISCAT UHF radar, we installed the 4-wavelengths photometer at Ramjordmoen, Tromsoe, Norway in October 9, 2001. The photometer is designed to detect auroral emissions with 427.8 nm (N2+ 1NG), 630 nm (OI), 670.5 nm (N2 1PG) and 844.6 nm (OI). Since then, the photometer continues observations automatically during dark times. The field of view of the photometer is about 1.2 deg. that is similar to that of the EISCAT UHF radar. To avoid possible uncertainties of the derivation of the average energy and flux of the precipitating electrons, the photometer is settled in viewing the field-aligned direction of the local magnetic field like EISCAT CP-1 mode. On days of October 16, November 13 and December 12 2001, simultaneous observations with the EISCAT were successfully made. The observations prove that the altitude profile of the electron density observed by EISCAT UHF radar synchronizes with change of the average energy of the precipitating electrons derived by photometer.

In this talk, we will present the quantitative comparisons of the average energy and flux of precipitating electrons derived with the EISCAT UHF radar and the 4-wavelengths photometer.