Relationships between the particle precipitation and the electric field based on simultaneous observations

*Masahiko Sugino[1] ,S. C. Buchert [1],Satonori Nozawa [1],Ryoichi Fujii [1]

Solar-Terrestrial Environment Laboratory, Nagoya University[1]

Satellites such as Akebono can directly measure the electric field and energy spectrum, and derive the field-aligned current. Spatial variations of the energy spectra can also tell us information about acceleration regions.
On the other hand, EISCAT measurements especially provide temporal variation of ionospheric parameters such as the electric field and the electron density. Ionospheric currents connecting the field-aligned current can be calculated. Energy spectra of precipitating electrons can also be derived from altitude profiles of electron densities measured by EISCAT.

We have used a large number of electric field and electron density profiles measured by EISCAT to study the statistical relations among fields, conductivities, energy spectra of precipitating electrons and currents. Three main remarks are obtained as follows.
1) The energy spectra tend to become softer with magnitude of the ionospheric electric fields.
2) Assuming that hard precipitation, which is ionizing at low altitudes, is caused by a parallel electric field, an anti-correlation between the parallel electric field and the ionospheric electric field is seen in some magnetic local time sectors.
3) Around magnetic midnight, relationships between the electron density and the ionospheric electric field suggest that other mechanisms such as a Cowling channel or polarization filed are more effective.
Based on these remarks, we will also present a comparative result by simultaneous observations.

Acknowledgement.
We are indebted to the Director and staff of EISCAT for operating the facility and supplying the data. EISCAT is an international Association supported by Finland(SA), France(CNRS), the Federal Republic of Germany(MPG), Japan (NIPR), Norway(NFR), Sweden(NFR) and the United Kingdom (PPARC).