

## Remote sensing of magnetospheric dynamics using Quasi-Corotating aurora

# Saori Toyoshima[1]; Hiroshi Fukunishi[2]; Minoru Kubota[3]; Yoshizumi Miyoshi[4]; Yukihiro Takahashi[5]; Ryuho Kataoka[6]; Yasuhiro Murayama[3]

[1] Science, Tohoku Univ.; [2] Department of Geophysics, Tohoku Univ.; [3] NICT; [4] STEL, Nagoya Univ.; [5] Dept. Geophysics, Tohoku University; [6] Dept. of Geophysics, Tohoku Univ.

<http://pat.geophys.tohoku.ac.jp/>

A new type of aurora, which is stationary on the sky with some patch structures, lasting for a few hours, was found in the magnetic evening sector by Kubota et al. [2003]. The stationary characteristic suggests that this type of aurora corotates with the Earth. The aurora of this event is named 'Evening Corotating Patch (ECP) aurora' by Kubota et al. [2003]. We identified 44 events similar to the ECP aurora during the period from October 14, 2000 to April 10, 2003. The motion of this type of aurora is not always corotating. Sometimes it drifts slowly. Considering these characteristics, we named this type of aurora 'Quasi-Corotating (QC) aurora'. We have investigated QC aurora statistically using ground and satellite data. The important characteristics of QC aurora were obtained and confirmed statistically in this study as follows. 1) Geomagnetic condition during the QC auroral event is quiet. 2) Most of QC aurora appear in the evening sector. The maximum occurrence probability is 0.45 at 1500 MLT, and the maximum number of events is around 1800 MLT. 3) The energy of electron precipitating electrons for QC aurora is in the 1 - 30 keV ranges. The mechanism of precipitation is the pitch angle scattering at equatorial plane. 4) The source region of QC aurora is not in the plasma sheet but in the dusk bulge of the plasmasphere, and the structure of QC aurora reflects directly that of cold plasma in the magnetosphere.

We develop a method for deriving the plasma flow in the magnetosphere from the motion of QC aurora using the MCC method. In order to evaluate the accuracy of the derived plasma flow, we compare the data with other independent measurements; drift velocity observed by the DMSP satellite and variation of ground magnetic field. The comparisons suggest that the method is successful in remote sensing derivation of plasma flow which is due to the  $E \times B$  drift. Moreover, we discuss the global pattern of plasma flow by comparing the flow velocities from QC aurora with both the Volland-Stern and the Weimer electric field models, and also by comparing with the variation of the polar cap potential. From these investigations, the motion of QC aurora, such stationary or quasi-stationary, is subject to the variation of the electric field in the magnetosphere. Our developed method for deriving the flow velocity from QC aurora is a powerful tool for monitoring magnetospheric dynamics and electric field, particularly in the dusk bulge region of the plasmasphere during geomagnetic quiet period. The motion and the structures of QC aurora reflect directly those of cold plasma in the source region. Therefore QC aurora can make images the cold plasma structures in the magnetosphere and monitor the electric field at subauroral latitudes during magnetic quiet period.