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Spatial Structures of Auroral Arcs Derived from the FORMOSAT-2/ISUAL Observation

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Various features of the auroral emissions are caused by precipitating particles, which have various energy distributions, from the magnetosphere into the upper atmosphere. Auroral emission profiles have been estimated by a numerical calculation method assuming the energy distribution of precipitating particles, collision processes between precipitating particles and neutrals, and an atmospheric model. However, generation mechanisms of some types of aurora cannot be explained by such a method. It is, therefore, necessary to examine the relationship between precipitating particles and auroral optical emission, particularly emission profile, based on the observations. Although previous ground-based and satellite observations have been used to understand horizontal extent of aurora and its dynamics, auroral emission profile has not been obtained so much by these observations because of atmospheric attenuation and lack of limb observations. In this study, we derive auroral emission profiles from the image data observed by FORMOSAT-2 satellite. The FORMOSAT-2 satellite was launched into a polar orbit with an altitude of 891 km and an inclination of 99.1 degree on May 20, 2004. The Imager of Sprites/ Upper Atmospheric Lightning (ISUAL) instrument was onboard the FORMOSAT-2 satellite as only one scientific payload, and images not only sprites and related optical phenomena but also auroral features by limb viewing. The ISUAL consists of three subsystems: an imager, a spectrophotometer, and an array photometer. An enhanced aurora was observed by the imager of ISUAL at -60 degree geomagnetic latitude and 0 LT on August 31, 2004. We have derived the auroral emission profiles from the images taking into account the direction of the magnetic field lines assuming a certain altitude of the auroral lower end of the hem. We compared these auroral emission profiles with model calculations based on a two-stream model developed by Ono (1993). Emission profiles of observed aurora best fit with Maxwellian distribution with mean energy of 4 keV. We could assume the energy flux of the precipitating electrons had Maxwellian distribution with mean energy of 4 keV. We have been trying to make simultaneous measurements by FORMOSAT-2 satellite and the ground based equipments or Reimei (INDEX) satellite to obtain strict auroral emission profiles. INDEX satellite was launched into a polar orbit with an altitude of 650 km and observes optical emission and particles. In this presentation, we show the results of the event observed on August 31, 2004 and the other event. If we can, we show the results of simultaneous observations.