東向きに拡大するオーロラサージの 3 次元構造

田中良昌[1]、小川泰信[1]、門倉昭[1]、Noora Partamies[2]、Daniel Whiter[3]、Carl-fredrik Enell[4]、Björn Gustavsson[5]、Urban Brändström[6]、Tima Sergienko[6]、Alexander Kozlovsky[7]、宮岡宏[1]

[1] *国立極地研究所*

[2] *フィンランド気象研究所*

[3] *サウサンプトン大学*

[4] *EISCAT 科学協会*

[5] *トロムソ大学*

[6] *スウェーデン宇宙物理研究所*

[7] *ソダンキュラ地球物理観測所*

3D structure of eastward expanding auroral surges

Yoshimasa Tanaka[1], Yasunobu Ogawa[1], Akira Kadokura[1], Noora Partamies[2], Daniel Whiter[3], Carl-fredrik Enell[4], Björn Gustavsson[5], Urban Brändström[6], Tima Sergienko[6], Alexander Kozlovsky[7], and Hiroshi Miyaoka[1]

[1] *National Institute of Polar Research*

[2] *The University Centre in Svalbard, Norway*

[3] *University of Southampton, UK*

[4] *EISCAT Scientific Association*

[5] *University of Tromsø, Norway*

[6] *Swedish Institute of Space Physics, Sweden*

[7] *Sodankylä Geophysical Observatory, Finland*

We present 3D spatial structure of three eastward expanding auroral surges (EEASs) observed on March 9, 2013. We conducted a campaign of auroral observations in northern Scandinavia using multiple imagers and the European Incoherent Scatter (EISCAT) radar from March 5 to March 9, 2013. Three EEASs were observed intermittently at about 15-minute intervals in the post-midnight sector (01:55-02:40 MLT) by monochromatic (428nm) all-sky EMCCD imagers at Tromsø (69.6 ^{o}N, 19.2^{o}E), Norway, Kilpisjärvi (69.0^{o}N, 20.9^{o}E), Finland, and Abisko (68.4^{o}N, 18.8^{o}E), Sweden, with an exposure time of about 2 seconds and an sampling interval of about 10 seconds. We applied the auroral computed tomography (ACT) method to the auroral images to reconstruct 3D structure of the EEASs. With a traditional model for electron auroral emission (Rees, 1989), energy distribution of precipitating electrons was further derived from altitude profile of auroral emission. The main results are as follows:

(1) Altitude of maximum emission was temporally stable and confined to a narrow range between 96 km and 114 km.

(2) Averaged energy of precipitating electrons was mostly distributed between 2 keV and 7 keV with a maximum at 4 keV.

(3) The averaged energy increases with increasing total energy flux of precipitating electrons.

(4) Correlation between the averaged energy and width of discrete arc was low.

As for item (3), the relation between the averaged energy and total energy flux may be consistent with a theory in which electrons are accelerated by a field-aligned potential difference (Morishima et al., 1993). On the other hand, the correlation between the averaged energy and the width of discrete arc was not clear (item (4)), because the averaged energy showed a strong dependence on the location of discrete arc, which may be explained by artifacts that appear at the edge of images. We perform numerical simulation to check if these results are due to the analysis technique.

References

Rees, M. H. (1989), Physics and chemistry of the upper atmosphere, Cambridge University Press, edited by J. T. Houghton, M. J. Rycroft, A. J. Dessler, New York.

Morishima, K., T. Ono, and K. Hayashi (1993), Nankyoku Shiryo (Antarctic Record), Vo1.37, No.3, 205−230.