

東向きに拡大するオーロラサージの3次元構造

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3D structure of eastward expanding auroral surges

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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°N, 19.2°E), Norway, Kilpisjärvi (69.0°N, 20.9°E), Finland, and Abisko (68.4°N, 18.8°E), Sweden, with an exposure time of about 2 seconds and a 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

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