# ディスクリートアークのオーロラトモグラフィ解析

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# Aurora tomography analysis of discrete arcs

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We present results from auroral computed tomography analysis of discrete arcs observed in Northern Europe on March 14, 2015. Wavy structures in the discrete arcs were detected at 22:15-22:20 UT by three 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, and four wide-view CCD imagers that compose Auroral Large Imaging System (ALIS). We mainly used narrow-band filters centered at a wavelength of 427.8nm for all the imagers. We set an exposure time to 1 or 2 seconds for all the imagers, and a sampling interval was 2 seconds for the EMCCD imagers and 10 seconds for the ALIS imagers. During this period, the EISCAT UHF radar measured the ionospheric parameters along the magnetic zenith at Tromsø.

Prior to the tomography analysis, there was a problem with the calibration of imagers because most of the imagers have not regularly been calibrated. Thus, we determined the calibration coefficients for the imagers self-consistently by the cross-validation method. Then, we applied the tomographic inversion technique to the calibrated images from the three all-sky EMCCD imagers. We compared the obtained altitude profile of the 427.8nm emission with the electron density observed by the EISCAT UHF radar. The main results are summarized as follows: (1) The altitude profile of the 427.8nm emission along the magnetic zenith was very similar to the electron density profile before 22:17:30 UT, while they were quite different after 22:17:30 UT. (2) Even for the similar profile cases before 22:17:30 UT, the electron density estimated from the 427.8nm emission by using empirical atmosphere models was smaller by about 0.3-0.4 times than observed with the EISCAT radar. (3) The averaged energy of precipitating electrons was higher around the center of auroral vortices where the total energy flux was also greater. The item (3) can be explained by the Ohm's law along the field lines, i.e., the relation that the field-aligned current is proportional to the field-aligned potential difference. As for the items (1) and (2), we discuss what causes the difference between the optical tomography results and the EISCAT observation.