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## Fine-scale structure of aurora in the sub-auroral region

Yusuke Ebihara<sup>1\*</sup>, Takeshi Sakanoi<sup>2</sup>, Kazushi Asamura<sup>3</sup>, Masafumi Hirahara<sup>4</sup>, Michelle F. Thomsen<sup>5</sup>

<sup>1</sup>RISH, Kyoto University, <sup>2</sup>Tohoku University, <sup>3</sup>ISAS JAXA, <sup>4</sup>Tokyo University, <sup>5</sup>LANL

Auroras sometimes appear in the equatorward of the main auroral oval. The "sub-auroral" aurora has been observed since 1970's, and known to consist of faint patches. The Reimei satellite revealed its complicated, fine-scale structures of the sub-auroral aurora. The observation was made by optical and particle instruments on board the Reimei satellite near the equatorward edge of the main auroral oval. The aurora has the following characteristics: (1) A full width at half maximum (FWHM) value is as low as only  $\sim 1.8$  km from optical measurements, and  $\sim 0.6$  km from particle measurements at the ionospheric altitude, which is much smaller than previously determined. (2) Using the IGRF model, the FWHM value of 0.6 km corresponds to 9 km in the equatorial plane ( $L \sim 5$ ), which is  $\sim 10$  times smaller than the gyroradius of typical protons in the inner magnetosphere. (3) The velocity distribution function of precipitating electrons is comparable to that of the trapped ones and does not demonstrate any plateau or positive gradient in the distribution at high energies greater than  $\sim 1$  keV. (4) The aurora was observed in geomagnetically quiet condition. (5) A geosynchronous satellite observed a significant increase in the plasma pressure of hot electrons in comparison with that of hot ions. The structuring of the aurora may be attributed to scattering processes of hot electrons as was previously suggested. If the structured aurora is a visual manifestation of the cold plasma that determines the growth of the waves scattering the hot electrons, an issue will be the extremely small scale of the cold plasma. Possible mechanisms leading to the extremely small scale structure of the cold plasma will be discussed.

Keywords: Inner magnetosphere, aurora, fine-scale structure, Reimei satellite, precipitating electrons