

Characteristics of black aurora and its generation process based on Reimei image-particle data

Takeshi Sakanoi[1]; Yoshizumi Miyoshi[2]; Andrei Demekhov[3]; Atsushi Yamazaki[4]; Kazushi Asamura[5]; Yusuke Ebihara[6]; Taku Takada[7]; Masafumi Hirahara[8]

[1] Grad. School of Science, Tohoku Univ.; [2] STEL, Nagoya Univ.; [3] Russian Academy of Science; [4] ISAS/JAXA; [5] ISAS/JAXA; [6] IAR, Nagoya Univ.; [7] Kochi-CT; [8] Dept. Earth & Planet. Sci., Univ. Tokyo

<http://pparc.gp.tohoku.ac.jp/~tsakanoi/>

There are some candidates for the generation process of black aurora. Reimei data have shown that the fine-scale black auroral feature seen in uniform diffuse aurora is probably caused by the suppression of pitch-angle scattering. However, its characteristics such as stability, shape (arc, dots, etc) and dynamics are not understood well. Furthermore, precise generation process and region causing the suppression of pitch-angle scattering is an open question. In this study, we focus on these precise characteristics of black aurora based on the simultaneous image-particle data with Reimei. After the successful launch in 2005, Reimei still continues auroral measurements at 650-km altitude in the post midnight sector. MAC measures N₂⁺ 1N (427.8 nm), OI (557.7 nm) and N₂ 1P (670 nm) simultaneously with spatial and time resolutions of 1 km and 120 ms, respectively. ESA and ISA measure electrons and ions, respectively, in the energy range of 10 - 12000 eV/q with time (spatial) resolution of 40 ms (300 m), respectively, although ESA was failed at August in 2008.

From comparison between auroral image and particle data, we find the latitudinal relationship between black aurora and pulsating aurora: Black aurora always appears in the region poleward of pulsating aurora, and the boundary between black and pulsating aurora corresponds to the equatorward edge of ion plasmashet. Interestingly, the black aurora is often accompanied by an inverted-V with typical peak energy of a few keV where we see the equatorward edge of ion plasmashet as mentioned above. The inverted-V seems to play important roles as follows. (1) The inverted-V produces the region-2 upward field-aligned current in the post midnight sector. (2) The inverted-V convergent potential structure produces the ExB drift motion of black aurora on the ionosphere. (3) It is suggested that ion beam is generated due to the inverted-V potential, and the existence of ion beam would affect the pitch-angle scattering process that is related to the black aurora.