Altitude profile of isolated proton aurora as estimated from digital camera observations from International Space Station

*Kazuteru Takahashi[1], Sota Nanjo[2], Yuta Hozumi[2], Keisuke Hosokawa[2], Yoshizumi Miyoshi[1]

1. Institute for Space–Earth Environmental Research, 2. The University of Electro-Communications

Proton aurora, that appears as an isolated spot at sub-auroral latitudes well away from the electron auroral oval, is called as the “Isolated Proton Aurora” (IPA). It has been believed that proton precipitation responsible for IPA is caused by scattering of protons through interaction with Electromagnetic Ion Cyclotron (EMIC) waves in the magnetosphere. It is well known that IPA appears in a horizontally (i.e., latitudinal and longitudinal directions) localized region. However, its spatial structure in the vertical direction has not been well understood. Therefore, we employ the full-color aurora images captured by the digital camera onboard the “International Space Station” (ISS) for deriving the altitude profile of emission of IPA. The digital camera onboard ISS is able to carry out limb viewing observations of the upper atmosphere of the Earth which allows us to capture the vertical structure of aurora, especially IPA. Nanjo et al. (2020) showed that it is possible to map the horizontal structure of aurora with high spatial/temporal resolutions. Thus far, however, The vertical structure of auroras has not been derived with the photographs captured from the ISS; thus, the details of the height structure of IPA are still unknown. In this study, we developed a method for mapping the vertical profile of the emission of IPA using limb-viewing digital camera images from ISS. In this presentation, we will discuss how the altitude profiles of the red and green emissions of IPA are distributed based on the mapping results of the altitude structure of the IPA observed in the southern hemisphere on April 20, 2018.

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