R006-57
Zoom meeting B ：11/4 AM2 (10:45-12:30)
11:30-11:45

Study of equatorward detachment of auroral arc from the oval using ground-space observations and the BATSRUS+CRCM model

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Study of an equatorward detachment of auroral arc from the oval using ground-space observations and the BATSRUS+CRCM model

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The linkage between equatorward detachment of arc from the auroral oval and magnetospheric processes remains poorly understood mostly due to the lack of satellite measurements in the source magnetosphere at the time of arc detachment. Recently several studies have shown that there is a common features of equatorward arc detachment from the main auroral oval for Stable Auroral Red (SAR) arcs (e.g., Shiokawa et al., AIP, 2009; EPS, 2017; Takagi et al., GRL, 2018) and STEVE (e.g., Gallardo-Lacourt et al., JGR, 2018). In this study, we present observations of an equatorward detachment of auroral arc from the main oval and magnetically conjugate measurements made by the Arase satellite in the inner magnetosphere. The all-sky imager at Gakona (magnetic latitude is 63.6 N), Alaska, shows the presence of auroral arc in both red- and green-line at local midnight (01-02 MLT) on 30 March 2017. The electron density derived from the Arase measurement shows that this arc occurred outside the steep plasmapause. The flux of low to medium energy electrons (10 eV-10 keV) penetrated deeper towards lower L-shells (L equal to 4.2) at the arc crossing as compared to the inner edge (L equal 4.4) of high-energy (greater than10 keV) plasma sheet electrons. We estimated auroral intensities for both red- and green-line by using Arase low-energy electron flux data. The estimated intensities show reasonable correspondence with the observed intensities. Further, we employ the simulation results of the Community Coordinated Modeling Center (CCMC), the BATSRUS+CRCM 3D MHD code to understand the connection between magnetospheric dynamics and detached auroral arc. Simulations show the build-up of higher pressure in the nightside inner magnetosphere and the inward motion of 1-10 keV energy electrons and ions from L equal to 4 to L less than 3 at 1240-1300 UT close to the time interval of the arc detachment. These findings indicate that the observed midnight arc at Gakona was associated with the localized enhancement of 10 eV-10 keV electron flux just inside the inner edge of the electron plasma sheet. We will discuss underlying possible mechanisms that can create such localized enhancement of electrons inside the inner edge of the electron plasma sheet.

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