R005-05
Zoom meeting C ：11/1 AM1 (9:00-10:30)
10:00〜10:15

カナダ･アサバスカにおけるサブオーロラ帯オーロラアーク分離の統計解析:STEVEに関する新しい考察

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Statistical study of subauroral arc detachment at Athabasca, Canada: new insights on STEVE

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In the past, individual statistical study of SAR (stable auroral red) arc and STEVE (strong thermal emission velocity enhancement) have been carried out at subauroral latitudes (Takagi et al., 2018 and Gallardo Lacourt et al., 2018). However, detailed comparative statistical study of geomagnetic conditions for different subauroral arcs at a single station is missing from the literature. A statistical study of subauroral arc with simultaneous emission in red and green-line also remains unexplored. The comparative statistical study of different arcs is important to understand the specific geomagnetic conditions under which the arcs develop as red arc, red+green arc, and STEVE. In this study, we present the first comparative statistical study of subauroral arc detachment from the main auroral oval at Athabasca (magnetic latitude = 61.5 N), Canada, for three different types of subauroral arcs: pure red arc, red arc with simultaneous emission in green-line (red+green arc), and STEVE. Based on 15-years (2006-2020) of all-sky imaging observations, this study not only uncovers the occurrence characteristics of different arcs but also provides important insights into the specific geomagnetic conditions under which STEVE develops. Red arc was the most common subauroral arc (139 events), followed by red+green arc (44 events), and STEVE (26 events) was a rare phenomenon. The detachment rate of red and red+green arcs exhibits dependence on both the solar flux and geomagnetic activity. The detachment rate of STEVE was higher during premidnight, whereas red and red+green arcs were higher around the midnight sector. The geomagnetic activity was relatively higher for STEVE, the decrease in the AL index and local X-component magnetic variations were ˜2-3 times higher for STEVE as compared to other arcs. STEVE shows a strong association with asymmetric ring current in terms of prominent bay-like enhancement in ASY-H index prior to the STEVE detachment. Such bay-like enhancement was ˜4 times higher for STEVE as compared to other arcs. STEVE events were accompanied by dispersionless injection for both electron and proton flux at the geosynchronous orbit. These results unambiguously suggest that STEVE develops after the substorm associated energy injection and significant intensification of asymmetric ring current in the dusk sector.