SAPS electric field and particle observations by the Arase satellite and SuperDARN

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The comparison between the ionospheric convection and magnetospheric electric field is important for understanding the magnetosphere-ionosphere coupling. However, there have been few studies making comparison between the SuperDARN convection and satellite electric field related to the Sub-Auroral Polarization Streams (SAPS). In this study, simultaneous observation of the SAPS electric field were carried out by SuperDARN radar and the Arase satellite. In 52 simultaneous observation events identified during the analyzed period from June 2017 to Dec. 2019, SAPS were observed by the SuperDARN radar near the calculated footprint of the Arase satellite and almost concurrently the satellite detected electric field enhancements. In association with the SAPS electric field, the satellite observed the plasmapause crossing and increase of low energy (< 1 keV) ions fluxes in most of the events. We performed a statistical analysis of these low energy ion enhancement events. The result is that the low energy ion enhancement appears mainly in the field-aligned directions and the intensity of flux enhancement has a weak positive correlation with the flow velocity of SAPS. On the other hand, the gap in timing of SAPS encounter often seen between the satellite and the ground also suggests that the actual ionospheric footprint of the Arase satellite would deviate from the foot-print calculated using the empirical magnetic field model. Details of the relationship between these low-energy ion characteristics and the electric field distribution, as well as the deviation of the ionospheric footprint of the satellite, will be discussed.

