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Zoom meeting B ：11/4 AM2 (10:45-12:30)
11:45-12:00

Plasma and field characteristics observed by the Arase satellite in the source of a substorm brightening aurora at L=6

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In this study, we would like to present a unique event in which the Arase satellite crossed the magnetospheric source region of a substorm brightening arc at 1752 UT on 12 October 2017, while a ground-based EMCCD camera at Tromsoe (69.66N, 18.94E) made a conjugate observation at the same time. The L-value of the Arase satellite was 6.9-5.2 at 1700-1830 UT. Magnetograms at Tromsoe and nearby stations in Scandinavia showed a sudden decrease of the H-component magnetic field starting at~1747 UT (1903 LT) with a maximum amplitude of ~180 nT, indicating a major substorm onset. Subsequently at 1750 UT, when the Arase satellite's footprint was moving equatorward in the southern part of the field-of-view of the EMCCD camera, a sudden brightening of auroral arc appeared very close to the footprint of the satellite. In addition to the optical signature, a series of Pi-2 pulsations were recorded at several mid-latitude magnetometers starting at ~1747 UT near the timing of the H-component decrease at Tromsoe, while an auroral kilometric radiation (AKR) starting at ~1749 UT can be seen in the wave data obtained by the Arase satellite. These simultaneous phenomena indicate the occurrence of an onset of a substorm at ~1747 UT. The magnetic and electric field data, as well as the particle data of low energy electrons and medium energy ions, show the characteristic variations and/or energizations around the timing of the Arase crossing over the brightening arc. The cross products of the variation of the electric and magnetic field show a series of field-aligned Poynting flux toward the ionosphere at the timing around the crossing. Field-aligned bi-directional electrons with an energy range between 66-1800 eV can be seen simultaneously with the brightening of auroral arc, which was probably caused by ionospheric electrons from the auroral brightening region. This is a unique conjugate observation that the ground-based optical device was observing the sudden brightening auroral arc during the onset of a substorm while a satellite made an in-situ measurement of the plasma in the auroral source region at the inner magnetosphere. The results of this analysis contribute to the understanding of the mechanism of substorm in the inner magnetosphere.