Initial study of a substorm onset auroral arc on 28 December 2018 by a ground EMCCD camera and the Arase satellite at L~5

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While many substrom-related observations have been made, few conjugate observations of substorm auroral arcs have been reported in the inner magnetosphere at L~4-6. In this study we present a conjugate observation of a substorm brightening auroral arc during a substorm onset observed by the Arase satellite and a ground-bases EMCCD camera. The event was observed at Gakona, Alaska (62.39°N, 214.78°E) on 28 December 2018. The camera showed that a west-east auroral arc moved from the east at ~0730 UT and subsequently broke up poleward at ~0743 UT. The ionospheric footprint of the Arase satellite was moving equatorward from the northwest to the southeast around the center in the field-of-view of the EMCCD camera. The maximum AE index reached ~600 nT during the auroral breakup, indicating the occurrence of a substorm. The particle data of low energy electrons and medium energy ions show the characteristic variations and energizations around the timing of the arc crossing by Arase. The magnetic and electric field data presented a series of quasi-periodic fluctuations, and their cross products show a series of field-aligned Poynting flux flowing earthward and equator-ward alternately at the timing around the crossing. Based on these observations we will discuss the generation mechanisms of the substorm auroral arc in the source region in the inner magnetosphere.

Keywords: substorm, auroral arc, conjugate observation

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