

Region-2 field-aligned current and ring current ions during storm main phase: Arase and AMPERE observations

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We present the first simultaneous in situ observation by the Arase satellite of the region-2 field-aligned currents (FACs) and the ring current during a storm main phase on 16 July 2017. The crossing of the postmidnight upward FAC with the maximum current density of 60 nA/m^2 at $L \sim 4.2$ and $\text{MLAT} \sim 20^\circ$ was determined by a change in the azimuthal magnetic field. The peak of the FAC density was located in the inner part of the ring current derived from the plasma pressure. The current driven by the oxygen pressure significantly contributed to the ring current density, in particular in the inner part. The FAC density value and invariant latitude in the inner magnetosphere were consistent with the corresponding FAC on the ionosphere derived from the AMPERE (Active Magnetosphere and Planetary Electrodynamics Response Experiment), indicating a connection of FAC between these regions.

Keywords: magnetic storm, ring current, field-aligned current, magnetospheric-ionospheric coordinated observation