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SAPS electric field and particle boundaries in the equatorial magnetosphere as observed by Arase

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Electric field (E-field) enhancement of subauroral polarization streams (SAPS) and particle boundaries in the inner magnetosphere is extensively investigated by analyzing particle and field data obtained by the Arase satellite and ionospheric convection data obtained by Super Dual Auroral Radar Network (SuperDARN). The poleward E-field of ionospheric SAPS is thought to be applied by a pair of the field-aligned currents driven by a latitudinal gap between the ion and electron plasma sheets (PS). Indeed, the enhancement of electric field is frequently observed between the two PS in the ionosphere, as reported by past studies using low-altitude satellites. Arase also frequently observes a radially-outward E-field enhancement right on the earthward side of the electron PS in associated with a poleward E-field of ionospheric SAPS identified by SuperDARN. A close examination of the Arase observations, however, reveals that SAPS E-field is not confined in the PS gap, but rather is often located in the region of the outward pressure gradient of the ring current ions. Their inner edge locations match in some events, while in some other cases, they do not match closely and the ring current ions are extended further inward than the SAPS E-field. We discuss possible mechanisms that could explain the variety of the spatial relationship of SAPS with the PS and ring current populations.