High-energy electron observations with the HEP instruments onboard Arase and its calibration status

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The high-energy electron experiments (HEP) onboard the Arase satellite detects 70 keV-2 MeV electrons and generates a three-dimensional velocity distribution for these electrons in every period of the satellite's rotation. Electrons are detected by two instruments, namely, HEP-L and HEP-H, which differ in their geometric factor (G-factor) and range of energies they detect. HEP-L detects 70 keV-1 MeV electrons and its G-factor is 9.3 x 10^{-4} cm^2 sr at maximum, while HEP-H observes 0.7 MeV-2 MeV electrons and its G-factor is 9.3 x 10^{-3} cm^2 sr at maximum. The instruments utilize silicon strip detectors and application specific integrated circuits to readout the incident charge signal from each strip.

In order to deduce the distribution of incident electrons from the direction and energy detections in orbit, we are developing a detector simulator using the Geant4 toolkit. Especially contamination from high energy particles must be considered. We are working on comparisons between the simulation results and observation. We are also planning electron beam experiments using HEP detector modules which are almost same as the flight model in order to compare detailed simulations and experimental data.

Since HEP started its normal observations in late March 2017, it has observed several cycles of sudden depletion and recovery of electron fluxes in the outer radiation belt in response to geomagnetic storms. When the geomagnetic activity was low for about a month, the electron fluxes slowly decrease in the outer radiation belt.

We will present calibration status using the simulator and also highlights of the HEP 1.5-year observations.