

R006-19

A 会場 : 9/26 AM1 (9:00-10:30)

9:30~9:45

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New method for calibrating Arase HEP-L data using XEP data and Geant4 simulation of MeV electron contamination

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The Arase satellite observes the dynamics of the Earth's radiation belts, including the electron fluxes over a wide energy range from a few electronvolts to several MeV. The measurements of the Arase high-energy electron experiment (HEP) instrument have been previously calibrated based on the modeled response functions of the instrument's energy channels. This utilized Geant4 simulations of electrons impacting the detectors of the instrument when arriving through the collimator hole. The current study presents a new, additional method for calibrating the HEP-L instrument data by exploring the level of contamination at the ~100 keV energies caused by penetrating MeV electrons. The estimation is performed using a Geant4 simulation of the HEP-L instrument, where the energy deposition of 1-10 MeV electrons to the detector layers is modeled. These MeV electrons do not only enter the instrument through the collimator but have enough energy to penetrate through the outer structure of the instrument. In the simulation, the electrons are initialized isotropically over a hemispherical dome around the instrument. The simulation results of the response of the HEP-L instrument's keV energy channels are used to estimate the level of contamination in the actual HEP-L measurements. Additionally, the actual measurements of MeV electrons from the extremely high-energy electron experiment (XEP) are utilized in the comparison and calibration. HEP-L measurements are also compared to measurements at the similar energy from the medium-energy particle experiment electron analyzer (MEP-e). The ratio of HEP-L and MEP-e fluxes is analyzed based on the level of MeV electron flux measured by XEP and the contribution of MeV electrons at lower energies is taken into account based on the Geant4 simulation. The new correction factors derived from MeV electron contamination are applied to comparisons of Arase data with Van Allen Probes observations during close conjunctions of the spacecraft. In particular, the pitch angle distributions are studied as they shed light on the wave-particle interactions occurring in the radiation belts. Previous comparisons have considered only the omnidirectional fluxes which offer a limited view of the radiation belt dynamics.