ジオスペース探査用放射線モニターの開発

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Development of Radiation Monitor for Observations in Geospace

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The region where particle energies range from several eV to several tens of MeV near the Earth is called Geospace. This region is useful to know how particles are accelerated in a dipolar field configuration. However, high-energy particles accelerated in this region have negative effect on human activities such as satellites and astronauts. Further information is needed to reveal the nature of this region in detail and improve human activities in space, including space weather prediction. Therefore, it is important to explore Geospace with radiation monitor.

However, it has been difficult to investigate this area with radiation monitors because of some problems such as contaminations of high energy particles (back-grounds) under the strong radiation filed in the radiation-belt. To overcome this difficulty, we must construct the detector that can distinguish real counts from the back-grounds. In addition, that can measure wide energy range of particles in Geospace. Furthermore, that must be compact to be loaded in satellites and must have high resolution and wide range of the field of view compared to the past detectors in order to achieve our missions. To achieve these improvements, it is useful to evaluate the detector with its simulation.

In this study, we simulated behavior of the detector with Geant4. Geant4 is a toolkit for the simulation of the passage of particles through matter, using Monte Carlo methods. With this toolkit, we designed prototypes of the detector, changing its constructions and materials. Then we irradiated this detector with some energetic particles to simulate the environment of Geospace, in order to find the best settings. In conclusion, we show results of these simulations and will discuss the requirement of the detector construction under strong radiation field.