10 years observation of charged pariticle flux with MAXI/RBM on the International Space Station

*Satoshi NAKAHIRA[1], Ryuho Kataoka[2], Haruka Ueno[1]

1. Japan Aerospace Exploration Agency, 2. National Institute of Polar Research

High energy charged particles in lower earth orbit are considered to relate to the plasma waves of the geospace. Recently, they are attracting more attention from Arase's observations. In this research, we focused on the observatories in the exposed facility of International Space Station (ISS), which is flying the altitude around 400 km and an inclination angle of 51.6 degrees. Here we employed Radiation Belt Monitor (RBM) consists of Si PiN diode equipped on Monitor of All-sky X-ray Image (MAXI) in operation from 2009 August to now. The RBM is sensitive to electrons above 0.3 MeV and the particle trigger counts are accumulated on a one-second basis. Since it has a two field-of-view towards horizontal and zenithal directions, the RBM has a capability to measure the anisotropy. Additionally, we utilized the SEDA-AP of the same platform, operated from 2009 August to 2018 March. Standard Dose Monitor (SDOM) can measure the energy spectra for electrons of 0.28—20.01 MeV with 7-channels at every 10-second interval.

We first searched for highly variable time intervals from MAXI/RBM time series data with 1-s time cadence, obtained from 2009 August to 2019 December. We applied peak-finding method to detect local maxima. When three peaks which has prominence higher than 7-sigma within 180 seconds we identified the time intervals to be "variable".As a result we obtain about 4400 events. Showing various patterns of time variation, it sometimes changes more than 3 orders of magnitude within a few seconds. Those time variations can be produced by both intrinsic time variation of its flux and spatial structure scanned by ISS flying at a velocity of 7.7 km/s.

Then, we tried to classify them by the time variation patterns. We calculated distance (similarity) for all combinations of extracted time series by the "Dynamic Time Warping" method, and then they are grouped by the "Ward" method. Consequently, they are roughly classified into five types; (1) several ~1s width spikes over a few minutes, (2) dense ~1s width shots over a few minutes, (3) a broad peak usually with small short-time variations, (4) doubleed peak and (5) quasi-periodic fluctuations of baseline with a time scale of ~10 seconds. We will discuss the origin of these variation patterns by employing MeV electron information of SEDA-AP/SDOM. Finally, we statistically discuss the solar wind parameter dependence or geomagnetic activitiy dependence of those variable events found in 10 years.

©2020. Japan Geoscience Union. All Right Reserved.