Unveiling SEP Acceleration and ICME Evolution in the Inner Heliosphere using Housekeeping Radiation Data Acquired by BepiColombo

JGR Space Physics

METHOD

10.1029/2024JA033147

Key Points:

- We characterized the housekeeping radiation observatory onboard BepiColombo/MMO with simulation for highly energetic particle observations
- The new calibration method with probability density functions shows good agreement with other instruments and the radiation model
- Housekeeping equipment commonly installed on spacecraft can be used for

Simulation for the Calibration of Radiation Housekeeping Monitor Onboard BepiColombo/MMO and Application to the Inner Heliosphere Exploration

<mark>n</mark>

G. Kinoshita¹ , H. Ueno² , G. Murakami³ , M. Pinto⁴ , K. Yoshioka⁵ , and Y. Miyoshi⁶

¹Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo, Bunkyo, Japan, ²Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan, ³Institute of Space and Astronautical Science (ISAS), Sagamihara, Japan, ⁴European Space Research and Technology Centre, European Space Agency, Noordwijk, The Netherlands, ⁵Department of Complexity Science and Engineering, Graduate School of Frontier Science, The University of Tokyo, Kashiwa, Japan, ⁶Institute for Space-Earth Environmental Research, Nagoya University, Nagoya, Japan

G. Kinoshita¹,

H. Ueno², G. Murakami², M. Pinto³, K. Yoshioka¹, Y. Miyoshi⁴ and Y. Saito²

(1: The University of Tokyo, Japan, 2: JAXA/ISAS, 3: ESA/ESTEC, 4: Nagoya University, ISEE)

The golden era for the inner heliosphere exploration

- Inner heliosphere observation is difficult due to the large potential difference
 Several missions are underway in the inner heliosphere recently
 Multi-point observations can chase the evolution of solar phenomena
- The maximum period of solar activity is going to come in 2025
 The importance of BC's cruise science

The current inner heliosphere observation network (Images are from NASA, ESA)



• Not a scientific instrument

- Suitable for the high energy particle detection
 Only instrument that can detect FDs
- Only deposited energies can be measured
 Deriving incident particle's energy & flux





The development of SPM data calibration method

- The SPM calibration method I developed is consistent with MPO/BERM (Figure)
- We are getting ready to analyze highly energetic particles such as GCR



The ICME & SEPs event on 2022/3

- Bepi & the other spacecraft detected ICME & SEPs event on 2022/3
- We compare multi-spacecraft data and track the spatio-temporal evolution



