Z122c Parameter Estimation for SEP Event Modeling: A Bayesian Approach Using Multi-Spacecraft Observations of the October 2021 Event

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Space environment safety is crucial for ambitious human activities like Artemis. Solar energetic particle (SEP) events, triggered by solar flares (SFs) and coronal mass ejections (CMEs), pose risks to human health and space systems. Since February 2023, Fujitsu and ISEE, Nagoya University, have collaborated to predict SEP profiles for lunar, Mars, and deep space exploration. We compare numerical modeling and multi-spacecraft observations of the October 2021 SEP event, using data from PSP, SolO, BepiColombo, SOHO, and STEREO-A. CME propagation is reconstructed using the SUSANOO model (Shiota et al. 2014, 2016) by comparing it with interplanetary scintillation data (Iwai et al. 2019) to derive CME shock parameters. These parameters drive a focused transport model to determine the SEP energy spectrum, dependent on the mean free path, acceleration rate, and injection efficiency. To improve prediction, we aim to identify optimal parameter aligning with multi-spacecraft data and simulations, using Bayesian and multi-objective optimization. This presentation will discuss our progress in predicting optimal parameter for enhanced SEP profile forecasting.