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Prediction model for a decay phase of high-energy solar energetic particle events

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Forecasting of solar energetic particle (SEP) events is one of the most important topics in space weather research as SEPs cause severe radiation hazards such as satellite malfunctions, radiation exposure for astronaut, high radiation doses of air crew, and loss of communications by high-frequency radio waves. There are two kinds of SEP forecasting research, forecasting of 1) SEP occurrence itself and 2) time evolution of SEP intensity. In this study, we focus on the time evolution of SEP intensity, especially, for high-energy SEPs having energy of over 100 MeV.

As a typical interplanetary shock can hardly accelerate ions up to 100 MeV, the high energy SEPs are accelerated near the Sun (namely, solar flares and/or coronal shock waves), then transported in interplanetary space followed by being observed at the Earth. We can simulate SEP transport in interplanetary space and reproduce an observation data of high energy SEPs by solving focused transport equation. Therefore, a time evolution of high energy SEP intensity may be predicted by using numerical simulation.

This study is dedicated for a deterministic prediction of decay phase of a high energy SEP event by the numerical simulation and observation data of initial phase of the event.

Keywords: Solar energetic particles, Particle transport