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Modeling SEP event fluxes and the radiation environment throughout the inner Heliosphere with the EMMREM model - simulations and comparison with in-situ data

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The Earth-Moon-Mars Radiation Environment Module (EMMREM) is a new comprehensive numerical framework for characterizing and predicting the radiation environment of the inner Heliosphere, being developed at Boston University in cooperation with several other institutions. The rationale behind this project is the need for better understanding of the radiation hazards in open space and in the vicinity of other planetary bodies, in light of planned future space exploration by manned and unmanned spacecraft. Studies of energetic particle vents with this module will allow us not only to predict the time-dependent distributions of high energy particle fluxes at different locations in the heliosphere, but also to gain better understanding of how different types of Solar Energetic Particle (SEP) events influence the radiation dose quantities, and what stages of these events contribute the most to the accumulated radiation.
We have modeled the time evolution of several major SEP events throughout the inner Heliosphere, and present flux and dose histories at different points of interest, such as Earth, Moon, Mars, and at different spacecraft observatories. We compare the model and its performance with in-situ flux data, and draw conclusions about space weather conditions during the event. We also present predicted radial gradients of the relevant Flux and Dose quantities throughout the inner Heliosphere for those events, and discuss dose contributions by SEPs and Galactic Cosmic Rays (GCRs).