

MHD-SDE Hybrid Simulation of the Cosmic Ray Modulation

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A reliable prediction of the space weather conditions on the radiation exposure caused by galactic cosmic rays (GCRs) is one of challenges topics in the field of space weather forecast. In order to understand heliospheric environments during extremely weak solar cycle such as past grand minima and the current solar cycle, we have developed a hybrid simulation model for the cosmic-ray modulation, which solves the stochastic differential equations (SDEs) describing a propagation of the GCRs in a dynamical MHD model of the heliosphere. We have calculated the dynamical model of the heliosphere with an adaptive mesh refinement technique. Space weather forecast system, SUSANOO, is imposed on the inner boundary of the dynamical model. By considering the solar wind velocity and the heliospheric magnetic field obtained from the dynamical model of the heliosphere, we have calculated the trajectories and the momentum histories of the GCRs that have a charge-sign dependence caused by the drift motion in the heliospheric magnetic field. In this presentation, we will show preliminary results of our MHD-SDE hybrid simulation for the cosmic-ray modulation during recent solar cycle.