

## Large-scale solar wind structures and cosmic rays

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Large-scale solar wind structures such as CMEs (coronal mass ejections) and CIRs (corotating interaction regions) are associated with the strong interplanetary magnetic field in the inner heliosphere, causing cosmic ray intensity variations of a few days time scale at the Earth. CMEs frequently occur in the solar maximum, while CIRs evolve well in the solar minimum. The transition of the large-scale solar wind structures essentially causes the solar cycle variation of cosmic ray intensity. We report newly developed three-dimensional magnetohydrodynamic (MHD) simulation code, which is capable of reproducing the MHD parameters of CMEs and CIRs at the Earth quantitatively, to discuss the reproducibility of the solar cycle variation of the inner heliospheric magnetic field structures. We also report our recent effort for natural extension to the heliosphere simulation, interlocked simulation with cosmic ray transport, and galactosphere simulation.