PROCEEDINGS OF SCIENCE

Modeling of the Anisotropy of Galactic Cosmic Rays in an MHD-simulated Heliosphere

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Cosmic-ray experiments including ground-based air-shower arrays as well as underground muon telescopes have reported the existence of anisotropy in the arrival directions of galactic cosmic rays. The origin of the anisotropy, however, has not been fully understood yet. At sub-TeV energies, the anisotropy does not exhibit a 22-year cycle variation expected from the reverse of the solar dipole magnetic field, although the amplitude of the anisotropy becomes attenuated by solar modulation effects. At TeV energies, there is not an established model for two distinct large-scale structures reported by a lot of experiments: a deficit region called the "loss-cone" and an excess region called the "tail-in". Above $\sim$100TeV, it has been pointed out that the amplitude and the phase of the anisotropy begin to change dramatically compared with those at TeV energies. The anisotropy reflects how cosmic rays propagate through the magnetic field in the heliosphere and the surrounding interstellar medium. In this presentation we study the influence of the heliosphere on the anisotropy by tracking particle trajectories in a heliosphere reconstructed from MHD simulations. We also discuss the anisotropy outside the heliosphere that can be derived from the experimental data obtained by the Tibet AS array.

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