

Test particle simulation of invading process of galactic cosmic rays into the heliosphere

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Heliospheric boundary plays an important role in preventing galactic cosmic rays (GCRs) from entering into the heliosphere. Nevertheless, particles having energies higher than GeV invade the heliosphere and are observed at the Earth. For a long time, detailed invading process has been unclear, since the structure of heliospheric boundaries have been poorly understood.

After that Voyager spacecraft, for the first time, explored in-situ this region in space, the structure of heliospheric boundaries are intensively studied. Recently, high accuracy MHD simulation of global heliosphere interacting with interstellar medium can be performed and detailed structures of the boundary region are getting revealed.

Here, we perform test particle simulation of GCRs by using electromagnetic fields obtained from global MHD simulation of the heliosphere. Initially a number of monoenergetic test particles are uniformly distributed in a certain region of interstellar space with velocity along the interstellar magnetic field. Trajectories of those particles are calculated numerically and examine how and from where the particles enter into the heliosphere. We will discuss the characteristics of the particles for various energies.

Keywords: galactic cosmic ray, heliospheric boundary, numerical simulation