

ACCELERATION OF PICKED-UP INTERSTELLAR HELIUM IONS AT THE EARTH'S BOW SHOCK: GEOTAIL OBSERVATION

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After ionization in the solar wind, He^+ ions of the interstellar origin are expected to be accelerated at heliospheric shocks (the terminating shock, CIR shocks, and planetary bow shocks), and to become the seed population for anomalous cosmic rays. Although there are many theoretical attempts to treat the 'injection' process of these picked-up helium ions at these shocks, there has been few direct observational evidence. In this report we will present the results of the case study of an event in which picked-up He^+ ions were reflected and accelerated at the earth's bow shock: At the GEOTAIL crossing of the bow shock on 1 July 1996, we observed two component of reflected ions: main component and sparse component. While the main component is consistently interpreted in terms of the specular reflection of solar wind protons, the sparse ion component is reflected to about three times further upstream than the main foot length. We show with the help of test particle simulations that the secondary foot component consists of picked-up He^+ ions being reflected and accelerated at the earth's bow shock, and that their reflection is mainly due to the magnetic mirror force working at the shock ramp.