

The Diffusive-Shock Acceleration of Electrons at the Earth's Bow Shock

Mitsuo Oka[1]; Toshio Terasawa[2]; Hiroshi Matsui[3]; Yasumasa Kasaba[4]; Hirotsugu Kojima[5]; Masaki Fujimoto[6]; Hiroshi Matsumoto[3]; Yoshifumi Saito[7]; Toshifumi Mukai[8]

[1] Earth and Planetary Sci., Tokyo Univ; [2] Dept. Earth Planetary Sci., Univ. of Tokyo; [3] RASC, Kyoto Univ.; [4] JAXA/ISAS; [5] RISH, Kyoto Univ.; [6] DEPS, TITECH; [7] ISAS; [8] ISAS/JAXA

The Earth's bow shock is known to accelerate electrons upto tens of keV. Generally, the standard acceleration scenario known as the Diffusive Shock Acceleration (DSA) is considered to be not effective at the Earth's bow shock due to its small spatial size, and intensive research has been carried out to find alternative acceleration mechanism(s).

As a result, shock drift acceleration mechanism has been accepted as a qualitative explanation to the observation, although recent quantitative analysis of observed electron energy spectra shows some discrepancies.

In this paper, we report, for the first time, an observation of a bow shock crossing event at which electrons are considered to be accelerated through the DSA process. On February 11, 1995, Geotail detected exponential increase of electron flux prior to a shock crossing. The waves responsible for electron scattering are determined to be whistler waves which have spatial scale

much smaller than MHD waves. We present a detailed comparison between the observation and the DSA theory.