

## Energetic ions upstream of the Earth's bow shock observed by GEOTAIL

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Energetic ions are at times observed in the upstream region of the Earth's bow shock, and they are thought to be produced at the bow shock. While the energy of the solar wind ions is a few keV at most, the energy of the backstreaming ions ranges from several 10 keV to several MeV. As candidates for production mechanism of the backstreaming ions at the bow shock, specular reflection, leakage from downstream shock, shock drift acceleration, and diffusive shock acceleration have been proposed. Since the production mechanisms are controlled both by the angle between upstream magnetic field and shock normal direction and by upstream solar wind parameters, local shock configuration is crucial for the production mechanism of the energetic ions.

In the present study we investigate backstreaming energetic ions observed by Geotail on a CME event. In addition to field aligned beams that often exist in the upstream region of the bow shock, we find loss cone distribution of backstreaming ions whose energy is between about 20 keV and several hundred keV. We show dependence of these two distinct populations of the energetic ions on the local shock angle.

We will discuss in detail the shock structure and the mechanism for the production of energetic ions at the bow shock, basing on the direct spacecraft observations.