Characteristic Enhancement of Lobe Ion Density Associated With the Passage of a Plasmoid: 2. Detailed Analysis of the Events

Taku Takada[1], Hisato Shirai[1], Toshifumi Mukai[2], Tsugunobu Nagai[3]

[1] STEL, Nagoya Univ., [2] ISAS, [3] Dept.Earth & Planet. Sci.

As will be reported in the accompanying paper in this meeting by Shirai et al., the GEOTAIL satellite has often observed enhancements of ion density and velocity in the tail lobe. In that paper they concluded that these effects are caused by a configurational change of lobe field lines associated with plasmoid ejections.

To begin with, we analyze lobe ion enhancements which accompany a bipolar signature in the magnetic field component Bz that is opposite in polarity to that expected from a plasmoid or TCR.

We then analyze the ion density enhacements not accompanied by a bipolar signature in Bz. We find that many of these events were detected near the magnetopause, from which it is concluded that their source is different from the other events discussed earlier in the talk.

As will be reported in the accompanying paper in this meeting by Shirai et al., the GEOTAIL satellite has often observed enhancements of ion density and velocity in the tail lobe. In this paper they concluded that these effects are caused by a configurational change of lobe field lines associated with plasmoid ejections. In this paper, we attempt to verify their conclusions.

To begin with, we analyze lobe ion enhancements which accompany a bipolar signature in the magnetic field component Bz that is opposite in polarity to that expected from a plasmoid or TCR. In particular, the timing of the Bz variation compared to that of the ion density enhancement is examined and good agreement is found with the model of Shirai et al. The peak in the density enhancement corresponds to the the time when Bz=0. It will be shown that the average time between the passage of a plasmoid and the lobe ion density enhancement is 40 minutes, which is the expected time delay between the passage of the plasmoid and the passage of the near-earth neutral line in its wake.

We then analyze the ion density enhacements not accompanied by a bipolar signature in Bz. We find that many of these events were detected near the magnetopause, from which it is concluded that their source is different from the other events discussed earlier in the talk. We suggest that these events are due to tail flapping, waves originating from a Kelvin-Helmholtz instability or breathing of the magnetotail associated with substorms.

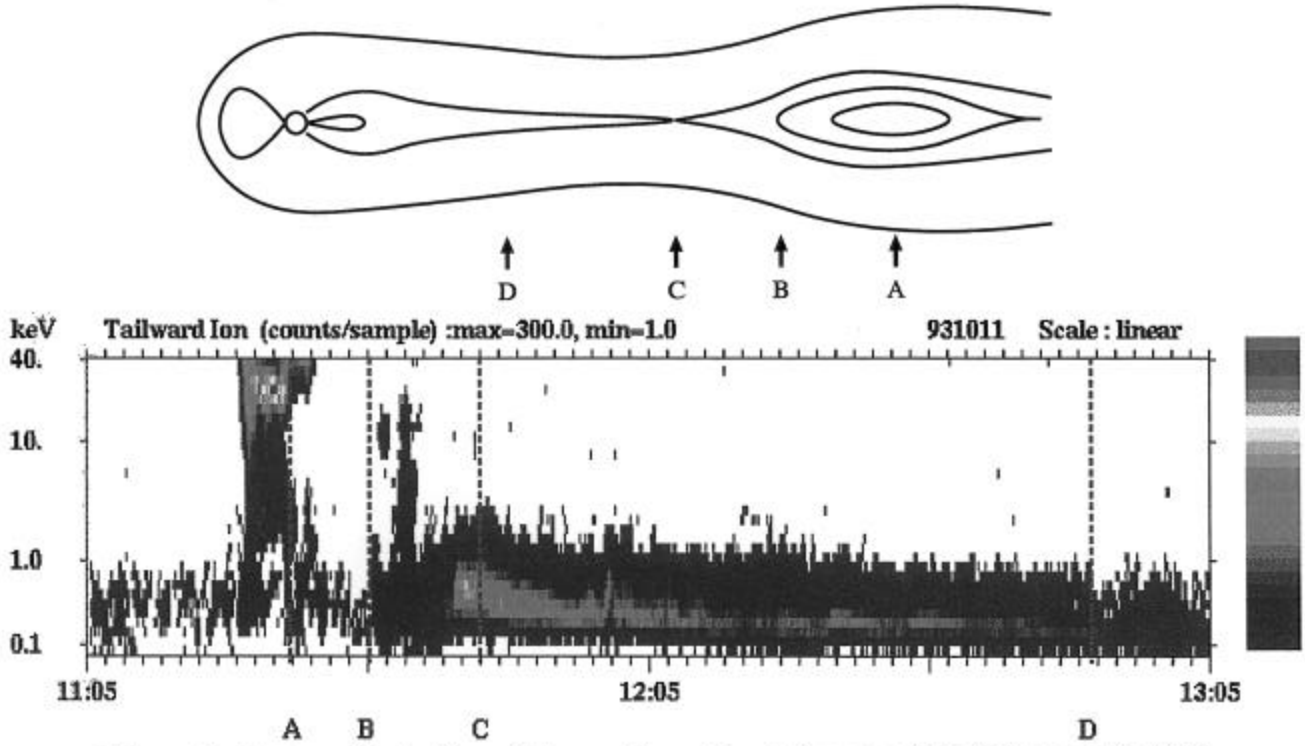

Figure 1. Cartoon illustration of the configurational change of the tail magnetic field during plasmoid ejection (top panel) and corresponding GEOTAIL observations for Oct.11.,1993 (bottom panel) . The ion E-t spectrogram is shown only for the tailward flows, with similarly labeld markers in the top panel.