



## Observations of Ion Heating in Inverted-V Structures in the High-Latitude Plasma Sheet Boundary Layer

Yanbo Cui (1), Suiyan Fu (1), George Parks (2), Qiugang Zong (1), Zuyin Pu (1), Lun Xie (1), Weijie Sun (1), Xi Bai (1), and Xi Chen (1)

(1) Institute of Space Physics and Applied Technology, Peking University, Beijing100871, China, (2) Space Sciences Laboratory, University of California, Berkeley, California 94720, USA

Ion beams of  $H^+$ ,  $He^+$  and  $O^+$  were observed escaping the Earth's ionosphere by Cluster when the satellites crossed the high latitude plasma sheet boundary layer (PSBL) in the southern hemisphere. These beams appear as inverted-V structures in the energy flux spectrograms. The pitch angles of the beams are  $\sim 0$  to  $30^\circ$ , hence these are ions streaming out of the ionosphere. These beams in the inverted-V structures occur with another ion population of ring-shaped distribution. These beams show the parallel temperature ( $T_{||}$ ) increases as the streaming velocity of the beam increases indicating the beams are being heated as they are accelerated by the field-aligned negative U-shaped potentials in the auroral acceleration region (AAR). The streaming velocity ranges from a few tens of km/s to several hundred km/s indicating a potential drop of  $\sim 10^2$  to  $10^4$  volts. Ions are heated more in the central U-shaped region than on the sides. These results provide important new information to modelers and theorists about how the escaping ions are heated.