Geophysical Research Abstracts,
Vol. 11, EGU2009-7910, 2009
EGU General Assembly 2009

Statistical studies of occurrence frequency and energy distributions of PSBL ion beams in dawn-dusk direction: Geotail and Cluster observations.

E.E. Grigorenko (1), M. Hoshino (2), C. Jacquey (3), E. Budnik (4), and L.M. Zelenyi (1)

(1) Space Research Institute (IKI), Space Physics, Moscow, Russian Federation (elenagrigorenko2003@yahoo.com), (2) University of Tokyo, Japan, (3) CDPP/CESR, CNRS/Université Paul Sabatier, Toulouse, France , (4) NOVELTIS, Ramonville Saint Agne, France

The phenomenon most frequently observed in PSBL is highly accelerated (up to tens keV) field-aligned plasma beams streaming along the magnetic field lines from the CS acceleration source. The characteristics of their ion and electron velocity distribution functions reflect spatial and temporal properties of the acceleration, which, in turn, are defined by the magnetic field topology in CS. Our observations in the PSBL of the Earth's magnetotail revealed two different types of plasma beams. The first type represents energy collimated and spatially localized ion beams having a rather long duration (up to 20 min) and energies $\leq$ 20 keV which are observed together with isotropic electron velocity distributions. These features indicate on ion acceleration in spatially localized resonant sources located in distant CS in the region of closed magnetic field lines (with finite Bz>0). Statistical studies of these ion beams registered at different X and Y locations by Geotail s/c (during 1993-1995 period) revealed that they are observed during quiet geomagnetic periods (|AL| < 200 nT) and sources of their acceleration are located at distant CS (at |X| > 110 Re). The analysis of more than 1000 PSBL crossings by Geotail and Cluster (to identify PSBL crossings in Cluster data we used Automated Multi-Dataset Analysis Tool (AMDA), a new service opened at CDPP) allows to reveal that distribution of occurrence frequency of these ion beams is almost uniform in dawn-dusk direction but their energies increases duskward which is in agreement with the suggested mechanism of ion beam acceleration by the quasi-steady dawn-dusk electric field. Another type of ion distributions in PSBL represents powerful (up to 140 keV) field-aligned ion beams with large parallel temperatures. They are observed along with the anisotropic electron velocity distributions. This feature is peculiar for the magnetic separatrix and indicates that ion beam acceleration takes place near the X-line. Such type of ion beams is observed in PSBL mainly during active periods (|AL| > 500 nT). During active periods the acceleration sources of these ion beams are located closer to the Earth, at |X| < 50 Re. Distribution of occurrence frequency of these ion beams is also almost uniform in dawn-dusk direction, but, contrary to the first type of beams, there are energetic ion beams of this type observed in the dawn flank. This feature of energy distribution indicates on sufficient role of inductive electric fields in ion acceleration near the X-line.