

Observation of heavy ions from the earth's ionosphere in the plasma sheet

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There are two plasma sources of the plasma sheet in the Earth's magnetotail, i.e., the solar wind and ionospheric outflows. Previous observations have shown that the ionospheric plasma contribution to the plasma sheet depends largely on geomagnetic activities. However, supply mechanism of the ionospheric plasma to the plasma sheet is far from well understood. In order to investigate the fate of ionospheric outflows in the plasma sheet, we have found cold O⁺ and He⁺ beams in the plasma sheet at the distance about 20 Re(Earth radii) in the Geotail LEP data from January 1997 to December 2005. The Energy-time spectrograms of the LEP ion data obtained in the plasma sheet show the signatures of cold heavy ion beams outflowing from the ionosphere. Because the mass analysis data of ion with energies less than 10 keV are not available, we identify ion species by velocity distribution function. The plasmas in the plasma sheet are dominated by the E×B drift, therefore the plasma bulk velocities perpendicular to the local magnetic field should be equal in spite of the ion species. We survey the differences of the geomagnetic activities for these ion beams in the plasma sheet. The results show that the intense ion beams are frequently observed when the geomagnetic storms occurred. The energy of these cold heavy ion beams is generally less than 10 keV. In this presentation we discuss these statistical tendencies of the cold heavy ion beams in the plasma sheet.

Keywords: magnetosphere, ion outflow, plasma sheet