



Implication for O⁺ acceleration in the magnetotail triggered by solar wind compression: 24 August 2005 event

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We examine an enhancement of O⁺ ions with energies >5 keV observed by the CIS instrument on board the Cluster spacecraft located in the magnetotail at X = -17.4 R_E on 24 August 2005. An enhancement is observed by spacecraft 4 between 0904 UT and 0911 UT. For the first 1-minute interval, the O⁺ flow direction is predominantly duskward. Multi-point magnetic field measurements by Cluster/FGM indicate that the current sheet becomes thick and B_z becomes the dominant component. Around 0905 – 0908 UT, O⁺ travels earthward, dawnward, and tailward. Peaks of pitch angle distribution are seen at 0-50 deg. and 130-180 deg. The magnetic field has a dominant X-component. The dawnward flux is strongly enhanced at 0908 UT, when the spacecraft crosses the current sheet.

Aurora images obtained by the IMAGE/FUV imager show no intense aurora activity during the interval. There are no clear high-energetic electron flux enhancements detected by LANL at geosynchronous orbit. Solar wind observations by ACE, Wind, and Geotail indicate that a high-density structure with a B_z of ~+40 nT compressed the magnetotail (X ~ -17 R_E) from 0904 to 0908 UT. Cluster O⁺ observations show that the lower-energy O⁺ (less than a few keV) has been enhanced in the plasma sheet intermittently since 0800 UT, particularly in the pitch angle range of 0 – 30 and 150 – 180 degrees.

We interpret that preexisting O⁺ ions with energies of less than a few keV were ac-

celerated when B_z increased at 0904 UT probably through an inductive dawn-dusk electric field. Cluster moved away from the central current sheet about one minute later to detect the accelerated O^+ which was bouncing between both hemispheres. We suggest that the acceleration was triggered by the solar wind compression of the magnetotail. Strong downward flux around 0908 UT is also discussed.