

MAGNETOSPHERIC SOLITARY STRUCTURE MAINTAINED BY 3000 km/s IONS AND ITS RELATION TO AURORAL BULGE AFTER A SUBTORM

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In the evening equatorial magnetosphere at about 4 R_E geocentric distance and 19 MLT, the four Cluster spacecraft observed a solitary structure with a width of about 1000~2000 km in the propagation direction. The solitary structure propagates sunward with about 5~10 km/s carrying sunward electric field (in the propagation direction) of up to about 10 mV/m (total potential drop of about 5~10 kV), depletion of magnetic field of about 25%, and a duskward $E \times B$ convection of about 50 km/s. The solitary structure is maintained by flux enhancement of selectively 3000 km/s ions (about 50 keV for H^+ , 200 keV for He^+ , and 750 keV for O^+). These ions are the main carrier of the diamagnetic current and the polarization charge causing the magnetic depletion and strong electric field. At the same time, a sunward propagating auroral bulge is observed at the magnetically conjugate ionosphere with the solitary structure, and field-aligned accelerated ionospheric ions are observed at Cluster from both hemispheres simultaneously. The propagation velocities agree between the auroral bulge and the solitary structure (keeping conjugacy). All these observations indicate that the sunward moving auroral bulge is caused by the sunward propagation of the solitary structure which is maintained by energetic ions. The solitary structure might also be the cause of Pi2-like magnetic variation observed by Cluster.

ring current, solitary structure, auroral bulge

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