



An isolated magnetic flux tube filled with dense plasma in the plasmasphere observed by KAGUYA

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Recent advances in satellite-based imaging techniques have made it possible to routinely obtain full global images of the plasmasphere. The Extreme Ultraviolet Imager (EUV) on the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite gave us complete sequential pictures. The EUV instrument could obtain the equatorial distribution of the plasmasphere from near apogee of the polar orbit. Even though this successful mission ended, in 2008 the Telescope of Extreme Ultraviolet (TEX) onboard Japanese lunar orbiter KAGUYA provided the first sequential images of the Earth's plasmasphere from the "side" (meridian) view. The TEX instrument obtained the global distribution of the terrestrial helium ions (He^+) by detecting resonantly-scattered emission at 30.4 nm. One of the most striking features of the plasmasphere as seen by TEX is an isolated magnetic flux tube filled with higher He^+ density than their neighbors, that we call "plasmaspheric filament". We surveyed the images obtained between April and June 2008 and found 4 events of plasmaspheric filament. In all 4 events the geomagnetic activities were quite low ($K_p < 2$). This result is consistent with some recent studies of "fingers", which are radially extended structures of enhanced brightness seen in the IMAGE-EUV images. Consequently, our research reveals that the finger structures observed by IMAGE-EUV represent isolated flux tubes filled with denser plasmas than their neighbors.