

Equatorial Magnetic Field of the Near-Earth Magnetotail: THEMIS Observations

*Shinichi Ohtani¹, Tetsuo Motoba¹

1. The Johns Hopkins University Applied Physics Laboratory

The equatorial magnetic field on the night side is critical for understanding not only the configuration of the magnetotail but also its state and dynamics. The present study observationally addresses various aspects of the equatorial magnetic field such as its equatorial distribution, spatial gradient, and the occurrence of extremely weak magnetic fields using measurements made by the THEMIS satellites. An emphasis is placed on the transition region between dipolar and stretched magnetotail configurations. The results are summarized as follows: (1) within $9 R_E$ from Earth the magnetic field is statistically organized to a noticeable extent by the radial distance, but at a given distance it is weaker closer to midnight suggesting that it also organized by the X distance; (2) At $9-12 R_E$, however, the spatial variation is less systematic suggesting that the magnetic field changes more dynamically; (3) in general, the equatorial magnetic field increases earthward steeply in the near-Earth region and far more gradually farther down the tail, and the transition takes place at $r \sim 9-12 R_E$; (4) the gradient of the equatorial magnetic field is predominantly earthward, but it can be transiently directed tailward in association with the dipolarization of local magnetic field; (5) the equatorial magnetic field becomes extremely weak (< 2 nT) in the transition region during the substorm growth phase as well as during prolonged quiet intervals, but any clear association can be found with the steady strong driver of the magnetosphere possibly because of its rare occurrence.

Keywords: Equatorial Magnetic Field, Near-Earth Magnetotail, Plasma Sheet, Bz Minimum, Tailward Gradient of Bz, Magnetospheric Configuration