

PLASMA STRUCTURE OF THE DIPOLARIZATIONS AND PLASMA INJECTIONS: RECENT THEMIS RESULTS

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A cluster of three inner Themis spacecraft is located at 9-11 Re in their apogee, in the transition region between dipole-like and tail-like fields, where the braking and transformation of the fast transient flows (BBFs) is thought to occur. Here we summarize the major results of studying the dipolarizations with probes configured as a triangle positioned horizontally near the neutral sheet. (1) A striking feature is a sharp dipolarization front (SDF) observed in some events: SDF represents a thin vertical current sheet, its thickness can be as small as several hundreds km, i.e. a fraction of the ion gyroradius, suggesting important kinetic processes to occur. The major component of its MVA normal is usually in radial direction, the SDF propagates Earthward at 100-300 km/s velocity which is decreasing with the decreasing radial distance. (2) The major plasma response to sharp dipolarizations at the periphery of dipole-like region consists of the increase of plasma pressure, decrease of plasma tube entropy and (usually) density, combined with an increase of plasma temperature and high energy particle flux. (3) Having two outer probes P3 and P4 separated by ~ 0.7 Re mostly in Y we are able to separate the variations of different scale and distinguish two distinct phases of dipolarization/injection process. Prior to the SDF arrival a ~ 1 min-long large scale increase of plasma flow and pressure is observed progressing inward at nearly fast speed, which is interpreted as the interaction region (sheath) of the plasma structure intruding Earthward from the tail. After the passage of slowly propagated SDF the spacecraft enters a plasma bubble which has highly structured/granulated plasmas and flows, here flow coherence failed at closely-spaced (0.7 Re in Y) spacecraft. All plasma structures associated with SCW in studied cases come from the outer region, tailward of 11 Re, that is from the tail-like (but not the dipole-like, where $B > \sim 5$ nT) plasma sheet region.

substorms, plasma injections, energetic particles

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