CHARACTERISTICS OF MAGNETIC DIPOLARIZATIONS IN THE VICINITY OF SUBSTORM ONSET REGION OBSERVED BY THEMIS

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With conjunction observations of electromagnetic fields and plasma from Time History of Events and Macroscale Interactions during Substorm (THEMIS) in the near-Earth magnetotail, we investigate the spatial and temporal properties of substorm dipolarizations in the near-Earth plasma sheet (NEPS) during a substorm at 03:23 UT on 12 February 2008. Substorm dipolarizations with different features are detected by three near-Earth THEMIS probes (THA (P5), THD (P3) and THE (P4)) in the magnetotail. In the current sheet with a large plasma beta value ($\beta > 2$, where β is the ratio of the plasma thermal pressure to the magnetic pressure), the dipolarization within the substorm onset region, $(-10.4, 2.8, -2.6)R_{E\_gsm}$, has a large initial magnetic field elevation angle, $\theta > 60°$, $\theta = \arctan(Bz/(Bx^2+By^2)^{1/2})$, and is accompanied by energetic ion (tens to hundred keV) dispersionless injection detected by THD (P3). This substorm onset dipolarization is characterized by *Bx* and *By* components around 0 nT with significant fluctuations. The *Bz* component increases sharply and its subsequent magnitude approaches the total magnetic field, *B*t. The maximum value of the elevation angle approaches 85° during the later substorm expansion phase. In the NEPS with $\beta \sim 1$, the dipolarization outside the substorm onset region is characterized by a magnetic elevation angle with a small beginning value of $\theta <$ 45° and following multi-step enhancements during the substorm expansion phase. The maximum value of the elevation angle approaches to 70° during the later substorm expansion phase. Our observation results indicate that characteristics of dipolarization with a large beginning elevation angle within the substorm onset region provide a new indicator to identify substorm onset location.