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Statistical analyzis of dipolarizations using spacecraft closely separated along Z in the near-Earth magnetotail.

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The THEMIS mission includes three closely separated probes that provide the opportunity to analyze the small and meso-scale dynamics of the cross-tail current sheet in the near-Earth magnetosphere (10Re). In this study, we focus on dipolarization events which occurred when two of these satellites were: (1) separated only along the Z direction (i.e. at the same location in the XYGSM) plane, and: (2) on separate sides of the neutral sheet. Following these criteria, our search resulted in 25 dipolarization events.
Based on these, we demonstrate that dipolarizations systematically correspond to a thickening of the current sheet rather than any other phenomena (e.g., flapping). We also show that the current density in the sheet systematically decreases after onset. Most of the events show an increase of the Laplace force and of the magnetic tension after the dipolarization onset. We find that the total energy density (total pressure) increases after 70% of the dipolarization events. However when excluding the Z-component of the magnetic field (which is cancelled by the dominant curvature terms) from the pressure, we find that the pressure decreases after 64% of events, and the remaining pressure increases occur closest to the neutral sheet. Average values are used in the time ranges [-10 -5] and [+10 +15] minutes around onset. We discuss the importance of both the spacecraft location relative to the neutral sheet and time scales chosen when calculating the pressure changes. These directly impact interpretations relative to dipolarization models.