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MESSENGER observations of dipolarization events in Mercury's magnetotail

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Recent observations by the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft have confirmed and broadened our view of Mercury's magnetosphere as a complex and dynamic system, heavily dominated by reconnection with the strong interplanetary magnetic field (IMF) in the inner solar system. Phenomena at Mercury analogous to a number of features of the terrestrial magnetosphere have already been observed by MESSENGER, including Kelvin-Helmholtz waves at the magnetopause boundary under strongly northward IMF, dayside reconnection in response to southward IMF, flux transfer events, plasmoid ejection, and substorm-like loading and unloading of the magnetotail. Here we further investigate the question of whether Earth-like substorms with explosive night-side reconnection and high-speed plasma-sheet flows develop in Mercury's magnetotail. Although these high-speed flows cannot be observed by MESSENGER because of obstructions to the field of view of the Fast Imaging Plasma Spectrometer and thermal constraints on spacecraft pointing, the associated magnetic field dipolarization can be directly measured by the MESSENGER Magnetometer. Multiple examples of such dipolarization events found from a systematic survey of the near-tail magnetic field measurements have important implications for substorm-like behavior at Mercury.