

A Near-Complete Example of Petschek Reconnection in the Distant Tail

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We report an observation of Petschek-type magnetic reconnection at a distant neutral line ($X = -230 R_e$, July 8, 1983) with a full set of signatures of the magnetic merging process. These features include a reversal of plasma flows from earthward to tailward, a pair of slow shocks and the magnetic field X-type line. These two slow shocks are shown to satisfy the shock criteria used by Feldman et al. [1987]. The spacecraft first crosses a slow shock to enter the earthward flowing plasmashet with velocity of about 440 km/s. The embedded magnetic field has a positive B_z component. The spacecraft next enters a region of tailward plasma flow with speed -670 km/s and an embedded negative B_z , indicating entry into the plasmashet tailward of the X-line. These observed velocities are comparable to calculated velocities based on Rankine-Hugoniot conservation relationships. The spacecraft subsequently returns into the south tail lobe by crossing another slow shock. Coplanarity analyses show that the two slow shocks have orientations consistent with that predicted by the Petschek reconnection model. We note that this event occurs during northward interplanetary magnetic fields. Thus, a magnetic stress built-up in the distant tail may be responsible for this reconnection process.

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