Plasmoids observed in the near-Earth magnetotail within X=-10 Re

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Recent GEOTAIL observations have revealed that the average location of the magnetic reconnection site is around X = -20 Re in the near-Earth magnetotail at substorm onset, although the exact location depends on the substorm intensity. However, for a substorm event that occurred at ~0153 UT on July 2, 1996, GEOTAIL observed a few plasmoids formed by the magnetic reconnection that occurred fairly close to the Earth. GEOTAIL was located around (X, Y) ~ (-7.3, 8.9) Re, observing southward magnetic fields a few times for ~12 min after the onset, followed by the dipolarization at ~0210 UT. The southward magnetic fields were accompanied by the preceding northward magnetic field, the enhancements of the total magnetic field and the total pressure, and the tailward flow, although the flow speed was somewhat slow. It is reasonable to interpret these as signatures for tailward moving plasmoids. GOES 8 was located around (X, Y) ~ (-5, 4) Re and observed the dipolarization at ~0155 UT, suggesting that the magnetic reconnection occurred between GEOTAIL and GOES 8. From Polar UVI auroral images and ground magnetic field data, this substorm, which was initiated at ~20 MLT and ~64 deg, was not very intense. The corresponding WIND data show that the southward IMF before the onset was not very large, but the duskward IMF and the solar wind dynamic pressure continued to be somewhat large for more than 12 hours before the onset. We discuss why the magnetic reconnection occurred much closer to the Earth than usual.