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Magnetotail Dipolarization and Associated Current Systems Observed by Cluster and DoubleStar

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A dipolarization and its associated current systems are studied using Cluster, DoubleStar TC1, and ground based observations. The Cluster spacecraft are located approximately 16 $R_{\rm E}$ down tail near 0030 LT. The DoubleStar TC1 spacecraft is located more Earthward at approximately 7 $R_{\rm E}$ just before local midnight. Auroral observations by WIC on the IMAGE spacecraft are used to determine the onset times of substorms. It is shown that the magnetic phenomena at the Earthward site of a magnetic reconfiguration region are governed by field-aligned currents, which in their turn generate auroral brightenings near the foot points of the spacecraft. It is also shown that the inward and outward motion of the dipolarization front near Cluster has a direct influence on the parallel plasma flow at TC1, indicating a piston mechanism. Just like a piston, the inward moving dipolarization at Cluster pushes in plasma along with the flux transport, which turns to parallel plasma flow at TC1. When the flow reverses at Cluster, i.e. outgoing flux transport, the plasma gets “sucked out” again, which is directly reflected in the plasma data from TC1.