



Nonlinear Electromagnetic Pulses Detected During Super-Alfvé

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We report first observations of nonlinear electromagnetic pulses detected concurrently in the Earth's geomagnetic tail near the current sheet (CS) and in the plasma sheet boundary layer (PSBL). The CS pulses were associated with super-Alfvénic plasma flows, $V_{\perp} > V_A$, and the PSBL pulses with sub-Alfvénic flows. The pulses had durations $\sim 3\text{-}5$ s, wave polarizations left (CS) and right (PSBL) handed elliptical in the plasma frame and an associated field-aligned current J_{\parallel} . The pulses were detected in a plasma with density $\sim 0.3 \text{ cm}^{-3}$, temperature $T_e \sim T_i \sim 3 \times 10^7 \text{ }^{\circ}\text{K}$ and $\beta \sim 10$ and included nongyrotropic electron and ion distributions and beams streaming along **B**. Wave activity was enhanced from below the ion cyclotron frequency to electron cyclotron and plasma and upper hybrid frequencies. We suggest the nonlinear pulses are solitary structures of ion cyclotron and Alfvén waves.