

Solitary Electromagnetic Pulses Detected with Super-Alfvénic flows in the Geomagnetic Tail

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Abstract

A long-standing unsolved problem in space physics concerns the understanding of mechanisms that produce plasmas that flow at hundreds of km s⁻¹ in the geomagnetic tail¹. Observations have shown that most flow speeds are sub-Alfvénic and can be explained by reconnection theories and simulation models². However, observations have also shown that on occasions, plasmas can flow faster than the Alfvén speed³. The significance of super-Alfvénic flows and the possible nonlinear effects that might accompany them were not discussed. Here we report first observations of solitary electromagnetic pulses (solitary waves) detected in the Earth's geomagnetic tail during intervals of super-Alfvénic flows and discuss their properties.