

# UNSTEADY CONVECTION AND FAST FLOWS IN THE MAGNETOTAIL

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The convection of plasma in the Earth's magnetotail cannot be adiabatic, since that would lead to exceedingly high pressure of the associated magnetic flux tubes closer to the Earth, the so-called pressure catastrophe. The natural way to avoid the pressure catastrophe is to significantly reduce the flux tube volume by reconnection, and observations show a near-Earth reconnection line typically around 20–25 Earth radii down tail. Earthward flows from this reconnection line are rather bursty and localized, and typically seen outside of 10 Earth radii. At this point they are strongly braked, diverted and repelled by the dominant dipolar magnetic field. The pressure gradients piled up and the vorticity of the flow lead to the substorm current wedge. When more and more flux tubes are piled up, the dipolarization front moves tailward and finally shuts off near-Earth reconnection.