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Plasma sheet turbulence and topology of magnetospheric domains

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Latest studies of a plasma sheet turbulence of the Earth's magnetosphere using data of Magnetospheric Multiscale Mission (MMS) support the obtained early results demonstrating high level of plasma sheet turbulence even during quite geomagnetic conditions. The level of turbulent fluctuations in the geomagnetic tail is greatly increased during disturbed geomagnetic conditions. Such turbulence has mainly electrostatic character with large amplitudes of electrostatic fluctuations. Spectra slopes of electric and magnetic field fluctuations have different values. The dependence of the value of the eddy diffusion coefficient determining the tail plasma transport is increased with geocentric distance in the midnight sector and has the plateau form at geocentric distances larger than ~13 Re. Such feature corresponds to the boundary of the tail current and ring current if the difference of these currents is determine by the topology of current lines. Tail current is closed by magnetopause currents and ring current is closed inside the magnetosphere. Both current systems exist in the condition of magnetostatic equilibrium, which means the constant plasma pressure at the field line. Plasma pressure distribution near the equatorial plane obtained using THEMIS observations shows the existence of the outer tail current boundary supported by radial plasma pressure gradients at geocentric distances ~10-13 Re. We discuss the selected features of magnetospheric turbulence and magnetospheric current topology for the explanation of the dynamics of magnetospheric substorms and storms.

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