Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04031, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04031
EGU General Assembly 2008

Thin current sheets in collisionless plasma: their structure, stability and plasma acceleration processes.

H. Malova (1,2)

(1) Space Research Institute of Russian Academy of Sciences, (2) Nuclear Physics Institute of Moscow State University (hmalova@mail.ru/+7(495)939-3553)

Thin current sheets (with the thicknesses about ion gyroradius) in the magnetosphere might determine the energy storage and release during substorm activity. In frames of analytical self-consistent model of multiscale current sheet the peculiarities of current sheet structure and stability are investigated. The influence of the asymmetry of plasma sources to the equilibrium shape and space position of current sheet is studied. It is shown that the asymmetry of plasma sources does not influence strongly the essential cross-tail current but the center of current sheet displaces away from more intensive plasma source. The role of temporal and spatial variable plasma sources in vertical flapping motion of TCS is discussed. The reconnection processes probably play an important role in magnetotail dynamics. The stability of current sheets in magnetotail is investigated in a frame of a linear perturbation theory. It is shown that there exist the narrow domains in parameter space where the system could be unstable. Other modes of perturbation as kink and sausage ones were also considered, and their characteristic times of development are estimated. The influence of plasma turbulence on a particle dynamics in the magnetotail is investigated in a frame of a model of the ensemble of planar electromagnetic waves propagating in all directions with the same phase velocity. The dependence of plasma acceleration on the position-space properties of the turbulence and the transport in the position space is explored. It is found that an initially Maxwell distribution of particle velocities transforms into a heavy-tailed kappa-like distribution. These results may be used to explain the structure and dynamics of current sheet in the magnetotail as well as the heating and energization of plasma particles.