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Multiscale and asymmetric current sheets in the Earth's magnetosphere

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Thin current sheets (TCSs) in the Earth's magnetosphere are believed to be the key structures determining the processes of magnetic energy storage and its release during substorms. Usually TCSs equilibrium configurations are supposed to be carried by counterstreaming plasma beams from northern and southern lobes. We develop the analytical self-consistent model of TCS, where the tension of magnetic field lines is balanced by the inertial force of particle motion, and investigate the influence of the asymmetry of plasma sources on TCS overall shape and its fine structure . Presence of anisotropy results in the offset of the spatial space position of current sheet the equilibrium state. It is shown that the asymmetry of plasma sources does not influence strongly the main part of the cross-tail current supported generally by meandering parts of ion orbits and curvature drift current of anisotropic electrons. TCS asymmetry is partially produced by the enhancement of negative diamagnetic currents at TCS edges, which are stronger at the side of plasma source where the plasma density. is higher The field reversal plane is also becomes displaced from more intensive plasma source because of the modifications of plasma pressure balance. This phenomena might be a cause of vertical flapping motions of TCS in the case of temporal and/or spatial variability of supporting plasma sources. We compare also the observations of asymmetrical current sheets in both the Earth's and Hermean magnetospheres. This work is partially supported by RFBR grant 04-02-39021.