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Peculiarities of thin current sheet structure in the Earth's magnetotail

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We examine a 1D self-consistent model of a multi-component thin current sheet in the Earth's magnetotail, that includes heavy oxygen ions as well as protons and electrons. The electrostatic effects due to the different dynamics of ions and electrons near the neutral plane are considered. A system of self-consistent equations of Vlasov-Maxwell is solved numerically, assuming a quasi- adiabatic behavior of ions and a Boltzman distribution of electrons. The anisotropic electrons are shown to dominate in the current sheet center, where an intense though narrow peak of electron current is embedded inside a thicker ion current sheet. We demonstrate that the maximum contribution of non-adiabatic oxygen ions in the total current across the magnetotail does not exceed 30%, but these heavy ions lead to a thickening of the current sheet by about 5-10 times. The mechanisms of asymmetric current sheet formation depending upon the characteristics of ion sources and quasi-adiabatic resonance processes, as well as their role in the dynamics of the perturbed magnetosphere will be also discussed.