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Separation of the kink and sausage modes of the flapping oscillations in the Earth's magnetotail

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Flapping oscillations observed in the current sheet of the Earth's magnetotail, represent rather slow waves propagating from the center to the flanks with a typical speed $\sim$20-60 km/s, amplitude $\sim$1-2R_e and quasiperiod $\sim$2-10 minutes. The relevant model is based on double gradient of magnetic field: gradient of tangential (B_x) component along the normal (z_{GSM}) direction and gradient of the normal component (B_z) along the x-direction.

In the framework of this model the rotation of the vector of magnetic field in the plane Z-Y as well as vector of plasma velocity is investigated to find differences between kink and sausage modes of the flapping oscillations.

The theoretical results are compared to the flapping oscillations observed by space mission THEMIS on 2008.05.03 in the morning sector of the magnetotail. The rotation of the velocity vector simultaneously observed on two spacecrafts of THEMIS mission corresponds to the kink mode of the flapping oscillations.

Behavior of the modes separating mechanism was investigated in cases of the noise, combined modes and additional sources of the flapping disturbance. It was shown that behavior of the speed vector is more stable than magnetic field's one. By this fact we can explain why theoretical prediction of magnetic field vector rotation was not found out in the experimental data.