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Kinetic Bounce modes in a 2D current sheet

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We analyse the dispersion of the kinetic 'ballooning- type' modes that may develop in 2D current sheet configurations, with a non null Bz , and investigate their possible destabilization by the resonant interactions with trapped particles. Considering a 'modified' Harris-type equilibrium, we solve the linearized Vlasov equations for perturbations with periods of the order of the particle bounce periods. An approximate scheme is used to describe the particle bounce motion, consisting in a Fourier decomposition of the particle motion. The perturbed distribution functions are calculated and the dispersion equation of the electrostatic eigenmodes of the sheet is derived from the quasi-neutrality condition. The possible existence of the resulting 'bounce' modes is studied for regimes of parameters relevant to the Earth current sheet. It is shown the electrostatic modes exist and are unstable, with growth rate of the order of one tenth of their frequency, provided that the ratio between the electron and ion temperature exceeds ~ 0.5 (the value depends on the structure of the sheet). This is typically a factor 2-4 larger than the Te /Ti ratio commonly observed in Earth current sheet, suggesting that the sheet in its normal state is stable with respect to these modes but would be rapidly destabilized, over time scales of tens of seconds, if the electron temperature is enhanced.