Geophysical Research Abstracts
Vol. 14, EGU2012-5781, 2012
EGU General Assembly 2012
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The effect of the temperature ratio Te/Ti on the stability of a 2D current sheet.

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In the general context of understanding the possible destabilization of the magnetotail before a substorm, a recent study (Tur et al. 2010) developed a kinetic model for electrostatic ballooning-type instabilities in resonant interaction with trapped particles moving in a 2D magnetic configuration. Using a quasi-parabolic equilibrium state (as Lembège and Pellat's model), the linearized gyrokinetic Vlasov equation is solved for electrostatic fluctuations with period of the order of the electron bounce period. The dispersion relation for electrostatic modes is then obtained through the quasineutrality condition. Unstable electrostatic modes are found whenever the temperature ratio Te/Ti is close to 1 with growth rate of the order of the minute. The present work aims to complete these theoretical investigations with some CLUSTER events showing that a temperature ratio about unity seems to be correlated with periods of enhanced electromagnetic activity in the plasma sheet. Thus, these observations suggest that this new theoretical approach has application and interest for understanding the stability of current sheets.