Geophysical Research Abstracts
Vol. 15, EGU2013-6469, 2013
EGU General Assembly 2013

A parametric study of non-linear evolution of tearing mode with temperature anisotropy

Iku Shinohara and Masaki Fujimoto

Japan Aerospace Exploration Agency / Institute of Space and Astronautical Science, Center for Science-satelite Operation and Data Archive, Sagamihara, Japan (iku@stp.isas.jaxa.jp)

We have studied the non-linear evolution of the tearing instability with temperature anisotropy, $T_\perp/T_{//}$ by using a 2-D full kinetic simulation. As predicted by the linear-theory, e.g. Chen and Palmadesso (1984), Quest et al. (2010), the growth rate of the tearing mode increases as higher anisotropy, $T_\perp/T_{//}$. Two parametric studies have been done: (i) changing the current sheet thickness with the fixed anisotropy ratio, and (ii) changing the anisotropy ratio and the ion-electron temperature ratio with a fixed current sheet thickness. As a result, we found that event in a thick current sheet case, $D/\lambda_i = 4$ (D is the current sheet thickness, and λ_i is the ion inertia length.), fast growth emerges at the non-linear stage and the growth rate is almost proportional to D/λ_i and that the growth rate and saturation level at the non-linear stage are independent on parameters once the explosive growth starts. The most impressible results are those (1) electron anisotropy plays important role to push the tearing mode into the non-linear stage and (2) there exists a threshold value of the ion-electron temperature ratio for enabling the explosive growth as the results of Tanaka et al. (2004). We think that these facts may be a big hint to solve the triggering mechanism of magnetic reconnection. We will show the results of our parametric study and discuss possible physical meaning of the threshold value for the explosive evolution.