Geophysical Research Abstracts
Vol. 17, EGU2015-11795, 2015
EGU General Assembly 2015

The diamagnetic drift of the X-line at the dayside magnetopause.

Lorenzo Trenchi (1), Federica Marcucci (2), and Robert Fear (1)

(1) (Lorenzo.Trenchi@gmail.com) School of Physics & Astronomy, University of Southampton, SO17 1BJ, UK, (2) IAPS INAF, Via del Fosso del Cavaliere 100, Rome, Italy

Magnetic reconnection at the Earth's magnetopause is the process whereby geomagnetic field lines become open and solar wind energy and momentum can flow into the magnetosphere.
Several statistical studies demonstrated how the different solar wind conditions affect this process. The interplanetary magnetic field (IMF) orientation mainly determines the location and the orientation of the X-line. Moreover, it is found that reconnection is favoured by low values of plasma β in the adjacent magnetosheath.
A possible explanation for this β-dependence invokes the diamagnetic drift of the X-line (Swisdak et al. 2003, 2010, Phan et al. 2010, 2013). This drift occurs when a plasma pressure gradient across the magnetopause and a guide field perpendicular to it are present. Reconnection should be suppressed if the X-line drift motion exceeds the local Alfvén speed. According to this mechanism, reconnection should be possible only in a portion of the $\Delta\beta$-shear angle plane, (where $\Delta\beta$ is the β difference between the two sides of the current sheet).
In this presentation, we examine a large number of dayside magnetopause crossings observed by Double Star TC-1, which comprise reconnection events that satisfy the Walén relation and non-reconnection events. This dataset comprises also several reconnection events during which TC-1 is probably close to the X-line. Overall, these observations confirm that the diamagnetic drift is probably able to turn off the reconnection at the magnetopause.
Moreover, we use a subset of the reconnection events to study the X-line motion along the magnetopause when reconnection is not suppressed. It is found that generally the X-line drifts along the magnetopause northward or southward according to the sign of By. Furthermore, it seems that the velocity of the adjacent magnetosheath also contributes to the X-line motion.