Geophysical Research Abstracts
Vol. 18, EGU2016-5192, 2016
EGU General Assembly 2016

Dependence of the location of the Martian magnetic lobes on the interplanetary magnetic field direction

Norberto Romanelli (1,2), Christian Mazelle (2,3), Cesar Bertucci (1), and Daniel Gomez (1)

(1) Institute for Astronomy and Space Physics, CONICET-UBA, C.A.B.A., Argentina, (2) Institute of Research on Astrophysics and Planetology, Centre National de la Recherche Scientifique, Toulouse, France, (3) Université Paul Sabatier, Institute of Research on Astrophysics and Planetology, Toulouse, France

The magnetic field topology surrounding the Martian atmosphere is mainly the result of gradients in the velocity of the solar wind (SW). Such variations in the SW velocity are in turn the result of a massloading process and forces associated with electric currents flowing around the ionosphere of Mars [Nagy et al 2004, Mazelle et al 2004, Brain et al 2015]. In particular, in the regions where the collisionless regime holds, the interplanetary magnetic field (IMF) frozen into the SW piles up in front of the stagnation region of the flow. At the same time, the magnetic field lines are stretched in the direction of the unperturbed SW as this stream moves away from Mars, giving rise to a magnetotail [Alfvén, 1957]. As a result and in contrast with an obstacle with and intrinsic global magnetic field, the structure and organization of the magnetic field around Mars depends on the direction of the IMF and its variabilities [Yeroshenko et al., 1990; Crider et al., 2004; Bertucci et al., 2003; Romanelli et al 2015].

In this study we use magnetometer data from the Mars Global Surveyor (MGS) spacecraft during portions of the premapping orbits of the mission to study the variability of the Martian-induced magnetotail as a function of the orientation of the IMF. The time spent by MGS in the magnetotail lobes during periods with positive solar wind flow-aligned IMF component $B_{\parallel}^{IMF}$ suggests that their location as well as the position of the central polarity reversal layer (PRL) are displaced in the direction antiparallel to the IMF cross-flow component $B_{\perp}^{IMF}$. Analogously, in the cases where $B_{\parallel}^{IMF}$ is negative, the lobes are displaced in the direction of $B_{\perp}^{IMF}$. We find this behavior to be compatible with a previously published $B_{\perp}^{IMF}$ analytical model of the IMF draping, where for the first time, the displacement of a complementary reversal layer (denoted as IPRL for inverse polarity reversal layer) is deduced from first principles [Romanelli et al 2014]. We also analyzed these results in the context of recent observations provided by the Mars Atmospheric and Volatile Evolution spacecraft [e.g. DiBraccio et al 2015].