

Current sheets in the Martian magnetotail

J. S. Halekas, D. A. Brain, R. J. Lillis, M. O. Fillingim, R. P. Lin, D. L. Mitchell

Space Sciences Laboratory, University of California Berkeley, USA

(jazzman@ssl.berkeley.edu / Phone: 510-643-4310)

The Martian magnetotail is formed by magnetic field lines draping around the ionosphere, rather than stretched dipole fields as in the terrestrial case. However, the structure in the deep tail is somewhat similar, insofar as it includes two lobes of oppositely directed magnetic field with a current sheet between them. The presence of strong localized crustal magnetic anomalies potentially complicates this structure near Mars, and the manner in which induced tail fields interact with crustal fields near the planet is not well understood.

The Martian current sheet was observed thousands of km deep in the tail by the PHOBOS-2 spacecraft. Recently, MGS observations by Ferguson et al. have shown that, even at the Mars Global Surveyor (MGS) mapping altitude of ~400 km, in regions of weaker crustal magnetic fields, the characteristic magnetotail structure of two tail lobes with a central current sheet can sometimes still be observed.

We now present MGS observations of current sheets in the Martian tail over a period of one Martian year, as identified by the characteristic magnetic field rotation. These current sheets can be seen at the 2 am orbit of MGS on approximately 15% of MGS orbits, and are found everywhere except for the regions of strongest crustal fields, where presumably any current sheet is pushed to higher altitudes. At some times, but not always, a hot electron "plasmashet" population is also found associated with the magnetic field rotation. We find clear variations in the preferred geographic location and characteristics of the current sheets as a function of season and IMF draping direction. In this presentation we will characterize the average magnetic structure and properties of the electrons near the current sheets and the variability thereof, and attempt to draw what conclusions we can about the magnetotail topology near Mars.