AOGS 2005


# Detection and Geometry of Electron Flows in the Martian Ionosphere

N. SERGIS[1], K. DIALYNAS[1], E. ROUSSOS[1,2] and X. MOUSSAS[1]
[1]*Department of Astrophysics, Astronomy and Mechanics, University of Athens*
[2]*Max-Planck-Institut fuer Sonnensystemforschung, Germany*

The northern Martian ionosphere is studied using electron flux data obtained by the electron reflectometer (ER) of the Mars Global Surveyor (MGS). A number of distinct hot plasma flux tubes are detected, primarily formed when the magnetospheric plasma is magnetically connected to the upper ionosphere, as a result of intense local electron precipitation. The physical and geometric characteristics, along with the distribution of these localised flows, are extracted and possible correlation with the magnetic features of the crust is further investigated. The upper Martian ionosphere is characterized by well defined flows of hot (electron energies >100 eV) magnetospheric plasma. The flows are able to create autonomous flux tubes within the ionosphere, with a usual width of a few hundreds of km.

The flux tubes are expected to be a result of extended non horizontal plasma motions in regions where reconnection between the surface crustal fields and the draped solar wind field occurs, practically creating magnetic paths allowing non horizontal plasma motion to prevail. They tend to be close to vertical near to strong magnetic fields of planetary origin, while almost horizontal in magnetically clear areas. The hot plasma precipitation, even though expected mostly where magnetic reconnection is present, seem to have constructed a generalized flux tube network in sub-ionospheric altitudes (200-400 km depending on the planetary region) transferring hot magnetospheric plasma within the Martian ionosphere.

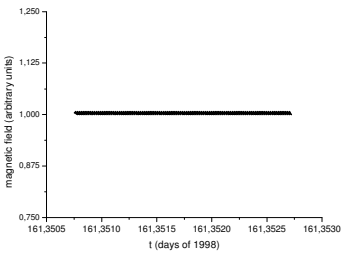


Figure 1: The basic plane projections of the magnetic field vector during an MGS passage through a flux tube (day 161 of 1998). Left: Time series projection of the horizontal component of the magnetic field vector. Right: Time series projection of the radial component of the magnetic field vector.