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Dayside Martian magnetosphere at the flank and in subsolar region.

O.Vaisberg (1), A.Ramazan (2), V.Ermakov (1), S.Shuvalov (1), I.Leonov (1)
(1) Space Research Institute of the Russian Academy of Sciences (olegv@iki.rssi.ru), Russia (2) Moscow Institute of Physics and Technology, Moscow

Abstract

Dayside magnetosphere of Mars is a thin layer between the magnetosheath and the ionosphere. The Mars Atmosphere and Volatile Evolution Mission (MAVEN) spacecraft provided, for the first time, high temporal and spatial resolution measurements enabling to study the structure of the dayside magnetosphere.

Analysis of Maven measurements at SZA ~ 70o of Mars showed that the structure and properties of the dayside magnetosphere strongly depend on the location in MSE coordinate system. At “high magnetic latitudes” (small angle relative to direction of the motional electric field vector -1/c Vsw x B where Vsw is the solar wind velocity vector) the energy of magnetospheric heavy ions is usually ~ 10-100 eV. Plume plasma often dominates in magnetosphere. Magnetic barrier is strong and spans through internal magnetosheath and magnetosphere. At “equatorial latitudes”, where motional electric field is nearly horizontal, the main features are irregular structure of magnetic field in barrier and in magnetosphere, magnetospheric plasma is not steady and often consists of decreasing energy structures. At “low magnetic latitudes” where motional electric field is directed Mars-ward the magnetic barrier is weak and magnetospheric plasma has smooth structure and energy ~ 10-20 eV.

The model of magnetosphere formed by solar wind-planetary atmosphere interaction (usually called induced magnetosphere) ([1], [2]) indicates that the dayside magnetosphere forms from the narrow slab of incoming magnetic flux tubes entering the magnetosphere in subsolar region filled with pick-up ions and convection to the two flanks while continuing the loading of the heavy atmospheric ions. These properties of the model are confirmed by the facts that the planetary ions flow in the flank of the magnetosphere moves parallel to magnetospheric boundary that is marked by the current layer and by the change of ion composition.

Analysis of the subsolar part of magnetosphere shows significant variability of the plasma and magnetic properties. There are several features that are different from what is observed at the magnetospheric flank. There are cases that magnetospheric layer is not observed between magnetosheath and ionosphere. In many cases magnetospheric population has properties suggesting that ionosphere is the main supply of magnetosphere. Description and comparison of two regions of magnetosphere is given.

References

[1] O.L.Vaisberg and L.M.Zelenyi, Formation of the Plasma Mantle in the Venusian Magnetosphere, ICARUS, Vol. 58, Issue 3, 412-430, 1984. ISSN: 10902643, ISBN: 0019-1035, DOI: 10.1016/0019-1035(84)90087-3

[2] L.M.Zelenyi and O.L.Vaisberg, Venusian Interaction with the Solar Wind Plasma Flow as a Limiting Case of the Cometary Type Interaction, In: Advances of Space Plasma Physics, ed. Buti, World Scientific, p. 59-76,1985.