Geophysical Research Abstracts
Vol. 14, EGU2012-1509, 2012
EGU General Assembly 2012

Comparisons between in situ measurements of the magnetic shadowing of high energy ions at Mars and hybrid model simulations, using contemporary particle and field measurements to define the upstream interplanetary conditions

S. McKenna-Lawlor (1), E. Kallio (2), M. Alho (2), R. Jarvinen (2), and V. Afonin (3)

(1) Space Technology Ireland, Maynooth, Co. Kildare, Ireland (stil@nuim.ie), (2) Finnish Meteorological Institute, Helsinki, Finland, (3) Space Research Institute, Moscow, Russia

Energetic particle data recorded by the SLED instrument aboard Phobos-2 while in circular orbit about Mars in March, 1989 showed the presence of magnetic shadowing. A 3-D, self consistent, hybrid model (HYB-Mars) supplemented by test particle simulations was developed to study the response of the Martian plasma environment to solar disturbances and to interpret, in particular, the SLED observations. The magnetic and electric fields, as well as the properties of high energy ions, present at Mars under conditions of extreme solar disturbance can be derived from HYB-Mars. Our initial study [McKenna-Lawlor et al., EPS 2011, in press] showed that the HYB-Mars model predicted an already well-documented plasma phenomenon at the planet, namely 'sw-flow shadowing (identified in the measurements of the ASPERA (plasma) experiment aboard Phobos-2). HYB further, importantly, predicted the occurrence of magnetic shadowing which is qualitatively similar to that recorded by SLED. The simulations in addition suggested that the configuration of a magnetic shadow depends on the pertaining solar wind density and velocity, and on the magnitude and direction of the interplanetary magnetic field.

The present work presents a more detailed study where plasma and magnetic field inputs to the HYB model come from measurements made aboard Phobos-2 contemporaneously with the SLED observations. In this way it is possible to realistically match the upstream interplanetary conditions with the configuration of the magnetic shadow recorded at various energies in the SLED data. One-to-one comparisons between the SLED observations and simulated high energy H+ fluxes will be presented in this context and similarities and differences between the observations and simulations discussed.