



Dynamics of Solar Wind Helium ions in the Martian environment

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Accordingly to Krasnopolsky and Gladstone [1996] part of the Martian Helium could be of solar origin, being deposited into the Martian atmosphere by the Solar Wind through charge exchange processes with planetary neutral species: the estimation of this deposition has been refined by Chanteur et al. [2009]. Sternberg et al [2010] have recently reported observations by instrument ASPERA-3 onboard Mars Express spacecraft which indicate the presence of Helium ions at low altitude in the Martian atmosphere. In order to further investigate this issue the dynamics of Solar Wind Helium ions in the Martian environment is examined by making use of test particle simulations in the electromagnetic field provided by a self-consistent three-dimensional hybrid simulation. The hybrid code used is an updated version of the code designed by Modolo et al (2005,2006) which for the first time took into account the two main species of the solar wind, protons and alpha particles, besides the main planetary ion species. Test particle simulations allow detailed a posteriori analysis that would be difficult to perform during the self-consistent run.

References

Chanteur, G.M., E. Dubinin, R. Modolo, and M. Fraenz, Capture of solar wind alpha particles by the Martian atmosphere, *Geophys. Res. Lett.*, 36, L23105, doi:10.1029/2009GL040235, December 2009.

Krasnopolsky, V. A., and G. R. Gladstone (1996), Helium on Mars: EUVE and PHOBOS data and implications for Mars' evolution, *J. Geophys. Res.*, 101, 15,765– 15,772.

Modolo, R. , Chanteur, G. M., Dubinin, E. and Matthews, A. P., Influence of the solar EUV flux on the Martian plasma environment, *Annales Geophysicae*, Vol. 23, pp 433-444, 28-2-2005

Modolo, R., G.M. Chanteur, E. Dubinin, and A.P. Matthews, Simulated solar wind plasma interaction with the Martian exosphere : influence of the solar EUV flux on the Bow Shock and the Magnetic Pile-up Boundary, *Annales Geophysicae*, 24, 3403-3410, 2006

Sternberg, G., S. Barabash, H. Nilsson, Y. Futaana, M. Hamrin, A. Fedorov, D. Brain, In search for Helium at Mars and Venus, 5th Alfven Conference, Sapporo, 2010