EPSC Abstracts
Vol. 5, EPSC2010-592, 2010
European Planetary Science Congress 2010

Global Conductivity Distributions in the Martian Ionosphere

M. Beharrell (1), J.A. Wild (1), H.J. Opgenoorth (2), and M. Lester (3)

(1) Lancaster University, Lancaster, UK, [email: m.beharrell@lancaster.ac.uk]. (2) Swedish Institute of Space Physics, Uppsala, Sweden. (3) University of Leicester, Leicester, UK.

Abstract

Recent studies based on Mars Global Surveyor magnetic field measurements indicate stratified ionospheric conductivity layers in the Martian ionosphere. The ionospheric Hall conductivity peaks between 130-140 km while the Pedersen conductivity profile is double peaked with a high altitude peak located between 180-200 km and a lower, typically much stronger, peak between 120-130 km. Observations suggest that the lower altitude Pedersen conductivity layer is only found under regions of strongly draped magnetospheric field lines and negligible crustal magnetic field. The resulting strong conductivity gradients are expected to strongly influence the electrodynamics of the Martian ionosphere and, by controlling the closure of field-aligned currents, modulate solar wind-ionosphere coupling.

In this study we combine realistic global crustal field, atmospheric, and ionospheric models [1,2,3] in order to estimate the planetary distribution of ionospheric conductivity. This enables us to investigate the spatial variations in both the vertical and horizontal directions under a wide range of realistic conditions. First results will be presented and their implications discussed.

Acknowledgements

With thanks to F. Forget and E. Millour for the Mars Climate Database [DVD-rom], and to J. Cain for the Martian crustal magnetic field model.

References

[1] Cain, J., et al. An n = 90 internal potential function of the Martian crustal magnetic field, J. Geophys. Res. (Planets), 108, E2, pp. 2-1. 2003.

[2] Lewis, S. R., et al. A climate database for Mars, J. Geophys. Res., 104, E10, pp 24,177-24,194, 1999.

[3] Pi, X., et al. A Chapman-Layers Ionospheric Model for Mars, Technical Report, JPL Publicaiton 08-24. 2008.