EPSC Abstracts,
Vol. 4, EPSC2009-237, 2009
European Planetary Science Congress,

Ion bulk flow in the ionospheres of Mars and Venus

M. Fränz (1), E. Dubinin (1), E. Nielsen (1), A. Angsmann (1), J. Woch (1), S. Barabash (2), R. Lundin (2) and A. Fedorov (3)

(1) MPI for Solar System Research, Katlenburg-Lindau, Germany (fraenz@mps.mpg.de / Fax: +49-5556-979-240), (2) Institute for Space Physics, Kiruna, Sweden, (3) CESR, Toulouse, France

Abstract

The upper ionospheres of Mars and Venus are permeated by the magnetic fields induced by the solar wind. It is a long-standing question wether these fields can put the dense ionospheric plasma into motion. If so, the cross-terminator flow of the upper ionosphere could explain a significant part of the ion escape from the planets atmospheres. But it has been technically very challenging to measure the ion flow at energies below 20eV. The only such measurements have been made by the ORPA instrument of the Pioneer Venus Orbiter reporting speeds of 1-5km/s for O+ ions at Venus above 300km altitude at the terminator [1]. Since these observations could never be confirmed by other instruments they have been debated. We here report on new measurements of the cross-terminator ion flow by the ASPERA 3 and 4 experiments onboard Mars and Venus Express with support from the MARSIS radar experiment which confirm O+ flow speeds of around 6km/s with fluxes of $1.2 \cdot 10^9/\mathrm{cm}^2\mathrm{s}$ (for Mars). We discuss the implication of these new observation for ion escape and possible extensions of the analysis to dayside observations which might allow us to infer the flow structure imposed by the induced magnetic field.

Bibliography

References

[1] Knudsen, W. and Spenner, K. and Miller K.L. and Novak V. (1980) *JGR*, 85, 7803–7810.

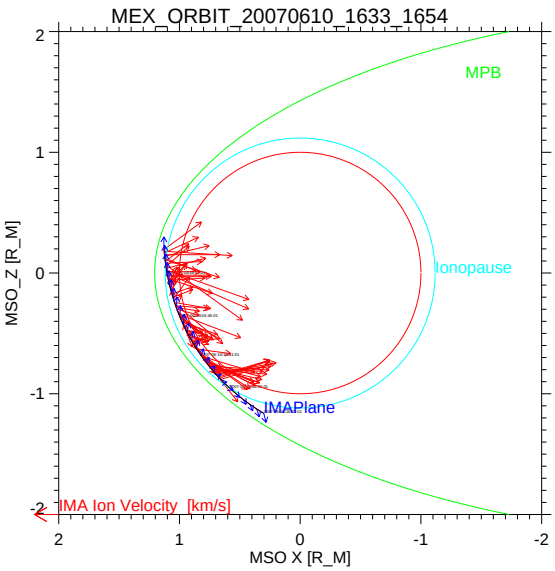

Figure 1: Ionospheric bulk velocity extrapolated from observation of the ASPERA-3 IMA ion sensor on board Mars Express made for a crossing of the ionosphere on 10 june 2007 16:33-16:54 UT. Red arrows are projections of the velocity vector onto the MSO XZ plane.