

Ionospheric Responses to Discontinuities in the Solar Wind

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Abstract

The solar wind plasma flow and associated IMF are highly variable. Past studies about Mars mainly focus on its interactions with steady solar wind conditions. However recent study found that the total escape fluxes can be significantly enhanced during solar wind pressure pulses [1]. This study focuses on ionosphere response to solar wind 1) density variation and 2) magnetic field direction change. Through numerical modeling, we found that the upper ionosphere of Mars responses almost instantaneously to solar wind density enhancement, while the lower ionosphere (below ~150 km) do not have any noticeable changes in density. Current sheet crossing can cause only moderate changes in the upper ionosphere of Mars with several min time delays. We also found that perturbations in density and integrated escape fluxes caused by the solar wind variations could last more than an hour.

References

[1] Edberg, N. J. T., H. Nilsson, A. O. Williams, M. Lester, S. E. Milan, S. W. H. Cowley, M. Fränz, S. Barabash, and Y. Futaana (2010), Pumping out the atmosphere of Mars through solar wind pressure pulses, *Geophys. Res. Lett.*, *37*, L03107.