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Electron densities of the martian ionosphere deduced from Mars Express radar soundings

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We present results based on data from the Mars Advanced Radar for Subsurface and Ionospheric Sounding (MARSIS) on board the Mars Express spacecraft. The instrument is active since August 14, 2005 and still operational, providing us with the top-side ionospheric traces. By inverting these traces, it is possible to obtain profiles of ionospheric electron density from the satellite altitude down to the altitude of the peak ionospheric electron density. It is shown that the obtained day-time densities are on average in good agreement with the Chapman ionospheric model with upward diffusion taken into account. Special attention is paid to the night-time region for which the basic Chapman theory predicts no ionization and the impact ionization by precipitating electrons becomes crucial. There are strong indications that the ionosphere in this region is formed by highly irregular structures and the condition of a horizontally stratified ionosphere is no longer valid. Unfortunately, the amount of data measured in this region is rather low.