



Electron densities in the ionosphere of Mars from the frequency of electron plasma oscillations detected by Mars Express

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The local electron plasma frequency obtained by the MARSIS (Mars Advanced Radar for Subsurface and Ionospheric Sounding) instrument on the Mars Express spacecraft, can be used to obtain important information on the electron density in the ionosphere of Mars. One of the advantages of this method is that the electron densities can be measured at very high altitudes. This study is done at the altitudes between 275 km and 1300 km. The excitation of electron plasma oscillations by the sounder transmitter creates harmonics of the local electron plasma frequency which are seen as closely spaced vertical lines in the upper left corner of the ionograms (displays of the echo strength versus frequency and time delay). In many cases, the fundamental of the electron plasma frequency cannot be observed, since it is below the lower limit of the frequency of the receiver. However, it can still be determined from the spacing of the harmonics. According to initial results which are obtained by the investigation of around 150 orbits, the average electron densities at a given range of solar zenith angle (SZA) decrease exponentially with increasing altitude, although there is considerable variability on individual passes. On the dayside of Mars, this behavior is valid until altitudes of around 750 km. The scale height in this altitude region is determined to be in a range between 95 km and 132 km. At higher altitudes, for some of the SZA ranges, irregularities are detected which are possibly related to the local magnetic field fluctuations. Also, at altitudes below 500 km, a substantial decrease in the electron density is seen when we go from dayside to nightside.