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Results from MARSIS surface souding mode measurement of total electron content of the martian ionosphere.

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The Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS), aboard Mars Express began routine science observations in early July, 2005. The objective of the subsurface experiment is to detect and characterize subsurface material discontinuities in the upper few km of crust.

In this presentation, using measurements from the MARSIS radar we discuss the distortion of the signal traversing Mars ionosphere. The dispersion of signals and method to correct them are shortly presented. The refractive index of the plasma is developed in a limited expansion and then the ionospheric parameters are varied to optimize the signal to noise ratio of the received signal. The total electron content is the major derived parameter however also the higher orders of the integrated electron density profile are also obtained. Using a select number of examples we illustrate our method.

The correction of MARSIS surface sounding mode provides us a powerful tool to study the martian ionosphere. Each orbit covers a large range of solar zenith angles, which allow us to characterize the behaviour of the ionosphere. To do that we use a simple layer Chapman model and estimate two parameters: the sub-solar maximum electron density and the neutral height scale.

Next we show that the spatial distribution of night time TEC values seems to be correlated to the magnetic field. We see an increase in TEC values when open magnetic field is growing up.

Finally we draw some general conclusions concerning the influence of the ionosphere on the radar signals, the method to correct it and the behaviour of the martian ionosphere as seen by MARSIS.