



Mars ionosphere data inversion by MARSIS Subsurface Signals analysis

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According to the Mars Express mission, the MARSIS primary scientific objectives are to map the distribution of water, both liquid and solid, in the upper portions of the crust of Mars. Moreover three secondary objectives are defined for the MARSIS experiment: subsurface geologic probing, surface characterization, and ionosphere sounding. The MARSIS orbital radar sounding suffers for the presence of a significant ionosphere that operates a phase distortion on the subsurface sounding signal: the phase distortion entails a delay, an increase of the side lobes level, a distortion of the waveform shape and a loss of signal to noise ratio. In MARSIS, therefore, an adaptive compensation of these effects, by Contrast Technique, is implemented in order to optimize the subsurface signals detection, which entails the estimation of Ionosphere parameters. This paper, starting from the data obtained during the normal sounding operation in the Mars north polar region, provides a description of the plasma frequency and extra time delay estimation versus SZA (Solar Zenith Angle) in order to verify the maximum plasma frequency (obtained during the previous missions to Mars), starting from the ionosphere model (gamma and uniform).