



MARSIS INVERSION APPROACH

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Abstract

The inversion approach of the data available from the MARSIS (Mars Advanced Radar for Subsurface and Ionosphere Sounding) instrument on Mars Express is described and applied in the south polar region of Mars. The data inversion gives an estimation of the compatibility of the materials composing the different detected interfaces with a list of reference categories as available in literature, including host and inclusion material.

The data inversion method is based on the analysis of the surface to subsurface power ratio and the relative time delay as measured by MARSIS. The MARSIS resolution permits us to identify layered structures present in the subsurface with a depth resolution of 150 m. A volume scattering and a multilayer analysis has been performed in order to analyze the influence of these scattering process on the obtained results. The data inversion has been performed at several frequencies to estimate the frequency dependent parameters affecting the behavior of the radar echoes. Data from SHARAD/MRO, that show multilayer structure of the first layer with higher depth resolution, have been utilized to provide an addition frequency for a better estimation of these parameters.

The results of the data inversion are given in a parametric way for each rock material and for few subsurface models.

The constraints, due to the known geological history of the surface, the local temper-

ature and the thermal condition of the observed zones and the results of other instruments on Mars Express and other missions to Mars, have to be considered to improve the validity of the utilized models.