



MARSIS DATA INVERSION APPROACH

Preliminary results

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Abstract

In this paper an inversion approach of MARSIS (Mars Advanced Radar for Subsurface and Ionosphere Sounding) data is presented. The data inversion permits the estimation

of the dielectric constant of the subsurface material; when impurity are present, it is possible the estimation of the inclusion dielectric constant and its the percentage on the host material. Few hypothesis on the surface composition or on the host material, taking into account the geological knowledge, are needed to reduce the range of the obtained values of the subsurface dielectric constant. The data inversion is based on the analysis of the data available from the MARSIS observations, that is the surface to subsurface power ratio and the relative time delay. The data inversion has been performed with a multi frequency analysis in order to estimate the frequency dependent parameters affecting the behavior of the radar echoes: to obtain the attenuation information, therefore, the geometric scattering terms must be frequency independent. This entails that the frames selection has to be addressed in areas where the Mars region exhibits moderate flat surface so that the surface backscattering is frequency independent; moreover, regarding the subsurface, flat regions can be selected by related echoes behavior (narrow shape).

The obtained results show a range of values, for the subsurface dielectric constant, that can be further reduced taking into account the geological history of the surface, the local temperature and the thermal condition of the observed zones and the results of other instruments of Mars Express and of other missions to Mars.