



Mars subsurface investigation by MARSIS and SHARAD

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Abstract

This paper is addressed to MARSIS (Mars Advanced Radar for Subsurface and Ionosphere Sounding in Mars Express ESA mission) data inversion. The data inversion gives an estimation of the materials composing the different detected interfaces, including the impurity (inclusion) of the first layer, if any, and its percentage, by the evaluation of the values of the permittivity that would generate the observed radio echoes.

The methodology utilized for the data inversion is applied in different areas of the Mars South Pole and the results are reported for each area. The scattering behavior of the surface and subsurface (flat or rough), according with the geometrical structure, is estimated by the shape of the radar echoes and is utilized for the correction of their power; in such a way the contributions due to the surface and subsurface shape are estimated and the corrected echoes contain only the surface and subsurface material features. In this paper, in order to define the main topics of the data inversion, are only considered areas where flat surfaces are present and clutter echoes are negligible; the clutter cancellation can be applied according with the well known techniques. The scattering (volume scattering) due to the inclusion in the host material has been considered. Several frames, from SHARAD (SHALLOW RADAR in Mars Reconnaissance Orbiter US mission), in the same Mars area, have been analyzed and they confirmed the layer attenuation obtained by MARSIS data. Within the MARSIS papers this one presents a quantitative and scientific parametric data inversion, based on a physical approach and gives numerical results on the dielectric constant of the detected interface.