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MARSIS RADAR DATA INTERPRETATION TO CHARACTERIZE THE DEEPER LAYERS IN THE
NORTH POLAR CAP ON MARS.**Abstract**

We performed a study using radar data from the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) on board of ESA's Mars Express spacecraft [1]. MARSIS collects data by transmitting a low-frequency radar pulse, between 1.3 MHz and 5.5 MHz with a 1 MHz bandwidth, which is capable of penetrating below the surface and to be reflected by any dielectric discontinuity present in the subsurface, reaching a depth of analysis of 3.7 km in icy deposits [2]. We analysed radargrams crossing Planum Boreum, the 1000 km diameter north polar plateau located in the centre of Borealis Basin, to study the deeper layered deposits identified in the north polar cap's stratigraphy (mapped by e.g. [3]). The main objective of our study was to obtain a stratigraphic geological profile to identify the deep trend of the Cavi unit, one of the main geological units which characterize Planum Boreum. This unit, deposited on a surface of unconformity, indicates the period of compositional variation of the placement materials at the bottom of the north polar plateau, in which the lithic percentage decreased exponentially to the advantage of an almost pure ice composition [3]. The Cavi unit represents an important element for the understanding of the north polar cap evolution, the past climate cycles on Mars and the changes in the orbital parameters of the planet [4]. The geological profile was obtained through the use of a Geographical Information System, which allowed us to correlate the USGS cartography with MOLA topography, and the MARSIS radargrams. The outline trace covers about 1500 kilometres, passing through the Planum Boreum and the surrounding areas. The final obtained stratigraphic profile allowed us: to have a global vision of the stratigraphic relationships of the various units, to show the trend of the Cavi unit, to identify some covered structures and also to formulate a plausible hypothesis about the evolution of the Planum Boreum. Using this method of radargram interpretation, we showed how to improve geological analysis of planetary sub-surfaces.

[1] Picardi et al. (2005), Science 310, 1925-1928, doi:10.1126/science.1122165 [2] Plaut et al. (2007), Science 316, 92-95, doi:10.1126/science.1139672 [3] Tanaka et al. (2008), Icarus, 196, p. 318-3582, doi:10.1016/j.icarus.2008.01.021. [4] Putzig et al. (2009), Icarus, 204, p. 443-457, doi:10.1016/j.icarus.2009.07.034.