

Preliminary results from radar-facies mapping of the lowermost north polar layered deposits, Mars

Nerozzi, S.¹ and Holt, J.W.¹

stefano.nerozzi@utexas.edu

1. Jackson School of Geosciences, The University of Texas at Austin, Austin, TX

The north polar layered deposits (NPLD) are the largest accumulation of water ice in the northern hemisphere of Mars, yet little is known about their age or accumulation history. Radargrams obtained with the Shallow Radar (SHARAD) on Mars Reconnaissance Orbiter (MRO) reveal first-order stratigraphic sequences bounded by erosional surfaces [Steel, 2012] that represent the key for understanding the recent climatic history of the planet [Holt et al., 2010]. However, great portions of the polar cap are still unmapped and no detailed studies of the lowermost layered deposits have been performed to date, primarily due to a general lack of visible exposures. The aim of this study is to use internal radar stratigraphy from SHARAD to reconstruct the first stages of ice accumulation and climatic changes of Mars. This objective will be achieved by identifying and mapping radar reflectors and unconformities with the highest detail possible.

First results are (1) new first-order unconformities and (2) second-order stratigraphic variations within single radar layers. The first were found in radargrams in the 90°E-180°E quadrant of the polar cap and may be related to known erosional surfaces or represent new first-order sequence boundaries in the NPLD. The second consist of multiple kinds of thickness variations and stratigraphic terminations, which probably indicate topographic control and changes in the latitudinal extent of water ice deposition.

Further mapping and analysis of SHARAD radargrams and resulting isopach maps will lead to the construction of a more complete and high-detail accumulation model of the NPLD, including both accumulation patterns and erosional events. In turn, these may be used to constrain models of recent climatic changes on Mars driven primarily by changes in orbital parameters.

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