

EGU21-3137, updated on 27 May 2022

<https://doi.org/10.5194/egusphere-egu21-3137>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Mapping the topography beneath the southern Martian polar cap using MARSIS high-resolution data

Giacomo Di Silvestro, Roberto Orosei, Luca Guallini, and Andrea Morelli

The ESA Mars Express mission was launched in June 2003 and reached Martian orbit in December of the same year. Among the instruments onboard, the Italian-American radar MARSIS has retrieved valuable data, therefore contributing many discoveries related to the Red Planet, such as the evidence of sub-glacial water lakes beneath the South Pole of Mars. The technique used by this antenna is the radar echo sounding which, thanks to the electromagnetic waves emitted at frequencies in the HF range – in four separate bands centered at 1.8, 3, 4, and 5 MHz - has the ability to penetrate the ice masses, allowing the study of the internal properties and structures of glaciers and the regolith underneath.

Based on selected MARSIS radargrams, the main purpose of our analysis is to define the topography and main morphologies of the bedrock beneath Ultimi Lobe, part of the South Polar Ice Cap. Geologically speaking, this region is characterized by the South Polar Layered Deposits unit, widely showing complex layering and locally broad deformational structures (i.e., faults and folds). In particular, through the use of a georeferenced model of the bedrock surface, we focused on the search for low-topographies possibly consistent with basins able to contain the subglacial water reservoirs inferred by Orosei et al. (2018) and Lauro et al. (2020). Furthermore, we are implementing an algorithm focused on semi-automatic surface delineation using radar echo observations. Through the implementation of this script and retrieved data/images, we suggest that the machine-learning algorithm could be trained for further analysis.