



## **Developing a methodology for the study of permafrost and habitability for future missions to Mars. Application to Nilli Fossae.**

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Mars is a fundamental objective in the exploration of the Solar System. At present day, the interest about this planet is increasing, as well as the number of mission to Mars and studies about this planet. Nowadays, the fundamental target of the exploration programs is the evaluation of habitability, what could be related to the existence of permafrost. The study of habitability and the behavior of permafrost and its active layer should has an important role in the selection of landing sites. These studies requires the use of very different types of data (images, topography, spectrometry, etc.), acquired by different spacecrafts (MGS, MO, MEx, MRO, etc.) at a wide range of wavelength (e.g., Visible, IR) and resolution (0.30 cm to some km). We propose a methodology to evaluate the possible existence of permafrost under the surface of Mars and its habitability. We focus this work in a protocol that is based on the analysis of as much as possible of the available data for this planet and the integration of all this distributed variables into a Geographic Information System (GIS).

We have applied this methodology to Nili Fossae, which was a candidate landing site for the MSL mission, as an example and a testing site. The proposed protocol includes the study of a wide variety of variables; geology, topography, climate, physical properties, geochemical composition, etc. Each one of these variables requires the use of different data and we apply diverse processing techniques for each one of them. Finally, in this work, we show the proposed flow-diagram that could permit us to evaluate the habitability and the existence of permafrost.