



Deception island, Antarctica: a terrestrial analogue for the study and understanding of the martian permafrost and subsurface glaciers

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The existence of permafrost on Mars was widely studied since Viking era and its presence is fundamental in the understanding of the water-cycle, the geological history of Mars, and the evolution of the martian hydrosphere. Viking, MOC, THEMIS, HRSC and HiRISE images allowed increase our knowledge about the role of ice on the martian landscapes. Polygonal terrains, glacial-like features, “basketball terrain” or pingos are some of the landforms that reveal the existence of frozen ice near the surface and in the ground forming the martian permafrost on present, recent or ancient times. The field observations and analyses done by Phoenix mission seem to confirm the existence of the martian permafrost hypothesized by the analyses of the images acquired by the previous missions to Mars. Moreover, the recent interpretations of the (RADAR) sensor on board of MRO mission also revealed that the surface of Mars seems to cover an important volume of ice forming glaciers covered by different materials.

Here we propose the study of the glaciers and permafrost of Deception Island (Antarctica) such as a terrestrial analogue of the glaciers and permafrost of Mars. This active volcanic island is an exceptional site to study the permafrost since the climatic conditions maintain the surface covered by the ice and snow during the main part of the year. This characteristic allows the existence of an important permafrost layer also during the summer, and permanent glaciers in the higher part of the island. In addition, Deception Island is an active volcano. Some of the glaciers are covered by the ash and tephra what made difficult to distinguish between the covered glacier and the permafrost. The eruptive volcanic materials could have similar characteristics than some martian regolith by lithology, granulometry and texture. In this way, the study of the permafrost and glaciers in Deception Island could help to understand the martian permafrost and glaciers at present. On the other hand, the objectives of our Antarctic research program in this island include some activities focused on drill shallow and depth (about 25 m) boreholes to extract ice-rich permafrost cores that will be analyzed to study the habitability on the permafrost. Results of these analyses could also used in astrobiological studies of the martian permafrost. In this work we show the most important characteristics of glaciers and permafrost in Deception Island, and some possible analogues from Mars.