

# Investigation in Mars analogue habitats of the Transantarctic Mountains of Victoria Land

J.P.P. de Vera (1), B. Foing (2), E. Ullrich (3), S. Ott (3)

(1) DLR Berlin, Institute of Planetary Research, Germany, (2) ESTEC/ESA Noordwijk, The Netherlands, (3) Heinrich-Heine-University Düsseldorf, Germany ([jean-pierre.devera@dlr.de](mailto:jean-pierre.devera@dlr.de) / Fax: +49-30-67055-507)

## Abstract

The Atacama Desert [1], the Dry Valleys in the Antarctic continent [2], the Rio Tinto in Spain [3] as well as some areas in the Sahara Desert [4] are identified as terrestrial Mars analogue regions. Field investigations in the permafrost of the Transantarctic Mountains of North Victoria Land were performed. One goal of this research is to find and characterise Mars like micro-habitats for microorganisms. The discovery of habitable dry and cold rocky areas and polygon soils as well as investigations on its micro- and macro-climate leads to the conclusion, that a new field area can be added to the list of Mars analogue regions on Earth. Some tests on “life-detector” instruments were performed in this region with preliminary positive results.

## 1. Mars analogue habitat

The GANOVEX X expedition (German Antarctic North Victoria Land Expedition) in the Antarctic summer season 2009/2010 took place on the Antarctic continent. Besides analysis on the geological formations, the distribution of microorganisms as lichens, fungi, green alga and cyanobacteria has been studied along a longitudinal and altitude transect. A diversity of micro-niches has been discovered. Cosmopolites and endemic microorganisms developed adaptation strategies to colonize retreat areas of eroded surfaces, fissures and cracks of granite, volcanic and metamorphic rocks in permafrost regions. These specific habitats were additionally characterized by measurements of the macro- and microclimate (UV-, IR-, VIS-/PAR-radiation, humidity, temperature, atmospheric ozone, water and aerosol content). Based on the discoveries in the mentioned area of the Transantarctic Mountains and due to comparisons to previous results obtained from some of the space-exposed cosmopolites in the space experiments

“Lithopanspermia” on BIOPAN 6 / FOTON M3 satellite and “LIFE” on EXPOSE on the International Space Station (ISS), we conclude, that this investigated Antarctic transect can be characterized as a Mars analogue area.

## 2. Tests with probable life-detector instruments

Tests with detection devices like an Infrared detector of Ocean Optics and the fluorescence and live activity detector Imaging-PAM of the company WALZ were performed. The goal was to look on the capacity of these instruments to resist and work in these harsh environments and to be suitable for further on development of sophisticated “bio-signature”-detectors for the implementation into future Mars rover, -Lander or robotic mobile entities.

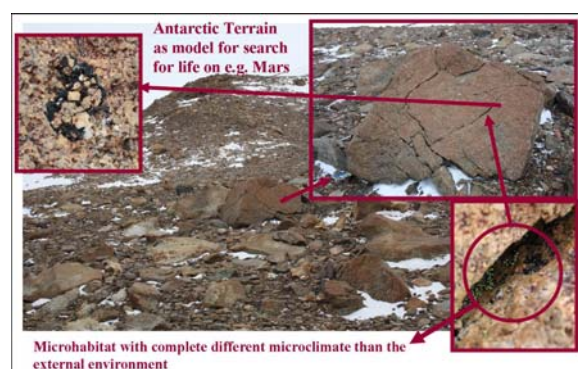


Figure 1: A Mars analogue micro habitat. Fissures and cracks in rocks are colonised by microorganisms.

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## References

[1] Wettergreen, D., Cabrol, N., Baskaran, V., Calderón, F., Heys, S., Jonak, D., Lüders, A., Pane, D., Smith, T., Teza, J., Tompkins, P., Villa, D., Williams, C., Wagner, M.: Second experiment in the robotic investigation of life in the Atacama Desert of Chile, Proc. ‘ISAIRAS 2005 Conference’, Munich, Germany, 5-8 September 2005 (ESA SP-603, September 2005).

[2] McCay, C.P.: The Search for life on Mars, *Origins of Life and Evolution of the Biosphere* Vol. 27, pp. 263–289, 1997.

[3] Fernandez-Remolar, D., Gomez-Elvira, J., Gomez, F., Sebastian, E., Martín, J., Manfredi, J.A., Torres, J., González Kesler, C., Amilis, R: The Tinto River, an extreme acidic environment under control of iron, as an analog of Terra Meridiani hematite site of Mars, *Planetary and Space Science* Vol. 52, pp.239 – 248, 2004.

[3] Paillou, Ph., Farr, T. G., Heggy, E., Rosenqvist, A., Eastern Sahara geology from orbital radar: potential analog to Mars, 35th Lunar and Planetary Science Conference, abstract no.1210, League City, Texas, March 15-19, 2004.