



The Relevance of Terrestrial analogue sites for the in situ planetary exploration

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Terrestrial Analogue Sites

The use of analogue environment has been developed since the very beginning of the space era to test the behavior and performances of the spacecraft and instruments.

To meet a the need of having the more similar conditions to space it was necessary to build vacuum and thermal chamber and also Solar simulation techniques.



The Cassini-Huygens spacecraft during the Solar Thermal testing

Terrestrial Analogue sites

Close artificial environments are not able to replicate the variability that planetary in situ exploration requires. Landing techniques, surface mobility, in situ experiments and also operations demand the use of conditions that can be found only in selected natural environments on Earth.

This approach was adopted since the Apollo era, than Viking and continues today.



Death Valley test landing site for Viking

Terrestrial Analogue Sites

Surface Exploration, either robotic either human, of a planet like Mars may imply the need to use different environments on Earth like:

- Dry Deserts
- Permafrost terrains
- Hydrothermal environment



High Canadian Arctic

Terrestrial Analogue Sites

Today many different analogue sites are in use as Atacama desert, Moroccan Desert, High Canadian Arctic.

The selection is usually left to the mission responsables that have to base their decision on the direct knowledge present in their staffs.



ExoMars rover tests in Atacama



Exomars DREAM Instrument test at Ibn Battuta

This is a not optimized situation and sometimes it is underevaluated. Analogues will become more relevant and critical with the increase on the exploration missions

A Modest Proposal: a Terrestrial Analogue Atlas

The creation of an Atlas of Earth Analogues would provide an important tool for selecting the more compliant site with respect to the mission to be realized, tested and operated.

This idea was firstly presented by dr. T. G. Farr during the International Mars Conference Organized by ASI on September 2004 in Ischia-Italy.

A data base for Mars started to be developed accordingly under a NASA contract.

Later, in 2009 during the International Mars Analogue Conference in Trento, the need of a coordination and harmonization of information on analogues was further discussed.

In the meanwhile other sites have been studied and qualified

A Terrestrial Analogue Atlas

The detailed study of the Martian or Lunar environments are of paramount importance and it is boosted by comparisons with suitable terrestrial environments and geological features.

The international panorama on terrestrial analogue sites suggests that the issue of an Atlas of Terrestrial Moon and Mars Analogues could be an extremely useful tool.

It could be issued under the patronage of UN.

The Atlas should contain as minimum:

- Geological description of the site
- Relevance for Mars or Moon
- Logistic information including transportation, accessibility and the availability of an in situ technical supports
- Period of the year when the site can be used.

A personal view

The comparison of the thermal behaviour of Martian surface temperatures measured by Viking wrt measured temperatures at McGill Canadian Arctic station and in Siberia allowed the Presenter to publish in 1979, on the special issue of the Journal of Geophysical Research dedicated to the Viking mission, the paper:
Thermodynamical study of Martian Permafrost
M. Coradini, E. Flamini

Only 30 years later I was able to visit and work at McGill Mars Station where those data had been acquired.



