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LOGOS: Lunar Organisms, GeoMicrobiology and Organic Compound Space Experiment

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Abstract

LOGOS is a concept designed for *in situ* science on the Moon or in its orbit. Measurement operations on an exposure platform as well as within a micro-greenhouse device are part of this concept. The goal is to investigate the use of lunar resources as well as to analyze the stability of biomolecules as potential biosignatures serving as reference for future space exploration missions to Mars and the icy ocean moons in the outer solar system.

1. Introduction

Astrobiological exploration of the solar system is a priority research area such as emphasized by the European Astrobiology Roadmap (AstRoMap) [1]. It is focusing on several research topics, such as "Habitability" and on "Biomarkers for the detection of life". Therefore, "space platforms and laboratories", such as the EXPOSE setup installed outside the ISS [2],[3], are essential to gain more knowledge on space- and planetary environments, which might be an essential basis for improvement of the robotic and human interplanetary exploration (Moon, Mars, Encedalus, Titan and Europa). In reference to these exposure platforms a new generation of hardware is needed to be installed in the lunar orbit or directly on the Moon. LOGOS is such a concept combining the life detection topics with topics relevant to autonomous life supporting systems. A combination of a sample exposure device and a micro-habitat for plants and microorganisms could address a tremendous number of questions from astrobiology and life sciences.

2. The main objectives

In focus of LOGOS are:

- *In situ* measurements by spectroscopy methods (such as Raman, IR, UV/VIS-spectroscopy) for analysis of biosignatures and their stability (future support of life detection missions on Mars and the icy moons in the outer solar system)
- *In situ* measurements of environmental conditions (radiation, pressure/vacuum, temperature, pH, humidity) in micro-modules / compartments in reference to planned micro-habitat experiments placed on the Moon or incorporated on an exposure facility in orbit

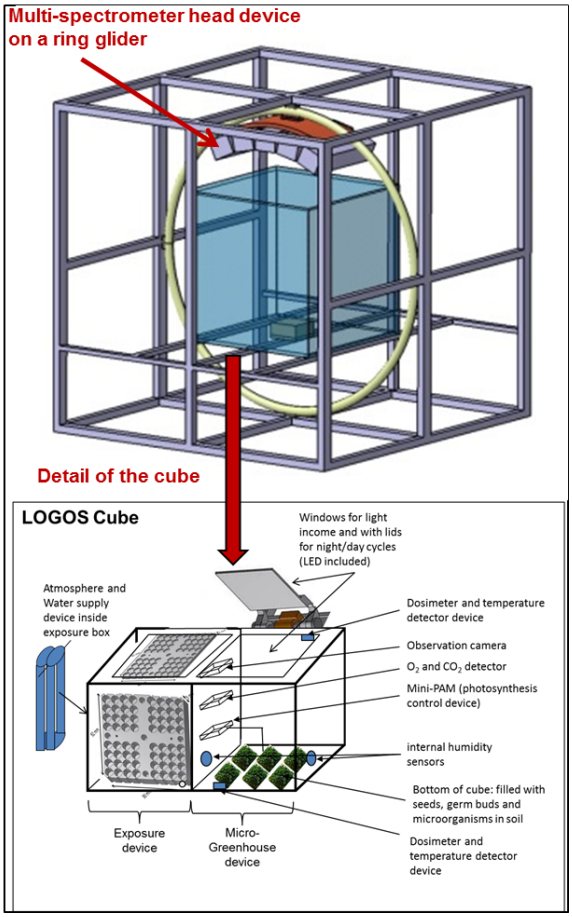

Figure 1: The LOGOS concept for multipurpose use

- *In situ* measurements of microorganisms' activity in micro-modules / compartments in reference to planned micro-habitat experiments placed on the moon or incorporated in the exposure facility in orbit

3. Summary and Conclusions

The Moon is an excellent platform to operate different space experiments which will be of relevance for astrobiology, life sciences and human space missions. LOGOS tries to fulfill a large number of scientific works in reference to these disciplines. The lunar environment is much harsher compared to Mars; and tests on biomolecules in this environment could provide information on their stability and therefore on the value to be used as reference for future space missions to Mars or the icy ocean moons in the outer solar system. Resources of the Moon such as the regolith or the freely available radiation on the surface could be tested by using them in a micro-greenhouse. Within this greenhouse different filters could test the optimal spectra range of the radiation.

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