Harnessing the power of microbe-mineral interaction in space: BioRock and BioAsteroid

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As the duration and ambition for spaceflight missions expands, it is necessary to develop strategies and technologies that will allow and facilitate human space exploration. Microorganisms perform countless tasks on Earth and they will be essential in space. Among their potential roles, some of the most promising ones are as building blocks of ecosystems and in biomining on other celestial bodies or planets. However, microorganisms in space also present challenges. Understanding microbial response to space conditions is therefore pivotal to harness their potential.

The ESA-supported BioRock experiment on the International Space Station (ISS) studied microbe-mineral interactions in space, with a view to its potential roles in extraterrestrial life support systems, for instance in situ Resource Utilization (ISRU) and biomining. The experiment was performed in microgravity, simulated Mars gravity and simulated Earth gravity, with three bacterial species: Sphingomonas desiccabilis, Bacillus subtilis and Cupriavidus metallidurans.

In this talk, I will present and discuss the results from BioRock. The data obtained demonstrate the potential for biomining in space, show the efficacy of microbe-mineral interactions for advancing the establishment of a self-sustaining human presence beyond the Earth, and allow to advance our knowledge on general microbial response to space conditions. Following the successful outcome of BioRock, we are performing a second experiment on the ISS, BioAsteroid, in late 2020. In this occasion, we will investigate the interaction of the bacterium S. desiccabilis and a fungus with meteorite rock.