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UNDERSTANDING LIMITATIONS OF MARS RESOURCES: ASSESSING VIABILITY OF LIFE AND USEFULNESS FOR HUMAN HEALTH APPLICATIONS

Abstract

As humanity expands its activities into deeper space for longer duration, it is crucial to make space systems as self-sustaining as possible. Especially for human activities on Mars that cannot rely on timely and frequent supplies from Earth, we need to build systems that fully utilize the potentials of in-situ resources and bioregenerative processes. In this work, we use a computational approach to test how useful it can be to bring Earth ecosystems to such long-term missions. Using ecological capabilities can be potentially useful for the production of diverse sets of compounds for human needs. We first check which essential nutrients for human health can be generated in theory when the catalytic capabilities of Earth organisms are combined with the resources available on Mars. It is then examined if such ecosystems can be viable and self-sustaining on Mars (specifically if they can keep producing metabolites essential for their own survival). This work thus helps us understand the limitations and potentials of using ecological systems as an aid to human life support on Mars.