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IMPLICATIONS OF NEW DISCOVERIES IN THE MARTIAN ENVIRONMENT

Abstract

Recent science results from the robotic Mars program revealed a new perspective on the Martian environment that is directly relevant to human exploration. These include the discovery of strong residual crustal magnetism, which may be able to locally shield a crew from charged particles; the discovery of perchlorate globally in the soil on Mars; the presence of shallow ground ice at middle latitudes revealed by small impact craters; new measurements by Curiosity of water of hydration in surface soils even at the equator; detection of nitrates in the soil on Mars; and the first mineralogy measurements of soils on Mars. These findings may provide important resources for Human exploration and insight into Martian history while at the same time pose new challenges.

As part of the 2016 Space Studies Program of the International Space University, hosted at the Technion Israel Institute of Technology in Haifa, a team of professionals from around the globe participated in a project to explore the implications of new discoveries in the Martian environment on a future Human exploration mission to Mars. Water, and in particular flowing water, is important for life as we know it on Earth and is an important resource for any future Human presence on Mars. While perchlorate may pose a significant hazard to future space missions, it may also be leveraged as a resource. In-situ resource utilization for life-support and habitability will reduce the overall mass supply architecture from Earth and reduce mission risk. A Mars Human exploration science and technology roadmap of priorities needed to further understand the potential use and effect of the Mars environment on crew and hardware is presented.