German Aerospace Center

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DLR investigates the existence of liquid salt solutions on Mars

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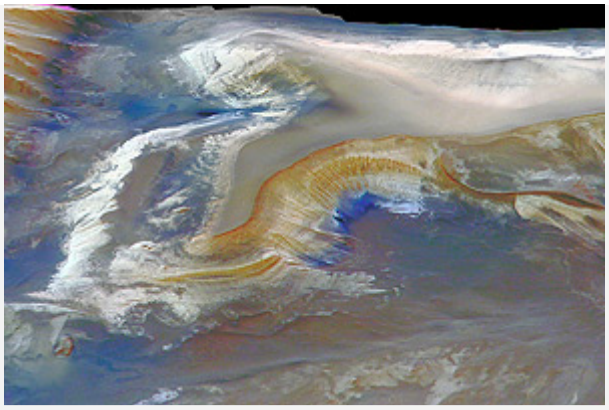
Salt solutions could support life



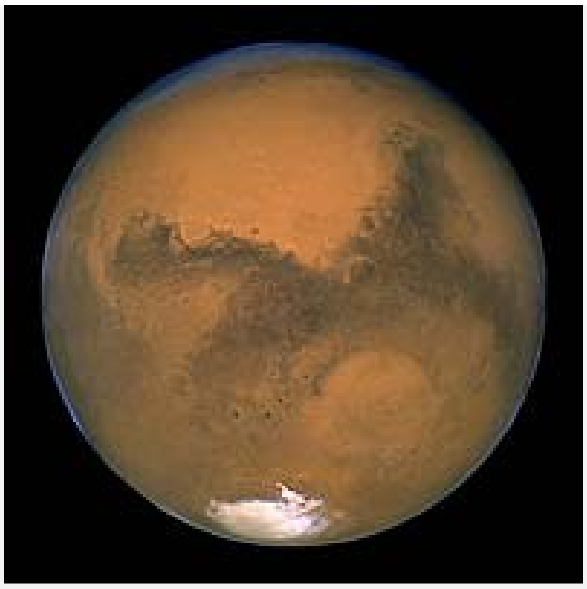
Bright areas on Martian hillsides

Is it possible that there are salt solutions on Mars that remain liquid despite the extremely low temperatures - a class of fluids known as cryobrines? Research findings at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have shown that this is a theoretical possibility. Experiments and modelling have indicated that the required conditions exist, especially during the Martian northern summer at higher latitudes. Prof. Diedrich Möhlmann of the DLR Institute of Planetary Research presented these initial findings on Friday 23 July and Saturday 24 July 2010 at the international COSPAR (Committee on Space Research) 2010 conference in Bremen.

"Our research was triggered by the findings of NASA's Phoenix Mars mission," explained Prof. Möhlmann: "In 2009, scientists showed, with images of salt solution droplets on the Phoenix probe, that cryobrines could exist on Mars. Since there is no liquid water on Mars' surface, cryobrines could possibly be a fluid medium that supports life." Prof. Möhlmann and his team have discovered that it is possible for the liquefaction of cryobrines during the northern summer at high northern latitudes to last all day. At middle latitudes, the phenomenon occurs over several hours during the morning and evening; this is due to the salts absorbing atmospheric humidity to liquefy - a process known to as deliquescence. A higher degree of humidity prevails during the northern summer, which declines further south.

Encouraging results

Deliquescence may at least temporarily cause liquid salt solutions to form at temperatures far below zero degrees Celsius for part of a day or part of a year. This fact is especially significant since the average night-time temperature on Mars is about minus 80 degrees Celsius. This liquid solution could allow flow processes, known as rheological processes, on the Martian surface. In the context of possible biological processes, this could also be a life-sustaining transport of nutrition and waste.



Mars

These are all qualities that are normally only attributed to water. The question of whether this is sufficient to make life possible is being investigated in the next phase by microbiologists at the Technical University of Berlin together with colleagues from the DLR Institute of Planetary Research. If life is possible in these temporary liquid salt solutions, the definition of habitability will need to be expanded: 'Pure' water would no longer be the sole prerequisite for the emergence of life.

The DLR and TU Berlin research teams are experimenting with these biological questions within the framework of 'Planetary Evolution and Life', an alliance of the Helmholtz Association. "We are still at the beginning, but our initial findings are extremely encouraging," declared Prof. Möhlmann, and he continued: "We are currently testing various micro-organisms to examine whether and how they survive in salt solutions. Under terrestrial conditions - that is, with a freezing point of zero degrees Celsius, this has been already explored, but not at temperatures below zero."

Contact

Lena Fuhrmann
Deutsches Zentrum für Luft- und Raumfahrt (DLR) - German Aerospace Center
Corporate Communications
Tel: +49 2203 601-3881
Fax: +49 2203 601-3249
E-Mail: lena.fuhrmann@dlr.de

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