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## Mars surface probably can't support life

### PRESS RELEASE

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The question of whether the planet Mars can support life has entranced lay people and scientists for years. New research suggests that dust devils and storms on Mars produce oxidants that would render the planet's

surface uninhabitable for life as we know it.

"As a consequence, any nascent life (microorganisms, for example) or even prebiotic molecules would find it hard to get a foothold on the surface of Mars, as the organic material would be scavenged efficiently by the surface oxidants," said Sushil Atreya, University of Michigan professor in the Department of Atmospheric Oceanic and Space Sciences.

Atreya is lead author on one of two papers published last month in the journal *Astrobiology* that discuss the findings. Atreya's paper: "Oxidant Enhancement in Martian Dust Devils and Storms: Implications for Life and Habitability."

The research for both papers was conducted by the U-M Department of Atmospheric Oceanic and Space Sciences, NASA Goddard Space Flight Center and the University of California, Berkeley, with several other universities and institutes participating.

The results also explain inconsistencies in earlier space experiments that sought to determine if Mars had or did support life. Mars is thought to have formed with the same ingredients that on Earth led to the formation of molecules associated with life. Yet, organic molecules have never been detected on Mars' surface, Atreya said.

The first *Astrobiology* paper calculated the excess carbon monoxide, hydroxyl and eventually hydrogen atoms produced when electric fields generated by dust devils and storms cause carbon dioxide and water molecules to split. Hydrogen and hydroxyl have been known to play a key role in the production of hydrogen peroxide in the Martian atmosphere.

UCLA-Berkeley's Gregory Delory, senior fellow at the Space Sciences Laboratory, is first author, with co-authors Atreya and William Farrell of NASA's Goddard Space Flight Center, in Greenbelt, Maryland. That paper is called "Oxidant Enhancement in Martian Dust Devils and Storms: Storm Electric Fields and Electron Dissociative Attachment."

Atreya's team then calculated that the amounts of hydrogen peroxide produced during these reactions would be large enough to result in its condensation—essentially hydrogen peroxide would snow from the sky and contaminate the planet when it fell.

Atreya's paper suggests that the hydrogen peroxide would scavenge organic material from Mars, and it could also accelerate the loss of methane on Mars, requiring a larger source to explain the recent detection of this gas on Mars. "Methane is a metabolic byproduct of life as we know it, but presence of methane does not by itself imply existence of life on a planet", said Atreya.

Scientists regard Mars as Earth's closest relative. "Of all the planets in the solar system, Mars resembles the Earth most. And outside of the Earth, it has the best chance of being habitable now or in the past when the planet may have been warmer and wetter," Atreya said. Presence of life below the surface of Mars now or in the past is not ruled out by this research.

The research also helps explain contradictory results in a series of experiments in 1970s that suggested microscopic life might have been present in Martian soil. Called the Viking Project, the primary objective was to determine if there was life—dead or alive—on Mars. Biological experiments conducted by the two landers, Viking 1 and 2, yielded conflicting results.

In addition to lead authors Atreya and Delory, co authors of both papers are Farrell, and Nilton Renno and Ah-San Wong, (University of Michigan), Steven Cummer (Duke University, Durham, N.C.), Davis Sentman (University of Alaska), John Marshall (SETI Inst., Mountain View, Calif.), Scot Rafkin (Southwest Research Institute, San Antonio, Texas) and David Catling (University of Washington). The research was funded by

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NASA's Mars Fundamental Research Program and NASA Goddard internal institutional funds.

For more information on Atreya, visit: <http://www-personal.engin.umich.edu/~atreya/index.html>

To see the abstracts at the journal Astrobiology, visit: <http://www.liebertonline.com/toc/ast/6/3>

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