

# Could water have carved channels on Mars half a million years ago?

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A spectacular example of gullies on Mars, at roughly -71 degrees latitude in the southern hemisphere. Credit: NASA/JPL-Caltech/University of Arizona

Could water have carved channels on Mars as recently as 500,000 years ago? If that's the case, it would boost the case for relatively recent life on the red planet.

There's abundant evidence showing that Mars was wet early in its 4.5 billion history, but new research suggests that the water comes in cycles,

providing opportunities for life to take a hold in between the long, cold ice ages.

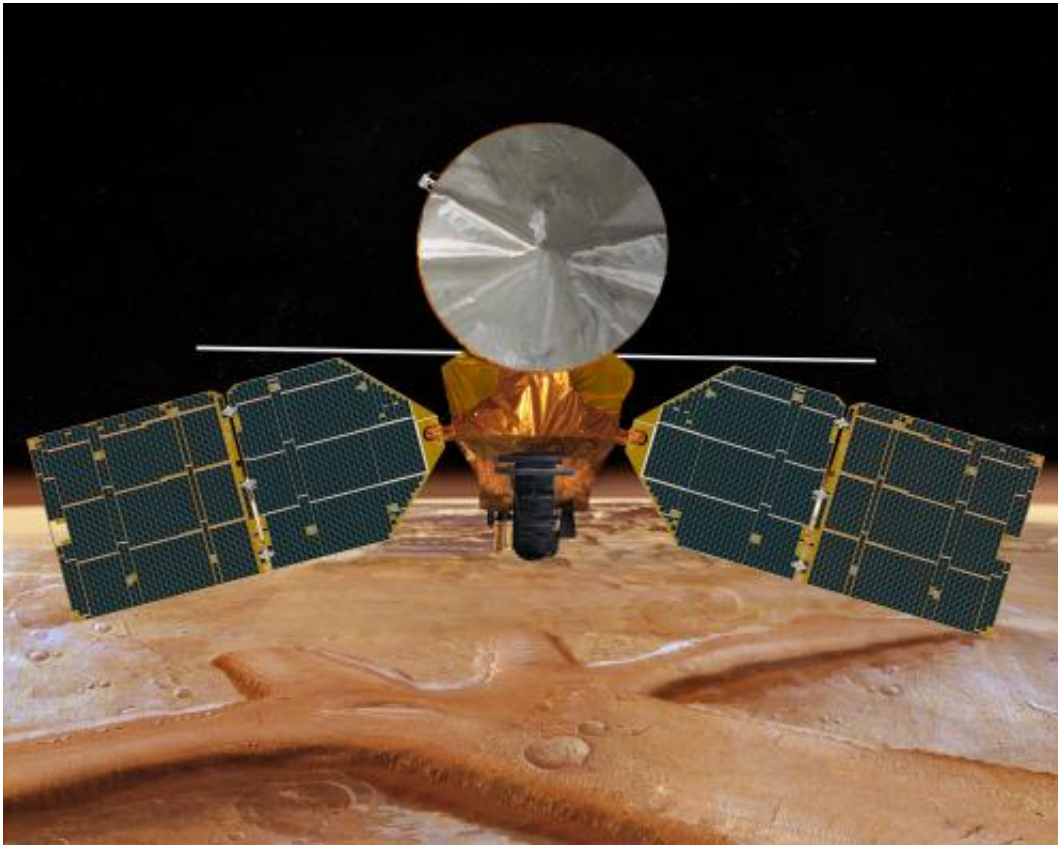
The suggestion comes after roughly 15 years of observations from NASA's Mars Reconnaissance Orbiter. The spacecraft's High Resolution Imaging Science Experiment (HIRISE) camera gave investigators the first high-definition look at the planet's surface. Additionally, NASA's Mars Global Surveyor spacecraft's Mars Orbiter Camera previously discovered [gullies](#).

With this powerful eye scanning Mars, almost immediately a new feature popped out—gullies. According to lead investigator Jay Dickson, the appearance of the gullies looks almost exactly like ones on Earth that were shaped by water. So the leading hypothesis of most gully formation is that it forms from flowing water, although some research suggests carbon dioxide frost contributes to gully modification.

"What we think is these older gullies that we're documenting now are remnants of a time when liquid water was more feasible at these locations," said Dickson, a planetary scientist at Brown University who has examined ice on Antarctica and Mars for more than a decade.

"The atmosphere was a little thicker and there was more sunlight hitting the poles, which moved the ice from the poles to mid-latitude locations."

His work was recently published in the scientific journal *Icarus* in a paper titled "Recent climate cycles on Mars: Stratigraphic relationships between multiple generations of gullies and the latitude dependent mantle."



NASA's Mars Reconnaissance Orbiter has captured hundreds of gullies using the HiRISE camera. Credit: NASA

## **Hundreds of gullies**

Dickson led a recent survey of more than 200 gullies in the Red Planet's southern hemisphere, where they tend to be more abundant. A follow up study targets gullies in the northern hemisphere as well, to see if the observations of both hemispheres match.

Dickson and his team discovered that the gullies did not all form at the same time. They believe water flows on Mars and creates a gully, with fan-shaped deposits at the mouth of the channel. Over time, meteorites and dust alter the landscape, then water flows again and leaves more

deposits, sometimes on top of the older ones.

Absolute ages are difficult to estimate from orbit because measuring the half-life of radioactive elements—a common method for dating rocks exactly—is not possible from a distance. Collecting such measurements requires a rover. Scientists can estimate ages, however, based on how many craters have formed in a given area. In general, the more craters a surface has, the older it is because there would have been more time for impacts from meteorites and other small bodies.

Climate change caused by the variations in the tilt of Mars' poles may be the reason for the periodic water flows. Over time, as the pole changes tilt, sunlight hits different areas of the planet, causing the ice to migrate from the poles to more "temperate" latitudes.

Right now, Mars is in a position where [liquid water](#) is unlikely to flow at gully locations. Climate models in concert with the gully observations predict, however, that water would have flowed as recently as 500,000 years ago.

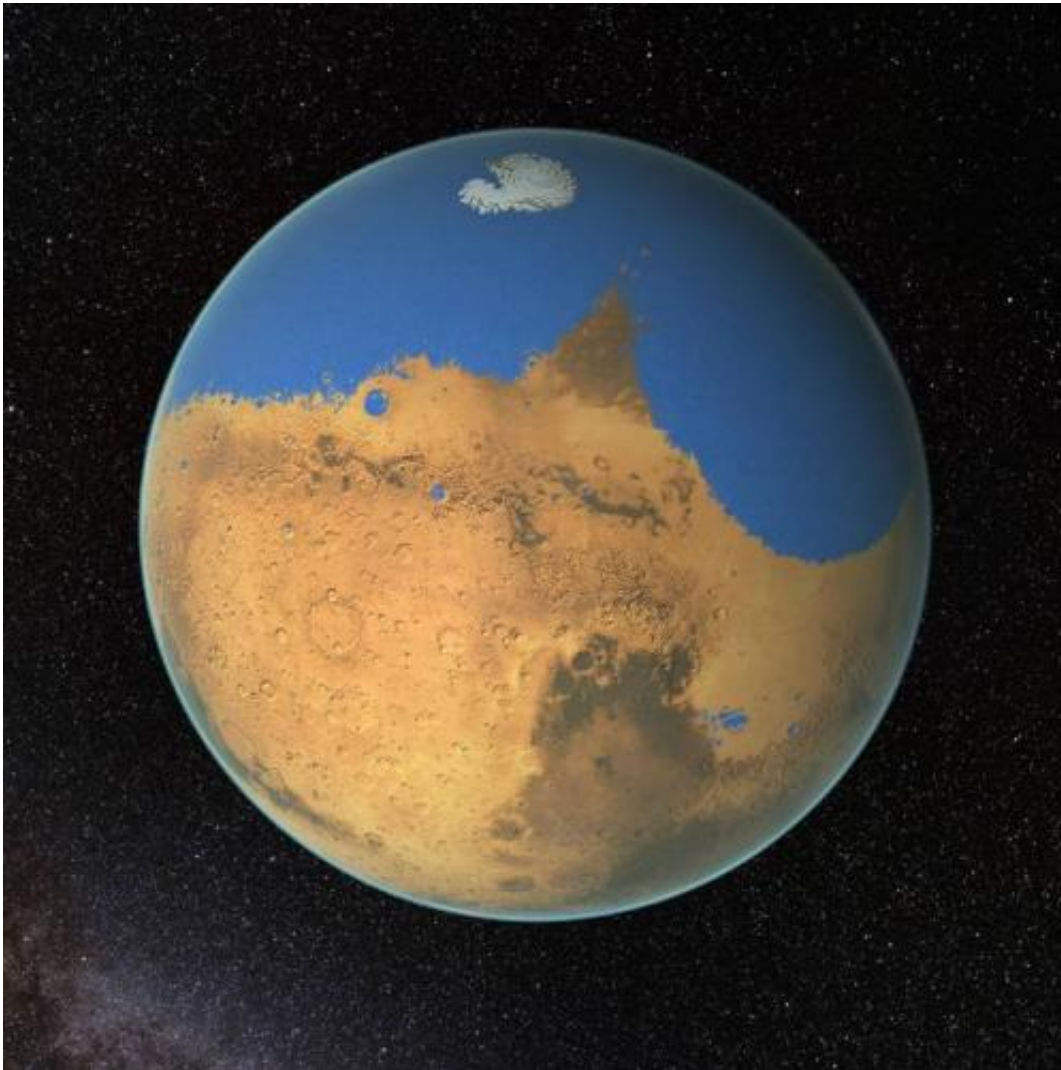


The gullies seen here are one of numerous examples on Mars, showing water flowing in the ancient past. Credit: NASA/JPL-Caltech/University of Arizona

### **Implications for life**

We don't know yet if life ever existed on the Martian surface. Water may have flowed for long periods of time, but whether the water was hospitable is an open question.

"We don't know how acidic it was, and don't know how much water there was," Dickson said.



Artist's conception of water on ancient Mars. Credit: NASA's Goddard Space Flight Center

What the study does point to, however, is a wider timespan for life to arise. Numerous observations of Mars in recent decades have shown evidence of not only gullies, but even a potential ancient shoreline where an ocean could have been. Furthermore, NASA's Opportunity, Spirit and Curiosity rovers have all found signs of ancient water in the rocks.

The only way to prove that [water](#) came more recently, however, is to get

a rover down into a gully. Current landing technology, however, isn't designed to do that well. The atmosphere is much thinner at the high altitudes where gullies are present, making it hard to use a parachute. And there's a risk a rover could slip on the slope if controllers misdirected it.

Dickson and his collaborators suggest sending smaller spacecraft to these sites, which would be lighter under their parachutes and perhaps more nimble on the surface than the heavy Curiosity, which weighs roughly two tons. When that will happen, however, depends on NASA's plans after the Mars 2020 rover, a near-twin of Curiosity that so far is the last confirmed surface mission in the agency's plans.

**More information:** "Recent climate cycles on Mars: Stratigraphic relationships between multiple generations of gullies and the latitude dependent mantle," *Icarus*, Volume 252, 15 May 2015, Pages 83-94, ISSN 0019-1035, [dx.doi.org/10.1016/j.icarus.2014.12.035](https://doi.org/10.1016/j.icarus.2014.12.035)

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