

Field geology at Mars' equator points to ancient megaflood

20 November 2020, by Blaine Friedlander



This composite, false-color image of Mount Sharp inside Gale crater on Mars shows geologists a changing planetary environment. On Mars, the sky is not blue, but the image was made to resemble Earth so that scientists could distinguish stratification layers. Credit: NASA/JPL

Floods of unimaginable magnitude once washed through Gale Crater on Mars' equator around 4 billion years ago—a finding that hints at the possibility that life may have existed there, according to data collected by NASA's Curiosity rover and analyzed in joint project by scientists from Jackson State University, Cornell University, the Jet Propulsion Laboratory and the University of Hawaii.

The research, "Deposits from Giant Floods in Gale Crater and Their Implications for the Climate of Early Mars," was published Nov. 5 in *Scientific Reports*.

The raging megaflood—likely touched off by the heat of a meteoritic impact, which unleashed ice stored on the Martian surface—set up gigantic ripples that are tell-tale geologic structures familiar to scientists on Earth.

"We identified megafloods for the first time using detailed sedimentological data observed by the

rover Curiosity," said co-author Alberto G. Fairén, a visiting astrobiologist in the College of Arts and Sciences. "Deposits left behind by megafloods had not been previously identified with orbiter data."

As is the case on Earth, [geological features](#) including the work of [water](#) and wind have been frozen in time on Mars for about 4 billion years. These features convey processes that shaped the surface of both planets in the past.

This case includes the occurrence of giant wave-shaped features in sedimentary layers of Gale [crater](#), often called "megaripples" or antidunes that are about 30-feet high and spaced about 450 feet apart, according to lead author Ezat Heydari, a professor of physics at Jackson State University.

The antidunes are indicative of flowing megafloods at the bottom of Mars' Gale Crater about 4 billion years ago, which are identical to the features formed by melting ice on Earth about 2 million years ago, Heydari said.

The most likely cause of the Mars flooding was the melting of ice from heat generated by a large impact, which released carbon dioxide and methane from the planet's frozen reservoirs. The [water vapor](#) and release of gases combined to produce a short period of warm and wet conditions on the red planet.

Condensation formed water vapor clouds, which in turn created torrential rain, possibly planetwide. That water entered Gale Crater, then combined with water coming down from Mount Sharp (in Gale Crater) to produce gigantic flash floods that deposited the gravel ridges in the Hummocky Plains Unit and the ridge-and-trough band formations in the Striated Unit.

The Curiosity rover science team has already established that Gale Crater once had persistent lakes and streams in the ancient past. These long-

lived bodies of water are good indicators that the crater, as well as Mount Sharp within it, were capable of supporting microbial life.

"Early Mars was an extremely active planet from a geological point of view," Fairén said. "The planet had the conditions needed to support the presence of liquid water on the surface—and on Earth, where there's water, there's life.

"So early Mars was a habitable planet," he said. "Was it inhabited? That's a question that the next rover Perseverance ... will help to answer."

Perseverance, which launched from Cape Canaveral on July 30, is scheduled to reach Mars on Feb. 18, 2021.

More information: E. Heydari et al, Deposits from giant floods in Gale crater and their implications for the climate of early Mars, *Scientific Reports* (2020).
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