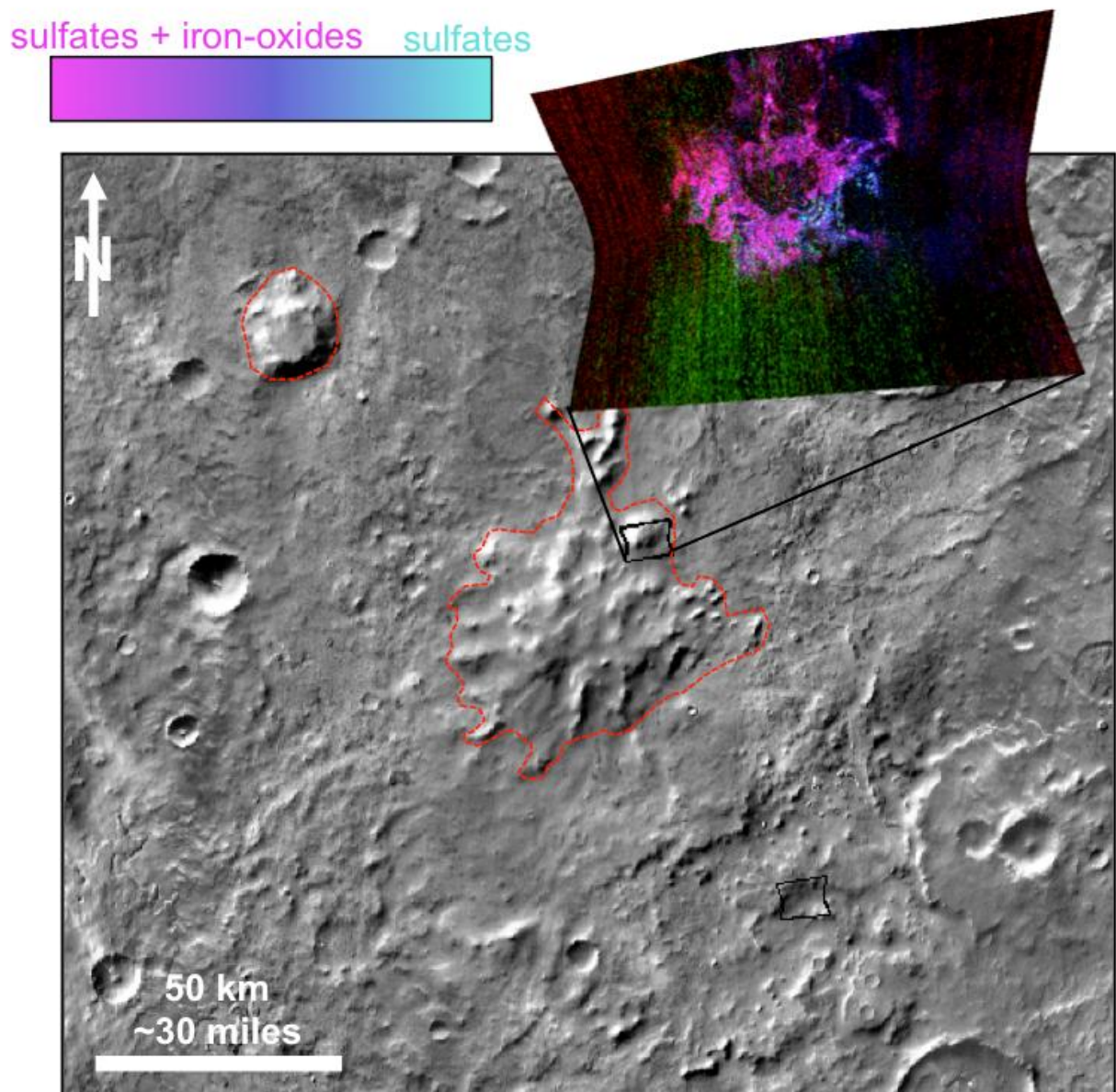


# Found: Clues about volcanoes under ice on ancient Mars

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This graphic illustrates where Mars mineral-mapping from orbit has detected a few minerals -- sulfates (blue) and iron oxides (pink) -- that can indicate where a volcano erupted beneath an ice sheet. The site is far from any ice sheet on modern Mars, in oddly textured terrain where the shapes of flat-topped mountains had previously been recognized as a possible result of ancient subglacial volcanism. Researchers used the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) to check surface composition in the area, and their findings strengthen the evidence for volcanic eruptions that burst through a cover of ice. These mountains are in a region called Sisyphi Montes. In this graphic, the base image shows a portion of the region about 130 miles (230 kilometers) across, centered at 17.73 degrees east longitude, 63.46 degrees south latitude. Red outlines indicate possible subglacial volcanic structures. CRISM data are presented in the overlay box at upper right, with an indication of the ground area covered by this CRISM observation. The color key at upper left shows how the spectrometer data correspond to presence of sulfates and iron oxide minerals, which are characteristic of subglacial volcanism sites on Earth. Credit: NASA/JPL-Caltech/JHUAPL/ASU

Volcanoes erupted beneath an ice sheet on Mars billions of years ago, far from any ice sheet on the Red Planet today, new evidence from NASA's Mars Reconnaissance Orbiter suggests.

The research about these volcanoes helps show there was extensive ice on ancient Mars. It also adds information about an environment combining heat and moisture, which could have provided favorable conditions for microbial life.

Sheridan Ackiss of Purdue University, West Lafayette, Indiana, and collaborators used the orbiter's mineral-mapping spectrometer to investigate surface composition in an oddly textured region of southern Mars called "Sisyphi Montes." The region is studded with flat-topped mountains. Other researchers previously noted these domes' similarity in shape to volcanoes on Earth that erupted underneath ice.

"Rocks tell stories. Studying the rocks can show how the volcano formed or how it was changed over time," Ackiss said. "I wanted to learn what story the rocks on these volcanoes were telling."

When a [volcano](#) begins erupting beneath a sheet of ice on Earth, the rapidly generated steam typically leads to explosions that punch through the ice and propel ash high into the sky. For example, the 2010 eruption of ice-covered Eyjafjallajökull in Iceland lofted ash that disrupted air travel across Europe for about a week.

Characteristic minerals resulting from such subglacial volcanism on Earth include zeolites, sulfates and clays. Those are just what the new research has detected at some flat-topped mountains in the Sisyphi Montes region examined with the spacecraft's Compact Reconnaissance Imaging Spectrometer for Mars (CRISM), providing resolution of about 60 feet (18 meters) per pixel.

"We wouldn't have been able to do this without the high resolution of CRISM," Ackiss said.

The Sisyphi Montes region extends from about 55 degrees to 75 degrees south latitude. Some of the sites that have shapes and compositions consistent with volcanic eruptions beneath an [ice sheet](#) are about 1,000 miles (about 1,600 kilometers) from the current south [polar ice cap](#) of Mars. The cap now has a diameter of about 220 miles (about 350 kilometers).

Provided by NASA

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