

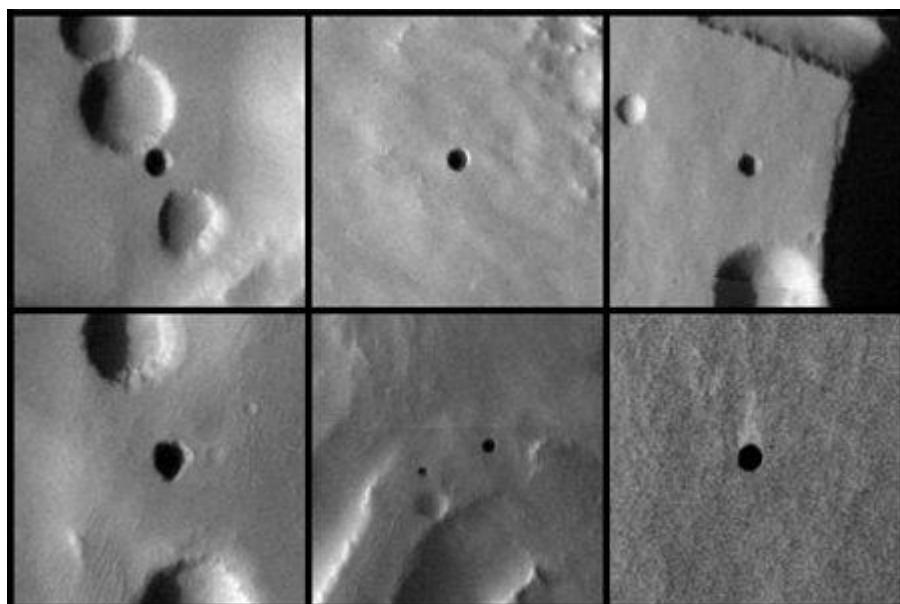
## Cave Skylights Spotted on Mars

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**September 21, 2007:** NASA's Mars Odyssey spacecraft has discovered entrances to seven possible caves on the slopes of a Martian volcano. The find is fueling interest in potential underground habitats and sparking searches for caverns elsewhere on the Red Planet.

Very dark, nearly circular features ranging in diameter from about 328 to 820 feet puzzled researchers who found them in images taken by NASA's Mars Odyssey and Mars Global Surveyor orbiters. Using Mars Odyssey's infrared camera to check the daytime and nighttime temperatures of the circles, scientists concluded that they could be windows into underground spaces.



**Above:** A montage image of the "Seven Sisters"--seven dark openings into cavernous spaces on the slopes of Arsia Mons. Researchers have nicknamed the features Dena, Chloe, Wendy, Annie, Abby, Nikki and Jeanne. [[More](#)]

Evidence that the holes may be openings to cavernous spaces comes from the temperature differences detected from infrared images taken in the afternoon vs. the pre-dawn morning. From day to night, temperatures of the holes change only about one-third as much as the change in temperature of surrounding ground surface.

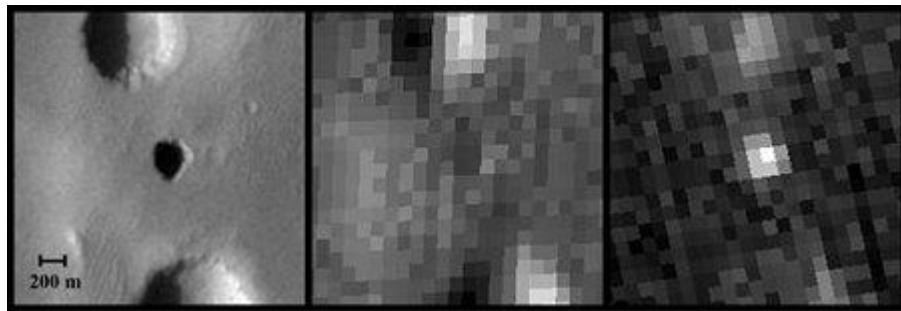
"They are cooler than the surrounding surface in the day and warmer at night," said Glen Cushing of the U.S. Geological Survey's Astrogeology Team and of Northern Arizona University, Flagstaff, Ariz. "Their thermal behavior is not as steady as large caves on Earth that often maintain a fairly constant temperature, but it is consistent with these being deep holes in the ground."

A report of this discovery by Cushing and his co-authors was published online recently by the journal *Geophysical Research Letters*.



"Whether these are just deep vertical shafts or openings into spacious caverns, they are entries to the subsurface of Mars," said co-author Tim Titus of the U.S. Geological Survey in Flagstaff. "Somewhere on Mars, caves might provide a protected niche for past or current life, or shelter for humans in the future."

The discovered holes, dubbed "Seven Sisters," are at some of the highest altitudes on the planet, on a volcano named Arsia Mons near Mars' tallest mountain.



**Above:** Each of the three images covers the same patch of Martian ground centered on skylight "Annie," which has a diameter about double the length of a football field. The left panel shows an ordinary white light view of Annie; right panels show infrared images in mid-afternoon (center) and just before sunrise (right). [[More](#)]

"These are at such extreme altitude, they are poor candidates either for use as human habitation or for having microbial life," Cushing said. "Even if life has ever existed on Mars, it may not have migrated to this height."

The new report proposes that the deep holes on Arsia Mons probably formed as underground stresses around the volcano caused spreading and faults that opened spaces beneath the surface. Some of the holes are in line with strings of bowl-shaped pits where surface material has apparently collapsed to fill the gap created by a linear fault.

The observations have prompted researchers using Mars Odyssey and NASA's newer Mars Reconnaissance Orbiter to examine the Seven Sisters. The goal is to find other openings to underground spaces at lower elevations that are more accessible to future missions to Mars.

The Jet Propulsion Laboratory manages Mars Odyssey and Mars Reconnaissance Orbiter for the NASA Science Mission Directorate, Washington. Arizona State University operates the Mars Odyssey's Thermal Emission Imaging System. For additional information about Mars Odyssey and the new findings, visit the [Odyssey mission home page](#).