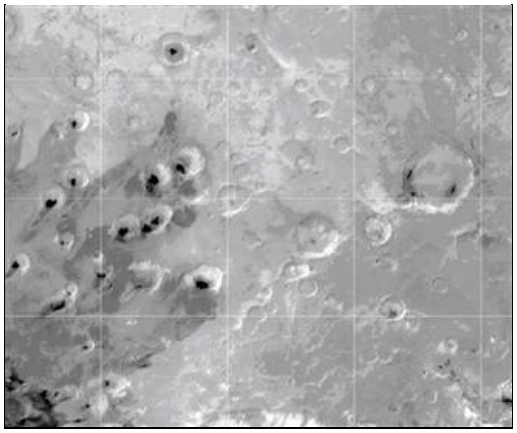
Mars methane: Geology or biology?

Methane plumes puzzle scientist, could be sign of microbial life



NASA/JPL/Malin Space Science Sys

Arabia Terra is one of the three equatorial regions where European Space Agency's Mars Express PFS instrument detected both water vapor and methane concentration. The other two areas are Elysium Planum and Arcadia Memnonia.

By Andrea Thompson
Space.com

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Plumes of methane gas detected over certain locations on Mars in 2003 could point to active geological processes on the red planet, or perhaps even to methane-burping microbes deep below the Martian surface, a new study reports.

Methane, a small (but important) constituent of Earth's atmosphere, makes up an even smaller percentage of **Mars' atmosphere** (which is 95 percent carbon dioxide), so detecting it on the red planet is a rare event.

In fact, it wasn't detected at all before 2003, when the European Space Agency's Mars Express orbiter (which is still circling the planet) picked up a **possible methane signature**.

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A search conducted with three ground-based telescopes that covered 90 percent of the Martian surface over three Mars years (seven Earth years) detected extended plumes of methane that varied with the seasons and seemed to emanate from specific locations. These include the Arabia Terra, **Nili Fossae** and Syrtis Major regions of Mars. The work was supported by NASA and the National Science Foundation.

In 2005, scientists also found **signs of water ice** beneath the surface near Mars' equator and, interestingly, near an area where methane has been detected.

The methane plumes started to show up in the northern hemisphere spring of Mars, gradually building up and peaking in late summer. At one point during the study, the primary plume contained about 19,000 metric tons (21,000 tons) of methane, comparable to the amount produced at the massive hydrocarbon seep at Coal Pit Point in Santa Barbara, Calif.

"It's a heck of a signpost," said study author Michael Mumma of NASA's Goddard Space Flight Center in Greenbelt, Md.

Where exactly the methane comes from is still unknown, though scientists have some ideas. Mumma and his team detailed these ideas and their findings in the Jan. 15 early online edition of the journal Science.

Geo or bio?
The release of methane is likely connected to the heating that happens as summer progresses in the northern hemisphere, Mumma said.

This heat could be melting ice that usually seals up pores or fissures in deep-relief areas such as scarps or craters walls (this is similar to how in the winter here on Earth, the sunny side of the street will have water and slush, while the shady side will stay frozen). The methane in this case would be coming from deeper below the surface.

Alternatively, the methane could be released by geochemical processes nearer the surface, within the top meter of the Martian terrain, Mumma said.

"We can't really tell the difference at this point," Mumma told SPACE.com.

On Earth, one of the main geological processes that releases methane is volcanism, but Mumma said this doesn't look to be the case on Mars because other gases spewed out in much greater amounts by volcanoes haven't been detected. Another possibility is a

process called serpentization, which transforms iron oxide into a mineral known as serpentine.

The most tantalizing possibility though is that the methane comes from subsurface Martian microbes.

Possible Earth analogues are the communities of **microorganisms that thrive in gold mines** a few kilometers below the surface in the Witwatersrand Basin of South Africa. The microbes use molecular hydrogen (produced as radioactivity in the surrounding rocks breaks apart water molecules) as an energy source, turning carbon dioxide to methane. Because photosynthesis isn't required, this same process could be taking place below the cryosphere boundary deep below the surface of Mars, where water transitions from ice to liquid water.

Of course, Mumma cautions, "we cannot state that we have detected biology or refute it."

Meanwhile, Tullis Onstott of Princeton University and colleagues are working on a new device for a potential future rover mission that could **trace the origin of the methane**.

CONTINUED : Short-lived

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