

naturenews

Published online 21 October 2008 | 455, 1018 (2008) | doi:10.1038/4551018a

News

Plumes of methane identified on Mars

Finding could influence choice of landing site for Mars Science Laboratory.

[Eric Hand \(/news/author/Eric+Hand/index.html\)](/news/author/Eric+Hand/index.html)

Ithaca, New York

More than four years after researchers first said they had found methane gas on Mars, a scientist claims that he has "nailed" the controversial detection and identified key sources of the gas.

On Earth, methane is mostly biological in origin; on Mars, it could signal microbes living deep underground. The latest work suggests that martian methane is concentrated in both space and time — at a handful of hotspots hundreds of kilometres across, plumes of methane bloom and dissipate in less than a year.

News of the detection is rippling through the Mars community just months before a destination is picked for the Mars Science Laboratory (MSL), the US\$2-billion rover that is due to launch in 2009. It will carry an instrument that could both detect trace amounts of methane and help discern whether it is of biological or geological origin. One of the proposed methane plumes blankets one of the seven possible landing sites: Nili Fossae, which was given a middling ranking by the science community after a September evaluation that did not consider the emerging methane results.



Nili Fossae is a hotspot for martian methane, says Michael Mumma (below).

JPL-Caltech/Univ. Arizona/NASA

"Now we've got these little signposts saying: 'Look, here I am. Come here!'" says Michael Mumma, a planetary scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. He presented his team's work on 11 October at a meeting of the American Astronomical Society in Ithaca, New York.



Michael Mumma, of NASA's Goddard Space Flight Center in Greenbelt, Maryland.

NASA

Mumma has been arguing for methane on Mars since 2003, when other startling findings began to emerge. One group, using the Canada-France-Hawaii Telescope on Mauna Kea, Hawaii, found global trace methane levels of 10 parts per billion, but could see no more detail than that. A second group, using thousands of spectra taken by the European Space Agency's Mars Express orbiter, found similar global levels, with hints of regional variability in concentration ([V. Formisano et al. *Science* 306, 1758–1761; 2004](http://dx.doi.org/10.1126/science.1101732) (<http://dx.doi.org/10.1126/science.1101732>)). But some of that paper's impact was diluted when the lead investigator, Vittorio Formisano of the Institute of Physics and Interplanetary Space in Rome, made separate claims of ammonia and formaldehyde that have not been confirmed.

Mumma, a spectroscopy expert, obtained data from telescopes in Hawaii and Chile that supported the notion of methane hotspots.

Now he says he knows for sure and is ready to publish. Having obtained four more years of data, Mumma has confirmed the presence of methane by matching four lines in his infrared spectra of the planet's atmosphere to the characteristic signature of methane — a more definite determination than previous analyses — and found more evidence that the methane is localized in discrete hotspots, which peak at levels of 60 parts per billion. "His numbers

have changed a lot over time. But Mike has made a pretty compelling case," says Steven Squyres, a planetary scientist at Cornell University in Ithaca, and principal investigator for the Mars rovers Spirit and Opportunity.

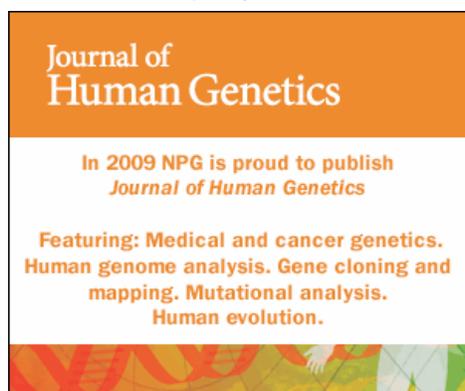
More important than the peak concentrations, Mumma says, are the short lifetimes of the plumes. Previously, methane was thought to be destroyed in the atmosphere by sunlight — a slow process that allows the gas to mix in the atmosphere and persist for about 300 years. A global level of 10 parts per billion and a lifetime of hundreds of years means that a few hundred tonnes of methane are entering the atmosphere each year: the work of a few thousand cows. But plumes of 60 parts per billion that live for less than a year imply a methane-production rate several orders of magnitude higher. "This is a big deal," says Sushil Atreya of the University of Michigan in Ann Arbor, a co-author of the 2004 Mars Express paper.

"Now we've got these little signposts saying: 'Look, here I am. Come here!'"

Whether the methane plumes are biological or geological in origin is impossible to know at the moment, says Atreya. For example, microbes could be living in deep groundwater below a permafrost zone, and their waste methane could percolate up and leak out. The methane could also come from chemical reactions in which buried volcanic rocks rich in the mineral olivine interact with water. A third possibility is that the methane is escaping from buried clathrates, deposits of methane ice formed long ago by one of the other two mechanisms.

But NASA's next Mars rover will be able to analyse, at levels of parts per trillion, the fractional concentrations of the carbon isotopes in each methane molecule. Life on Earth prefers to process lighter carbon-12 atoms. And so, on Mars, methane freighted with carbon-12 could be a sign of a biological origin.

ADVERTISEMENT



(<http://ad.doubleclick.net/click:h=v8/3761/o/o/%2a/l:207596312;o-o:0:9050413;4307-300/250:28237754/28255633/1;~sscs=%3fhttp://www.nature.com/jhg>)

John Grotzinger, a geologist at the California Institute of Technology in Pasadena and project scientist for the MSL, says the methane detection could be important in deciding the MSL's destination. "We're going to take this very seriously," he says. "We all need to sit back and evaluate the data and find out if Nili Fossae is the only place where this occurs." The methane results could be considered at a meeting early next month, when the seven sites are evaluated from an engineering and safety standpoint.

A reshuffling of the sites' rankings could be in order, Grotzinger adds, but he wants some hard data to consider. "Talks don't count. The paper needs to be published," he says.

A paper describing Mumma's work is under review at *Science*.

Comments

Reader comments are usually moderated after posting. If you find something offensive or inappropriate, you can speed this process by clicking 'Report this comment' (or, if that doesn't work for you, email redesign@nature.com). For more controversial topics, we reserve the right to moderate before comments are published.

Mars missions run on hypergolic contact of compacted dollar bills and credulity. Send a polarimeter to detect biological homochirality or stop flogging a dead horse. Nature 226 251 (1970) "Indigenous Lunar Methane and Ethane" 6 ppm methane in Apollo lunar regolith. THE MOON IS ALIVE! Horsefeathers.

Posted by: "Uncle Al" Schwartz | 22 Oct, 2008

Add your own comment

You can be as critical or controversial as you like, but please don't get personal or offensive, and do keep it brief. Remember this is for feedback and discussion - not for publishing papers, press releases or advertisements, for example. If you ramble on in an annoying way too often, we may remove your posting privileges.

You need to be registered with Nature to leave a comment. Please log in or register as a new user. You will be re-directed back to this page.

[Log in / register \(/news/login/index.html\)](/news/login/index.html)