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NASA Rover Dims Hopes for Martian Methane

Surface readings are at odds with earlier Mars methane reports.

The Curiosity rover used a laser to sample freshly drilled rock dust on Mars.

http://photojournal.jpl.nasa.gov/catalog/PIA16765

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NASA's Curiosity rover has failed to find significant signs of methane in the Martian atmosphere, mission scientists reported on Thursday. The new rover information suggests that earlier reports of Martian methane -- once seen as a

possible sign of microbial life on the planet -- may have been off target.

If the Curiosity finding holds up, it would raise questions about one of the most intriguing discoveries made about Mars in recent years: that periodic and large-scale plumes of organic methane are released from beneath the planet's surface.

"We consider this to be a quite definitive conclusion, and we're very confident with it," Chris Webster, manager of the Planetary Science Instrument Office at NASA's Jet Propulsion Laboratory in Pasadena, California, said of the new rover readings reported in the journal Science.

"It puts an upper limit on the background methane on Mars that is very constraining of any scenarios for its production on the planet."

The special interest in the gas comes from the fact that some 90 percent of the methane on Earth is the product of living microbes. Signs of methane plumes in the Martian atmosphere seen by Earth-based telescopes had earlier raised hopes of detecting similar microbial life hidden under the Martian surface.

Original Discovery Defended

The lead author of that 2009 methane plume discovery report, Michael Mumma of NASA's Goddard Space Flight Center in Greenbelt, Maryland, said that he stood by his finding that substantial and localized plumes of methane were released on Mars in 2003.

He suggests that the Martian atmosphere destroys methane much more quickly than Earth's does, and that within three years of the original measurements new observations showed that half of the methane was gone.

"These findings are actually consistent with our results," Mumma said of the findings from Curiosity. "We reported that the methane releases are likely to be sporadic and that the methane is quickly eliminated in the atmosphere.

"The good news here is that the rover instrument designed to detect methane is working, and we look forward to ongoing monitoring in the future."

Other American and European researchers have also detected elevated levels of methane in the atmosphere of Mars -- for example, the European Space Agency's Mars Express orbiting spacecraft found methane in 2004 -- but none with the specificity reported by Mumma's team.

Curiosity Counters Methane Reports

Webster said that he took the previous reports of methane on Mars "at face value," since they too were published in peer-reviewed journals. But he said the Curiosity observations were clearly different.

While methane can be produced through geological processes, on Earth it is overwhelmingly a byproduct of microbes called methanogens. Best known as denizens of the guts of creatures ranging from humans to cattle to termites, these organisms produce the marsh gas found in wetlands and landfills. But they can also live deep underground.

Because of the harsh environment on Mars – high levels of surface radiation; low temperatures; and dry, acidic conditions – scientists have generally agreed that any microbes now alive on the planet would likely inhabit the deep underground.

Mumma's team did not point to biology as the source of the methane plumes they identified, but they did raise it as a possibility along with geological processes.

Surface Measurements Will Continue

The new paper makes the case that the methane levels Curiosity detected on the ground are so low that the likelihood of a biological source is vanishingly small.

"Methane is a very well understood gas that is quite stable," Webster said. "We know how long it lasts and how it is destroyed over decades."

While it is conceivable that something exists in the Martian atmosphere that destroys methane at a much faster pace than on Earth, "we have no evidence, no observations of what it might be," he said.

Webster said the rover's instruments have not detected any methane so far, but the possibility of error put the upper limit of methane at 1.7 parts per billion. That means that the Martian atmosphere could hold at most about 10,000 tons (nine million kilograms) of methane, notes the University of Michigan's Sushil Atreya, a co-author on the new study. On Earth, the atmosphere holds about six billion tons (5.44 trillion kilograms) of methane.

The methane-detecting device is on the rover's Sample Analysis at Mars (SAM) instrument panel and is called the tunable laser spectrometer. Webster said that efforts to detect methane will continue, but will likely be reduced if results continue to come back negative.

A European satellite is scheduled to arrive at Mars in 2016 with the specific goal of searching for gases such as methane. The ExoMars Trace Gas Orbiter was initially going to be a joint venture with NASA, but the agency pulled out for budgetary reasons.