How much methane on Mars? Zero. Findings a setback in search for life

By Scott Gold
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The most high-fidelity search for methane on Mars has turned up none, a result that significantly reduces the chances of finding microbial life on the Red Planet.

The highly awaited results of tests conducted by NASA's Curiosity rover do not completely rule out the possibility that something is alive on Mars, researchers said. But the findings, published online

http://www.latimes.com/science/sciencenow/la-sci-mars-methane-20130920,0,7807004,full.story
Thursday by the journal Science, strongly suggest that Mars is barren.

“We’re very confident in this result,” said study leader Christopher R. Webster, who oversees the development of planetary science instruments at NASA’s Jet Propulsion Laboratory in La Cañada Flintridge. “It’s a very robust measurement.”

PHOTOS: Curiosity's journey, from landing to Lego

Last year, Curiosity released an initial batch of test results showing methane levels on Mars of no more than five parts per billion. That announcement deflated scientists across the globe, who had hoped for higher and more electrifying numbers.

Thursday’s report on the most sensitive methane tests ever conducted on Mars — six atmospheric samples measured from last fall to this summer — was even more definitive. Even stretching statistical error to its end point, the scientists concluded that there is no more than 1.3 parts per billion of methane in the Martian atmosphere. But the practical result was zero.

“We have not detected methane,” Webster said. The tests, he said, indicate “a low probability that there is ongoing microbial activity today.”

What’s more, scientists said, Mars is efficient at distributing gases like methane evenly across its surface. That means Curiosity was not just testing methane levels in Gale Crater, the geological feature just south of the equator where the rover is doing its work.

The results, Webster said, “are representative of the atmosphere as a whole.”

But the possible existence of methane of Mars speaks to arguably the largest single question that science seeks to answer: Is there life beyond Earth today?

Curiosity has sent home a trove of geological evidence suggesting that Mars — which used to be wet and warm like Earth — once fostered a habitable environment. Indeed, the very first rock the rover drilled from beneath the Martian surface contained hydrogen, carbon, oxygen, nitrogen and other key building blocks of life.

But discovering even a fraction of Earth’s methane on Mars could suggest that it is capable of harboring life now, not billions of years ago.

Methane seeps out of some of the most “alive” places on Earth — termite colonies, swamps, cow pastures. Earth’s atmosphere contains more than 1,700 parts methane per billion, and 90% of it is produced by something biological.

Mars rock yields building blocks of life

“But we’ve been doing this almost a year now, and it’s not budging,” said Sushil K. Atreya, director of the Planetary Space Laboratory at the University of Michigan and a leading Curiosity scientist. “It’s a little disheartening. If there were a lot of methane, it would imply a lot of things. It opens up the possibility of life.”

Over the years, the search for methane on Mars has been provocative and maddeningly inconsistent. And in certain corners of science, the invisible and fairly innocuous gas is downright divisive.

In 2004, the European Space Agency’s Mars Express orbiter reported methane in the Martian atmosphere at 10 parts per billion, an announcement that sent a jolt through the scientific community. Around the same time, scientists said they had used ground-based instruments on Earth to detect numerous “plumes” of methane on Mars, one of which contained a whopping 21,000 tons of the gas.

But questions have dogged those results ever since.

Skeptics claimed that the instruments aboard Mars Express were clouded by other elements in the Martian atmosphere, and that large amounts of methane in Earth’s atmosphere might have tainted the measurements that purported to have discovered the “plume.”

If the plume was real, “it should still have been there,” said Paul Mahaffy, a leading Curiosity scientist at the NASA Goddard Space Flight Center in Maryland.

“The bottom line is that we’ve had the ability to look over the better part of a year,” said Mahaffy, a
coauthor of the new report in Science. “We’re just not seeing methane.”

PHOTOS: See Curiosity's images from Mars

The search for methane on Mars, however, is not over, “and this does not rule out the possibility of life,” Atreya said.

There are, for instance, “many types of terrestrial microbes that don’t generate methane,” said Michael Meyer, NASA’s lead scientist for Mars exploration and an expert in the field known as astrobiology.

What’s more, scientists have theorized that methane vanishes more quickly on Mars than it does on Earth. Some researchers, for instance, have argued that methane decays quickly when it encounters Martian soil. Others believe that the dust devils that frequently scour the surface of Mars create strong electrical fields that can zap the gas away.

“That’s plausible,” Mahaffy said.

So the hunt continues. In 2014, Curiosity will likely receive new software that would allow it to search for methane in even higher fidelity than parts per billion.

Detecting trace amounts of methane would be one thing, but perhaps more importantly, it could allow Curiosity to show that those levels are changing. Proving that the levels vary could open the door, once again, to the possibility that there is a current source of methane on Mars.

Curiosity will get some help in 2016, when the ExoMars Trace Gas Orbiter is expected to reach the Red Planet. That craft, a joint project of the European and Russian space agencies, will scour the surface of Mars for methane — and if it finds it, will attempt to determine whether it is biological or geological in origin.

“The intriguing methane story continues,” Mahaffy said. “We’re still very motivated to keep looking. Methane seems to be a little elusive.”

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