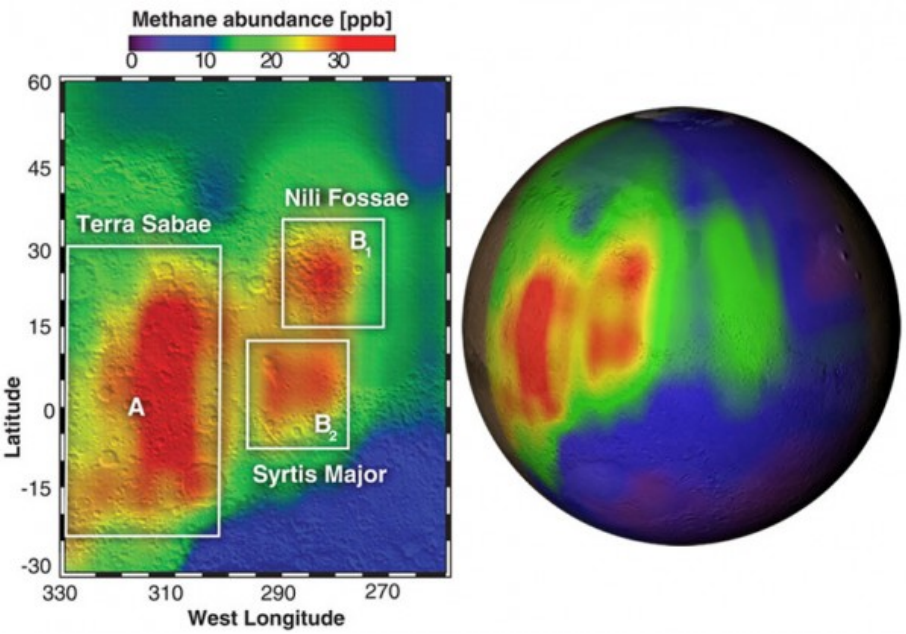
ADRIAN CHO Staff Writer

Mars Rover Finds No Evidence of Burps and Farts

2013-09-19 14:00 | 0 Comments



NASA

Blown away? Earth-based observations in 2003 indicated plumes of methane on Mars (red), but higher-precision measurements on the planet's surface find no such gas.

Like a hound sniffing the wind, NASA's Curiosity rover, the 899-kilogram, car-sized robot that landed on Mars 13 months ago, has analyzed the Red Planet's thin atmosphere and found no traces of the gas methane. That finding will disappoint many people, as methane is a potential sign of life. (Some microbes make it, and cows belch it in huge quantities.) It also puts the kibosh on claims that, at least occasionally, large clouds, or "plumes," of methane appear on Mars. Or so say the authors of the new work. The researchers who made some of the earlier observations are sticking to their guns.

Even skeptics of the previous claims say Curiosity's data do not prove that Mars is devoid of methane or life. But the results will dampen the excitement whipped up by previous reports, predicts Kevin Zahnle, a planetologist at NASA's Ames Research Center in Moffett Field, California, who does not work on Curiosity. "The certainty that methane is there will go away," he says, even if its presence can't be ruled out.

The quest for martian methane has a long history. The first observation came in 1969 from researchers working with NASA's Mariner 7 spacecraft, which flew past Mars. Months later, the team backed off that claim. In 2004, scientists working with the European Space Agency's Mars Express orbiter reported traces of methane. Like the Mariner researchers, the Mars Express team aimed to detect methane by studying the spectrum of sunlight passing through the martian atmosphere and looking for evidence that infrared light of specific wavelengths had been absorbed by methane to form "spectral lines." Others doubt that the spectrometer's resolution was fine enough to spot the gas.

The strongest evidence for methane comes from a team led by Michael Mumma, a planetary scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Using Earth-based telescopes to study sunlight reflected from the planet, the team found concentrations as high as 45 parts per billion near three geological features at a specific time: summer in the northern hemisphere of Mars in the Earth year 2003. The gas may have seeped from cliff faces heated by the sun, Mumma speculates. Trapped methane could be evidence of microbial life—ongoing or long ago—below the surface.

But there's a catch: The researchers have seen no methane since 2006. That absence is puzzling, as methane on Mars ought to linger hundreds of years before sunlight breaks it down. So some other process must destroy the methane much faster, Mumma and colleagues argued in *Science* in 2009.

Curiosity's on-the-spot measurements aim to clarify the issue. "We're the first measurement from the martian surface," says Christopher Webster, a planetary scientist at NASA's Jet Propulsion Laboratory in Pasadena, California, and lead author of the new study. That's a big advantage. Whereas Earth-based observers must sift possible martian signals from the far larger ones from Earth's atmosphere, Curiosity's Tunable Laser Spectrometer (TLS) probes isolated gulps of martian gases. Shining a laser through the gas, TLS can measure spectral lines with far higher resolution than terrestrial telescopes and detect methane with much greater sensitivity.

The TLS team sees no methane. Given the estimated uncertainties in their method, the researchers place an upper limit on methane in the martian atmosphere of 1.3 parts per billion, as they report online today in *Science*.

So do the results rule out the existence of the plumes? That depends on whom you ask. Mumma stands by his observations and argues that because methane on Mars must break down quickly, the new limit poses no problems. "So far the TLS results don't challenge anything we said in the 2009 paper," he says. Webster sees it differently. Had the methane measured by Mumma spread out evenly over the planet, then TLS should have detected a concentration of 6 parts per billion, he says. Explaining the gas's rapid disappearance "requires physics and chemistry that is unknown," he says—a point that Mumma happily accepts.

Scientists generally agree that Mars should have at least a little methane. The gas can be produced through nonbiological processes. And researchers say it's still possible that the martian surface contains pockets of methane-producing microbial life. TLS researchers will keep sniffing. They can improve the sensitivity of their measurements at least 10-fold by pumping the carbon dioxide out of their samples to concentrate the other substances in them, says Paul Mahaffy, a planetary scientist at Goddard and a member of the TLS team: "My one-liner would be, the hunt for the elusive methane continues."

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