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NASA's Curiosity Rover Finds Strange Fluctuating Oxygen Levels on Mars

Oxygen levels seem to spike in Mars' spring season, occasionally in tandem with shifting methane levels

A view of Gale Crater, where the Curiosity rover is currently conducting research. (NASA JPL-CalTech)

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Puzzling scientists, oxygen levels in Mars' [Gale Crater](#) seem to ebb and flow seasonally, NASA's Curiosity rover has found.

Tucked inside the rover is a portable chemical lab called [Sample Analysis at Mars](#) (SAM), which tests the Martian air and measures its components. According to NASA, SAM confirmed that the Martian atmosphere is "95 percent by volume of carbon dioxide, 2.6 percent molecular nitrogen, 1.9 percent argon, 0.16 percent molecular oxygen, and 0.06 percent carbon monoxide."

Thanks to SAM's atmospheric analyses, scientists back on Earth were able to determine that the atmosphere's nitrogen and argon levels followed "a predictable seasonal pattern, waxing and waning in concentration in Gale Crater throughout the year." Oxygen, though, didn't follow that pattern at all. Instead, [according to NASA](#), "the amount of the gas in the air rose throughout spring and summer by as much as 30 percent, and then dropped back to levels predicted by known chemistry in fall." Since the pattern repeated each spring, the researchers suspect that "something was producing it and then taking it away." But what?

"The first time we saw that, it was just mind boggling," says [Sushil Atreya](#), a climate scientist at the University of Michigan in Ann Arbor, [in a statement](#). The researchers checked SAM to make sure it was working properly and then tried to brainstorm other possibilities for the fluctuations, but came up with few alternatives.

"We're struggling to explain this," says [Melissa Trainer](#), a planetary scientist at NASA's Goddard Space Flight Center who led this research. "The fact that the oxygen behavior isn't perfectly repeatable every season makes us think that it's not an issue that has to do with atmospheric dynamics. It has to be some chemical source and sink that we can't yet account for."

The discovery of oxygen's strange behavior on Mars comes on the heels of another gas-filled mystery for researchers studying the red planet, reports Alexandra Witze for [Nature](#). In June, NASA scientists reported that after months of low atmospheric methane, they saw a spike in the gas that Russian physicist Oleg Korablev described as "excitingly huge."

With the new oxygen findings, Trainer's team is wondering if the rise and fall in oxygen levels is somehow linked to fluctuating methane because "at least occasionally, the two gases appear to fluctuate in tandem," according to NASA.

The most likely source for both the methane and oxygen fluxes is some currently unknown geologic process, either involving soil on the surface or water in the Martian atmosphere, reports [Mike Wall for Space.com](#). When water molecules bust in the atmosphere, oxygen is released. But there would need to be five times more water present than current calculations show for that hypothesis to hold up.

Soil is the most likely source, but no geologic process currently known to science could explain either of the fluxes.

“We’re beginning to see this tantalizing correlation between methane and oxygen for a good part of the Mars year,” says Atreya. “I think there’s something to it. I just don’t have the answers yet. Nobody does.”

About Melissa Locker

Melissa Locker is a writer, editor, and coffee drinker living in New York City. Her work can be seen in TIME, The Guardian, Elle, and more.

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