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NASA Curiosity Finds Evidence Of Atmosphere Thinning On Mars

April 8, 2013

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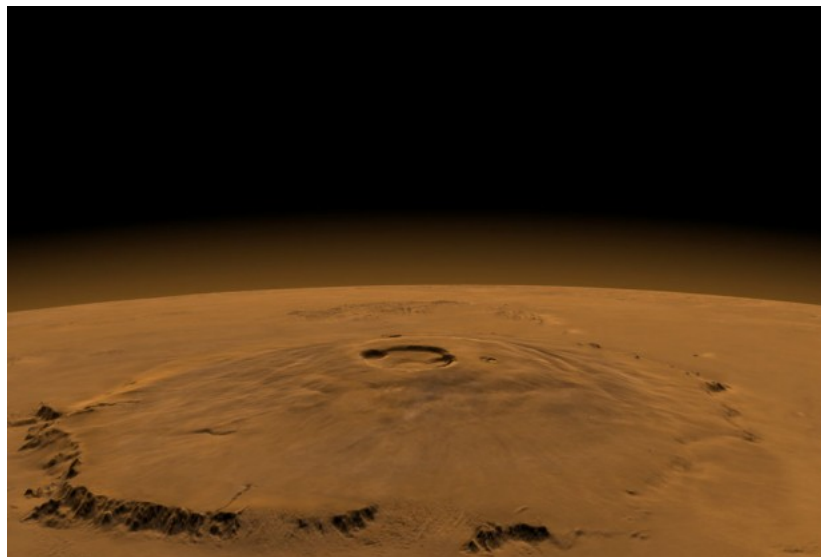


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Lawrence LeBlond for redOrbit.com – Your Universe Online

NASA's *Curiosity* rover has been busy searching for signs that life may have once existed on the Red Planet. In the eight months since NASA dropped the rover on Mars, it has made significant progress in the hunt for water and life.

In the latest round of evidence pertaining to Mars' past, new measurements from *Curiosity* point towards the sky. These measurements, which consisted of analysis of Argon atoms in the planet's air, show that Mars' atmosphere has thinned over time.

The study has found a heavier version of the Argon isotope has built up relative to a lighter one that existed in Mars' past. This confirms that a substantial amount of the planet's original atmosphere had escaped into space. Scientists believe that as much as 95 percent of Mars' original atmosphere that it started out with billions of years ago is now gone.

The key measurements taken in the present air show a significant proportion of heavier isotopes, leading the team of researchers to assume that the once lighter isotope had no place to go but up into space. Previous measurements have found the same atmospheric release with oxygen, carbon and water vapor.

The missing isotope, Ar36, has been largely replaced by the heavier Ar38. Since Argon is a non-reactive noble gas, a lack of Ar36 implies that gravity was not able to stop it from escaping the planet's atmosphere. Because of the heaviness of Ar38, it was able to hold more tightly to the surface due to gravity, and is lost at a much lower rate.

Professor *Sushil Atreya* of the University of Michigan at Ann Arbor said the team has "been waiting for this result for a long time."

"Argon is chemically inert. It does not interact with the surface; it does not exchange with the interior [of the planet]. So it's the cleanest, clearest signal of escape," he told *BBC News*.

Atreya, who also spoke about the new measurements at the European Geosciences Union (EGU) General Assembly in Vienna this week, is a co-investigator on the Sample Analysis at Mars (SAM) experiment, a sophisticated lab tucked away inside *Curiosity*'s belly.

The lab, which has previously been used to study rock specimens of the Red Planet's surface, can also suck in air

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from the atmosphere to examine the concentration of gases and elements present.

The presence of Argon is but only a small fraction of the current Martian atmosphere (5.3 parts per million), so in order to make an assessment, SAM had to amplify the Argon in its sample chamber by removing other, dominant gases in the sampling, the first time Curiosity has used such a procedure on the mission.

The test showed there are 4.2 atoms of Ar36 for every one of Ar38. By comparison, that ratio is 5.5 to one in the atmospheres of the Sun and Jupiter, which can be considered the baseline for when the [Solar System](#) formed.

But because Mars has no global magnetic field to protect atoms and molecules from being stripped away from the upper atmosphere by solar wind, the lightest versions of those atoms and molecules are the ones that are most likely lost in space.

However, while most of the original atmosphere has been sucked away, what remains behind is still quite active, according to [Atreya](#).

Not only has Curiosity taken measurements of the level of Argon in the atmosphere, but it has also used the Rover Environmental Monitoring Station (REMS) provided by Spain to take other readings of the air quality on Mars. Scientists have noticed a steady increase in air temperature since Curiosity began taking readings eight months ago. The team said while the readings are not strongly tied to the rover's location, humidity has differed significantly at different regions throughout the rover's route. The humidity measurements are the first systematic experiments of its kind taken on the Red Planet.

The REMS sensor has also detected the presence of whirlwind patterns during the first 100 days on the Martian surface. While there has yet to be any visual evidence of these patterns, the scientists said they had found similar evidence of these dust devils in earlier missions to Mars.

"A whirlwind is a very quick event that happens in a few seconds and should be verified by a combination of pressure, temperature and wind oscillations and, in some cases, a decrease in ultraviolet radiation," said REMS Principal Investigator Javier Gómez-Elvira of the [Centro de Astrobiología](#), Madrid.

Curiosity's air measurements have been very precise and the new data resolves large discrepancies found in a 1976 measurement by NASA's [Viking](#) project and from small volumes of Argon extracted from Martian meteorites.

"We've been seeing the same kind of behavior in the carbon dioxide isotopes and the water isotopes – they're all telling us the same story; that gases have been escaping from Mars over time, and the argon isotope just really nails it," [Atreya](#) said.

In Mars' past, a thicker atmosphere would have meant a stable enough atmosphere that water could have remained on the surface, and this could have assisted any life that may have been present. In today's atmosphere, the air pressure is so low that any exposed water would rapidly boil away.

Not all researchers have been on board with a suitable past atmosphere for life. However, Professor John Grotzinger, a Curiosity project scientist at the Jet Propulsion Laboratory (JPL) in Pasadena, California, argues that the rocks being observed by Curiosity look like they were formed under stable conditions.

"We see these mudstones and we see the textures that indicate stratification," he told BBC News. "It's kind of hard to imagine that [these textures] would be preserved if the mud was boiling – if the water in the mud was boiling."

While Curiosity remains hard at work searching for evidence of past life on the Red Planet, NASA is busy itself readying a new mission called [MAVEN](#) that will launch for Mars at the end of the year.

The MAVEN satellite is being deployed to specifically address the issue of atmosphere loss. Its high altitude measurements will perfectly complement the studies conducted by Curiosity on the surface.

Source: Lawrence LeBlond for redOrbit.com - Your Universe Online

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