Eos
EARTH & SPACE SCIENCE NEWS
VOL. 101 | NO. 2
FEBRUARY 2020

Our Magnetic Brains

Los Angeles's Shaky Underbelly

Beavers: Nature's Firefighters

Up in Smoke

As wildfires scorch the land, scientists are using novel methods to study the damage to our air.

AGU 100
ADVANCING EARTH AND SPACE SCIENCE

Curiosity Rover Reveals Oxygen Mystery in Martian Atmosphere

The Martian atmosphere is thin and cold and consists mostly of carbon dioxide. Although certainly unsuitable for humans, Martian air could hold clues to whether other life-forms live—or once lived—on the Red Planet. *Trainer et al.* report the first measurements of the five major components of the Martian atmosphere captured over several seasonal cycles.

The researchers made the new measurements over almost 3 Martian years (about 5 Earth years) using the Sample Analysis at Mars (SAM) instrument suite on NASA's Curiosity rover. In that time, Curiosity explored a 16-kilometer stretch of Gale Crater, located near the equator. Four or five times per season (like Earth, Mars has a winter, spring, summer, and fall), SAM collected an air sample to examine the atmosphere's composition.

On average, the data revealed, the equatorial Martian atmosphere consists of 95% carbon dioxide, 2.59% nitrogen, 1.94% argon, 0.161% oxygen, and 0.058% carbon monoxide. However, throughout the year, some of these concentrations vary widely because of seasonal freezing of carbon dioxide at the planet's poles, which periodically removes much of this gas from the atmosphere.

With its suite of scientific instruments, the car-sized Curiosity rover can sample both the surface and the atmosphere of Mars, helping search for signs of past and present habitability. Credit: NASA/JPL-Caltech/MSSS

Seasonal polar freezing—and subsequent thawing—of carbon dioxide also causes atmospheric pressure to rise and fall throughout the year. SAM measurements showed that nitrogen and argon concentrations at the equator reflect these seasonal pressure changes, but with a time delay. This result suggests that seasonal pressure changes drive movement of air across the planet faster than the gases in the air can mix to reflect each season's composition.

The researchers also found unexpected patterns in seasonal and year-to-year oxygen concentrations that cannot be explained by any known atmospheric or surface processes on Mars. They suggest that these variations could be due to chemical reactions in surface rocks but note that further research is needed to solve this mystery.

The new findings provide a clearer picture of seasonal atmospheric compositions on Mars, which could aid in the ongoing search for signs of past or present life on the planet. (*Journal of Geophysical Research: Planets*, https://doi.org/10.1029/2019JE006175, 2019)

—Sarah Stanley, *Science Writer*