

# MEASURING MARS' ATMOSPHERE LOSS

Mars began as a warm, wet planet that gradually dried out as it lost its atmosphere. To investigate Mars' climate history, scientists measured the ratio of argon isotopes in the upper atmosphere using NASA's MAVEN mission. This ratio reveals how much argon and other gases have been lost to space through a process called sputtering.

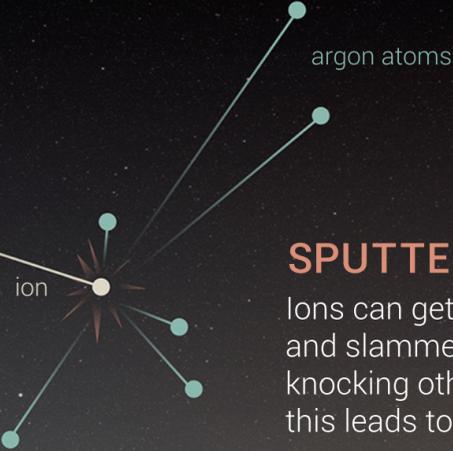


Argon-36 depletion in Mars' atmosphere over time



## ARGON

This noble gas is removed from the atmosphere only through sputtering. Because the argon-36 isotope is lighter than argon-38, it is removed more efficiently. By measuring the ratio of light to heavy argon at various altitudes, scientists can determine how much of the gas has been lost to space.



## SPUTTERING

Ions can get "picked up" by the solar wind and slammed into the top of the atmosphere, knocking other atoms into space. Over time, this leads to significant atmospheric erosion.

# 65%

## ARGON LOST TO SPACE

New measurements show that Mars has lost the majority of its argon through sputtering. Based on this finding, models of corresponding CO<sub>2</sub> and H<sub>2</sub>O loss suggest that early Mars had an atmosphere as thick as that of Earth today.

4 billion years ago

present