Ancient volcanic blast provides more evidence of water on early Mars

May 4 2012

Curiosity: The Next Mars Rover. Image courtesy of NASA/JPL-Caltech

(Phys.org) -- The atmosphere of Mars is less than 1 percent the density of Earth's. It's one of the reasons liquid water covers much of our planet but cannot exist on the Red Planet. As more research points toward the possibility of water on early Mars, scientists have increased their studies on the density of its atmosphere billions of years ago. It's not an easy task. In fact, it's very difficult to even determine Earth's atmospheric pressure from the same time frame.

Georgia Tech Assistant Professor Josef Dufek is attempting to learn more about the past atmospheric conditions by analyzing two unlikely sources: ancient volcanic eruptions and surface observations by the Mars rover Spirit. His new findings, published by the journal Geophysical Research Letters, provide more evidence that early Mars was saturated with water and that its atmosphere was considerably thicker, at least 20

times more dense, than it is today.

“Atmospheric pressure has likely played a role in developing almost all Mars’ surface features,” said Dufek, an instructor in the School Earth and Atmospheric Sciences. “The planet’s climate, the physical state of water on its surface and the potential for life are all influenced by atmospheric conditions.”

Dufek’s first research tool was a rock fragment propelled into the Martian atmosphere during a volcanic eruption roughly 3.5 billion years ago. The deposit landed in the volcanic sediment, created a divot (or bomb sag), eventually solidified and remains in the same location today. Dufek’s next tool was the Mars rover. In 2007, Spirit landed at that site, known as Home Plate, and took a closer look at the imbedded fragment. Dufek and his collaborators at the University of California-Berkeley received enough data to determine the size, depth and shape of the bomb sag.

Dufek and his team then went to the lab to create bomb sags of their own. They created beds of sand using grains the same size as those observed by Spirit. The team propelled particles of varying materials (glass, rock and steel) at different speeds into dry, damp and saturated sand beds before comparing the divots with the bomb sag on Mars. No matter the type of particle, the saturated beds consistently produced impact craters similar in shape to the Martian bomb sag.

By varying the propulsion speeds, Dufek’s team also determined that the lab particles must hit the sand at a speed of less than 40 meters per second to create similar penetration depths. In order for something to move through Mars’ atmosphere at that peak velocity, the pressure would have to be a minimum of 20 times more dense than current conditions, which suggests that early Mars must have had a thicker atmosphere. Click here for a video demonstration.

"Our study is consistent with growing research that early Mars was at least a transiently watery world with a much denser atmosphere than we see today," said Dufek. "We were only able to study one bomb sag at one location on the Red Planet. We hope to do future tests on other samples based on observations by the next rover, Curiosity."

Curiosity is scheduled to land on Mars on August 5.

Provided by Georgia Institute of Technology

Citation: Ancient volcanic blast provides more evidence of water on early Mars (2012, May 4) retrieved 18 April 2024 from https://phys.org/news/2012-05-ancient-volcanic-blast-evidence-early.html