Strange Rock Formations on Mars Explained

By SPACE.com Staff

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Rocks on Mars are in some areas scattered in a strangely uniform fashion, puzzling scientists for years. Now they've figured it out.

Researchers had thought the rocks were picked up and carried downwind by extreme high-speed winds thought to occur on Mars in the past.

Although Mars is a windy planet, its atmosphere is very thin, so it would be difficult for the wind to carry the small rocks, which range in size from a quarter to a softball, said Jon Pelletier, a geoscientist at the University of Arizona in Tucson.

Pelletier and his colleagues now think the rocks are constantly on the move, rolling into the wind, not away from it, and creating a natural feedback system that results in their tidy arrangement.

Rock-n-roll

Here's what they think happens: Wind removes loose sand in front of the rocks, creating pits there and depositing that sand behind the rocks, creating mounds. The rocks then roll forward into the pits, moving into the wind. As long as the wind continues to blow, the process is repeated and the rocks move forward.

The rocks protect the tiny sand mounds from wind erosion. Those piles of sand, in turn, keep the rocks from being pushed downwind and from bunching up with one another.

"You get this happening five, 10, 20 times then you start to really move these things around," Pelletier said. "They can move many times their diameter."

The process is nearly the same with a cluster of rocks. However, with a cluster of rocks, those in the front of the group shield their counterparts in the middle or on the edges from the wind, Pelletier said.

Because the middle and outer rocks are not directly hit by the wind, the wind creates pits to the sides of those rocks. And so, instead of rolling forward, the rocks roll to the side, not directly into the wind, and the cluster begins to spread out.

The research is published in the January issue of the journal *Geology*.

Lots of evidence

Several pieces of evidence have come together to support this idea of how rocks are organized along some areas of the Martian surface.

For instance, when study team member Andrew Leier of the University of Calgary in Canada was a graduate student at UA, he told Pelletier about an experiment on the upwind migration of rocks that his thesis advisor James Steidtmann of the University of Wyoming had conducted.

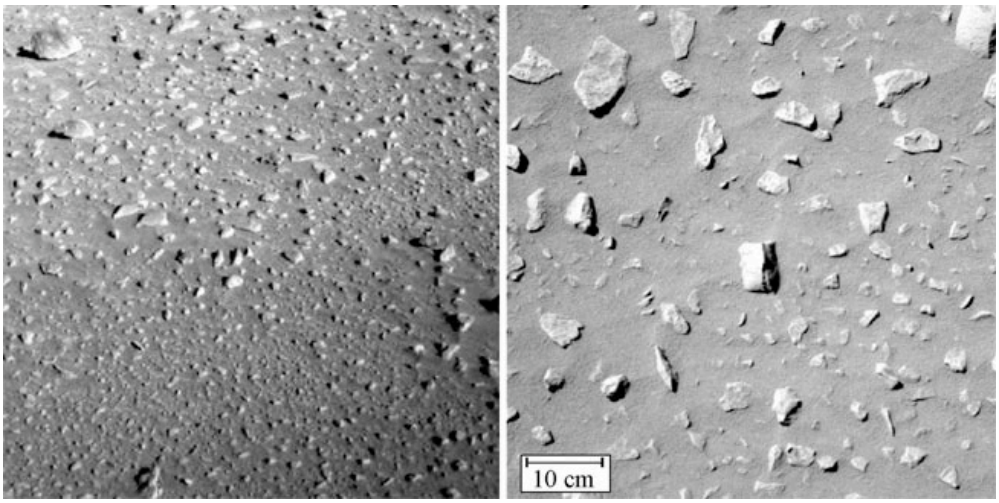
Steidtmann used a wind tunnel to see how pebbles on sand moved in the wind, revealing the rocks moved upwind and that over time, a regular pattern emerged.

Some time later, while attending a lecture that showed pictures of uniformly organized rocks on Mars, Pelletier recalled his conversations with Leier, and it all came together.

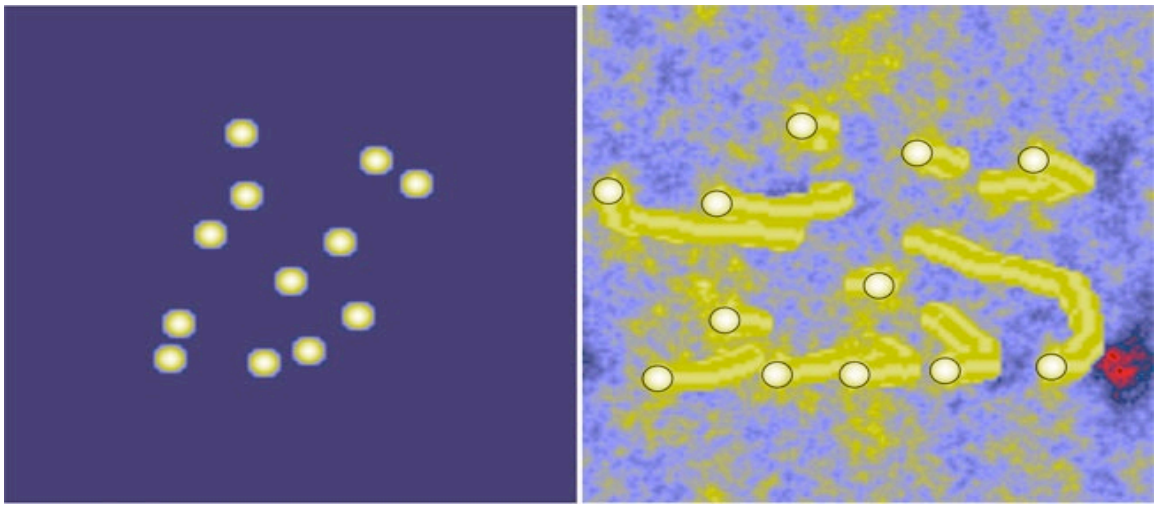
Meanwhile, Leier had noticed a similar phenomenon when observing sand dunes in Wyoming. Basically, loose pebbles and rocks there seemed to spread away from each other in an almost organized fashion — similar to what is seen on the sandy surface of Mars.

In the recent study, Pelletier tested out the idea with three computer models, including models of air flow, sand erosion and deposition, and rock movement. He compared the model results with the distances between each rock and its nearest neighbor in Mars images taken by the Mars Exploration Rover, Spirit. The patterns of the Martian rocks matched what the model predicted.

Pelletier plans to apply the same numerical models to larger features on Mars such as sand dunes and wind-sculpted valleys and ridges called "yardangs."



Small rocks called clasts are uniformly spaced along the surface of Mars, including in the intercrater plain between Mars' Lahontan Crater. The images were taken by the navigation camera (left) and panoramic camera (right) aboard the Mars Rover Spirit. Credit: Geological Society of America.



The computer simulations showed how rocks with an initial position (left) might end up being arranged (right). The yellow streaks behind the rocks represent the sand piled up behind the rocks by the wind. Credit: Jon D. Pelletier, The University of Arizona.