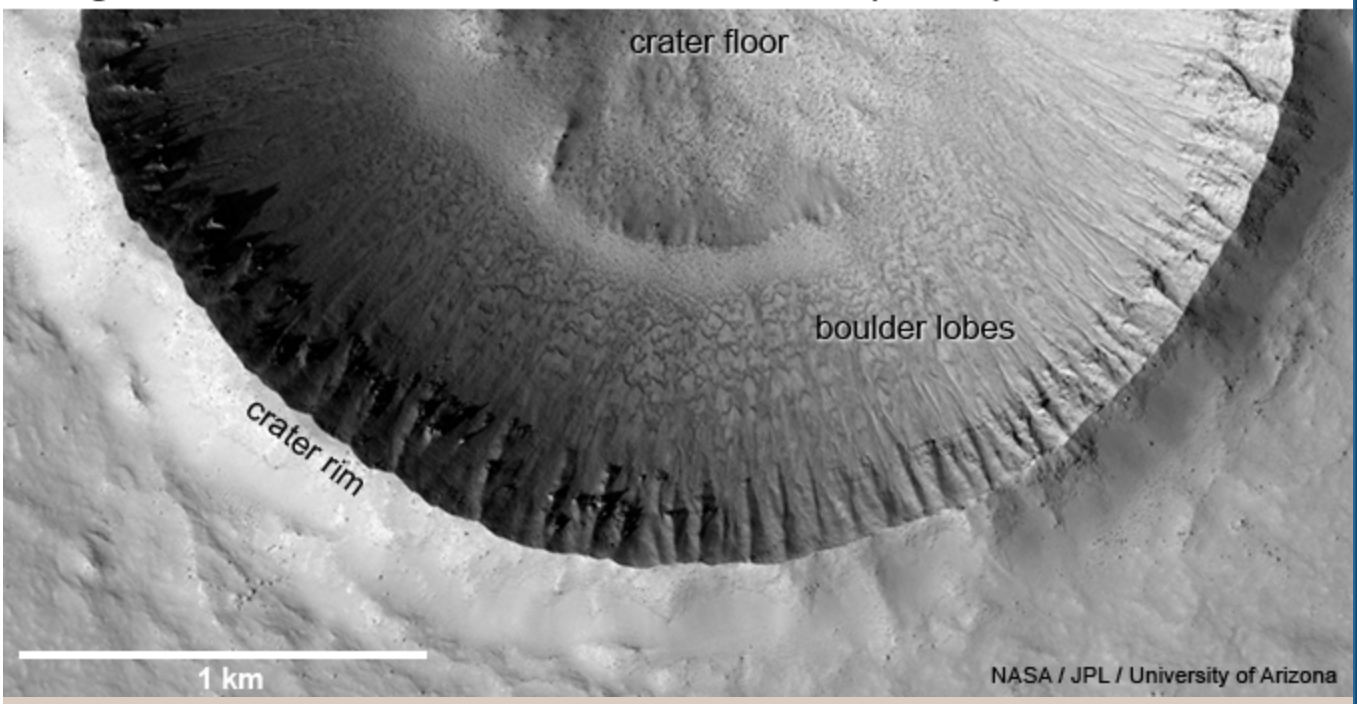
PLANETARY SCIENCE RESEARCH DISCOVERIES
CosmoSparks

Quick Views of Big Advances

Rolling Stones on Mars

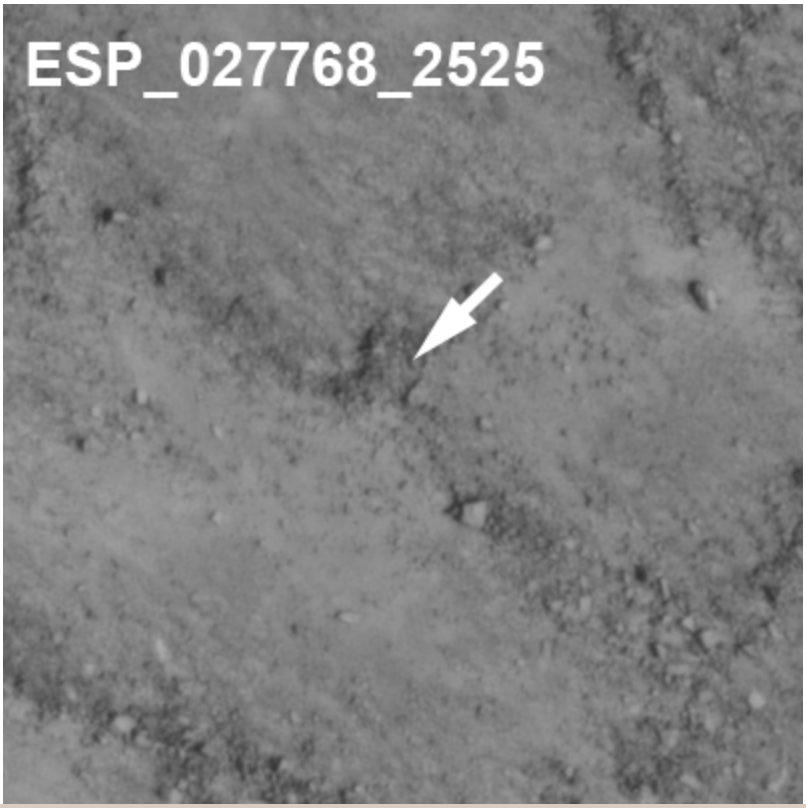
How surface materials on Mars moved in the past or move in the current cold, desert climate is an ongoing topic of research because it requires understanding the factors that cause things to move, such as action by water, ice, temperature cycling, wind, gravity, seismic activity, and impacts. A good case in point is the movement of boulders on the steep slopes of high-latitude Martian craters. A research team headed by Colin Dundas (U.S. Geological Survey, Flagstaff, Arizona) compared images obtained at different times by the High Resolution Imaging Science Experiment (HiRISE) onboard NASA's Mars Reconnaissance Orbiter to document for the first time that boulders have moved down these slopes during the timeframe of this mission. The movement usually occurred near lobate-shaped deposits of boulders but also on other slopes of the crater walls (see image, below, showing boulder lobes). Their research identifies the movement of boulders as a new style of geologic activity that is playing an active role in modifying these high-latitude, steep slopes today under current climatic conditions.

High-latitude Martian Crater Wall with Lobate-shaped Deposits of Boulders



This portion of HiRISE image ESP_026564_2405 shows patterns of lobe-shaped deposits of boulders on a north-facing crater wall. Dundas and colleagues documented the movement of boulders near these lobate landforms and on other crater slopes.

The amazingly high-resolution data allowed Dundas and coauthors to see that boulders shifted positions several meters down the crater walls, without leaving visible tracks or bounce marks on the surface (see images below for an example).



Dundas and coauthors created this comparison between two HiRISE RDR images. (RDR products are radiometrically-corrected images resampled to a standard map projection.) The comparison shows a boulder's downslope change in location (about five meters) between images acquired in June 2012 and November 2017. Looking in front of the white arrowhead, a round boulder is visible to the left of the arrowhead in one image and to the right in the second image. HiRISE images courtesy of NASA/JPL/University of Arizona.

Whether boulder movement is causing the formation of the boulder lobes or only modifying pre-existing deposits is not clear and the answer awaits additional analyses. The fact that the boulders *are* moving means liquid water is not required. Further observations and modeling will help the researchers figure out the process or combination of processes contributing to cold-climate boulder movement and landform development on steep, high-latitude Martian slopes.

See Reference:

· Dundas, C. M., Mellon, M. T., Conway, S. J., and Gastineau, R. (2019) Active Boulder Movement at High Martian Latitudes, *Geophysical Research Letters,* v. 46, p. 5075-5082, doi: 10.1029/2019GL082293. [***open access article***]

See also:

HiRISE Mass Wasting Science Theme Description

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