HIRISE™

Exploring Mojave Crater

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THE UNIVERSITY OF ARIZONA

ALLUVIAL FANS IN MOJAVE CRATER: DID IT RAIN ON MARS?

Enhanced color images are less than 1 kilometer across; black and white, less than 5 km

Aptly-named Mojave Crater in the Xanthe Terra region has alluvial fans that look remarkably similar to landforms in the Mojave Desert of southeastern California and portions of Nevada and Arizona.

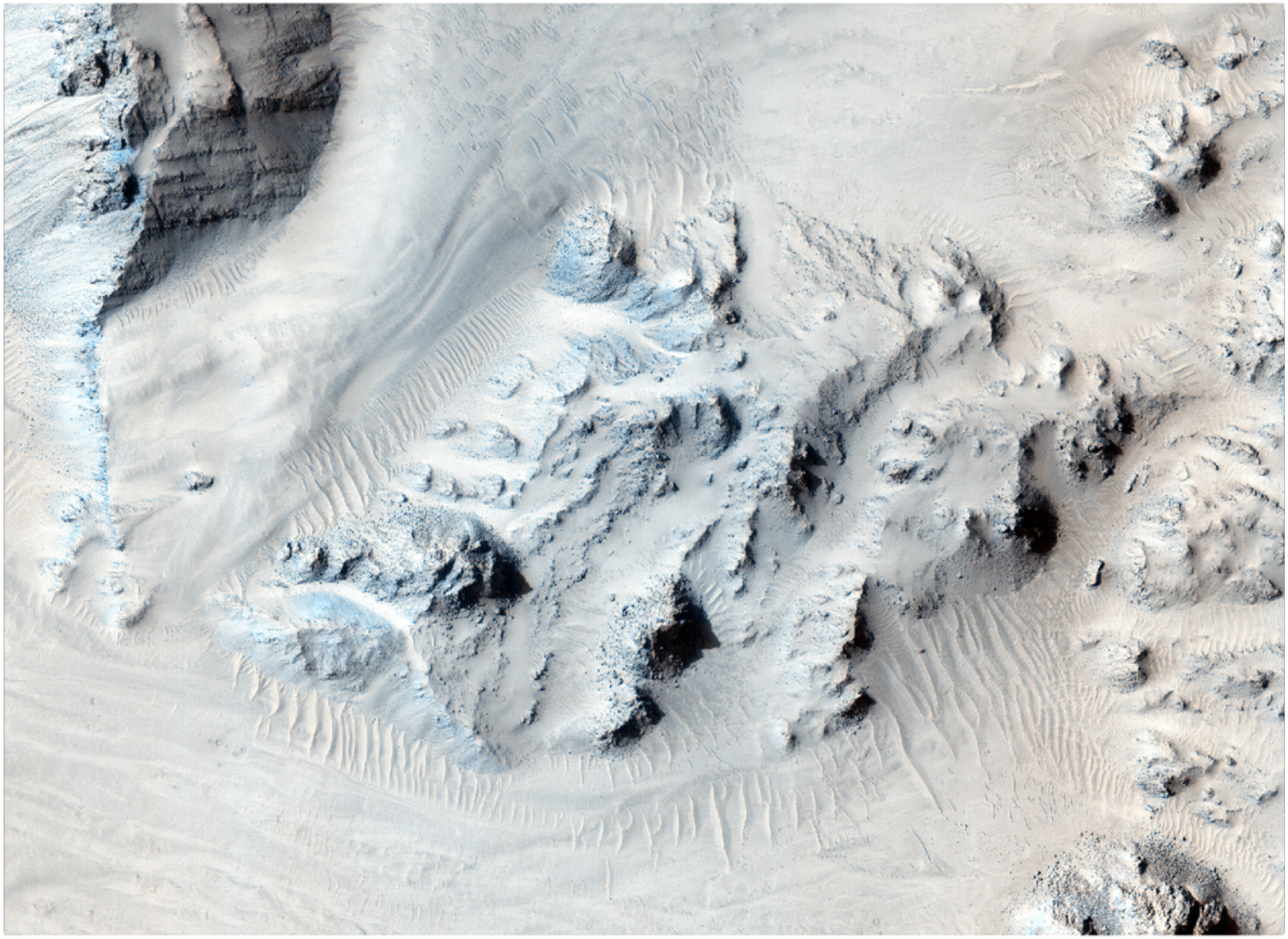
Alluvial fans are fan-shaped deposits of water-transported material (alluvium). They typically form at the base of hills or mountains where there is a marked break, or flattening of slope.

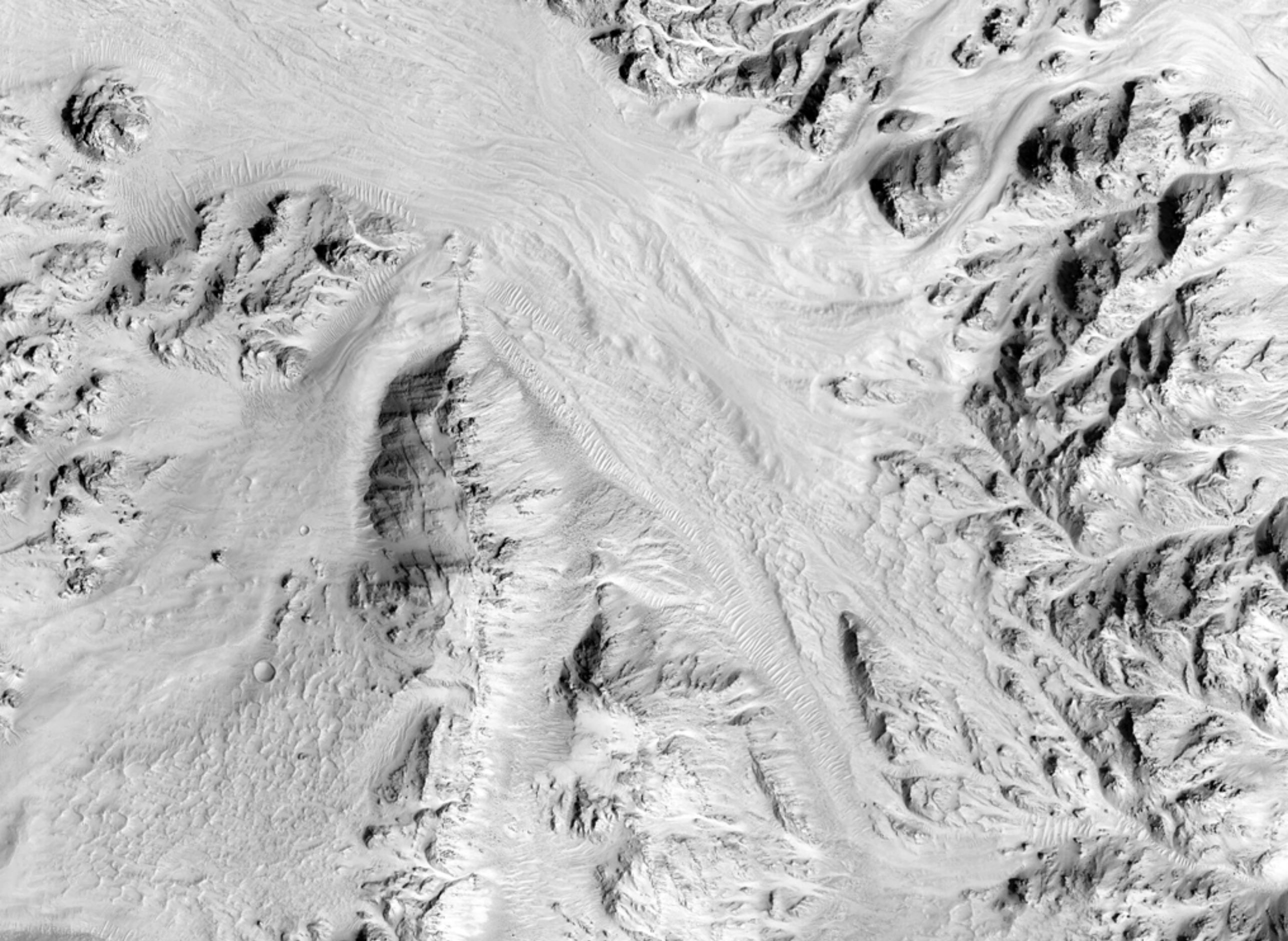
They typically deposit big rocks near their mouths (close to the mountains) and smaller rocks at greater distances. Alluvial fans form as a result of heavy desert downpours, typically thundershowers. Because deserts are poorly vegetated, heavy and short-lived downpours create a great deal of erosion and nearby deposition.

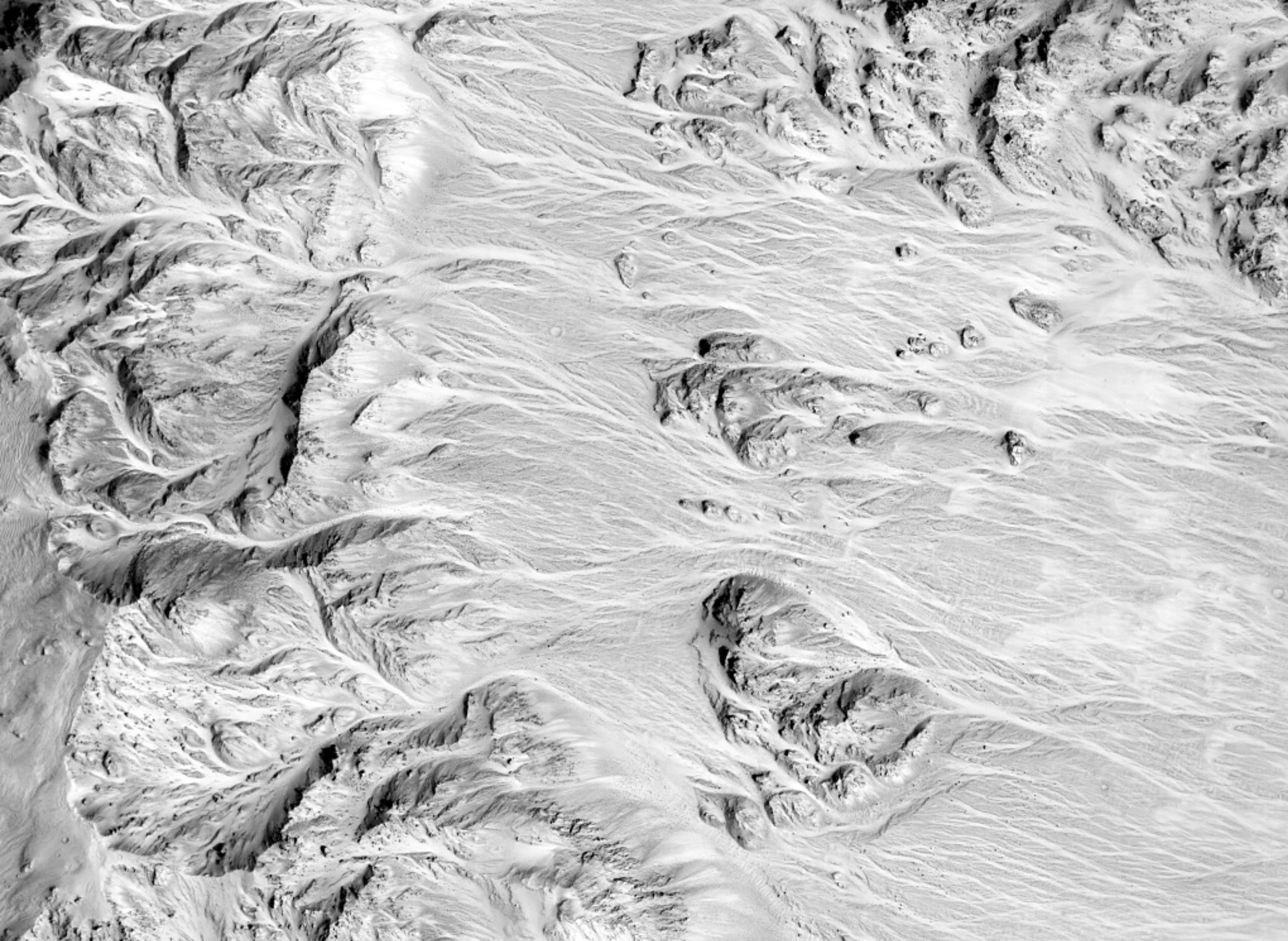
There are fans inside and around the outsides of Mojave crater on Mars that perfectly match the morphology of alluvial fans on Earth, with the exception of a few small impact craters dotting this Martian landscape.

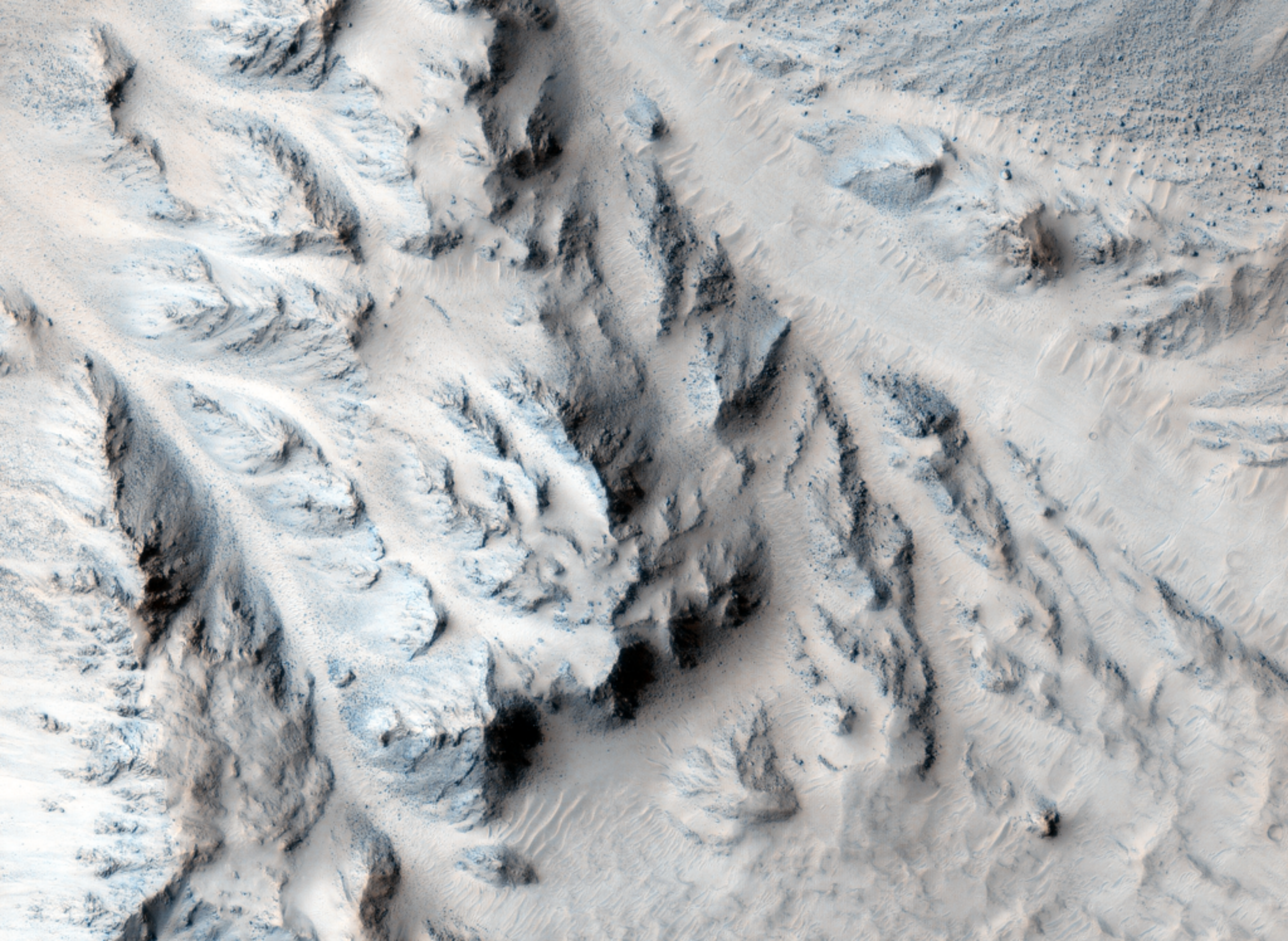
Channels begin at the apex of topographic ridges, consistent with precipitation as the source of water, rather than groundwater. This remarkable landscape was first discovered from Mars Orbital Camera images. Mars researchers have suggested that impact-induced atmospheric precipitation may have created these unique landscapes.

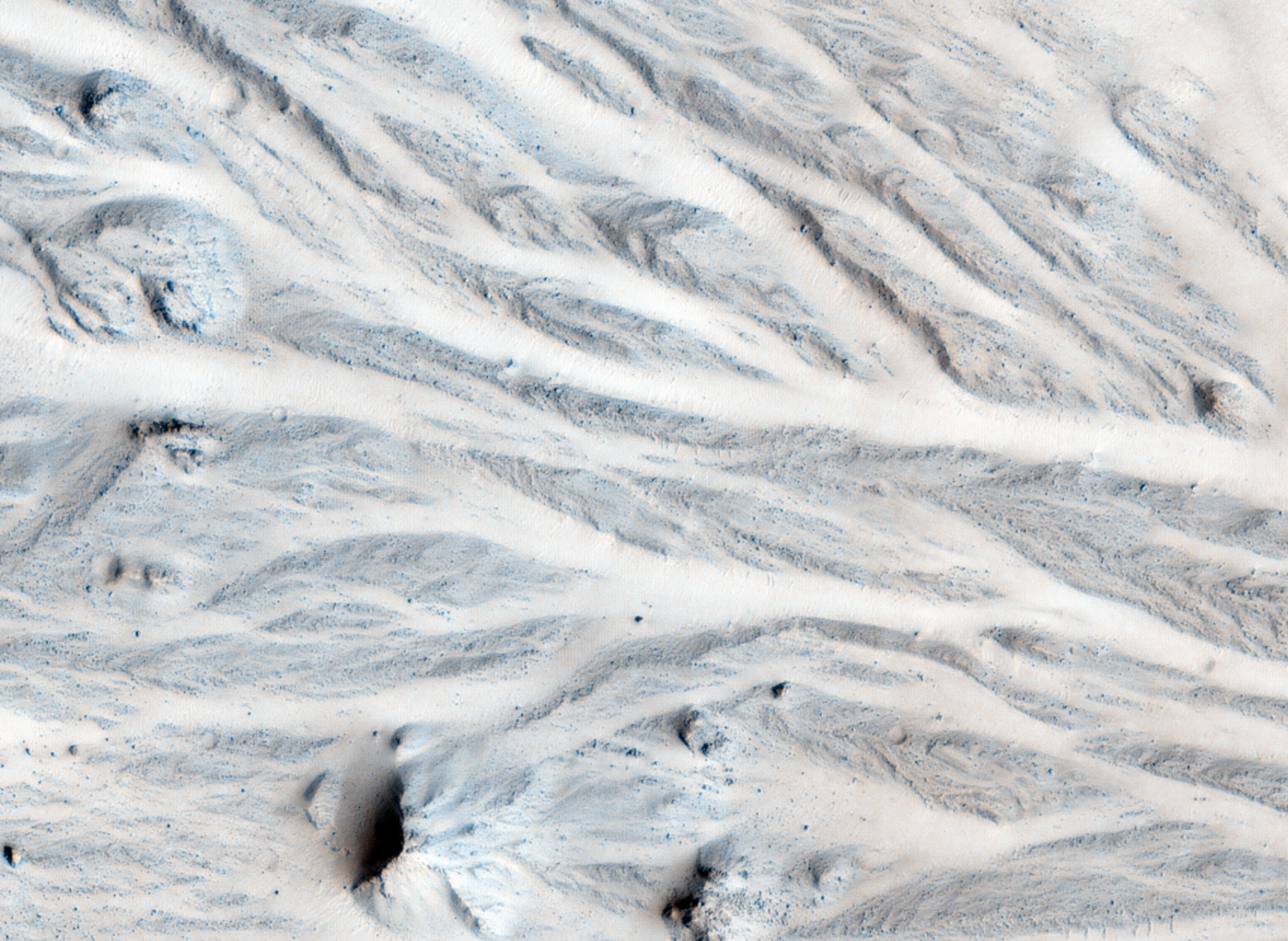
This HiRISE image at up to 29 cm/pixel scale supports the alluvial fan interpretation, in particular by showing that the sizes of the largest rocks decrease away from the mouths of the fans.

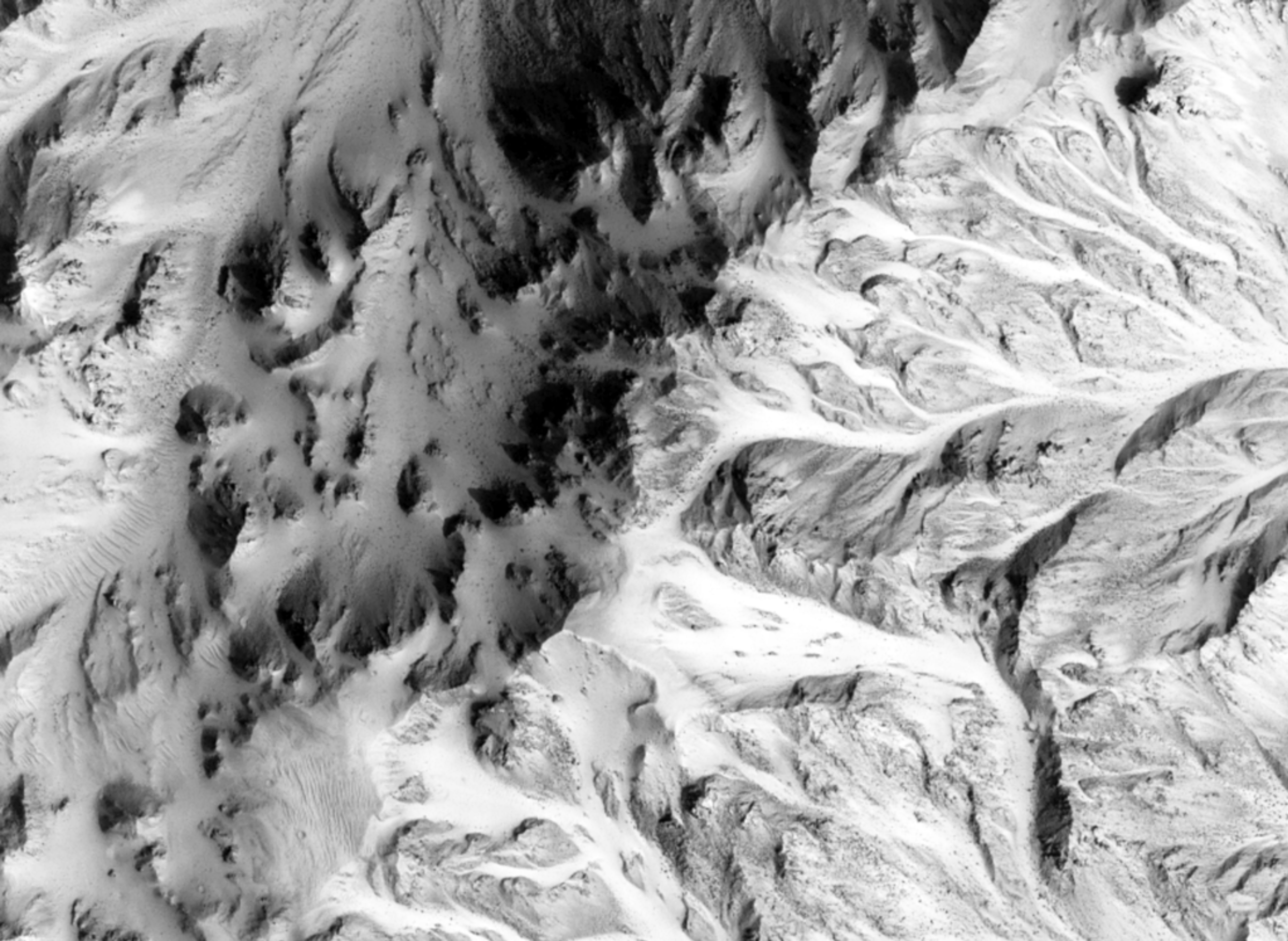


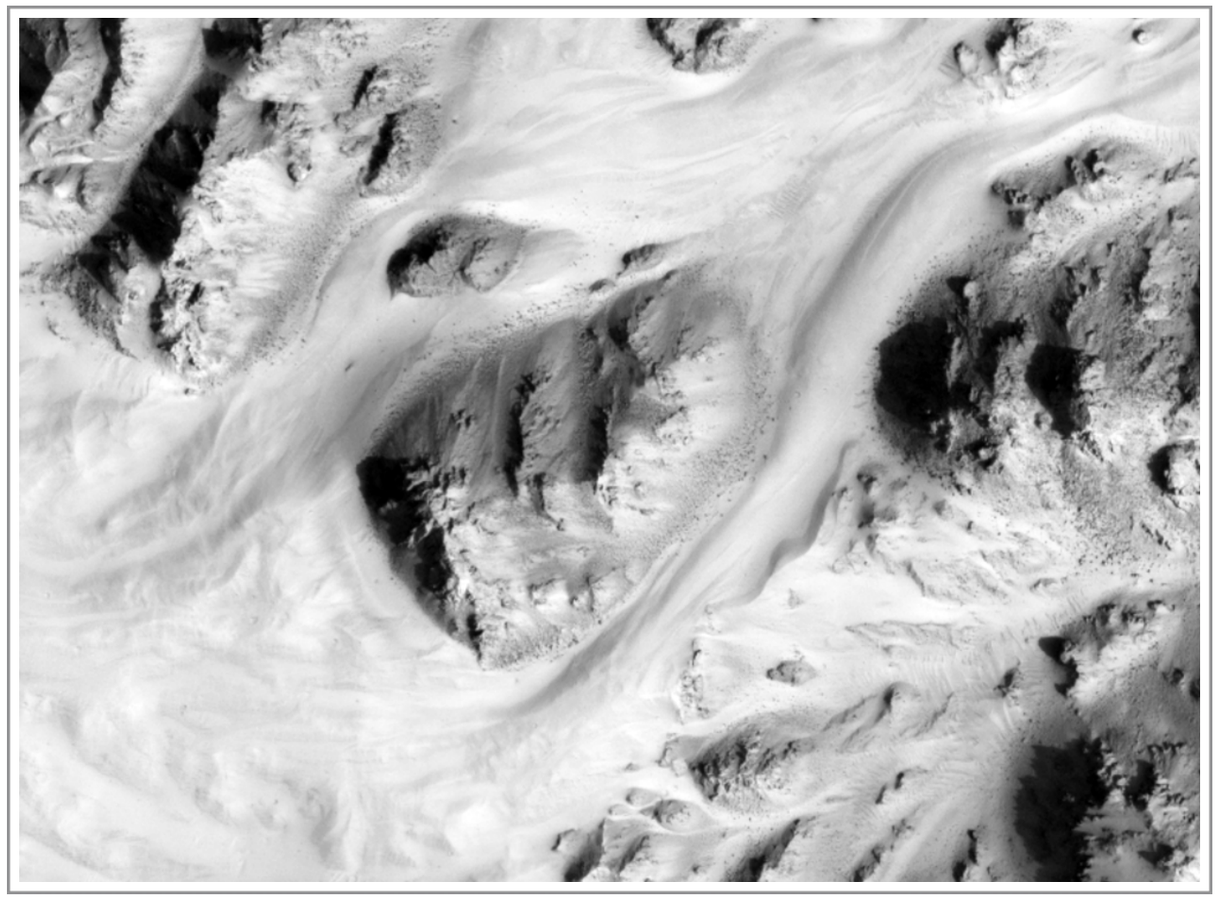


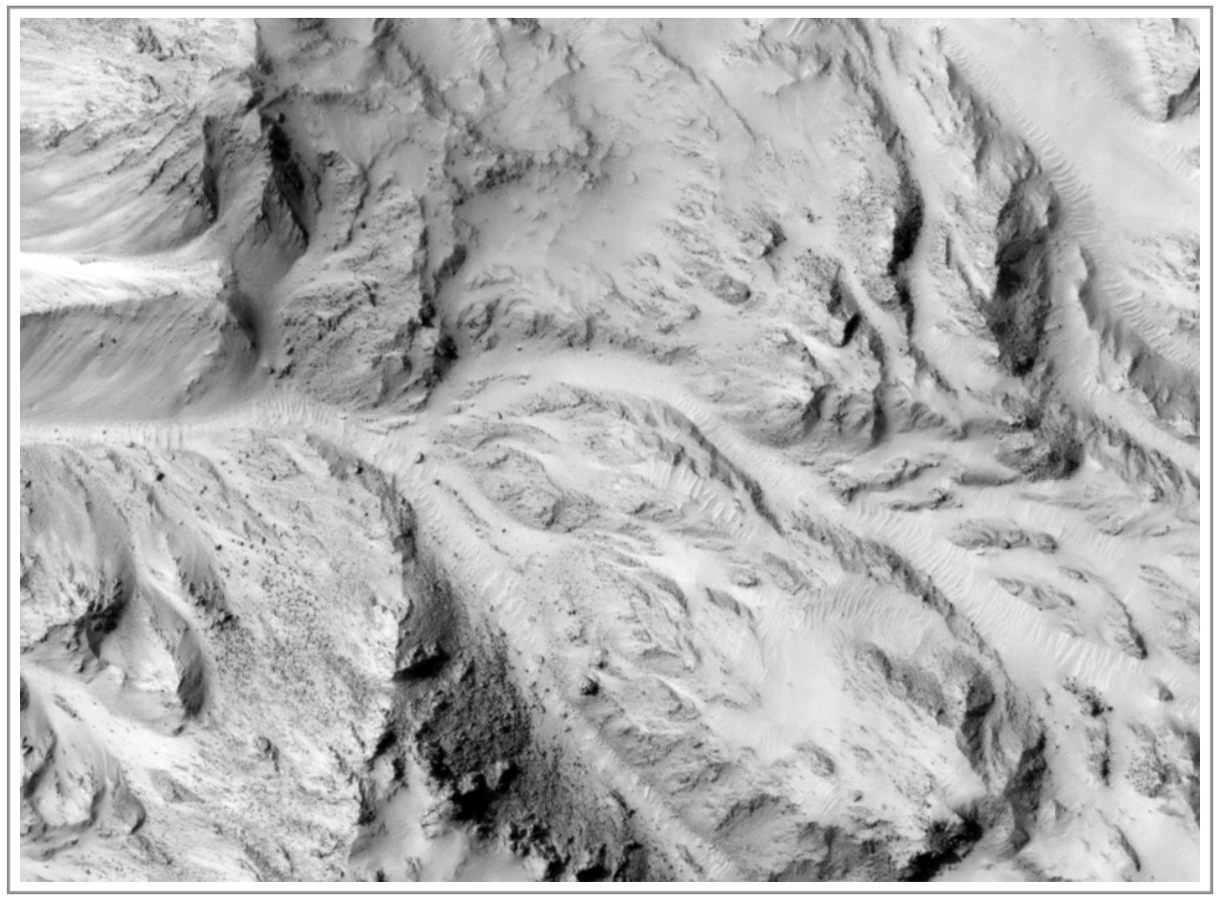


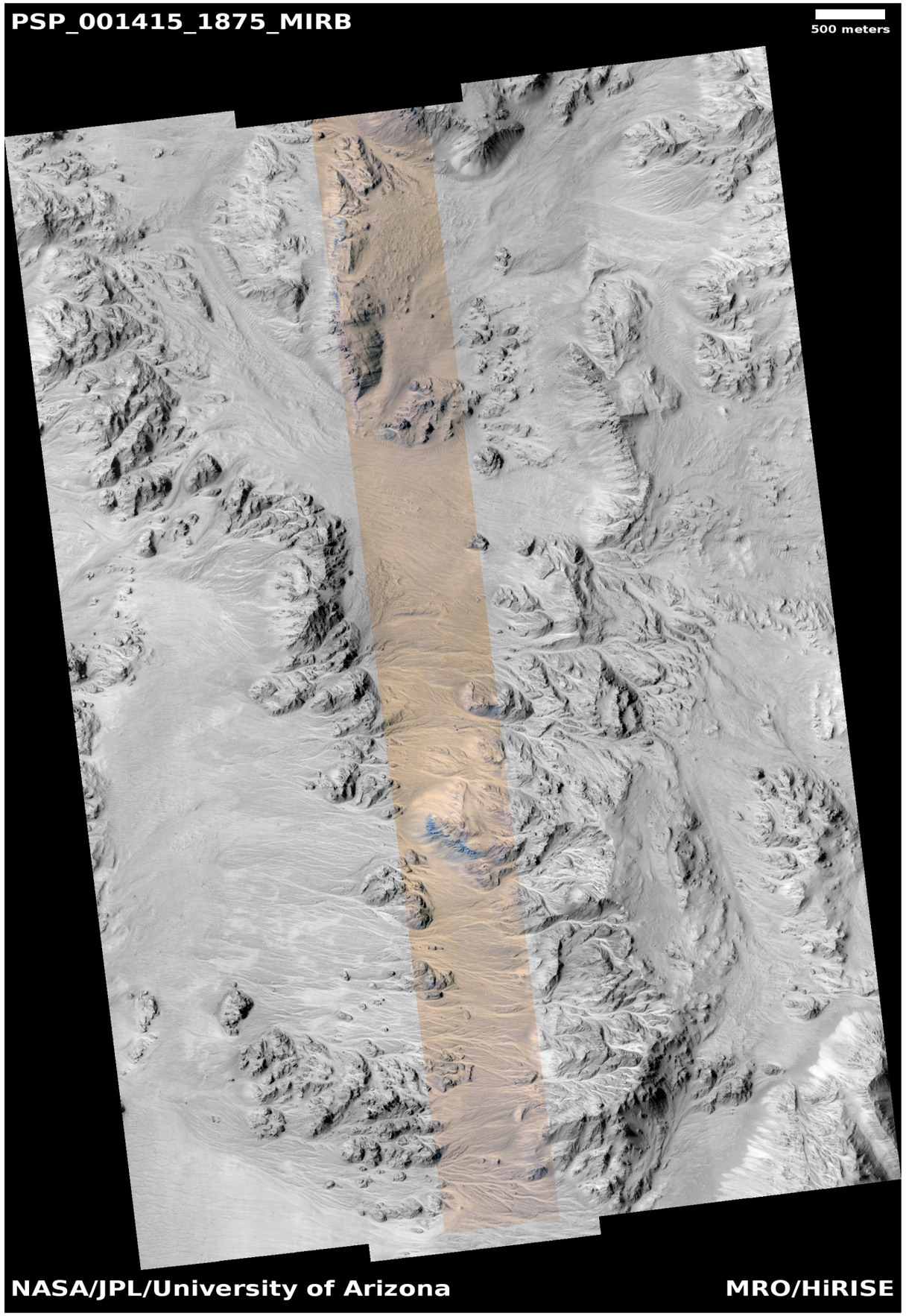












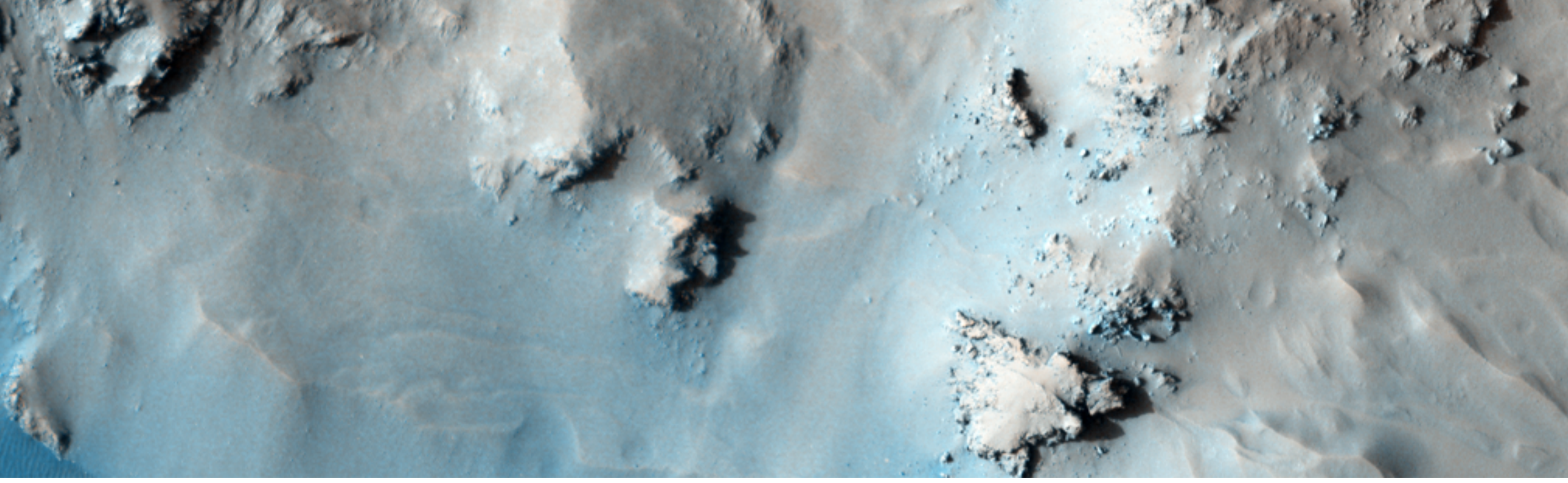
About this observation: PSP_001415_1875

Acquisition date	14 November 2006	**Local Mars time**	3:29 p.m.
Latitude	7.6 degrees	**Longitude (East)**	327.4 degrees
Range to target	274 km (171 miles)	**Resolution**	27.4 cm/pixel

For more, visit uahirise.org/PSP_001415_1875

Caption by Alfred McEwen

MOJAVE CRATER FLOOR AND CENTRAL UPLIFT



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This observation shows a portion of the central uplift structure in Mojave Crater.

Central uplifts are a typical feature of large impact craters on the Earth, the Moon and Mars; craters larger than 6 or 7 kilometers in diameter on Mars typically form this mountain-like peak in the central portion of the crater interior.

This peak consists of rocks originating from several kilometers beneath the pre-impact surface. Mojave has a very prominent central uplift as it has a diameter of 60 kilometers (37 miles). In this image, boulders as large as 15 meters (50 feet) across have been eroded from the massive uplifted rock and have rolled downslope. Fine-grained debris has also collected in the topographic lows, and has been shaped by the wind into dunes and ripples.

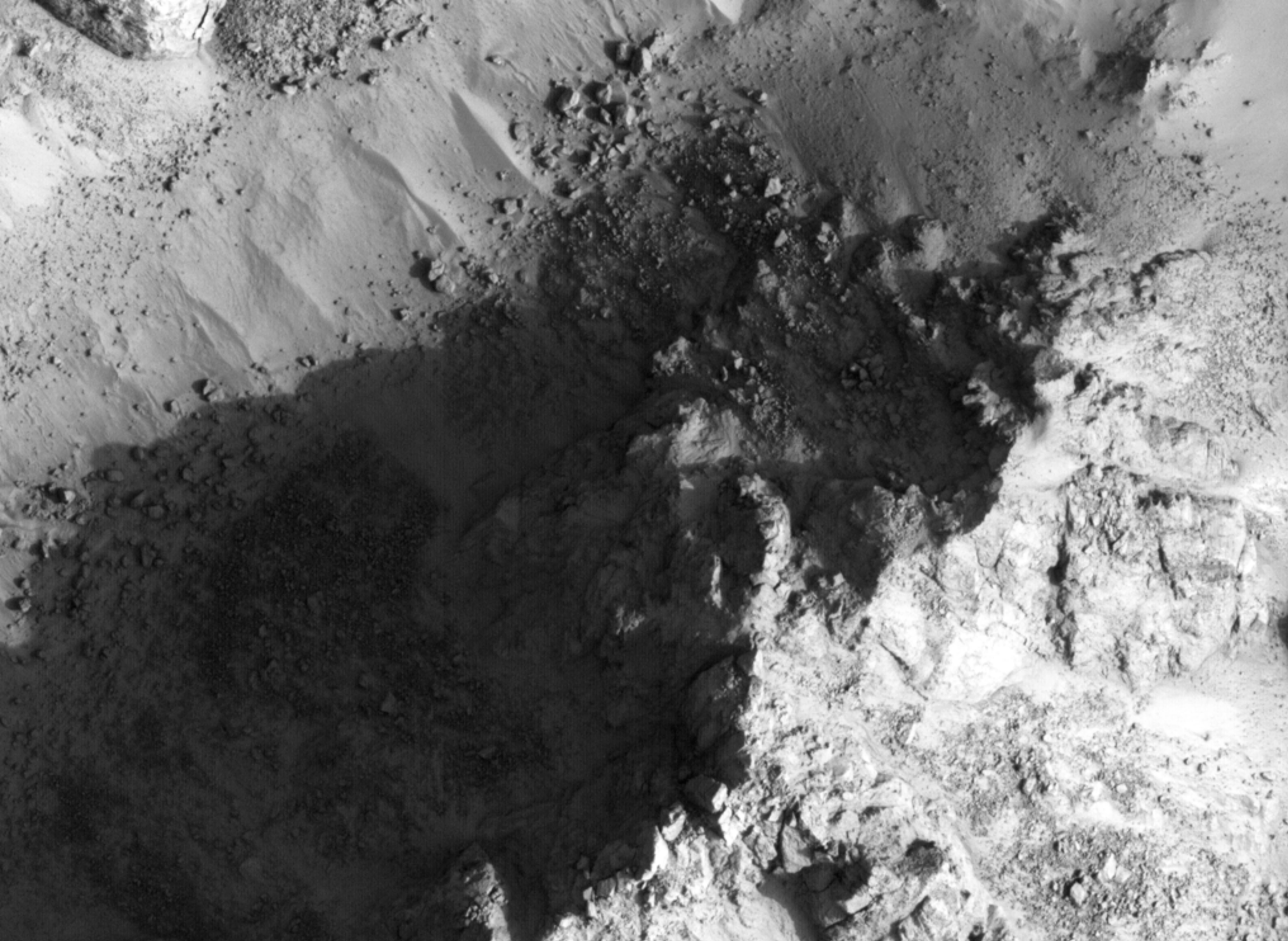
Notably absent from this image are the striking drainage channels and alluvial fans that are abundant on the wall-terraces and ejecta of Mojave Crater (see PSP_001415_1875). These features were likely formed by surface runoff of liquid water, which may have been released from the subsurface during the impact event that formed Mojave.

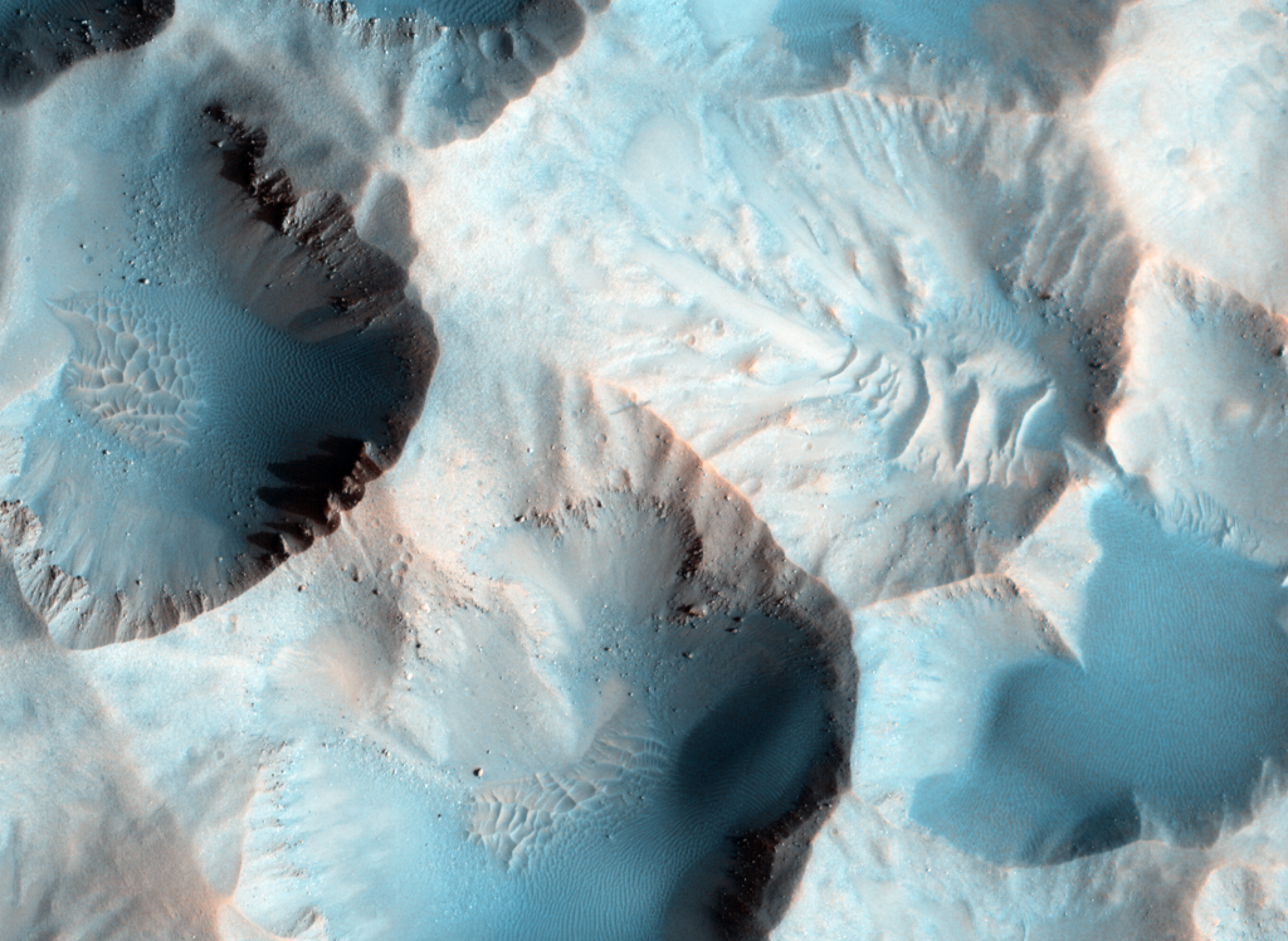
Previously, it had been suggested that a brief, torrential downpour over Mojave Crater delivered the water. However, Mars Orbiter Camera's (MOC) images of Mojave's central uplift have previously shown no evidence for surface runoff, and the higher resolution of this HiRISE image confirms that this part of the crater appears untouched by liquid water.

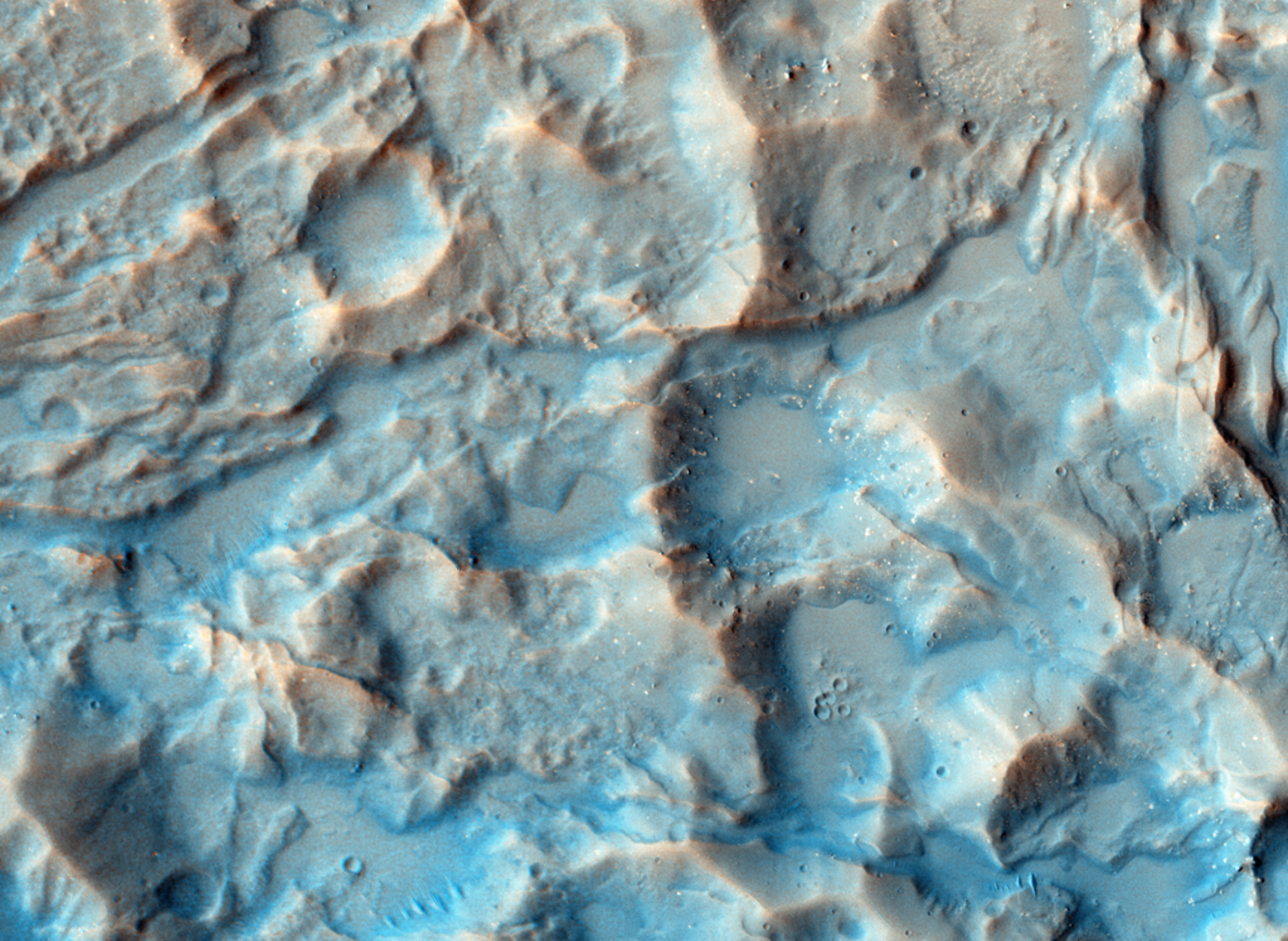
So the question remains: by what means was the water, in the form of runoff, supplied to Mojave? This question, in addition to several others regarding this phenomenon, are currently being investigated by the HiRISE team and their collaborators.

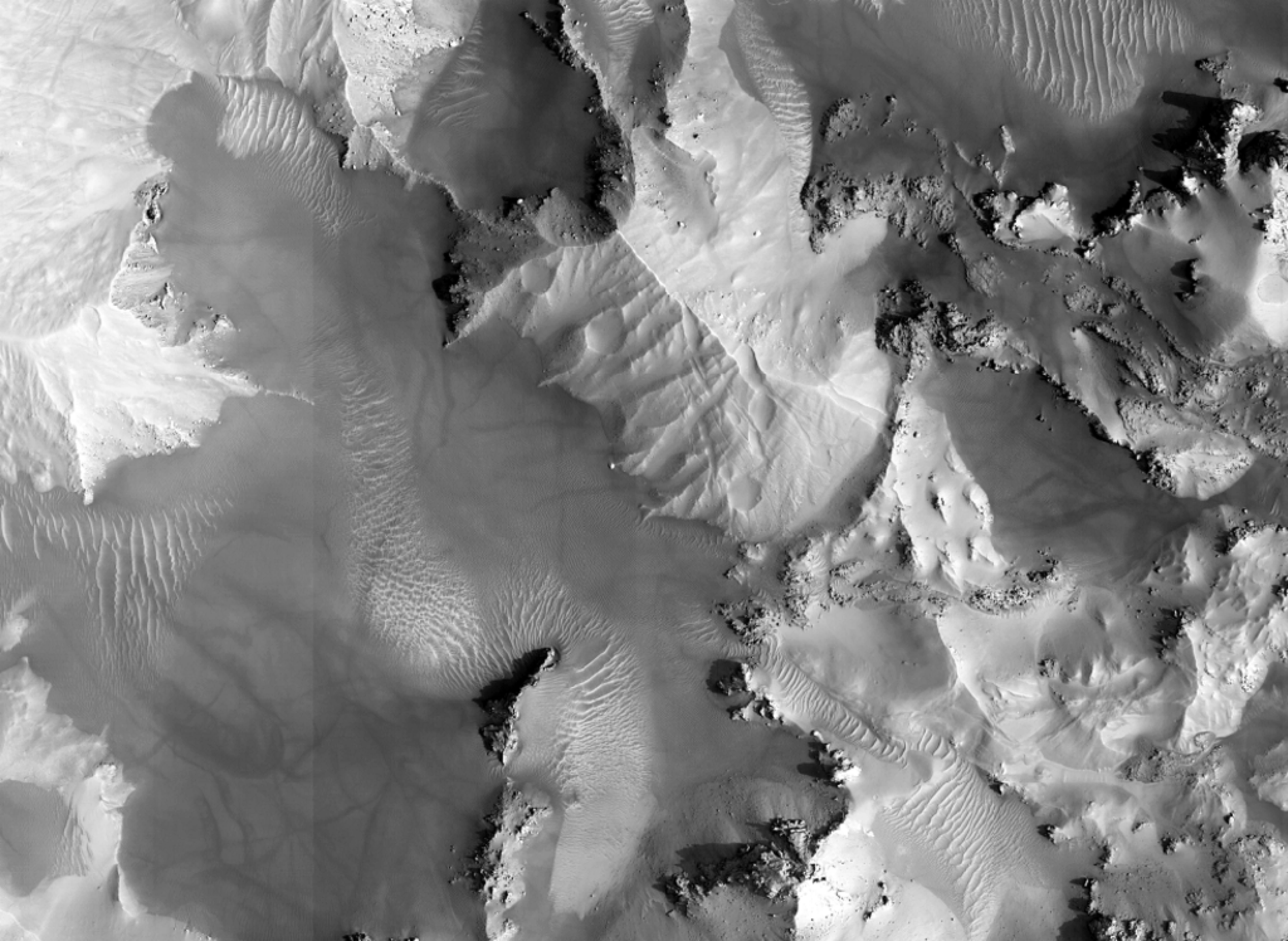
The full HiRISE image shows that the crater floor south of the central uplift is densely pitted and fractured. These pits, many of which are partially filled with dark sand, lack raised rims and a circular form. This suggests that they are not impact craters. In fact, very few definite impact craters are seen on the floor and walls of Mojave, implying that it is incredibly young and relatively well preserved for a crater of its size.

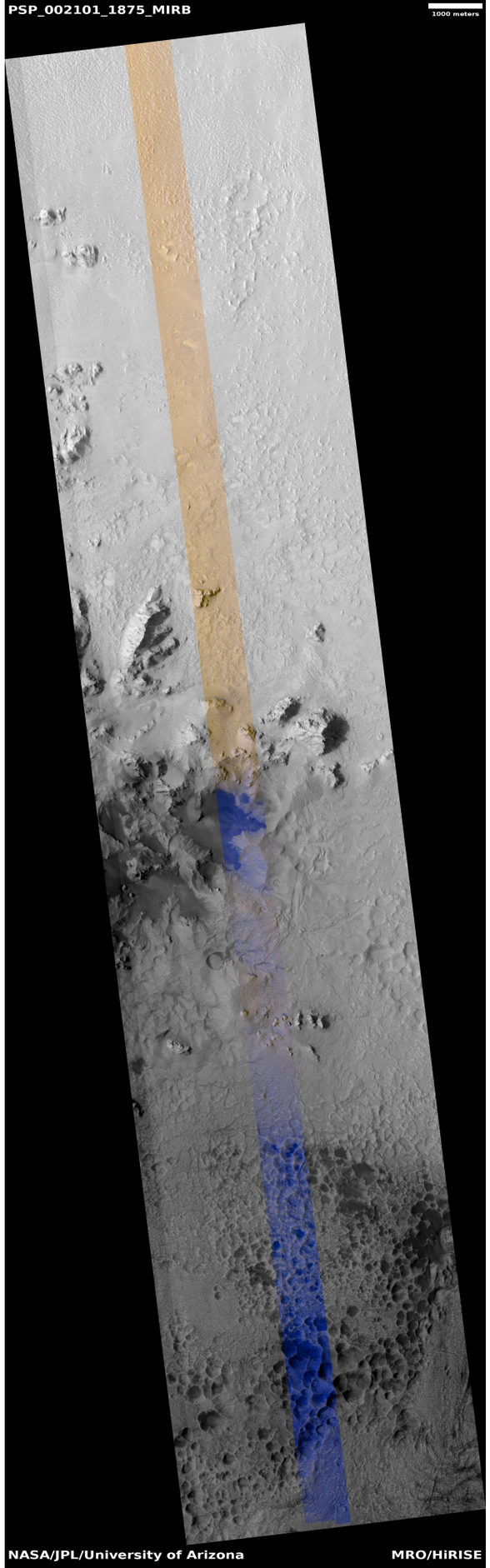
HiRISE images covering Mojave crater and the surrounding region are yielding new insights into impact processes on Mars.











About this observation: PSP_002101_1875			
Acquisition date	7 Jan 2007	**Local Mars time**	3:37 p.m.
Latitude	7.5 degrees	**Longitude (East)**	327.1 degrees
Range to target	277 km (173 miles)	**Resolution**	27.7 cm/pixel

For more, visit uahirise.org/PSP_002101_1875

Caption by James Wray and Livio Tornabene

HiRISE (High Resolution Imaging Science Experiment) is the most powerful camera event sent to another planet. One of six instruments aboard the Mars Reconnaissance Orbiter, the HiRISE camera offers us unprecedented high resolution images of the Red Planet.
For more, visit uahirise.org

NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, Calif., manages the Mars Reconnaissance Orbiter for NASA's Science Mission Directorate, Washington. Lockheed Martin Space Systems is the prime contractor for the project and built the spacecraft. The HiRISE camera was built by Ball Aerospace and Technology Corporation and is operated by the University of Arizona. The image data were processed using the U.S. Geological Survey's ISIS3 software.