Landforms

River Valleys

A river valley is a long, narrow region of low land between ranges of mountains, hills, or other high areas, formed by running water carrying land away. River valleys show that water once flowed and cut through the landscape, even if the water is no longer there.

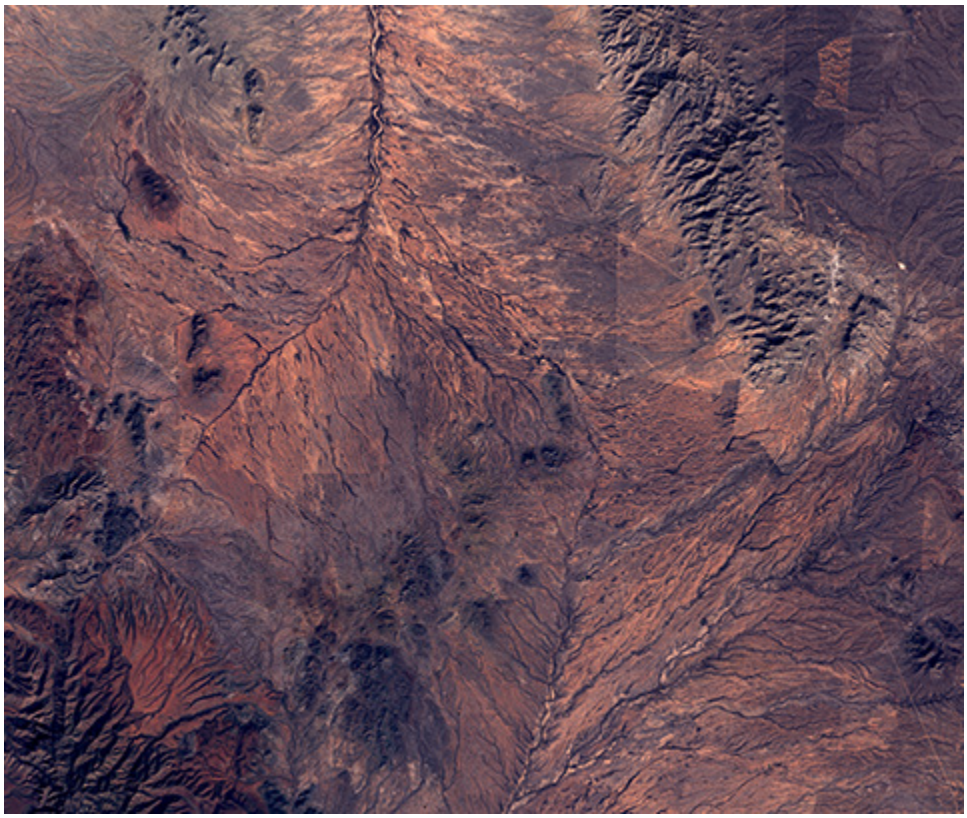

Image credit: USGS/NASA Landsat

A branching network of water-carved channels in southern Arizona and northern Mexico.

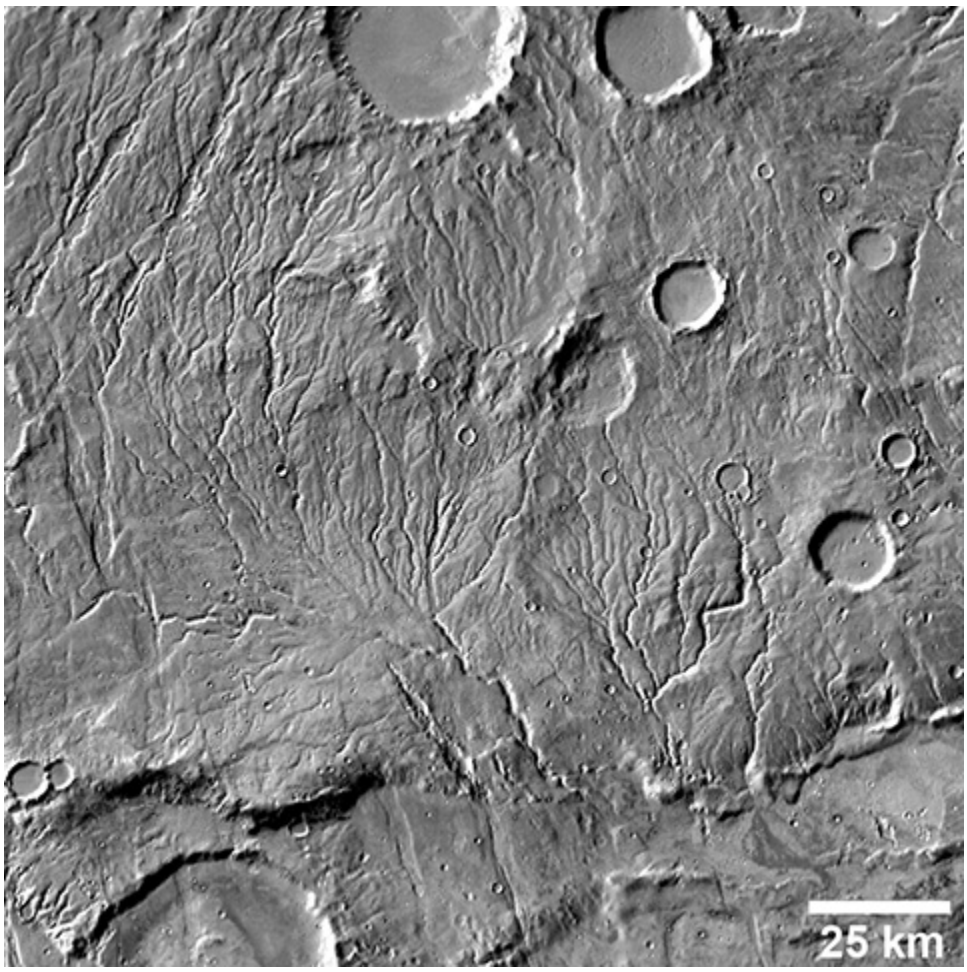

Image credit: NASA/JPLCaltech/Arizona State University

Warrego Vallis, Mars. The branching network of valleys is evidence that water used to flow on Mars. Circular features are craters.

Alluvial Fan

An alluvial fan is a fan-shaped pile of sand and gravel that was formed by water flowing into an open area. Alluvial fans usually form where canyons leading from mountains empty out onto flat land. They also form in craters. Alluvial fans show that there once was enough water to move the sand and gravel, even if the water is gone.

Image source: NASA/METI/AIST/Japan Space Systems and U.S./Japan ASTER Science Team.

An alluvial fan in China. This is a very large fan, roughly 60 km (37 miles) across.

Image credit: NASA/JPL/MSSS

An alluvial fan in a crater on Mars. This fan is much smaller than the example from Earth shown above, only about 15 km (10 mi) in length. The small circles are craters on the fan's surface.

River Delta

A river delta is a fan-shaped pile of sand, gravel, and mud formed when flowing water enters a still body of water such as an ocean, sea, or lake. When the water slows down, it drops the particles it was carrying. The Mississippi river delta and the Nile River delta are famous examples on Earth. It takes a lot of water to form a delta. Finding a river delta on Mars would be strong evidence that water once flowed there.

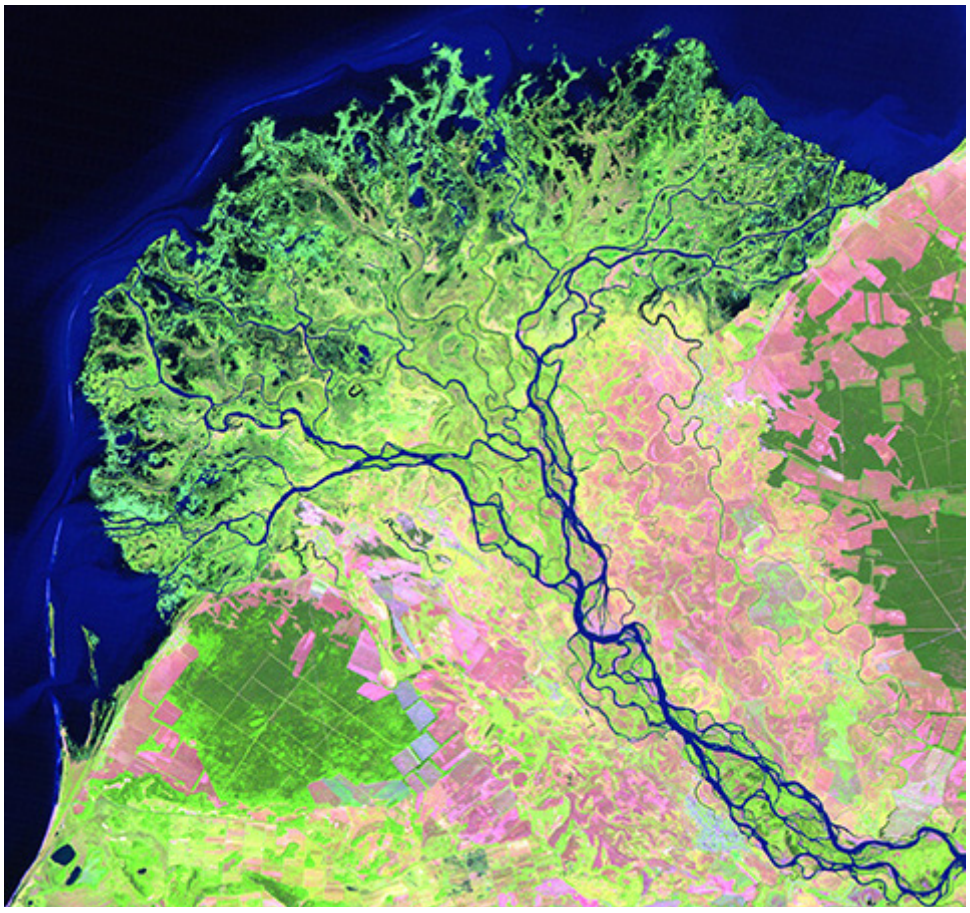

Image credit: Landsat/USGS/NASA

The Selenge River delta in Russia. This is a false color image. The Landsat satellite uses filters to measure particular colors, including some that the human eye can't see. These are turned into colors that we can see in false color images like this. Bright green and pink highlight different kinds of plants, while blue is water.

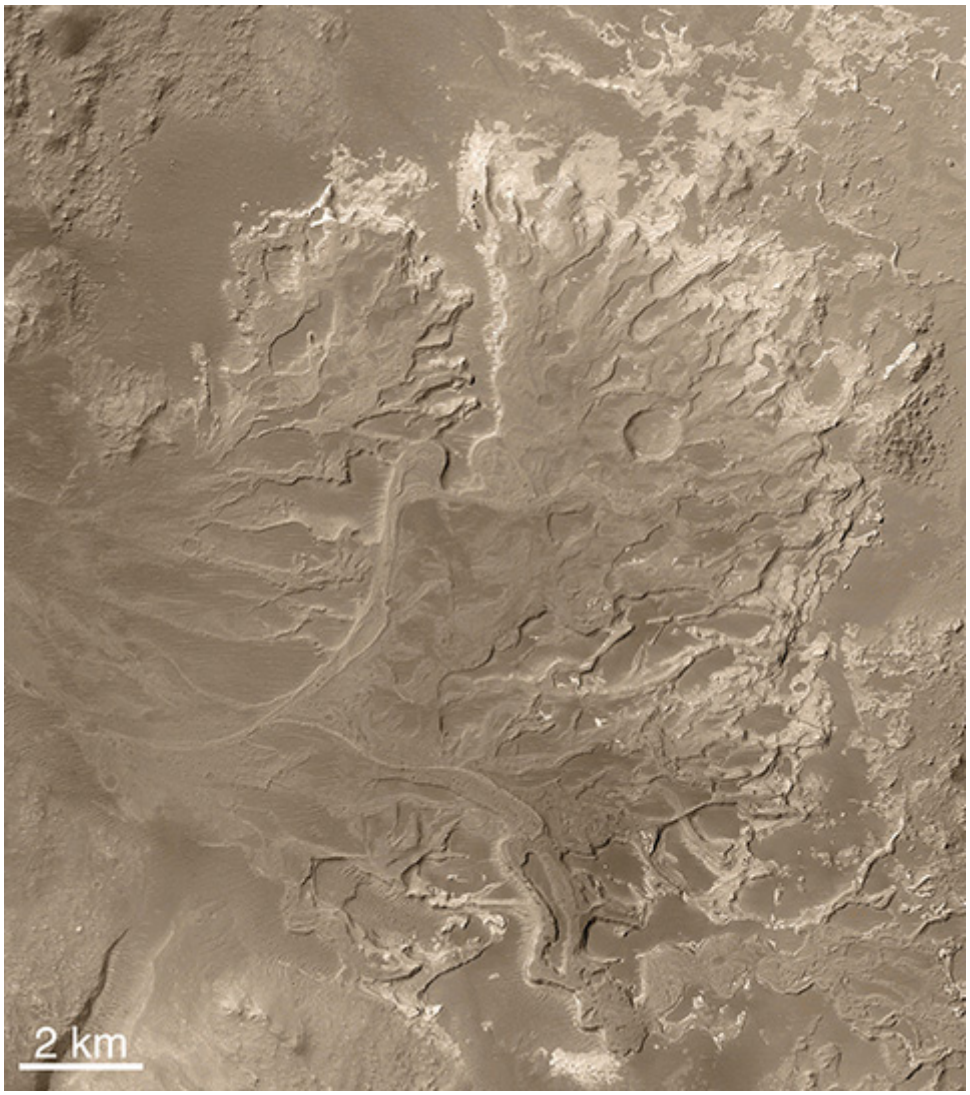

Image credit: NASA/JPL/MSSS

Eberswalde delta on Mars. The water that formed a lake in this crater and flowed down the river channels that made the delta is gone, but the shape of the landform tells scientists that it must have formed in water.

Layered Rocks

Layered rocks form when large numbers of small particles (like sand) lying flat are cemented together. Some layered rocks formed from grains that settled out in water, but others formed from grains dropped from wind. It can be hard to tell the difference without studying the layered rocks up close.

Image credit: USGS EROS

Layered rocks in the Grand Canyon. The rocks in the layers are made of sediment that was moved by water and wind.

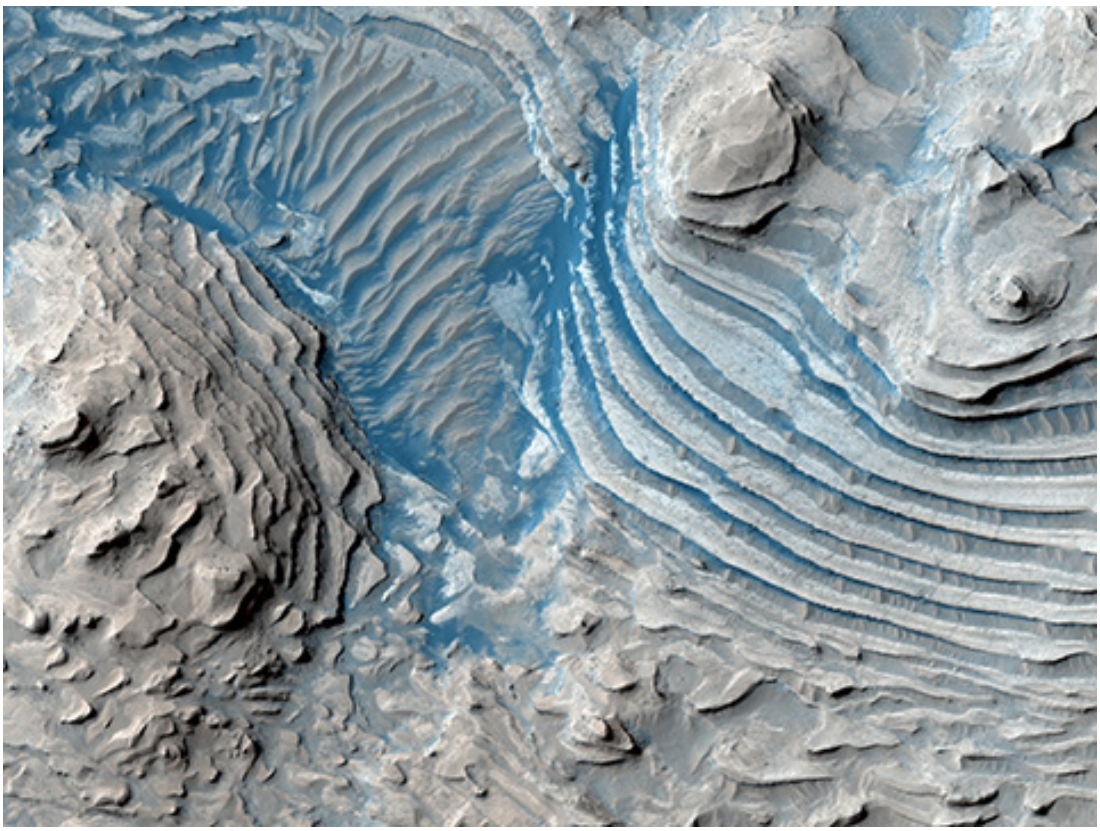

Image credit: NASA/JPL/University of Arizona

Layered rocks formed by the collection of sand and dust in a crater in the Meridiani Planum region of Mars. These layers once covered the floor of the crater but have been carved by the wind. This image is in exaggerated color, which makes the dark sand look slightly blue. To the eye it would look black or dark brown.

Sand Dunes

Sand dunes are piles of sand that are created and moved by wind. Dunes help us learn about the environment of present Mars. They don't tell us as much about Mars in the past. Many sand dunes on Mars are dark because the sand comes from broken-down black volcanic rocks.

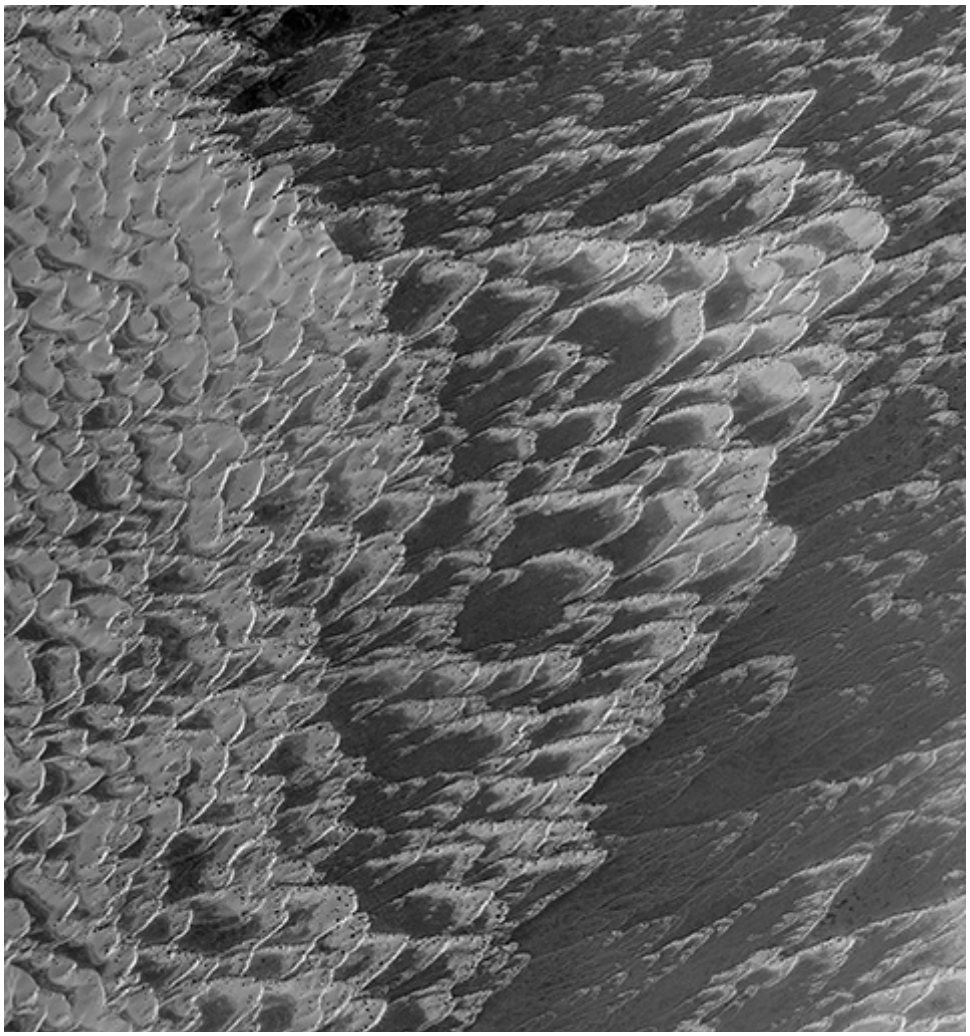

Image credit: USGS EROS

Black and white aerial view of sand dunes at White Sands National Park in New Mexico. Scientists can tell which direction the wind usually blows by the shape of the dunes. In this case, the wind blows from the upper right of the image to the lower left.

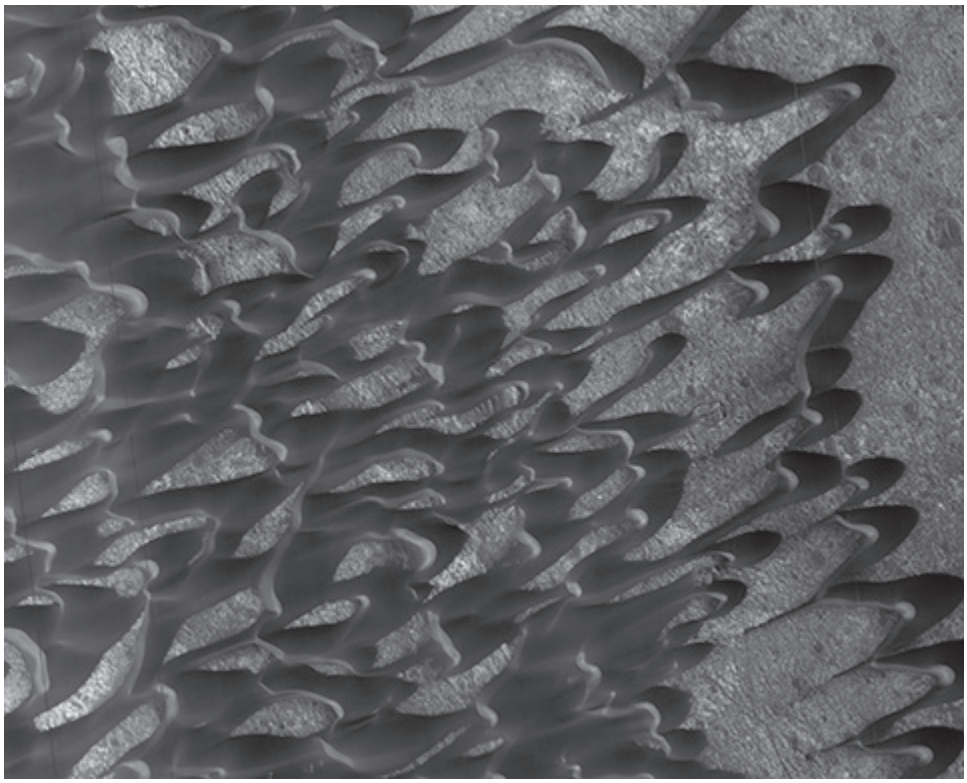

Image credit: NASA/JPL/University of Arizona

Black and white satellite view of sand dunes on Mars in an area called Nili Patera. Scientists can look at the way the crescent shapes are pointing to tell which way the wind usually blows. In this case the wind blows from the upper right to the lower left. The dunes are made of black sand, so they look dark compared to the bedrock below them.

Lava Flows

Flowing lava from volcanoes cools and hardens into areas of very hard rock. Lava flows often are stronger than other rocks in the area, so they form a hard layer called “cap rock” that wears away much more slowly than other rock. On Mars, lava flows often have lots of craters. Scientists can analyze volcanic rocks to figure out how old they are.

Image credit: USGS EROS

Aerial view of the SP Crater lava flow in northern Arizona. Black and gray volcanic rocks sit on top of tan and red sedimentary rocks. The edge of the flow has a rounded shape.

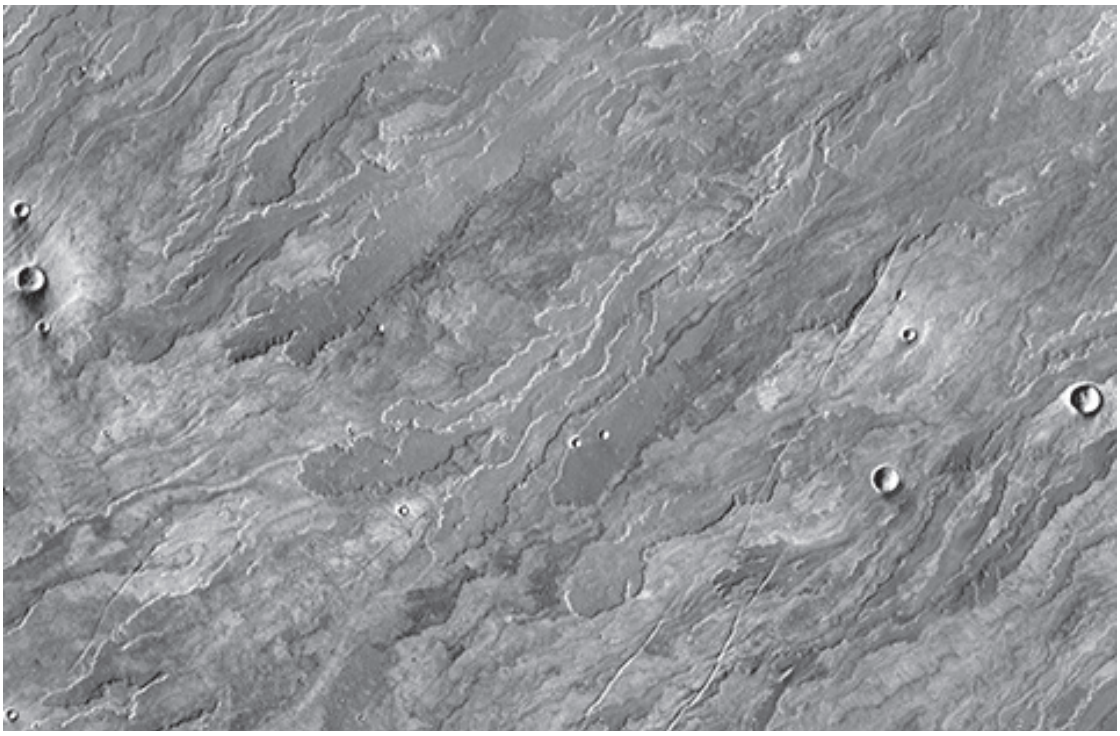

Image credit: NASA/JPL/MSSS

Satellite image of lava flows on the side of the giant volcano Arsia Mons on Mars. Scientists can tell the flows are geologically "young" because there are not many craters on them. This image was taken by a camera that sees infrared light, so brighter areas like the sunlit sides of the flows and craters are warmer.