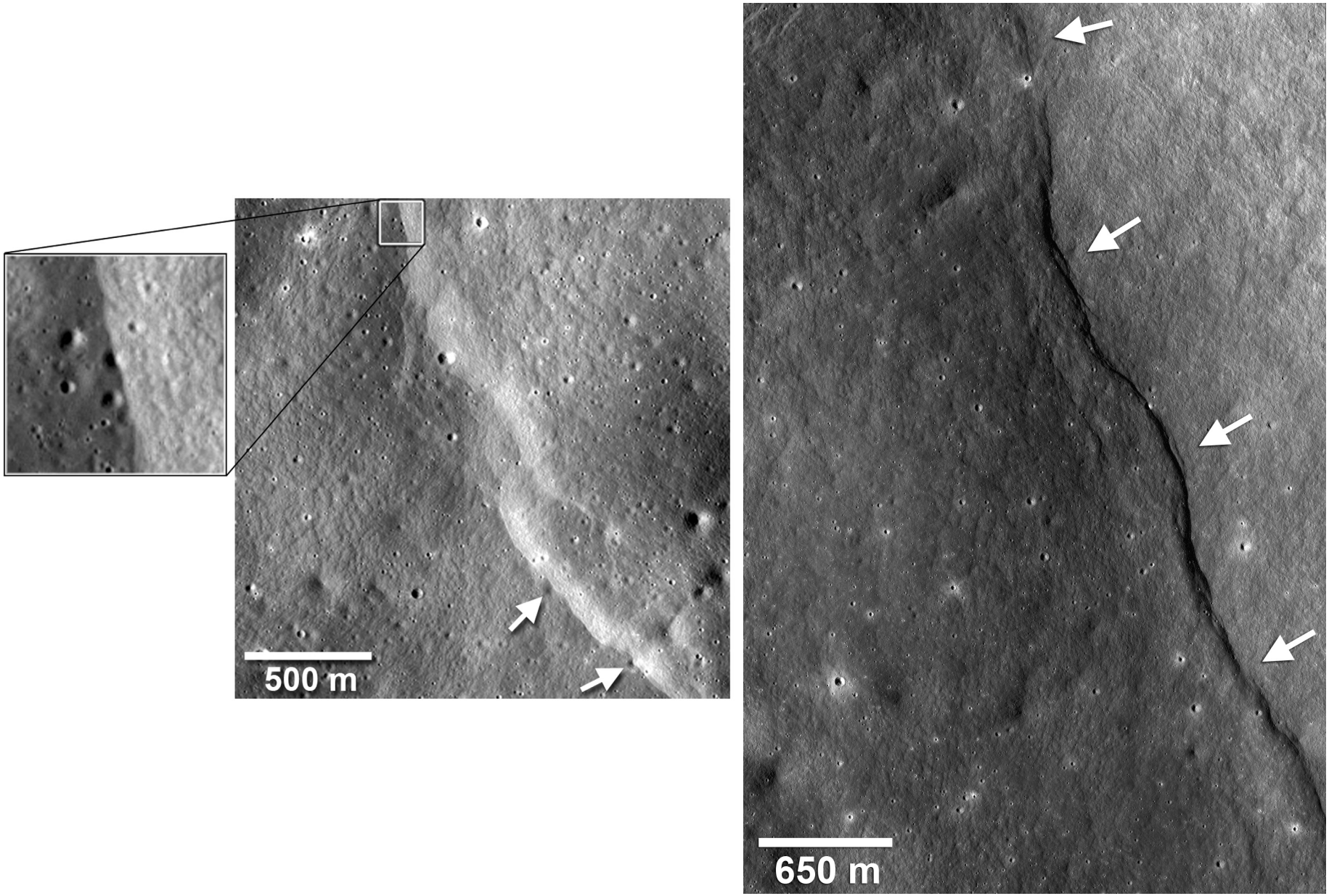


LUNAR RECONNAISSANCE ORBITER: The Shrinking Moon

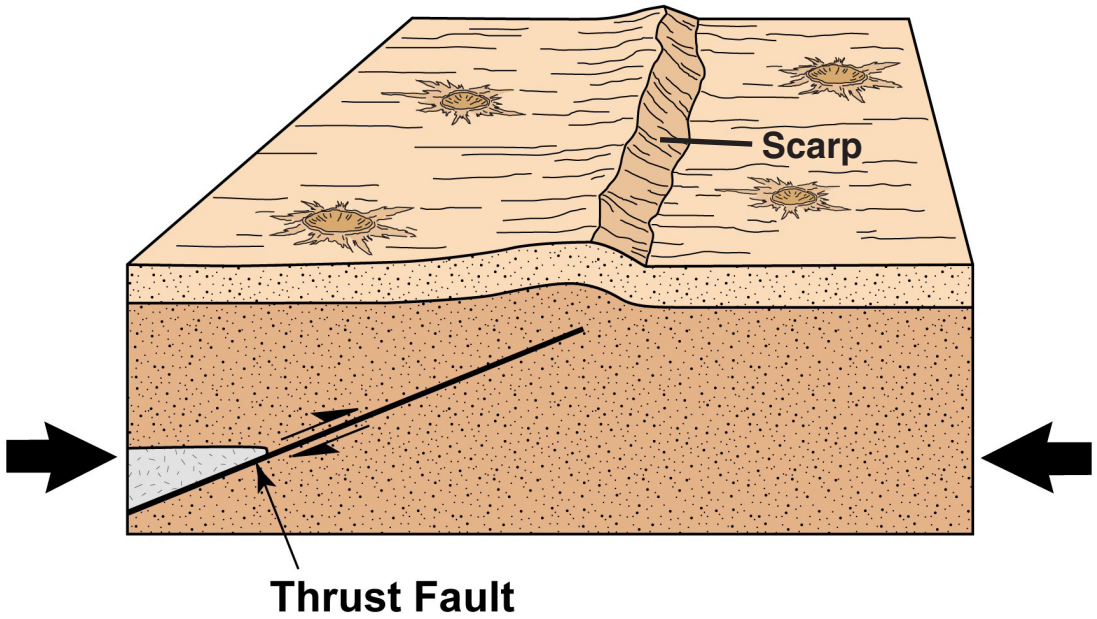
The Shrinking Moon

The Moon started off hot, but where did the heat come from? The decay of radioactive elements made the early Moon hot enough to melt. Scientists hypothesized that the early Moon was hot enough to completely melt while others suggested only the outer part of the Moon was hot enough to melt. These two hypotheses predict very different amounts of contraction (shrinking) due to interior cooling. Contraction from cooling is similar to a grape skin that wrinkles as a grape shrinks. Contraction causes the lunar crust to be pushed together, breaking the near-surface materials. The result is a steep slope on the surface called a scarp (as shown in the diagram). Scarps on the Moon are usually a few tens of meters high, and are less than a few tens of kilometers in length. Scientists look for scarps in the Moon's crust as an indicator of its cooling history.

The high resolution photographs taken during the Apollo era revealed small scarps in the lunar crust. While these highest resolution photographs gathered from the Apollo missions were helpful, they did not cover the entire Moon because they orbited the Moon only around its equator. It wasn't until data from the Lunar Reconnaissance Orbiter Camera (LROC) onboard the Lunar Reconnaissance Orbiter (LRO) were returned that scientists found scarps elsewhere on the Moon. What they have discovered has changed our understanding of the Moon.

Since the Moon is constantly impacted by meteors, landforms like the small scarps and small impact craters (those less than about 1,200 feet across) are quickly eroded and destroyed. These small features that we can see are therefore likely to be young. If a small crater has been cut by a scarp, the scarp must have formed after the crater. Looking at these relationships helps scientists learn about the ages of surface features.

Scientists have found hundreds of previously undetected scarps in LRO images. LROC data have shown that many of the newly discovered scarps formed much less than a billion years ago, and they could be as young as 50 million years! The scarps are found globally, making a shrinking moon the most likely explanation for their wide distribution. The small size of the scarps indicates that the Moon has contracted only a little over the last several hundred million years. A small rather than large amount of contraction supports the hypothesis that the early Moon did not totally melt. The young age of the scarps suggest that the Moon continues to cool even today.



Thrust faults are formed when the lunar crust is pushed together, breaking the near-surface materials. The result is a steep slope on the surface called a scarp as shown in this diagram. Credit Arizona State University

More Information
http://nasa.gov/lro
https://www.facebook.com/LunarReconnaissanceOrbiter
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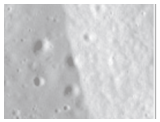
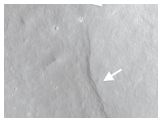
Goddard Space Flight Center manages the Lunar Reconnaissance Orbiter for NASA's Science Mission Directorate.

Image credit info:



Front left image: A fault scarp cut across and deformed several small diameter (~40-m diameter) impact craters (arrows) on the flanks of Mandel'shtam crater (6.5°N, 161°E). The fault carried near-surface crustal materials up and over the craters, burying parts of their floors and rims. About half of the rim and floor of a 20 m-in-diameter crater shown in the box has been lost. Since small craters only have a limited lifetime before they are destroyed by newer impacts, their deformation by the fault shows the fault to be relatively young.
Credit: NASA/GSFC/ASU/Smithsonian



Front right image: A thrust fault pushed crustal materials up the side of Gregory crater (2.1°N, 128.1°E). White arrows indicate the fault scarp.
Credit NASA/GSFC/ASU/Smithsonian