

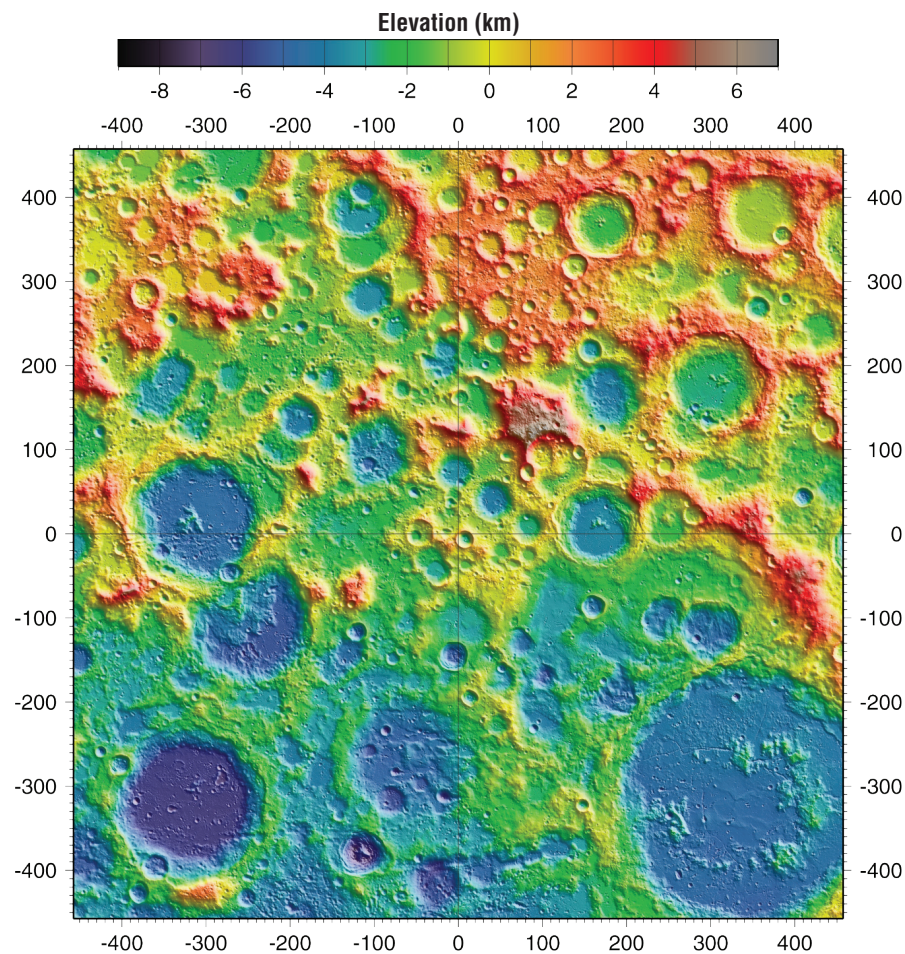
LUNAR RECONNAISSANCE ORBITER: Detailed Topography of the Moon

LRO—Lunar Reconnaissance Orbiter

The shape of a planetary surface tells scientists a lot about how that surface formed and changed over time. A common way for scientists to measure the shape of a planetary surface is by using a laser altimeter. A laser altimeter is an instrument that sends laser pulses to the surface and measures how long it takes for the pulse of energy to be reflected back to the instrument. That round-trip time is used to measure the distance between the surface and the spacecraft. As the surface (and distance between the two) changes, a precise record of the shape or topography, of the planet is created. The Lunar Orbiter Laser Altimeter (LOLA) instrument aboard the Lunar Reconnaissance Orbiter (LRO) rapidly sends five laser pulses to the lunar surface (140 shots per second). LOLA has created the highest resolution topographic map of any planetary surface, including Earth. With each orbit of LRO around the Moon, LOLA provides a strip of elevation data directly underneath the spacecraft. As the Moon slowly rotates below LRO, LOLA gathers data that covers the entire lunar globe. During its first four years in orbit, LOLA measured the height of more than 6 billion points on the Moon.

The images on the front show the topography of the near (left) and far (right) side of the Moon. Blue colors indicate lower surfaces, while red and white are higher surfaces. One of the surprising parts of lunar topography is that the crust on the far side of the Moon is much higher than on the near side. The near side of the Moon has large, low-lying, relatively smooth plains of basalt rock, which are shown as bluish-green features. These features appear as dark areas when the Moon is viewed with the naked eye from Earth. The low region (in blue)

on the far side image is the South Pole Aitken basin (SPA). SPA is a large impact basin that is more than 2,500 kilometers wide, one of the largest impact structures in the solar system, and the deepest area on the Moon. The highest surfaces on the far side of the Moon, which show up as white features, reach 10 kilometers (about 6 miles or 32,000 feet) above the average height of the lunar surface.



Topography of the south pole of the Moon as measured by the Lunar Orbiter Laser Altimeter aboard LRO. Axis units are in kilometers. Credit NASA/GSFC/MIT



More Information

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Goddard Space Flight Center manages the Lunar Reconnaissance Orbiter for NASA's Science Mission Directorate.

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Front left image: Topography of the near side of the Moon, from the LOLA instrument onboard LRO. Credit NASA/GSFC/MIT



Front right image: Topography of the far side of the Moon, from the LOLA instrument onboard LRO. Credit NASA/GSFC/MIT