

Due to the lapse in federal government funding, NASA is not updating this website.



Earth's Moon



# Weather on the Moon

## 3 QUICK FACTS

Surface temperatures on the Moon range from higher than 250°F to lower than -410°F.



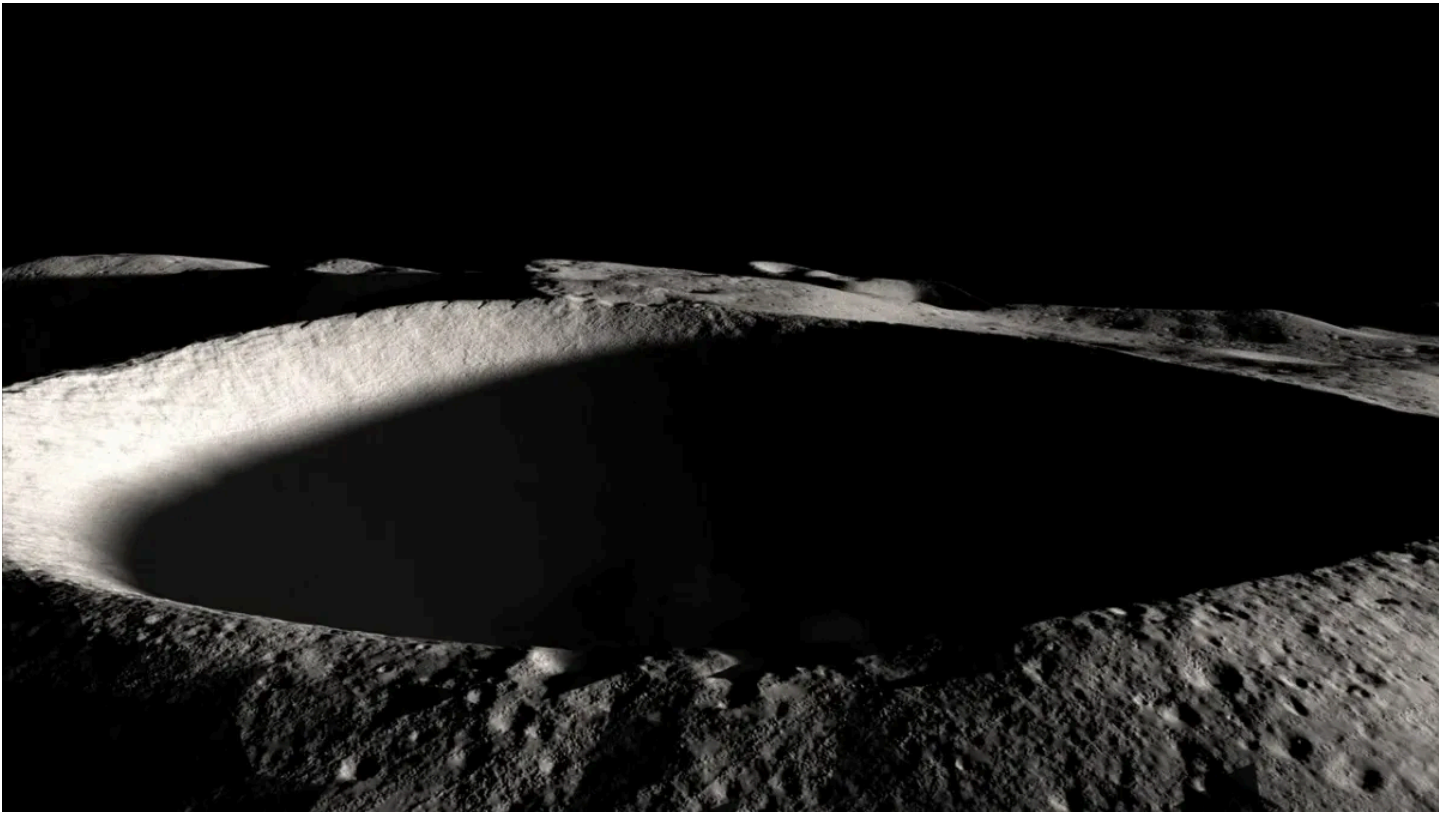
The Moon has hardly any atmosphere and no global magnetic field to shield it from space radiation.



On the Moon, snow does not fall. Thunder never rolls. No clouds form in the pitch-black sky. “Weather” on the Moon means something completely different than it does on Earth. The lunar climate is dominated by temperature swings of hundreds of degrees, incoming space rocks of all sizes, and particles and energy traveling from the Sun and beyond.

### Extreme Exosphere

Searing heat and bone-chilling cold are both common on the Moon, and changes in temperature are quick and dramatic, because the Moon doesn't have an atmosphere like Earth does. One cubic centimeter of Earth's atmosphere contains one hundred trillion times as many molecules as the same amount of space near the lunar surface. In other words, the lunar environment is *almost* empty, but not quite. The barely-there layer of gas around the Moon is called an **exosphere**.



Visualization of data from NASA's Lunar Reconnaissance Orbiter showing a permanently shadowed lunar crater.  
NASA's Scientific Visualization Studio

The lunar exosphere is too skimpy to trap or spread the Sun's energy, so differences between sunlit and shadowed areas on the Moon are extreme. Temperatures near the Moon's equator can spike to over 250°F (121°C) in daylight, then plummet after nightfall to -208°F (-133°C). In deep craters near the Moon's poles, permanent shadows keep the surface even colder — NASA's Lunar Reconnaissance Orbiter has measured temperatures lower than -410°F (-246°C). These forever-dark places harbor ice deposits that may be billions of years old.

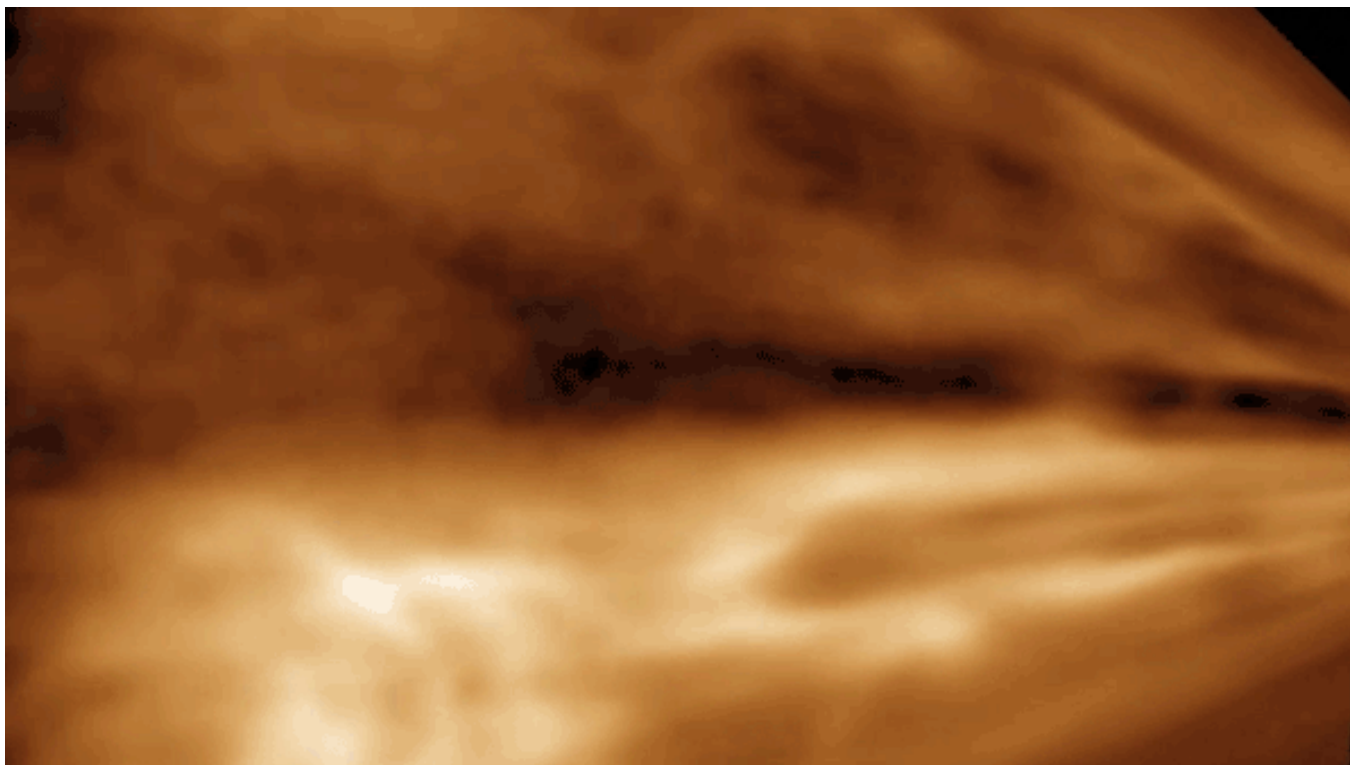
## Weather from Space

The Moon's exosphere is much too thin to produce weather as we know it on Earth. Instead, lunar “weather” comes straight from space.

### Solar Wind

An ongoing stream of solar “wind” gives the Moon a sunburn, charges the lunar landscape with static electricity, and supplies chemical ingredients that could make water.

**Learn More** →



### Galactic Cosmic Rays (GCRs)

Galactic cosmic rays arrive from distant reaches of the Milky Way, and sometimes even from other galaxies. These rays can break the Moon's surface atoms apart, releasing radiation.

### Coronal Mass Ejections (CMEs)

Shock waves from giant eruptions on the Sun deliver occasional bursts of high-energy particles to the Moon. These eruptions are called coronal mass ejections, or CMEs.

### Micrometeoroids

Micrometeoroids, and sometimes larger space objects, pelt the lunar surface. This dry shower of debris shuffles materials in the Moon's exterior layers, exposing fresh material in a process known as impact gardening.

*Writer: Caela Barry, NASA's Goddard Space Flight Center*

*Science Advisor: Liam Morrissey, Memorial University of Newfoundland*

KEEP EXPLORING

## Discover More Topics from NASA

## Moon Water and Ices →

What's big, covered in water, yet 100 times drier than the Sahara Desert? It's not a riddle, it's the Moon!

## Moon Formation →

Earth's Moon was born out of destruction. There are several theories about our Moon's formation, but almost all share that...

## Moon Composition →

The Moon is a differentiated world. This means that it is made of layers with different compositions. The Moon has...

## Solar Wind on the Moon →

As you read this, the Sun is blasting charged particles (electrons, protons, and other ions) out into the solar system....



### National Aeronautics and Space Administration

NASA explores the unknown in air and space, innovates for the benefit of humanity, and inspires the world through discovery.

[About NASA's Mission](#)

[Join Us →](#)

#### Follow NASA



[More NASA Social Accounts](#)

[NASA Newsletters](#)

[Home](#)

[News & Events](#)

[Multimedia](#)

[NASA+ LIVE](#)

[Missions](#)

[Humans in Space](#)

[Earth](#)

[The Solar System](#)

[The Universe](#)

[Science](#)

[Aeronautics](#)

[Technology](#)

[Learning Resources](#)

[About NASA](#)

[NASA en Español](#)

[Sitemap](#)

[For Media](#)

[Privacy Policy](#)

[FOIA](#)

[No FEAR Act](#)

[Office of the IG](#)

[Budget & Annual Reports](#)

[Agency Financial Reports](#)

[Contact NASA](#)

[Accessibility](#)

