

## [Science and technology news](#)

- [Home](#)
  - [Nanotechnology](#)
  - [Physics](#)
  - [Space & Earth](#)
  - [Electronics](#)
  - [Technology](#)
  - [Chemistry](#)
  - [Biology](#)
  - [Medicine & Health](#)
  - [Other Sciences](#)
- 
- [Earth Sciences](#)
  - [Astronomy](#)
  - [Environment](#)
  - [Space Exploration](#)

# LADEE Mission to Study the Moon's Fragile Atmosphere



October 26th, 2009 by Patrick Barry

[Enlarge](#)

In 1968, on many occasions, NASA's Surveyor 7 moon lander photographed a strange "horizon glow" after dark. Researchers now believe the glow is sunlight scattered from electrically-charged moondust floating just above the lunar surface.

**Right now, the Moon is a ghost town. Nothing stirs. Here and there, an abandoned Apollo rover — or the dusty base of a lunar lander — linger as silent testimony to past human activity. But these days, only occasional asteroid impacts disrupt the decades-long spell of profound stillness.**

[Ads by Google](#)

[How to make electricity](#) - \$198 homeowner's kit that power Co execs tried to outlaw in 17 states - [www.Power4Home.com](http://www.Power4Home.com)

And this stillness presents scientists with an important opportunity.

Currently, the Moon's tenuous [atmosphere](#) is relatively undisturbed. But that won't be true for long. [NASA](#) is planning to return people to the Moon, and human activity will kick up dust, expel rocket exhaust, and release other gaseous emissions into the lunar atmosphere. Because the atmosphere is so thin, these disturbances could quickly swamp its natural composition.

If scientists are ever to know the lunar atmosphere in a relatively natural state, now is the time to look. So researchers are building a probe called the Lunar Atmosphere and Dust Environment Explorer (LADEE) that will orbit the Moon and measure its wispy atmosphere better than ever before.

"It's important that we understand it in its pristine state before there's much perturbation," says Anthony Colaprete of NASA's Ames Research Center in Moffett Field, California. "It's such a fragile system. It's possible that it will be hard to study once humans are once more living and working on the Moon."

### **Thinner than thin**

Right about now, you might be thinking to yourself: "Hold on a second. I thought the Moon doesn't have an atmosphere!" And you would be almost correct. The Moon's "atmosphere" is so tenuous that it's technically considered an exosphere, not an atmosphere.

"It's not anything like an atmosphere we would think of," Colaprete says. For example, a cubic centimeter of Earth's atmosphere at [sea level](#) contains about 100 billion billion molecules. That same volume of the Moon's exosphere contains only about 100 molecules.

In fact, that's so thin that molecules in the lunar exosphere almost never collide with each other. Rather than constantly ricocheting off each other to create a cohesive, swarming mass of molecules as happens in Earth's atmosphere, molecules in the lunar exosphere fly unimpeded, like microscopic cannon balls following curved, ballistic trajectories.

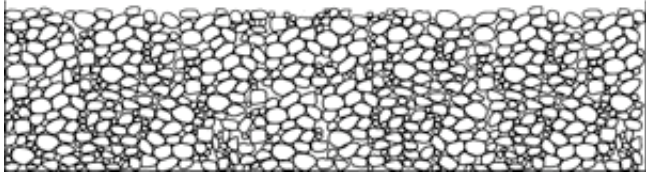
[Ads by Google](#)

[Nasa Satellite Image](#) - Get Satellite Maps, Aerial Photos & More With The Free Maps Toolbar - [Maps.alot.com](#)

And the weirdness of the exosphere doesn't stop there. During the lunar night, the Moon's exosphere mostly falls to the ground. (Just imagine if our atmosphere fell to the ground at night!) When sunlight returns, the solar wind kicks up new particles to replenish the exosphere.

Also, intense ultraviolet sunlight kicks electrons off particles in the lunar soil, giving those particles an electric charge that can cause them to levitate. Ambient electric fields lift these charged dust particles as high as kilometers above the surface, forming an important part of the exosphere.

Lunar astronauts will have to live and work in this bizarre environment, so scientists want a better picture of the exosphere and its odd behaviors. Levitating dust can get into equipment, spacesuits, and computers, causing damage and shortening the hardware's useful life. In fact, moondust wrecked havoc with the Apollo spacesuits, which were nearly threadbare by the time they returned to Earth. Knowing how much dust is floating around in the exosphere and how it behaves will help engineers design next-generation lunar hardware.



This animation shows how individual molecules may move near the surface of the Moon to form an exosphere.

After it launches in 2012, LADEE's spectrometers and dust detectors will measure the concentrations of 18 different chemicals in the exosphere, including methane and water vapor. These sensors will document how those chemicals vary, both from place to place and over time.

Beyond the inherent scientific value of understanding the chemical makeup of the Moon's exosphere, knowing how chemicals move within the exosphere could help answer a question of keen interest to future human habitants: How could the Moon have frozen reserves of water?

Evidence suggests that the Moon might harbor stores of ice in deep, dark polar craters. On the lunar surface, fierce sunlight would quickly sublimate any ice and the vapors would drift off into space. But a deep dark crater, combining unimaginable cold with an absence of sunlight, could provide a safe-haven for frozen water.

A popular idea is that icy comets brought water to the Moon in a series of ancient impacts. But there's a problem: Even if a comet landed in one of those dark polar craters by sheer luck, the heat of impact would evaporate most of the ice. So how could significant amounts of ice accumulate?

The Moon's exosphere could help.

Suppose a comet hits the Moon and leaves some H<sub>2</sub>O molecules on the exposed surface. That water could survive by, essentially, leaping to safety. Water molecules could "jump" across the lunar surface by escaping into the exosphere and later be recaptured by the surface as the exosphere breathes in and out. Individual water molecules could move around in this way until they land in one of the dark polar craters, where they would accumulate as solid ice.

Data from LADEE should show whether this "jumping" process works in a way that could explain how cometary ice could have found its way into those craters. "We can estimate the likelihood that the water on the Moon is cometary in origin," Colaprete says.

So much information from such a trifling amount of atmosphere! Stay tuned for results from LADEE.

Source: by Patrick Barry, Science@NASA

[Ads by Google](#)



Rate this story - 4 / 5 (2 votes)

- rank
- [1](#)
- [2](#)
- [3](#)
- [4](#)
- [5](#)

[view popular](#)

**Rank Filter**

2.

Move the slider to adjust rank threshold, so that you can hide some of the comments.

Display comments: [newest first](#)

- [otto1923](#) - 20 hours ago
    - Rank: not rated yet
- Nothing stirs.

Well, there are those transient outgassing phenomena around the Aristarchus complex and elsewhere <http://www.lunarp...tgassing>

-An area well worth exploring IMO. Its got everything- rilles, volcanic domes, gasses, etc.

- o [report abuse](#)

Please [register](#) or [sign in](#) to add a comment. Registration is free, and takes less than a minute. [Read more](#)

Email

Password

Forgot your password? [Click here](#) to reset it

Notify me via email of follow-up comments posted here

- [print](#)
- [email](#)
- [pdf](#)
- [txt](#)
- [blog](#)
- [bookmark](#)
- [aA](#)
- [Aa](#)

October 26th, 2009 [all stories](#)

Comments: [1](#)

- rank
- [1](#)
- [2](#)
- [3](#)
- [4](#)
- [5](#)

4 / 5 (2 votes)

- 
-



 My Today's Top Story ([learn more](#))

• [hide](#)

• **Related Stories**

• [CU-Boulder to build \\$6 million instrument for NASA lunar orbiter](#)

📅 Jan 10, 2009 | ☆ not rated yet | 👤 0

• [Get Ready For Total Lunar Eclipse Wednesday Night](#)

📅 Feb 19, 2008 | ☆ not rated yet | 👤 0

• [Goddard Scientists to Hunt for Treasure and Explore Electric Dust Fountains on the Moon](#)

📅 Apr 02, 2008 | ☆ not rated yet | 👤 0

• [Moon's polar craters could be the place to find lunar ice, scientists report](#)

📅 Dec 18, 2008 | ☆ not rated yet | 👤 0

• [NASA gets ready for moon water search](#)

📅 Jan 15, 2008 | ☆ not rated yet | 👤 0

• [hide](#)

• **Tags**

[atmosphere](#), [exosphere](#), [lunar atmosphere](#), [nasa](#), [sea level](#), [asteroid impact](#), [lunar lander](#)

• [hide](#)

- [Feature stories](#)
- [Popular](#)
- [Spotlight](#)



- [Scientists Make Ink Disappear, Make Paper Reusable](#)

[Chemistry](#) / [Materials Science](#)

🕒 5 hours ago | ☆ 3.3 / 5 (4) | 🗨 1



- [What Comes After Hard Drives?](#)

[Electronics](#) / [Hardware](#)

🕒 Oct 23, 2009 | ☆ 4.1 / 5 (31) | 🗨 36

- [Study Shows Time Traveling May Not Increase Computational Power](#)

[Physics](#) / [Quantum Physics](#)

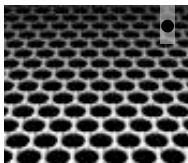
🕒 Oct 22, 2009 | ☆ 4.2 / 5 (18) | 🗨 4



- [Running electronics using light](#)

[Nanotechnology](#) / [Nanophysics](#)

🕒 Oct 19, 2009 | ☆ 4.3 / 5 (18) | 🗨 1



- [How Perfect Can Graphene Be?](#)

[Nanotechnology](#) / [Nanomaterials](#)

🕒 Oct 13, 2009 | ☆ 4.6 / 5 (29) | 🗨 5

- [hide](#)

- **Relevant PhysicsForums posts**

- [Planet's Julian Date of a point in orbit](#)

🕒 2 hours ago

- [Comet C/2008 O2 McNaught photos??](#)

🕒 15 hours ago

- [My dwarf is bigger than your dwarf](#)

🕒 16 hours ago

- [Planets <--> solar systems <--> galaxies](#)

🕒 19 hours ago

- [Cut the Earth In Half](#)

🕒 Oct 25, 2009

- [Hour Angle Definition](#)

📅 Oct 25, 2009

- More from [Physics Forums - General Astronomy](#)

## Other News



### [Bad weather delays NASA new rocket test flight](#)

[Space & Earth](#) / [Space Exploration](#)

📅 1 hour ago | ☆ not rated yet | 👍 0

(AP) -- NASA tried for hours Tuesday to launch its newest rocket for a shakedown flight, but clouds and high wind kept it stuck on the pad.



### [Detecting Life-Friendly Moons](#)

[Space & Earth](#) / [Space Exploration](#)

📅 20 hours ago | ☆ 4.9 / 5 (8) | 👍 2

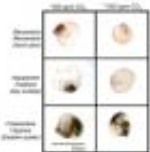
The search for life-friendly real estate around distant stars doesn't have to be limited to planets. New research shows that habitable exomoons can be detected with a new method using current technology.

### [Simple measures can yield big greenhouse gas cuts, scientists say](#)

[Space & Earth](#) / [Environment](#)

📅 21 hours ago | ☆ 3.4 / 5 (5) | 👍 2

New technologies and policies that save energy, remove atmospheric carbon and limit greenhouse gas emissions are needed to fight global climate change - but face daunting technological, economic and political hurdles, a Michigan ...



### [Ocean acidification may contribute to global shellfish decline](#)

[Space & Earth](#) / [Earth Sciences](#)

📅 22 hours ago | ☆ 3 / 5 (6) | 👍 1

Relatively minor increases in ocean acidity brought about by high levels of carbon dioxide have significant detrimental effects on the growth, development, and survival of hard clams, bay scallops, and Eastern ...

## [UN signals delay in new climate change treaty](#)

[Space & Earth](#) / [Environment](#)

🕒 8 hours ago | ☆ 1 / 5 (1) | 👤 0

(AP) -- Just weeks before an international conference on climate change, the United Nations signaled it was scaling back expectations of reaching agreement on a new treaty to slow global warming.



- [Researchers create all-electric spintronics](#)

[Nanotechnology](#) / [Nanophysics](#)

🕒 1 hour ago | ☆ 5 / 5 (1) | 👤 0

- [Anxious pregnant mothers more likely to have smaller babies](#)

[Medicine & Health](#) / [Health](#)

🕒 12 minutes ago | ☆ not rated yet | 👤 0



- [Magnetic mixing creates quite a stir \(w/ Video\)](#)

[Physics](#) / [General Physics](#)

🕒 23 minutes ago | ☆ not rated yet | 👤 0

- [Scientists use world's fastest supercomputer to create the largest HIV evolutionary tree](#)

[Medicine & Health](#) / [HIV & AIDS](#)

🕒 28 minutes ago | ☆ not rated yet | 👤 0

- [Research continues on secure, mobile, quantum communications](#)

[Technology](#) / [Engineering](#)

🕒 48 minutes ago | ☆ not rated yet | 👤 0

- [Chewing gum can reduce calorie intake, increase energy expenditure](#)

[Medicine & Health](#) / [Health](#)

🕒 18 minutes ago | ☆ not rated yet | 👤 0

- [Blinkx adds music video search tool](#)



[Technology](#) / [Internet](#)

🕒 48 minutes ago | ☆ not rated yet | 👤 0

- [No such thing as a break in a curveball?](#)

[Medicine & Health](#) / [Neuroscience](#)

🕒 41 minutes ago | ☆ not rated yet | 👁 1



- [Podcast: Tiny sea creature and a new medical adhesive](#)

[Chemistry](#) / [Materials Science](#)

🕒 29 minutes ago | ☆ not rated yet | 👁 0

- [Vegetables can protect unborn child against diabetes](#)

[Medicine & Health](#) / [Diseases](#)

🕒 18 minutes ago | ☆ not rated yet | 👁 0

## PhysOrg Account

- [Register](#)
- [Sign In](#)
- [Newsletter](#)
- [Favorites](#)
- [Activity](#)
- [PM](#)
- [My News](#)
  
- [Feature Stories](#)
- [Weblog](#)
- [Archive](#)
  
- [Video](#)
- [Free Magazines](#)
- [Free White Papers](#)



[advanced search](#)

twitter

facebook



**RSS 2.0**  
 customize


**mobile**  
 version


**NEWSLETTER**



- [news feed by category](#)

- **▼ Quick Navigation ▼**

- **[Nanotechnology News](#)**

[Bio & Medicine](#) - [Nanophysics](#) - [Nanomaterials](#)

- **[Physics News](#)**

[General Physics](#) - [Condensed Matter](#) - [Optics & Photonics](#) - [Superconductivity](#) - [Plasma Physics](#)  
 - [Soft Matter](#) - [Quantum Physics](#)

- **[Space & Earth News](#)**

[Earth Sciences](#) - [Astronomy](#) - [Environment](#) - [Space Exploration](#)

- **[Electronics News](#)**

[Consumer & Gadgets](#) - [Hardware](#) - [Robotics](#)

- **[Technology News](#)**

[Internet](#) - [Software](#) - [Business](#) - [Engineering](#) - [Semiconductors](#) - [Other](#) - [Telecom](#) - [Energy](#) -  
[Computer Sciences](#) - [Hi Tech](#)

- **[Chemistry News](#)**

[Biochemistry](#) - [Polymers](#) - [Analytical Chemistry](#) - [Materials Science](#) - [Other](#)

- **[Biology News](#)**

[Plants & Animals](#) - [Evolution](#) - [Ecology](#) - [Cell & Microbiology](#) - [Biotechnology](#) - [Other](#)

- [Medicine & Health News](#)

[Psychology & Psychiatry](#) - [Research](#) - [Medications](#) - [Cancer](#) - [Genetics](#) - [HIV & AIDS](#) - [Diseases](#)  
- [Other](#) - [Health](#) - [Neuroscience](#)

- [Other Sciences News](#)

[Mathematics](#) - [Archaeology & Fossils](#) - [Other](#) - [Social Sciences](#) - [Economics](#)

- [top](#)
- [Home](#)
- [Help](#)
- [What's new](#)
- [About us](#)
- [Partners](#)
- [Search](#)
- [PDA version](#)
- [Contact us](#)
- [RSS feeds](#)

© PhysOrg.com 2003-2009 [Privacy Policy](#) | [Terms of Use](#)