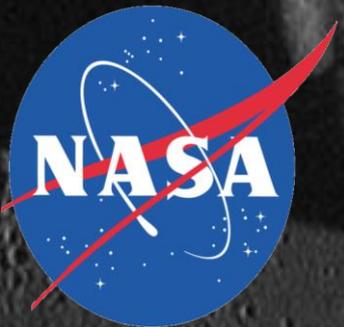
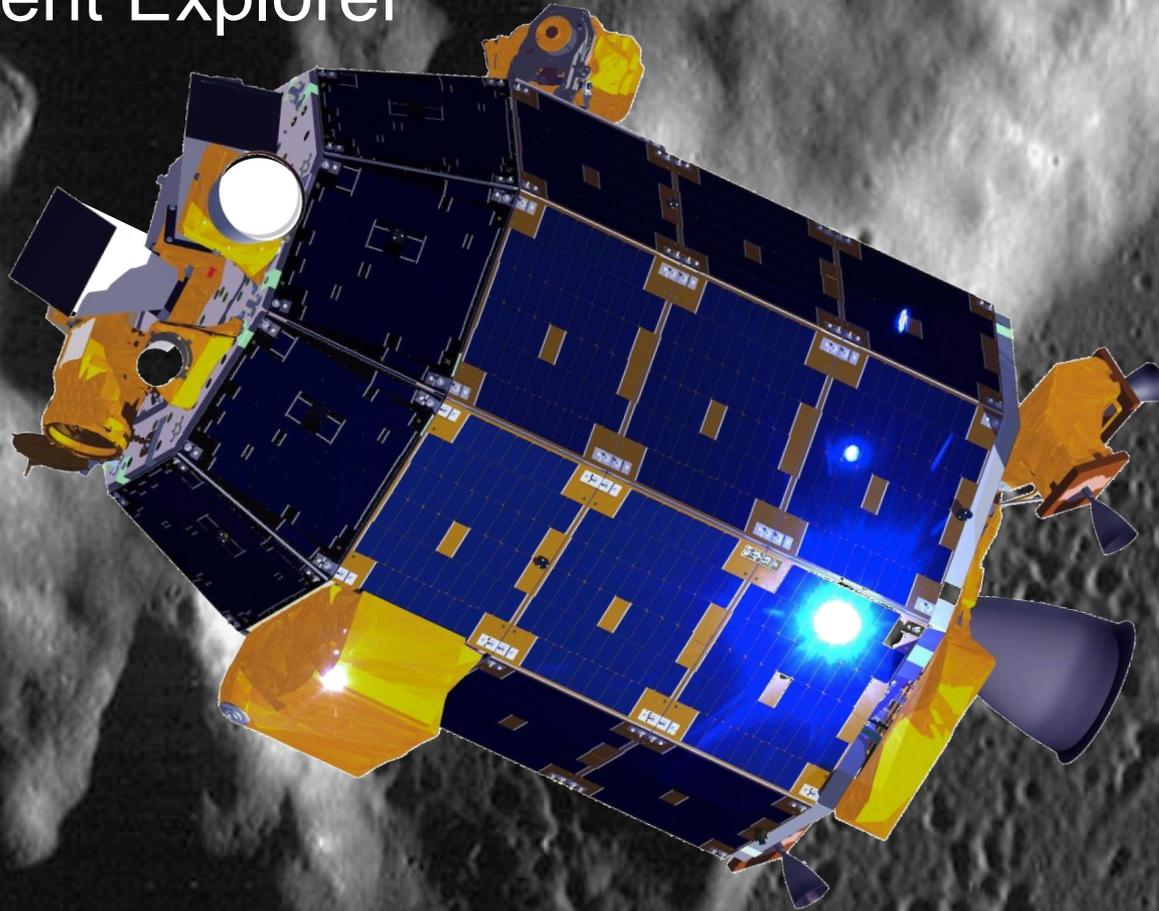


# LADEE

Lunar Atmosphere and Dust  
Environment Explorer

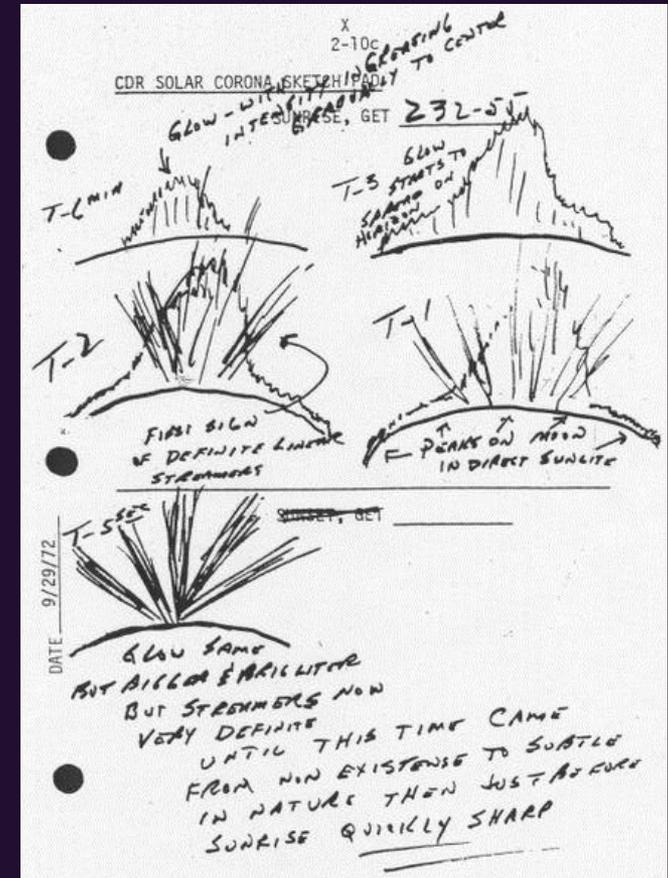


February 22 2013  
NASA Ames Research Center  
NASA Goddard Space Flight Center  
NASA Wallops Flight Facility

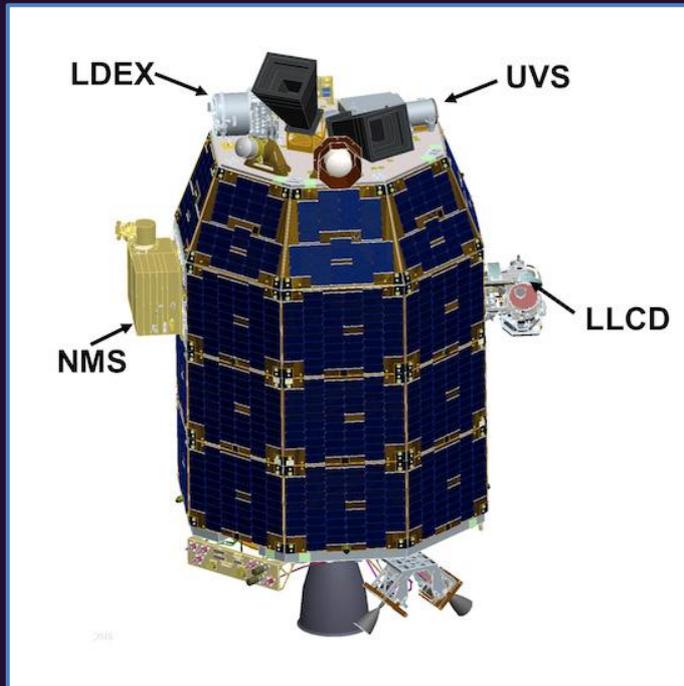
# LADEE: Lunar Atmosphere and Dust Environment Explorer

## Objectives:

- Solve the mystery of “lofted lunar dust”
  - The Apollo 17 astronauts sketched this phenomenon they saw at twilight, which might be lofted dust.
- Determine the makeup of thin lunar atmosphere
  - The lunar atmosphere is so tenuous that the molecules don’t bump into each other, something we call an “exosphere”



# LADEE Science Instruments



## Neutral Mass Spectrometer (NMS)

- Directly measures atmospheric species



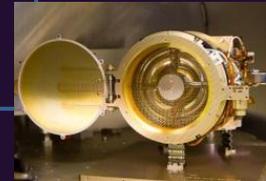
## UV-VIS Spectrometer (UVS)

- Measures both dust and atmosphere



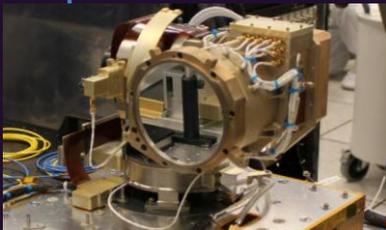
## Lunar Dust Experiment (LDEX)

- Directly analyzes dust



## Technology Demonstration – Lunar Lasercom

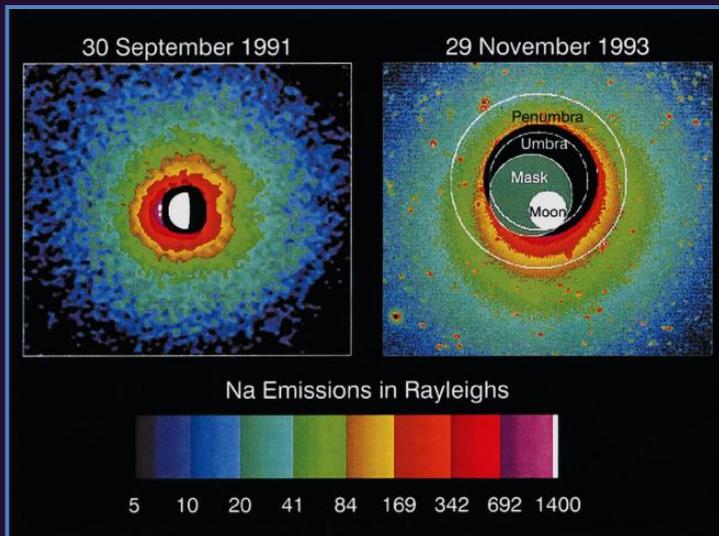
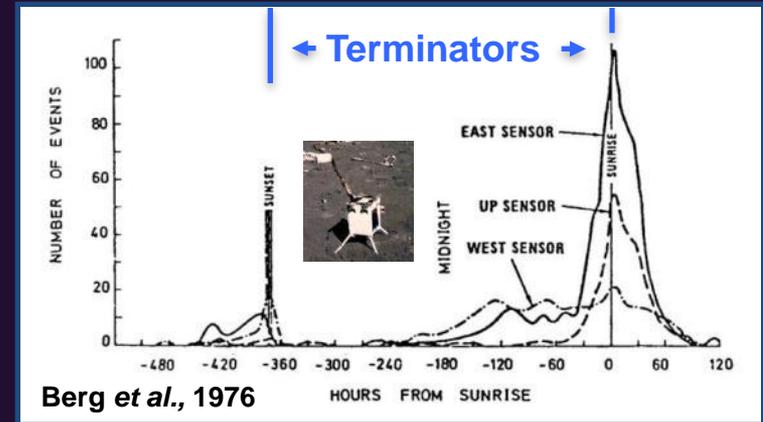
- This technology can dramatically increase the rate data can be sent/received from the Moon



# LADEE Science

## Dust:

One of the Apollo experiments found that dust is lofted above the ground at the terminators, i.e. dusk and dawn. Dust is thought to be electrostatically lofted as it passes between the positively charged day side and the negatively charged night side.

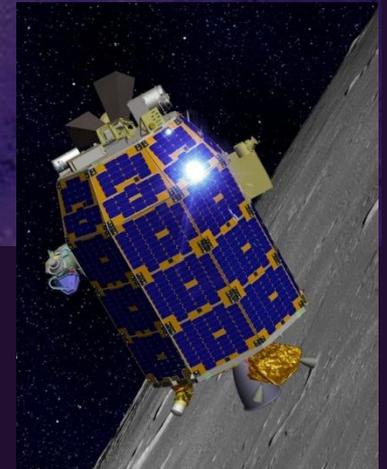


## Atmosphere:

We can see some components of the lunar exosphere from the ground, like these sodium observations, but many components that we think are there cannot be detected remotely; we need to get closer. LADEE will also allow us to better understand the distribution and variability of the molecules, which will allow us to connect the species to the processes that created them.



# Earth's **New** MOON



LADEE is the next step in our lunar renaissance, following other recent successful missions - LRO, LCROSS, Chandrayaan-1, Kaguya, GRAIL - that are painting a whole new picture of a Moon we only thought we knew.

# LADEE: Next Visitor to Our Moon

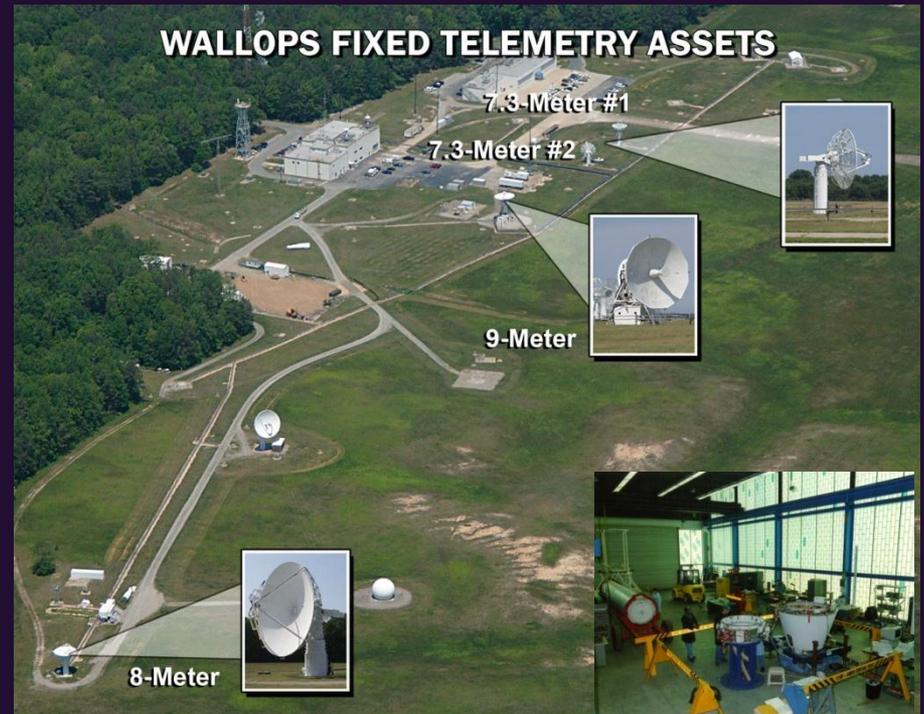


- A Mission of Firsts-
    - Ames' 1<sup>st</sup> in-house built spacecraft
    - First Moon launch from WFF
    - First launch of Minotaur V rocket from WFF
    - First demo of Laser Communications (will send data back 6X faster)
  - If LADEE stays as a night launch, over 60% of US population could view—weather permitting!
  - As a day launch, entire DelMarVa region could view.
- Our goal is to get 10,000 visitors to your Mid-Atlantic Regional Spaceport (MARS) for the launch!*

# WFF preparing for LADEE launch



LADEE Pathfinder activities - View towards the south after gantry roll-away on newly enlarged Pad 0B w/ Min V mockup.



# Submit Your Events

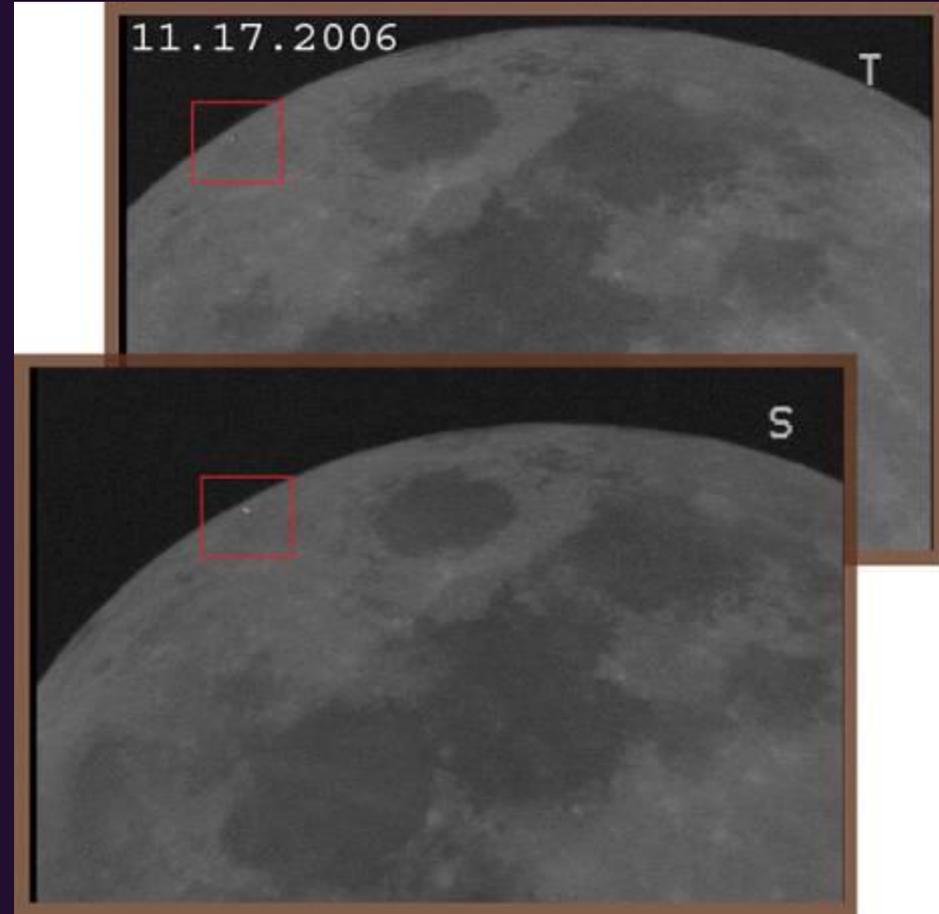


- Hosting a Viewing Event? Submit your event to our map at <http://moon.nasa.gov/ladeelaunch.cfm>
- We are posting free downloadable New Moon materials on the site and up to date mission information
- Let us know if you need a NASA Expert to attend your event. Contact Elaine Lewis at: [elaine.m.lewis@nasa.gov](mailto:elaine.m.lewis@nasa.gov)

# You Can Participate in LADEE! Recording Lunar Impacts



We think meteoroid impacts may be one of the major sources of the lunar atmosphere and dust. Observations of the flashes of meteoroid impacts on the Moon can be made using 8 to 14 inch diameter telescopes, the kind of telescopes that some schools and many amateur astronomers have. These observations could be very valuable to the LADEE mission.



[http://www.nasa.gov/mission\\_pages/LADEE/main/get-involved.html](http://www.nasa.gov/mission_pages/LADEE/main/get-involved.html)

# You Can Participate in LADEE! Meteor Counting



- Even if you don't have a telescope, you can still participate in the science of the LADEE mission!
- The vast majority of meteoroids impacting the Moon are too small to be observable from Earth.
- Small meteoroids encountering the Earth's atmosphere can result in easily-observable meteors.
- Conducting counts of meteors during the LADEE mission will allow us to estimate what is happening on the Moon at that time.
- [http://www.nasa.gov/mission\\_pages/LADEE/main/get-involved.html](http://www.nasa.gov/mission_pages/LADEE/main/get-involved.html)



Image credit: NASA/ISAS/Shinsuke Abe and Hajime Yano

# Meteor Counter

Available on the  
App Store

For iPhone, iPad & iPod Touch

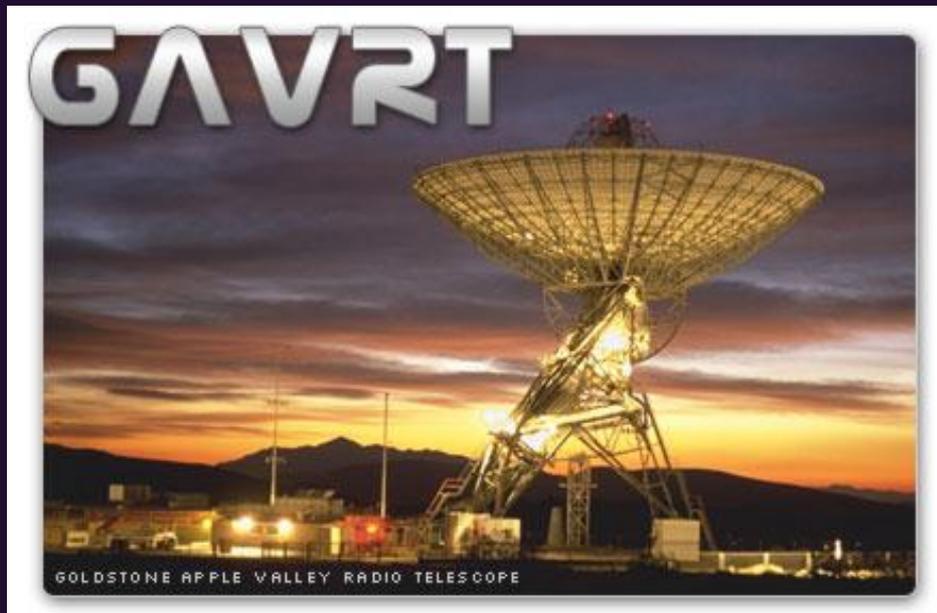
Now for Android too!



# You Can Participate in LADEE! Student Spacecraft Tracking



- Directly involving thousands of students around the world in the mission.
- Extension of GAVRT – Goldstone Apple Valley Radio Telescope run by Lewis Center for Educational Research and JPL.
- Students can remotely operate the 34m Goldstone dishes from their classrooms.
- Track and monitor the health and status of the spacecraft in flight.
- <http://deepspace.jpl.nasa.gov/dsn/gavrt/>



# Why Wallops is the Space Place!

- Rich 67-year history...first launch June 27, 1945
- Conducted critical testing for the Mercury capsule, leading to astronauts flying in space. Continues support for testing the next generation human space capsules
- More than 16,000 launches for WFF since 1945!
- Home to NASA's only owned/operated launch range; major tenants include U.S. Navy, NOAA, U.S. Coast Guard, Mid-Atlantic Regional Spaceport and commercial aerospace operations
- Home to NASA's scientific balloon program—a typical NASA science balloon, when fully-inflated, is so large the Super Dome could fit inside of it.
- More than \$1 Billion in launch and governmental assets on Wallops Island
- Home to NASA's sounding rocket program—some 20-30 launches each year; sounding rockets can fly up to 900 miles above the Earth's surface
- Manages assets and launches from operational sites all over the world: Norway, Sweden, Australia, Brazil, Bermuda, Antarctica, Greenland, Marshall Islands, as well as Alaska, Texas, North Carolina, New Mexico, and Hawaii
- Home to MARS!(That is the Mid-Atlantic Regional Spaceport), a commercial spaceport created under the auspices of the VA Commercial Spaceflight Authority; one of only a handful of spaceports in the nation
- Moon mission and International Space Station cargo resupply missions planned for 2013
- Neighbor to Chincoteague and Assateague Islands; popular tourist destination (some 1.4 million visitors/year) and home to the world-famous Chincoteague Ponies