

# Rocket heading to dust-up on moon

**Water hunt** | The West Coast has a front-row seat for a moonshot that aims to kick up a big plume

By **JOE ROJAS-BURKE**  
THE OREGONIAN

An Atlas V rocket is on a collision course with the moon, and when it hits early Friday morning, the blast will kick up a miles-high plume of debris visible from Earth. Or at least that's what NASA scientists are hoping.

Their goal is to find water — if there is any to be found — frozen deep in the permanently shaded floor of a crater at the moon's south pole. Water will be key to the success of future moon colonies and not just for drinking; it can be split into oxygen for breathing and hydrogen for fuel.

"With that you have the basics for human sustainability," says John Marmie, deputy project manager for the space agency's Lunar Crater Observing and Sensing Satellite, or LCROSS, mission.

The show starts at 4:31 a.m. Friday, when the spent upper stage of the Atlas V rocket will strike its target: an ancient crater called Cabeus that is 60 miles across and nearly a mile deep. Four minutes later, a second spacecraft will fly through the debris plume, collecting and relaying data back to Earth before smashing into the moon, creating a second debris plume.

Oregon and the rest of the West Coast will have good views for amateur astronomers using telescopes with a diameter of at least 10 inches, NASA scientists say. The impacts won't be big enough to see with the naked eye or binoculars.

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See a computer simulation of the NASA mission and keep up with the spacecraft at [oregonlive.com](http://oregonlive.com)

**Anthony Colaprete, project scientist and principal investigator at NASA, talks about the LCROSS mission, which concludes Friday morning when the satellite crashes into the moon.**

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## Atlas V: NASA faces uncertainties with mission

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Clouds of ejected material will peak in 30 to 100 seconds and remain visible only for a few minutes. But the event will play out under scrutiny by 18 major Earth-based observatories and four Earth-orbiting instruments, including the Hubble space telescope, Marmie says.

Previous moon orbiters have found likely signs of water. Last month, for instance, a NASA instrument on the Indian Space Research Organization's Chandrayaan-1 spacecraft measured wavelengths of light absorbed on the lunar surface that matched the pattern expected of water molecules. But the concentration is small: about 32 ounces per ton of moon dust, researchers estimated.

LCROSS scientists hope their

### Where to watch for free

**Portland:** OMSI, 1945 SE Water Ave., Portland, will project the impact in its auditorium via a live satellite feed from NASA starting at 3:30 a.m. More information: 800-955-6674 or [www.omsiedu](http://www.omsiedu)

**Sun River:** The Sun River Nature Center and Observatory, next to Lake Aspen on River Road, will have 10 telescopes for viewing and will play a live satellite feed from NASA on video screens, starting at 4 a.m. More information: 541-

593-4442

**Ellensburg, Wash.:** Central Washington University's astronomy club will have three telescopes, including a 12-inch scope with a CCD camera to photograph the impact, and will play a live satellite feed from NASA, starting at 3:30 a.m. in Lind Hall (Northwest corner of University Way/Eighth Avenue and Chestnut Street). More information: e-mail: [astroclb@cwu.edu](mailto:astroclb@cwu.edu). Web: [www.cwu.edu/~astroclb](http://www.cwu.edu/~astroclb)

\$79 million experiment provides definitive evidence of water and a clearer picture of how much might exist at the moon's south pole. But some scientists say the mission faces big uncertainties.

For one, the hollow rocket stage may not produce a big enough bang. Peter Schultz of Brown University told Science magazine that the space agency's models may underestimate the chances that debris will hit the crater rim instead of rising into view. Schultz's experiments with hollow projectiles fired

into fake lunar soil sprayed out debris at lower angles than solid projectiles do. The dirt and rubble of the upper few meters of the moon is highly compressible, Schultz said, adding that predicting how it will absorb impact is challenging.

NASA scientists are more confident. "Our simulations show that the debris will get kicked up long enough for us to view it," Marmie says. "We think it's gonna work."

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