Lunar CRater Observation and Sensing Satellite

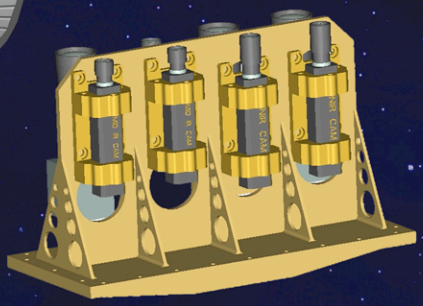
LCROSS

The LCROSS mission directs the 2000-kg launch vehicle upper stage to a permanently shadowed region of a lunar pole. After separating from the rocket stage, the Shepherding Spacecraft observes the impact and debris cloud with cameras and spectrometers to detect water concentrations down to a level of 0.5% and measure this value with a factor of two uncertainty accuracy. The Spacecraft then follows the upper stage to the lunar surface and becomes a 600-kg+ secondary impactor. Both impacts will be visible to Earth and lunar orbiting instruments.

Launch Vehicle Upper Stage Impactor

Lunar Gravity Assist Lunar Return Orbit (LGALRO) followed by LCROSS Spacecraft

Cameras and Spectrometers mounted on the Shepherding Spacecraft

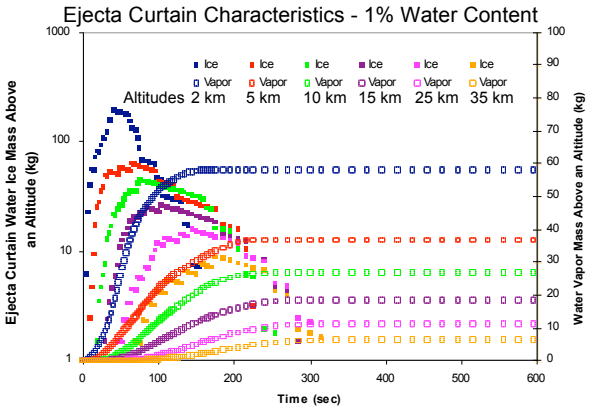


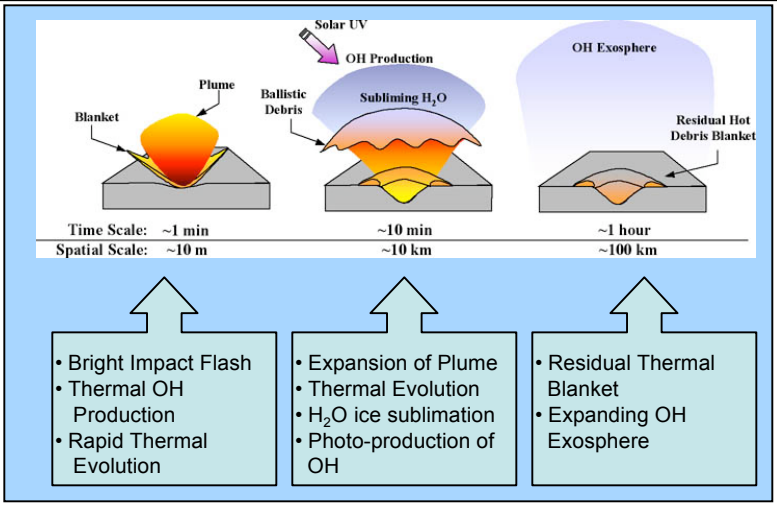
NASA-Ames Research Center is managing the development of the LCROSS mission. The Shepherding Spacecraft is being developed by Northrop Grumman. Spacecraft components from the Lunar Reconnaissance Orbiter Project are being used, along with instruments and components from other companies.

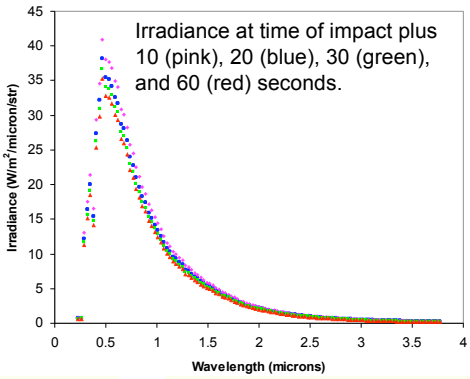
LCROSS

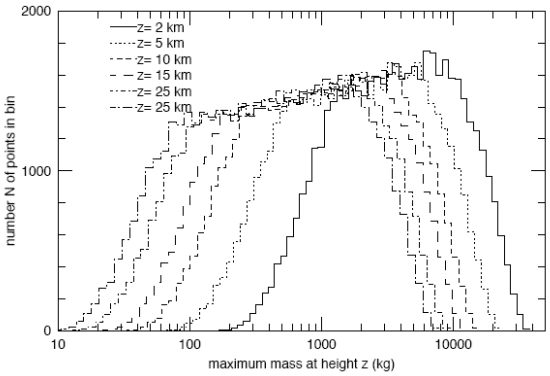
LCROSS: Opportunities for Observations from Ground-based and Space-based Telescopes

There are a variety of ground-based and orbital observatories that can observe the dust and water plumes caused by the LCROSS impacts. The impacts are nominally scheduled for February 2009 and are planned to occur with most favorable viewing geometry (at the time of impact) from Hawaii and North & South America. The LCROSS team encourages astronomers and planetary scientists to observe the impacts to further our understanding of impact physics, lunar resources (water), and lunar geology and origins (polar regolith), and thereby support scientific and exploration objectives. The LCROSS Project is committed to working with the observational scientists to provide mission information that is critical to the planning and proposal of observations. In this way the LCROSS Project aims to develop a coordinated observation campaign utilizing ground-based and space-based observational assets.

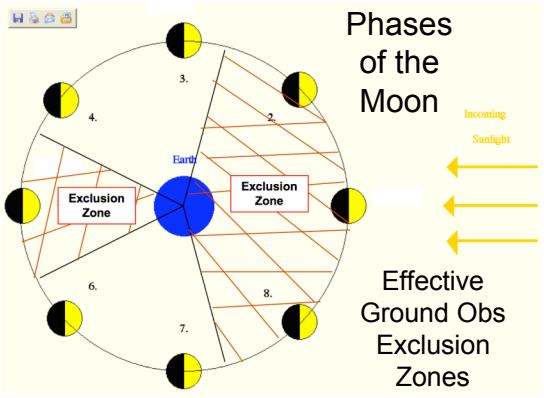








Total ejecta mass at any altitude depends on a variety of parameters, including, but not limited to, impact angle, impactor density and ejecta flight angle. This figure (left) shows a Monte-Carlo study of ejecta mass at altitude for a variety of key impact parameter combinations.



Product	Measurement	Time Scale	Spatial Scale	Observation Platform
Water ice in plume	Near IR	sec-hours	0.1-10 km	S-S/C
Water vapor in plume	Near IR, 308 nm OH^* line, 619 nm $H2O^*$ line, mid-IR, radio	sec-days	1-100 km	S-S/C, ground based, lunar orbital, earth orbital
Water ice in fresh ejecta	Mid IR	min-days	1-100 km	S-S/C, lunar orbital
Plume properties	Near IR	min-days	0.1-10 km	S-S/C, ground based
Regolith properties	Mid IR	days	1-100 m	S-S/C, lunar orbital

For additional information regarding the LCROSS observation campaign and also funding opportunities through NASA, contact Dr. Jennifer Heldmann at NASA Ames Research Center, LCROSS Observation Campaign Coordinator (jheldmann@mail.arc.nasa.gov, 650-604-5530). For mission information visit http://lcross.arc.nasa.gov.