Results from the LAMP Instrument on the LRO Mission

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The Lyman Alpha Mapping Project (LAMP) is a far-ultraviolet (FUV) imaging spectrograph on NASA's Lunar Reconnaissance Orbiter (LRO) mission. Its objectives are to (i) identify and localize exposed water frost (and possibly other volatiles) in permanently shadowed regions (PSRs), (ii) characterize landforms and albedos in PSRs, (iii) demonstrate the feasibility of using natural starlight and skyglow illumination for future lunar surface mission applications, and (iv) characterize the lunar atmosphere and its variability (including transients resulting from the LCROSS impact). As a byproduct, LAMP will map the Moon at FUV wavelengths, allowing new studies of the microphysical and reflectance properties of the regolith. LAMP does this by measuring the signal reflected from the nightside lunar surface and in PSRs using both interplanetary Lyα and FUV starlight as light sources. Both these light sources provide fairly uniform, faint illumination.

In the >10 months since the LRO Mapping Orbit Insertion on 9/15/2009, LAMP has spent most of the time accumulating UV photon lists from nadir-pointed observations, with only occasional off-Moon pointings for monthly stellar calibrations, limb atmosphere observations, and LCROSS support. Even so, the typical night-side count rates of only ~300-500 counts/s require that many months of data collection are needed before acceptably accurate albedo maps can be obtained. However, preliminary brightness maps indicate that PSR regions have lower FUV reflectivities than non-PSR regions.

Atmosphere studies are not part of the primary 1-year mission for LRO, although some very useful data will be obtained serendipitously. More directed atmospheric observations and campaigns are expected to occur in the planned extension of the LRO. Central to these studies will be frequent targeted limb observations, e.g., along the dawn terminator, where the diurnal concentrations of atmosphere are largest, and where horizon glow can be studied for the relative contributions of dust and sodium emissions.

LAMP successfully observed a plume containing H_2, Hg, Ca, and Mg that was generated by the LCROSS Centaur impact into Cabeus crater. The species detected by LAMP underscore the fact that water is not the only volatile likely to be found in abundance in the PSRs.

Results from surface mapping, atmosphere studies, and LCROSS support will be presented.