

LRO Lyman Alpha Mapping Project (LAMP) Latest Results and Plans for LRO Extended Science Mission 5.

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Far-ultraviolet (far-UV) reflectance measurements of the Moon, icy satellites, comets, and asteroids have proven surprisingly useful for advancing our understanding of planetary surfaces, expanding upon the primary historical use of UV instruments to investigate planetary atmospheres and auroral processes. This new appreciation for planetary far-UV imaging spectroscopy is provided in large part thanks to a decade of investigations with the Lunar Reconnaissance Orbiter (LRO) Lyman Alpha Mapping Project (LAMP). LRO-LAMP far-UV spectral-imaging maps of the lunar day-side, night-side, and permanently shaded regions (PSRs) are useful in the context of understanding numerous properties not originally conceived of prior to LRO's launch in 2009.

Detailed far-UV spectral analyses [1], supplemented by laboratory efforts [2], investigate regolith structure/porosity and the relative aging of surface features by space weathering [3,4,5,6,7]. These analyses support the previous identification of diurnal variations in hydration features [8,9,10], and identify compositional signatures in regolith (i.e., feldspar-rich highlands) [5,7].

Global searches of water signatures outside of lunar PSRs are allowing us to confirm and elucidate the findings of surface water/hydroxyl and its variability [8,9,10].

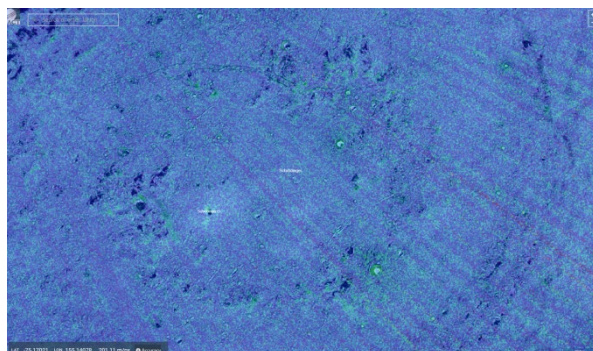


Figure 1. Schrodinger crater, LAMP nightside Lyman-alpha albedo overlayed on LROC WAC basemap at 45% opacity <https://bit.ly/3r0uog6>.

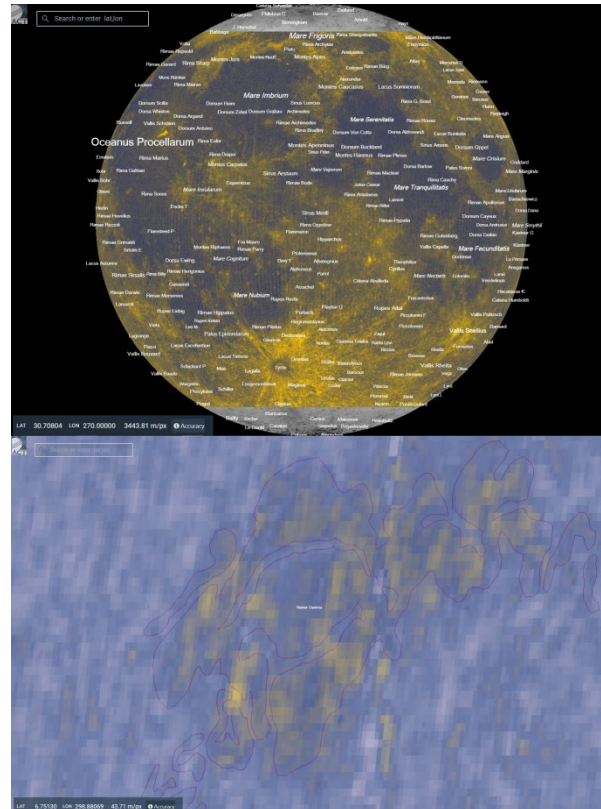


Figure 2. (top) Nearside view of LAMP dayside Off-band/On-band albedo ratio map, showing immature crater rays <https://bit.ly/3n8PWGj>. **(bottom)** Same as top, viewing the Reiner-Gamma region overlayed on LROC WAC basemap at 50% opacity with optical swirl boundaries shown <https://bit.ly/3n69qeL>.

The LRO Extended Science Mission 5 (ESM5) enables more surface reflectance data (60-190 nm) at a variety of incidence and emission angles to improve signal, spectral, and photometric quality and further develop our innovative UV reflectance techniques [11]. Ongoing laboratory studies are constraining the compositional and photometric properties of lunar samples and simulant analogs [12]. Observations of comets [13], the interplanetary medium, and other targets are planned for ESM5, in addition to support of,

and landing gas-plume imaging of, the exciting series of upcoming lunar missions.

Figures 1 and 2 show a few overlays of LAMP day-side Off-band/On-band ratio and Lyman-alpha maps on LROC WAC mosaic basemaps, as now available on the QuickMap tool [14].

Haiku: Ultraviolet / Make Moon maps / Transport of water

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[14] We acknowledge the use of imagery from Lunar QuickMap(<https://quickmap.lroc.asu.edu>), a collaboration between NASA, Arizona State University & Applied Coherent Technology Corp.