LRO Lyman Alpha Mapping Project (LAMP) Far-UV Maps: A New View of the Moon. K. D. Retherford[1], T. K. Greathouse[1], G. R. Gladstone[1], A. R. Hendrix[2], K. E. Mandt[1], A. F. Egan[3], D. E. Kaufmann[3], P. O. Hayne[4], S. A. Stern[3], J. Wm. Parker[3], M. W. Davis[1], C. Grava[1], D. M. Hurley[5], J. T. S. Cahill[5], A. M. Stickle[5], Y. Liu[1], M. A. Bullock[3], W. R. Pryor[6], P. D. Feldman[7], J. Mukherjee[1], P. Mokashi[1], C. J. Seifert[1], and M. H. Versteeg[1]; [1]Southwest Research Institute, San Antonio, TX (kretherford@swri.edu), [2]Planetary Sciences Institute, Tucson, AZ, [3]Southwest Research Institute, Boulder, CO, [4]Jet Propulsion Laboratory, Pasadena, CA, [5]Johns Hopkins University Applied Physics Laboratory, Laurel, MD, [6]Central Arizona University, Coolidge, AZ, [7]Johns Hopkins University, Baltimore, MD.

Abstract. Far ultraviolet (FUV) maps obtained using the Lunar Reconnaissance Orbiter (LRO) Lyman Alpha Mapping Project (LAMP)'s innovative nightside observing technique [1,2] reveal features on the Moon in a new light. Dayside FUV albedo maps obtained using the more traditional photometry technique with the Sun as the illumination source are very complementary. Together, these LRO-LAMP investigations provide a unique perspective on the lunar "hydrological cycle," connecting the surface abundance of water frost trapped in the Moon's cryosphere to volatile transport processes involving the lunar exosphere.

LAMP Instrument. The LRO-LAMP UV imaging spectrograph is studying how water is formed on the Moon, transported through the lunar exosphere, and deposited in permanently shaded regions (PSRs)[2,3]. Importantly, the nightside imaging technique allows LAMP to peer into the PSRs near the poles, and determine their UV albedos. LAMP nightside and dayside brightness maps cover wavelength range 57-196 nm. Lyman-α, on-band and off-band albedo maps (i.e., on and off the water frost absorption band at ~165 nm) are useful for constraining the abundance of surficial water frost [1,4,5].

Key Results. Global nightside and dayside maps are divided (at ±60° latitude) into polar and equatorial regions with stereographic and equirectangular projections, respectively. Additionally, new spectral image cube maps have been created for several regions of interest with 2 nm resolution, and are being expanded to cover the full globe.

LAMP FUV albedo measurements indicate ~1-2% surface water frost areal-mixing abundances in a few PSRs based on spectral color comparisons, and we find that many PSRs may have porosities of ~0.7 based on relatively low albedos at Lyman-α [1,5]. The FUV albedo maps reveal lower albedo regions and/or spectral shapes consistent with water frost within the coldest PSR regions, determined with correlative analyses using LRO-Diviner maps [5]. Mandt et al. [6] reported an updated analysis of the PSR reflectance measurements, and more recent work includes a search for albedo changes on monthly timescales.

Global dayside FUV albedo maps enable comparisons between the nightside and dayside photometry techniques to help validate the use of Lyman-α and starlight as illumination sources. Analysis of dayside spectra for selected regions complement the nightside maps, and are used to investigate space weathering and hydrated surface signatures [7,8]. A lab study of the FUV reflectance properties of Apollo samples, lunar simulants, and water ice is underway to further characterize the UV reflectance techniques [9]. The FUV spectral inversion property of the lunar albedo discovered by the Apollo 17 UVS is confirmed with the LAMP dataset [4]. Hendrix et al., [10] report that swirl regions show a UV-reddening, perhaps in response to differences in space weathering processes within these regions, and Cahill et al., [11] report follow up comparisons between LAMP maps and imagery from other LRO instruments.

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