MAPPING LUNAR PERMANENTLY SHADED REGIONS IN THE FAR ULTRAVIOLET. K. E. Mandt[1], T. K. Greathouse[2], B. Byron[3,2], K. Retherford[2,3], and The LRO LAMP Team, [1]Johns Hopkins University Applied Physics Laboratory, Laurel, MD (Kathleen.Mandt@jhuapl.edu), [2]Southwest Research Institute, San Antonio, TX, [3]University of Texas at San Antonio.

Introduction: The south pole of the Moon is of great interest for exploration and scientific research because many low-lying regions are permanently shaded (PSRs) and are likely to trap volatiles for extended periods of time. A primary goal of the Lunar Reconnaissance Orbiter (LRO) mission [1] is to characterize the spatial and temporal variability of water on the Moon, with a focus on the PSRs. We have produced spectral maps of the Lunar south pole using Lyman Alpha Mapping Project (LAMP) far ultraviolet (FUV) observations [2] and use them to evaluate surface frost, regolith properties and illumination conditions in the PSRs.

LRO-LAMP Mapping: LAMP observations are made through passive remote sensing in the FUV wavelength range of 57-196 nm using reflected sunlight during daytime observations and reflected light from the IPM and UV-bright stars during nighttime observations [2,3]. Observations in the FUV can provide information about surface frost and porosity of the regolith [3].

In this study we focused on the region within 5° of the south pole, (Fig. 1) and produced maps using nighttime data taken between September 2009 and February 2014. Summing over long time periods is necessary to obtain sufficient signal to noise. These maps use updated instrument calibration, background subtraction methods, and nighttime illumination models to provide spectral maps of the PSRs. We show here several of the maps produced for this study, including brightness and albedo in the "Off Band" [3], or 155-190 nm, where we are able to observe scattered sunlight at low solar zenith angles (SZA).

Additional LRO Observations: We compare these updated LAMP maps with observations by LRO Diviner, Mini-RF, and the Lunar Orbiter Laser Altimeter (LOLA). Diviner has measured the minimum, average and maximum temperature of the top few cm of regolith [4]. Mini-RF measures the Circular Polarization Ratio (CPR) of the upper meter(s) of the surface. High values can be interpreted either as ice or increased surface roughness [e.g., 5]. Finally, LOLA normal albedo measurements can be used to infer ice or other properties such as porosity and grain size of the top few microns of regolith [5].

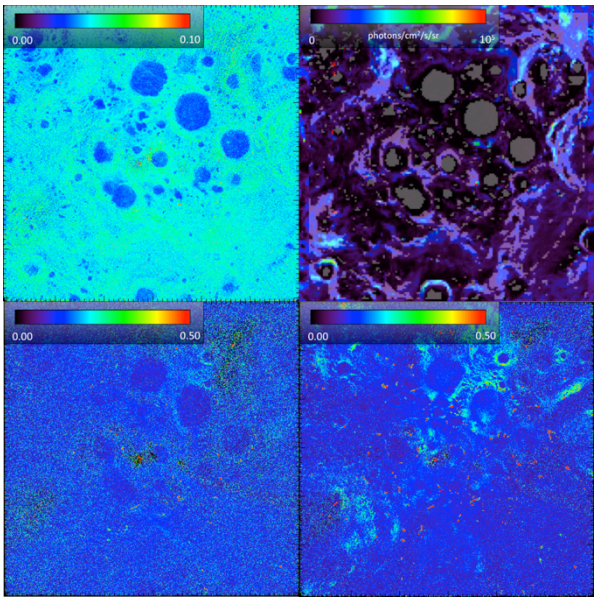

Figure 1: LAMP maps for the Lunar south pole region: (top left) LAMP daytime average 155-190 nm brightness. (top right) Average LAMP night time Lyman-α albedo maps with SZA restricted to > 91°. PSRs are shaded in gray. (bottom left) Average LAMP Off Band albedo with SZA restricted to > 91° and (bottom right) using no sza restriction.

References: [1] Chin et al. (2007) SSRv, 129, 391-419. [2] Gladstone et al. (2010) SSRv, 150, 161-181. [3] Gladstone et al. (2012) JGR, 117, E00H04. [4] Paige et al. (2010) Science, 330, 479-482. [5] Spudis et al. (2013) JGR, 118, E20156. [6] Lucey et al. (2014) JGR, 119, 1665-1679.