LRO-LAMP OBSERVATIONS OF ILLUMINATION CONDITIONS IN THE LUNAR SOUTH POLE PERMANENTLY SHADED REGIONS. K. E. Mandt[1], E. Mazarico[2], T. K. Greathouse[3], B. Byron[4,3], K. D. Retherford[3,4], G. R. Gladstone[3,4], Y. Liu[3], A. R. Hendrix[5], D. M. Hurley[1], A. Stickle[1], G. W. Patterson[1], J. Cahill[1] and J.-P. Williams[7]; [1]Johns Hopkins University Applied Physics Laboratory, Laurel, MD, Kathleen.Mandt@jhuapl.edu; [2]Goddard Space Flight Center, Greenbelt, MD; [3]Southwest Research Institute, San Antonio, TX; [4]University of Texas at San Antonio, San Antonio, TX; [5]Planetary Science Institute, Boulder, CO; [6]University of California at Los Angeles.

Introduction: The south pole of the Moon is an area of great interest for exploration and scientific research. Many low-lying regions are permanently shaded and are likely to trap volatiles for extended periods of time, while adjacent topographic highs can experience extended periods of sunlight. A goal of the Lunar Reconnaissance Orbiter (LRO) mission [1] is to characterize illumination variability of the lunar polar regions for future exploration. We compare far ultraviolet (FUV) observations made by the Lyman Alpha Mapping Project (LAMP) [2] with a model that uses topographic data [3] to evaluate illumination at the lunar south pole (within 5° of the pole).

Mapping the South Pole in Ultraviolet: 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 [2,4]. We show in Fig. 1 several maps produced using nighttime data taken between Sept. 2009 and Feb. 2014.

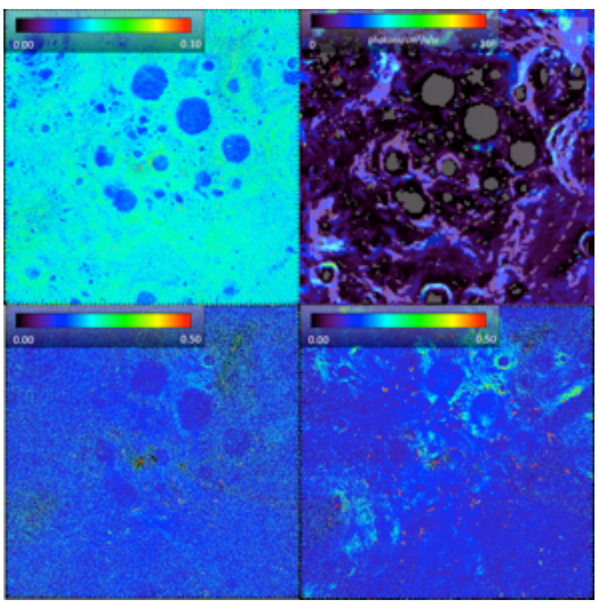

Figure 2: LAMP Lunar south pole region maps: (top left) daytime average 155-190 nm brightness. (top right) Average night time Lyman-α albedo with sza restricted to > 91°. PSRs are shaded in gray. (bottom left) Average 155-190 nm albedo with sza restricted to > 91° and (bottom right) using no sza restriction.

To isolate scattered sunlight observed by LAMP we subtract the albedo measured with a solar zenith angle (sza) > 91° from the albedo mapped using all observations. LAMP observes the highest rate of scattered sunlight in Haworth and Shoemaker.

Comparison with Model and LRO Datasets: As Fig. 2 shows for Haworth, the LAMP maps do not correlate well with the model. However, preliminary results comparing LAMP maps with other LRO datasets show a correlation with Diviner measurements for maximum temperature.

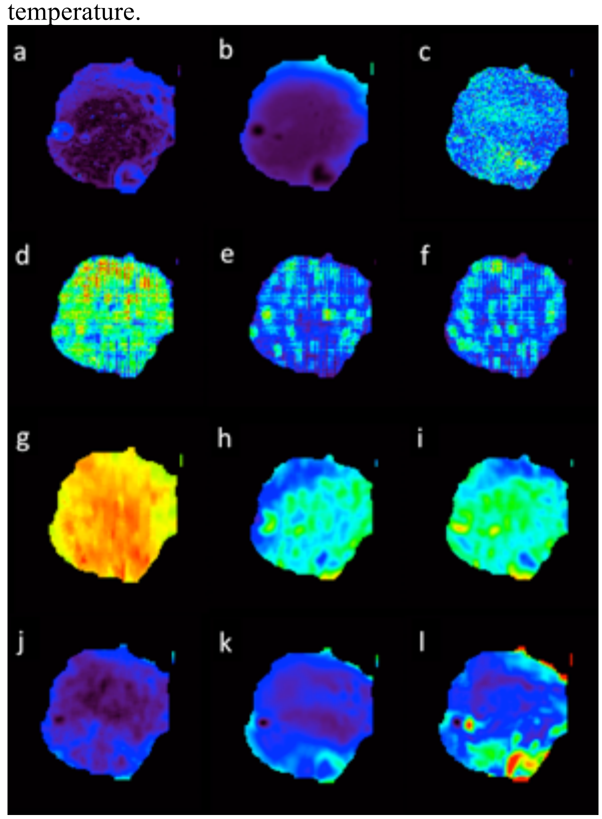

Figure 5: Comparison of LRO datasets for Haworth: (a) slope from LOLA topography, (b) elevation from LOLA topography, (c) LAMP excess albedo showing scattered sunlight, (d-f) illumination model, (g) LOLA normal albedo, (h) & (i) mini-RF circular polarization ratio, and (j) minimum, (k) average, and (l) maximum temperature measured by Diviner.

References: [1] Chin et al. (2007) SSRv, 129, 391-419. [2] Gladstone et al. (2010) SSRv, 150, 161-181. [3] Mazarico et al. (2011) Icarus, 211, 1066-1081. [4] Gladstone et al. (2012) JGR, 117, E00H04.