The Low Latitude Extent of Lunar Slope Hydration Derived from the Lunar Orbiting Neutron Spectrometers and LOLA Topography. T. P McClanahan[1], I. G. Mitrofanov[2], G. Chin[1], W. V. Boynton[4], L. G. Evans[5], M. Litvak[2], T. A. Livengood[3], R. Z. Sagdeev[6], A. B. Sanin[2], R. D. Starr[7], and J. J. Su[6], G.M. Milikh[6] [1]NASA/GSFC, Greenbelt, MD (timothy.p.mcclanahan@nasa.gov), [2]Institute for Space Research, Moscow, Russia, [3]CRESST/UMD/GSFC, Greenbelt, MD, [4]Lunar and Planetary Laboratory, Tucson, AZ, [5]Computer Science Corporation, Lanham-Seabrook, MD, [6]University of Maryland, College Park, MD, [7]Catholic University of America, Washington, DC.

Introduction: Epithermal neutron count-rate maps from the two lunar orbiting neutron spectrometers: including the Lunar Exploration Neutron Detector (LEND) onboard the Lunar Reconnaissance Orbiter (LRO), and the Lunar Prospector Neutron Spectrometer (LPNS) were correlated with topographic slope and illumination factors derived from the Lunar Orbiting Laser Altimeter (LOLA) [1-4]. In that approach we decomposed the polar region epithermal neutron count-rate maps in latitudes above ±75° as a function of a common slope geomorphology using a two-parameter insolation model [5]. All six of the derived maps for both poles and the three epithermal detector systems we considered, indicated the poleward-facing slopes in polar latitudes above 75° have a consistent suppression of epithermal count-rates consistent with enhancements in hydrogen. Results from LEND's high-resolution Collimated Sensor for Epithermal Neutrons (CSETN) indicates the poleward facing slopes, may be enhanced by at least ~20 to 25 ppm H relative to equivalent equator-facing slopes. These consistent observations indicate polar hydrogen distributions are biased by the topography towards trapping in regions at the lower end of the insolation continuum. Spatial distributions of these effects appear to be ~uniform in high-latitudes suggesting a solar wind source or an active hydrogen transport process. However, the local spatial scale of slopes and cratering appears to have an influence on the results due to instrumental blurring.

In this research, we will shift the focus of the investigation towards the mid-latitudes to quantify the low-latitude extent of the slope hydration effects. We consider both the LEND and LPNS detector results, and use a topographic masking technique developed in [5] that isolate slopes of increasing spatial scale, showing improvements in the signal-to-noise ratio. Evidence from this experiment shows the low latitude extent of slope hydration effects. Results also suggest small craters and slopes, perhaps at ~meter or less scales, may also act as cold-traps for hydrogen in polar latitudes. These small traps may collectively reflect a systematic trapping of hydrogen as a function of local insolation conditions. Evidence suggests these small cold-traps are effectively blurred by these detector systems broader instrument response and may provide an explanation for the Extended Polar Suppression of Epithermal Neutrons (ESPEN) that indicates poleward increases in hydrogen beginning near ±70° latitude [6,7].

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