IS DRYGALSKI CRATER WET? JOINT ANALYSIS OF LUNAR EPITHERMAL NEUTRONS FROM THE LRO LEND AND LUNAR PROSPECTOR NEUTRON SPECTROMETERS. T.P. McClanahan[1], I.G. Mitrofanov[2], W.V Boynton[3], G. Chin[1], R.D. Starr[4], L.G. Evans[5], G. Droege[3], A. Sanin[2], M. Litvak[2], J. Garvin[1], R. Sagdeev[6], G. Milikh[6], Astrochemistry Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD 20771, (timothy.p.mcclanahan@nasa.gov), [2]Institute for Space Research, RAS, Moscow 117997, Russia, [3]Lunar and Planetary Laboratory, Univ. of Arizona, Tucson AZ, [4]Catholic Univ. of America, Washington DC, [5]Computer Sciences Corporation, Lanham MD 20706, [6]University of Maryland, Space Physics Dept.

Introduction: We investigate the epithermal neutron fluxes observed over the near south-polar Drygalski crater using the Lunar Reconnaissance Orbiter's (LRO), Lunar Exploration Neutron Detector (LEND) detector systems and the Lunar Prospector Neutron Spectrometer (LPNS) [1-3]. We correlate these observations with the Lunar Orbiting Laser Altimeter (LOLA) [4]. These observations indicate the epithermal neutron fluences observed over Drygalksi are significantly low and the LEND results suggest the region may contain the highest-hydrogen concentrations in the Moon's southern hemisphere. These observations have important implications for lunar volatile research as Drygalksi's large-scale, geomorphology and lower latitude -78° may provide clues to the physics of the lunar hydrogen budget.

Initial Results: Recent studies of the Moon's south pole indicate little correlation between low-epithermal rates (high-hydrogen) and regions of permanent shadow [5,6]. Our initial results performed during July 2009 to May 2011 are depicted in the LEND south-polar epithermal count rate map in Figure 1. This map illustrates low-epithermals as purple to black patches. Permanent shadow regions are outlined in white delineating Cabeus (A) and Shoemaker (B), which suggest higher-hydrogen. Other permanent shadow regions are inferred to contain lower Hydrogen abundances. The *green*-boxes in Figure 1 and 2 encompass the 150km diameter and 5km deep Drygalski crater. The neutron suppression region overlies Drygalski's poleward-facing inner slopes and north of the permanent shadow region near daughter crater Drygalksi V (C). This region reflects minimal epithermal rates: 4.80±0.05 cps vs. 4.82±0.02 for Shoemaker and 4.83±0.03 for Cabeus. Also, of interest in this result is the symmetric crescent shape and position of the suppression region which is consistent with the high inner-slopes and concave side of the suppression region facing the pole. This result is consistent with illumination predictions for cratered geomorphology [7, 8]. This observation may suggest a correlation of epithermal neutron fluences to illumination condition.

However, During LRO station keeping LEND is turned off yielding lower observation time and counting statistics over the Drygalski region. We revisit this research and include an additional 1.3 years of LEND collimated data up to September 2012.

References: [1] Chin *et al.* (2007) *Sp. Sci. Rev.* #150 [2] Mitrofanov *et al.* (2007) *Sp. Sci. Rev.* #150 [3] Feldman *et al.* (1998) *Science,* #281 [4] Smith *et al.* (2007) *Sp. Sci. Rev.* #150 [5] Mitrofanov *et al.* (2011) *Science* [6] Boynton *et al.* (2012) *JGR.* [7] McClanahan *et al.* (2010) *LPSC* [8] Carruba *et al.* (1999) *Icarus* #142

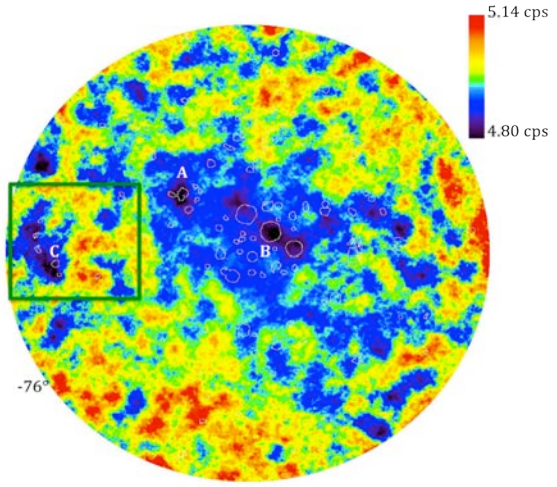

Figure 1: Initial Results: LEND South Polar Stereographic Epithermal Map with white permanent shadow regions A) Cabeus B) Shoemaker, *green*-box delineates C) Drygalski. Coverage from July 2009 to May 2011.

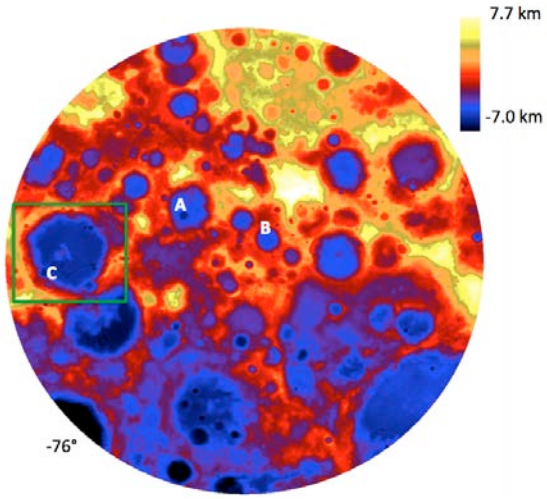

Figure 2: LOLA South Polar Stereographic DEM with white permanent shadow regions A) Cabeus B) Shoemaker, green-box delineates C) Drygalski region.