DEFINITION OF THE LEND-DERIVED CONTOURS OF NEUTRON SUPPRESSED REGION IN CABEUS CRATER. A. Sanin[1], I. Mitrofanov[1], W. Boynton[3], D. Golovin[1], L. Evans[4], K. Harshman[3], A. Kozyrev[1], M. Litvak[1], A. Malakhov[1], T. McClanahan[8], G. Milikh[2], M. Mokrousov[1], R. Sagdeev[2], V. Shevchenko[5], V. Schvetsov[6], R. Starr[7], J. Trombka[8], A. Vostrukhin[1], [1]Space Research Institute, RAS, Moscow, 117997, Russia, sanin@mx.iki.rssi.ru ; [2]University of Maryland, Collage Park, USA; [3]University of Arizona, Tucson, AZ 85721, USA; [4]Computer Science Corporation, Washington, USA; [5]Sternberg Astronomical Institute, Moscow, Russia; [6]Joint Institute of Nuclear Research, Dubna, Russia; [7]Catholic University, Washington, DC 20064, USA; [8]Goddard Space Flight Center, Greenbelt, USA

Introduction: The Lunar Exploration Neutron Detector (LEND) instrument is designed to perform orbital mapping of Moon neutron flux in wide energy range [1]. The primary goal of the LEND experiment is to search of enhanced content of hydrogen in circumpolar regions of Moon. Here we are describing a search for contours of Neutron Suppressed Region (NSR) in Cabeus crater. The NSR is a region with deficiency of epithermal neutron flux from regolith which associated with high Hydrogen abundance in subsurface.

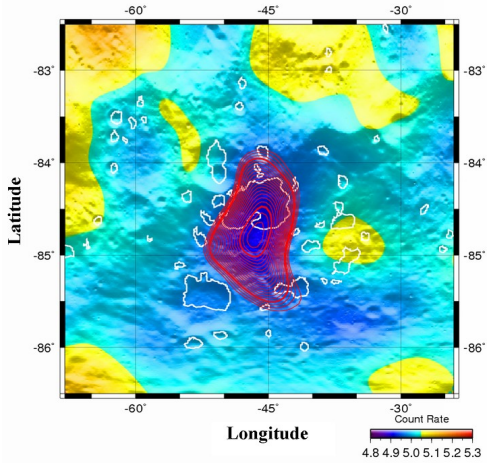
Scientific background: High energy protons and nuclei of cosmic rays collide with nuclei in regolith within a depth of first meters and produce secondary neutrons with high energies. Neutrons diffuse in the subsurface colliding with soil nuclei until they leak from the surface, or are absorbed due to capture reaction, or decay due to finite life time. The energy spectrum of leaking neutrons depends on the soil composition and, mostly, on the content of hydrogen, because H nuclei are the best neutron moderators.

The LEND onboard the NASA LRO mission have spatial resolution up to 10 km from 50 km orbit. To find water-rich region at lunar circumpolar regions one may suggest at least two methods of LEND neutron data analysis: 1) analysis based on PSR contours known from lunar topography data and 2) analysis based on neutron only data. Here we will presenting the second method.

The boundaries of LEND-defined NSRs are determined from the neutron measurement data only, because there is no *a priori* information to facilitate its definition. Contours for iso-neutron-suppression are determined from the smoothed map (Figure 1) in order to remove the small-scale noise due to local statistical fluctuations. The counting rate statistic for the area inside each of the contours is determined from the raw instrument counts, i.e. *without smoothing*. The difference between the neutron counting rate for the areas inside the contours and the reference belt at the same latitude is shown in Figure 2. Two types of contours may be selected: 1) a contour with most significant epithermal neutron suppression in comparison with the reference belt (the primary boundary of NSR) and 2) a contour represented the deepest part of the NSR, i.e. strongest suppression in neutron counts associated with the area inside.

This method of NSR searching may be used with neutron map with different smoothing parameters to be able to find a most confident area and an area with most suppressed epithermal neutron flux.

References: [1] Mitrofanov I.G. et al. (2008) *Astrobiology*, 8, 4, 793–804. [2] M. T. Zuber et al., *Space Sci. Rev*. 150, 63 (2010).



Figire 1. Iso-neutron-suppression contours for NSR within *Cabeus*. Bold lines correspond to contours with highest H concentration and most significant epithermal neutron suppression. White contours for PSRs determined from the LOLA topography data [2].

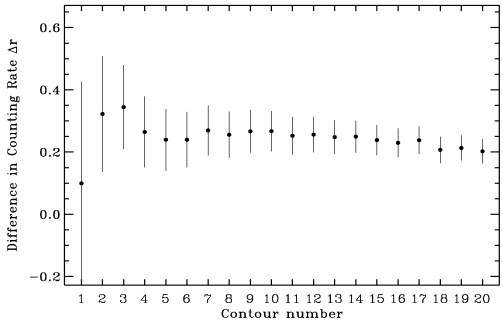


Figure 2. Suppression of epithermal neutron flux at the NSR within *Cabeus* is shown as the difference in counting rate Δr at the area of reference latitude belt and area inside the successive contours.