SEARCHING FOR WATER ICE PERMAFROST: LEND RESULTS FOR ABOUT THREE YEARS OF OBSERVATIONS. A. B. Sanin[1], I .G. Mitrofanov[1], M. L. Litvak[1], A. Malakhov[1], W. V. Boynton[2], G. Chin[3], G. Droege[2], L. G. Evans[5], J. Garvin[3], D. V. Golovin[1], K. Harshman[2], T. P. McClanahan[1], G. Milikh[4], M. I. Mokrousov[1], R. Z. Sagdeev[4], R. D. Starr[6], [1]Institute for Space Research, RAS, Moscow 117997, Russia, sanin@mx.iki.rssi.ru, [2]Lunar and Planetary Laboratory, University of Arizona, Tucson AZ, USA, [3]NASA Goddard Space Flight Center, Greenbelt MD, 20771, USA, [4]Space Physics Department, University Maryland, College Park, MD, USA, [5]Computer Sciences Corporation, Lanham MD 20706, USA, [6]Catholic University of America, Washington DC, USA.

Introduction: More than 50 years ago, it was suggested that some areas near the lunar poles are sufficiently cold to trap and preserve for a very long time (~Gy) hydrogen bearing volatiles, either primordial or produced at the Moon via solar wind interactions or brought to the Moon as water ice by comets and meteoroids [1,2]. The results of observations made by radar onboard the Clementine spacecraft and by neutron (LPNS) and gamma-ray (LPGRS) spectrometers onboard the Lunar Prospector mission have been interpreted as an enhancement of hydrogen abundance in permanently shadowed regions (PSRs) [3]. Unfortunately, the spatial resolution of the LPNS was much broader than the size of any largest PSRs [4] requiring model dependent data deconvolution to reslve signal from PSRs itself.

Data Analysis: We would like to present updated results of analysis of Lunar Exploration Neutron Detector (LEND) data for about three years of lunar mapping. Data measured by collimated LEND detectors allows one to look at neutron flux distribution at Moon poles with much better spatial resolution then was achieved at previous space missions.

Using the LEND data we had tested the hypothesis that all PSRs are contain a large amount of water ice permafrost and test for hydrogen presents in regolith of regions outside of PSRs.

Discussion: Both analyses of individual PSRs and studies of groups of PSRs have shown that these spots of extreme cold at lunar poles are not associated with a strong effect of epithermal neutron flux suppression [5]. We found only three large PSRs, Shoemaker and Cabeus in the South and Rozhdestvensky U in the North, which manifest significant neutron suppression, from -5.5% to -14.9%. All other PSRs have much smaller suppression, no more than few percentages, if at all. Some PSRs even display excess of neutron emission in respect to sunlit vicinity around them. Testing PSRs collectively, we have not found any average suppression for them. Only group of 18 large PSRs, with area >200 km^2, show a marginal effect of small average suppression, ~2%, with low statistical confidence. A ~2% suppression corresponds to ~125 ppm of hydrogen taking into account the global neutron suppression near the lunar poles and assuming a homogeneous Hydrogen distribution in depth in the regolith [6].

Testing for hyfrogen presents in regolith of regions outside of PSRs has been done by detection of local spots of suppression and excess of epithermal neutron emission at the lunar poles. Found areas there named as Neutron Suppression Regions (NSRs) and Neutron Excess Regions (NERs). These NSRs may be identified with spots of water-ice rich permafrost on the Moon. It is shown that detected NSRs are include in both permanently shadowed and illuminated areas, and they are not coincident with Permanently Shadowed Regions (PSRs) at the bottom of polar craters, as has been commonly expected before LEND presented neutron data with high spatial resolution [7].

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