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Estimation of the Hydrogen Abundance in the Cabeus and Shoemaker Craters

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The galactic cosmic rays produce in regolith high energy neutrons (with energies about 1 – 20 MeV). These neutrons are moderate to epithermal energies by multiple collisions with nuclei of regolith before they are able to escape from the surface and may be detected by a neutron detector on orbit. The leakage flux of epithermal neutrons depends on the concentration of hydrogen in the regolith, because more collisions with hydrogen nuclei lead to faster moderation and thermalization of neutrons before they can escape.
Neutron spectrometer LEND (Lunar Exploration Neutron Detector) launched into lunar orbit onboard the Lunar Reconnaissance Orbiter (LRO) mission has a task to test the presence of a hydrogen bearing regolith in the lunar polar regions. Due to the neutron collimation module LEND can provide resolution $\sim$10 km from 50 km orbit during mapping phase of LRO mission.
In addition to the well-known reductions of epithermal neutron fluxes in both lunar polar regions poleward of 70°S and 70°N latitudes (observed by both Lunar Prospector Neutron Spectrometer and LEND) several local spots of epithermal neutron flux suppression in comparison with surrounding areas were found from analysis of LEND data. These suppressions mark enhanced content of hydrogen or water in the regolith. It was found that epithermal neutron flux from most of PSRs is not significantly different in comparison with neutron emissions from surrounding areas. Only PSRs in Cabeus and Shoemaker craters near the South pole show a significant suppression. On the other hand several spots of epithermal flux suppression were found completely or particularly outside of any large PSRs.
We would like to present results of estimations of hydrogen concentration in regolith in South polar regions at vicinity of Cabeus and Shoemaker craters. These estimations are based on the analysis of LEND collimated detectors data accumulated from September 15, 2009 till December 20, 2012 and on numerical simulations of the neutron fluxes from regolith with different elemental composition.