Geophysical Research Abstracts
Vol. 14, EGU2012-10457, 2012
EGU General Assembly 2012

Analysis of data from LEND instrument on LRO: May water deposits be expected on poles of Mercury?

I. Mitrofanov
Institute for Space Research, Profsojuznaja str. 84/32, 117997 Moscow, Russia (imitrofa@space.ru)

Lunar Exploration Neutron Detector (LEND) of LRO measured the flux of epithermal neutrons with high spatial resolution [U+F07E]10 km for the amplitude of 50 km. The LEND data from the polar caps above 80[U+F0B0] latitude were tested for the presence of local spots of epithermal Neutron Suppression Regions (NSRs), which have been identified with wa-ter ice permafrost.

The model has been proposed, which explains the origin of water at lunar poles by chemical reactions between hydrogen of solar wind with oxygen of lunar regolith. The so-called solar water could be produced under the sunlit surface, and than migrate either at cold traps in he local vicinity from the irradiated spot of origin, or at cold subsur-face layer just below of the uppermost layer of origin.

Similarly to the Moon, there are data of radio sensing of Mercury, which points out that this planet might have the water ice deposits at poles. Therefore, one may suspect that the main physics could also be similar at poles of the Moon and the Mercury:
- if the water ice deposits are on the lunar poles, they should be at the Hermean poles as well;
- if comets are not the main source for the water at lunar poles, they should not also be the main source for the polar water deposits on the Mercury.

However, one should also take into account that the Moon and the Mercury have rather different physics of inter-action between the plasma of solar wind and the surface:
- the Mercury have the dipole magnetic field, which is large enough to shield the equatorial belt of the planet from the direct interaction with the plasma of solar wind;
- flux of solar wind and solar radiation at the orbit of Mercury are much larger than they are at the Earth orbit;
- the average temperature of illuminated spots at Hermean poles is much larger than the temperature of illuminated spots at poles of the Moon.

In addition to current neutron data from LRO, the data from MESSENGER should be studied for better under-standing of polar water ice deposits at the Moon and at the Mercury. Additional data will be provided by neutron mapping from the BeppiColombo spacecraft, which will map neutron albedo of bother Hermean poles (the MESSENGER maps only the southern hemisphere).

First of all, one have to test that Mercury have extended suppression regions of epithermal neutrons around both poles, as the Moon has. If hydrogen at polar regolith is delivered by the solar wind, the polar suppression of Mercury should be rather different from one of the Moon, because Hermean magnetosphere should chanelize the plasma of solar wind plasma toward the poles.

Second, one have to test the presence of local NSEs at the Hermean poles and to compare them with the lunar NSRs. If NSRs at both celestial bodies are associated with deposits of solar water, one could expect to find more water rich permafrost on the Mercury than on the Moon at areas with similarly cold surfaces, because at the same thermal conditions production rate of water molecules from the solar wind should be higher on Mercury than on the Moon.