



Estimation of water distribution at Gale crater based on the joint analysis of DAN/MSL and HEND/Odyssey data.

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The observations made by the Dynamic Albedo of Neutrons (DAN) experiment onboard the MSL rover Curiosity have been analyzed to search for variability of the neutron flux along a traverse of the rover. The results of such an analysis have been used to compare surface measurements with measurements performed during the Mars Odyssey orbital mission with the neutron spectrometer HEND flying around Mars more than 10 years.

DAN instrument consists of pulse neutron generator (DAN/PNG) and neutron detectors of epithermal and thermal neutrons (DAN/DE). In active mode of measurements DAN/PNG emits very short (~ 2 microseconds) pulses of high energy neutrons (14MeV) which penetrate to a subsurface under the rover, losing their energy down to the epithermal and thermal range. This process strongly depends on the soil composition; especially it is sensitive to the depth distribution of Hydrogen (which could exist in the soil in the hydrated minerals). The moderated neutrons can escape from the soil and be detected by DAN/DE within hundreds of microseconds after the pulse. It is recorded as a time profile of die away curve and its shape brings to us information about the subsurface structure and hydrogen abundance. In passive mode DAN/PNG is off and DAN/DE is measuring natural neutron background produced by Galactic Cosmic Rays (GCRs) and induced neutron background from Radioisotope Thermoelectric Generator (RTG) installed onboard MSL rover (as a main power supply system). Variations of this background along MSL traverse also could be used for a monitoring of the average content of water.

HEND instrument is a neutron spectrometer measuring Martian neutron flux in a wide energy range starting from 0.4eV up to 15 MeV. It is installed onboard Mars Odyssey mission as a part of Gamma Ray Spectrometer (GRS) suite. During last 11 years it provides global mapping of neutron flux from martian surface to derive distribution of water/water ice in Martian subsurface.

In our investigation we have compared last results of water abundance measured by DAN instrument in different Curiosity locations with predictions made by long term orbital observations based on HEND data. In this analysis we have tried to compare average distribution of water in the vicinity of MSL landing site both in the top layer of regolith and at the depths 20-40 cm below the surface.