ARABIA AND MEMNONIA EQUATORIAL REGIONS WITH HIGH CONTENT OF WATER: DATA FROM HEND/ODYSSEY. I.G. Mitrofanov[1], M.L. Litvak[1], A.S. Kozyrev[1], A.B. Sanin[1], V.I. Tretyakov[1], W.V. Boynton[2], D.K. Hamara[2], C. Shinohara[2], R. S. Saunders[3], [1]Space Research Institute, RAS, Moscow, 117997, Russia, imitrofa@space.ru, [2]University rsity of Arizona, Tucson, AZ 85721, USA, [3]NASA Headquarters,Washington, DC 20514, USA.

Introduction. After one martian year of neutron mapping measurements by the High Energy Neutron Detector (HEND) onboard the Mars Odyssey spacecraft [1], a map of the planet was produced showing the summer season in each hemisphere when winter deposition of CO_2 on the surface is absent (Figure 1). The data for northern and southern poleward water-rich regions are presented in [2-7]. Here we discuss the HEND results for two equatorial regions, Arabia and Memnonia, which were found to be associated with a rather strong depression of epithermal and high energy neutrons (Figure 1).

Data Analysis. The surface of Arabia and Memnonia was devided into surface elements 2°x2° , which were studied individually to estimate water content in the subsurface. Two altenative models were tested for neutron data deconvolution (see [7]): the Homogeneous Model (HM) with homogeneous depth distribution of water and soil (the fraction of water ς_{HM} was the variable parameter), and the Double-Layered Model (DLM) with the dry layer containing 2 wt% of water at the top and the wet layer at the bottom (the thickness of dry layer h_{up} and the water content of wet layer ς_{down} are two vaiable parameters).

Results. The consistency of HM and DLM with observational data was tested for the samples of pixels for Arabia and Memnonia. It was shown that DLM model is better supported by the observational data for Arabia and Memnonia in comparison with HM. The best fitting values of parameters ς_{down} were used for estimation of water content at these regions. It was shown (see [7]) that North Arabia (0°-45°E, 0°-30°S) contains on average 9.0 wt% of water under a dry layer with thickness of 26 g/cm^2; the South Arabia (0°-45°E, 0°-20°S) contains on average 10.0 wt% of water under a dry layer with thickness of 32 g/cm^2; the Memnonia (180°-200°E, 0°-25°S) contains on average 9.0 wt% of water under a dry layer with thickness of 29 g/cm^2.

One particular surface element with coordinates (30°E, 10°N) has the smallest emission of epithermal neutrons in the equatorial belt (Figure 2).The best fitting subsurface parameters for this element correspond to 16 wt% water under a dry layer with thickness 29 g/cm^2 [7]. This estimate for the dry layer is consistent with the average value found for the entire North Arabia. Therefore, this result showing a high content of water at this surface element is not produced by uncertainties in the model-dependent data deconvolution. The value of 16 wt% corresponds to a real minimum in epithermal neutron flux in Arabia. We name this spot "Arabian Water-Rich Spot", or AWRS. It lies around an old eroded crater between craters Cassini and Schiaparelli.

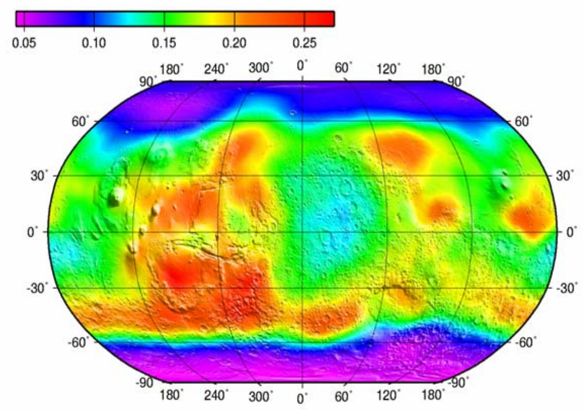

Figure 1. Map of epithermal neutron flux measured for frost-free martian surface.

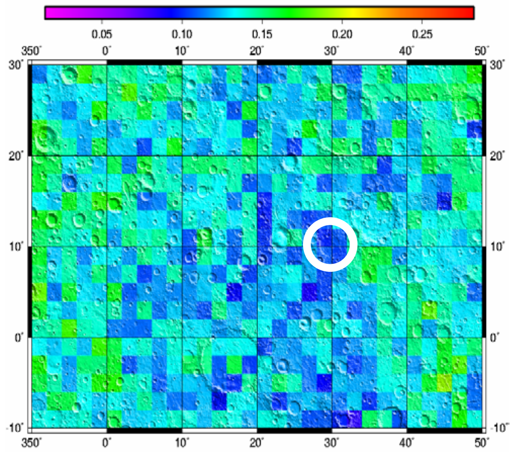

Figure 2. Map of epithermal neutron flux from Arabia. AWRS is shown by white circle.

References:

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