Taliks in Arabia and Memnonya as a part of global circulation of water on Mars

Nikita Demidov

Moscow State University

nikdemidov@mail.ru

A Russian detector of hydrogen (HEND) onboard Mars Odyssey has been mapping the concentration of hydrogen in the upper meter of the martian regolit beginning from October 2001. Although the data obtained allow us to understand status of the martian hydrosphere, a geological interpretation of the received materials have not been made. In particular, the nature of large positive anomalies of the hydrogen in two large maritian regions (Arabia and Memnonya) located at low latitudes is not clear. They can be explained by both the presence chemically bound water and free water in the form of ice or brines.

Using multiple regression and factor analyses, we tried to find a correlation between spatial distribution of the hydrogen and other factors, namely, geological features (age and type of rocks), relief characteristics (altitude, exposition of a slope, inclination of a surface etc.), thickness of unfrozen layer, thermal inertia, albedo, and the concentration chemicals in the regolit. We suggested that distinction in correlation between the factors examined for high and low latitudes can be caused by both difference in processes controlling water content and difference in chemical forms of the hydrogen for latitudes. Statistically significant correlation (R = 0.89) was detected in the Memnonya - Farsida region where boarder between H-rich region and H-poor region coincides with global geological boarder. It must be also mentioned that we observed strange contours in both H-rich regions in low latitudes, which can be a result of eruptions of groundwater.

Based on the results obtained, we put forward a hypothesis that the high content of hydrogen in the Arabia and Memnonya regions is due to bearing taliks, which serves as a channel for surface seepage of global intrapermafrost aquifer horizon. Thus, this process can be a part of global water circulation on ? ?rs, which includes evaporation and sublimation of intrapermafrost water after their rise on the ground surface, transfer and condensation of water on the polar caps, supply ?f aquifers as a result of ice melting in the bottom of polar caps, movement of intrapermafrost water from poles to equator and their surface seepage within the Arabia and Memnonya regions.

This hypothesis will be checked on the basis of information on chemical composition of maritian ground here. If our hypothesis is true, concentrations of these chemical elements will be correspondent to their concentrations in the same places on Earth.