LARGE BASINS OF WATER IN EQUATORIAL REGIONS OF MARS. V. Yakovlev. Kharkiv National Academy of Municipal Economy 61001, 38, Kirova str., Kharkiv, Ukraine, Yakovlev_val@mail.ru

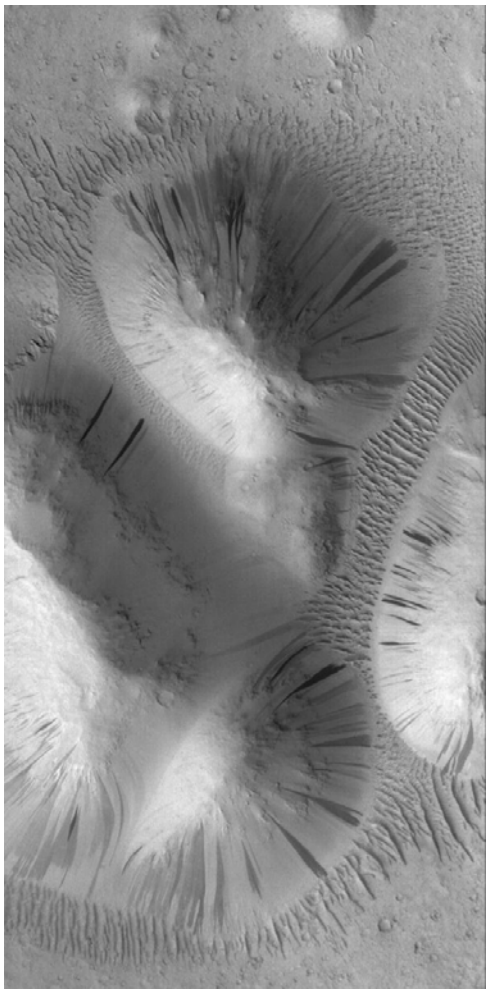

Fig. 1. A group of Martian hills is in the district of Aeolis. 1,5 S., 202,9 W. Width of bar ~3 a km is Illumination: from below on the left. Season: north the winter is Date of survey [1].

On the subequatorial plain of Aeolis there are discernable conical hills which I consider to be "hydrolaccoliths" – that is structures, consisting of the frozen water of underground origin. The nature of band-like streams on the slopes of hills may represent an argument either for or against this conclusion. Soil, liquid and snow can move under the influence of gravitation. I believe that this is wet with water subsurface for the followings reasons:

1. Apart of streams of dragging, dry streams also should have tracks of dust suspension moved by air, as it shown by pictures of crater Zunil made by Mars Recorder in 2007 [2]. Similar halos in the case of structures near Aeolis are not observed - that is sole-colored streaks with clear-cut edges.

2. As experiments have shown, [3] streams have needle-shaped beginnings, which does not normally pertain to dry soil or snow, and forms triangular traces. At the same time, outpouring from ice crack is possible.

3. We do not see any products of transfer of material piling on the top, which would normally be the case if the streams consisted of soil. Streams pass on small scale craters not breaking their integrity. A more realistic scenario is that liquid moistens surface of slope, which consists of ice. The fact that of streams disappear at the foot of slopes can be explained by filtration of liquid in the unconsolidated sediments that are not constrained by the ice.

4. Streams originate at the tops of conical slopes, where amount of dust will be minimal.

5. Evenly spread change of coloring along the streams also reveals their liquid nature. This change may be related to phase transitions, different levels of transparency, chemical reactions, dust etc.

6. At one place the strip at issue crosses in central part of crater (fig. 1). A dry stream could hardly act so whereas liquid could moisten ground which covers it. In theory capillary forces opposing Martian gravitation should ensure three times higher rising of water.

7. Geometrical plainness of the stripes shows that the surface of the slopes in the bottom of the structures concerned is highly smooth and, in general close to the shape of cone. In the top part of strips on fig. 1 it is possible to see gullies. It is reasonable to assume, that streams redistribute substance from the top parts of hills to in bottom besides, flowing lines of contours testify laminar character of current.

This may result from cumulating of periodical flowing of water from the crack, its move and freezing of its thin layers on the ice surface under cover of mineral dust.

A strong argument in favor of icy structure of hills in Aeolis is a form, which can be seen between two hills in lower part of the picture 1. This shape apparently derives from confluence of two growing hills, not from their erosion. I.e. we what we observe are accumulative forms, not erosive farewell rocks.

On the other hand erosion of a hill in Elysium area confirms its ice nature - none of fragments reaches the bottom of a slope, they simply melt [4]. There are no traces of sliding stones which can be often observed in other areas. And the shape of the separated from a file of isometric fragments resembles crushing of glaciers.

As the proof of the ice nature of hills on plains is the picture (fig. 2) that demonstrate almost degraded ice hill [5].

Characteristic frame specifies in the similar nature of eolian forms in the past, an oval outline, and the main thing - is butte in an average part of the structure, that having characteristic for considered hills form and a streak of a stream on it.

As example of the intermediate form can serve the structure in Elysium area (fig. 3), that has significant destructions in northern and east part.

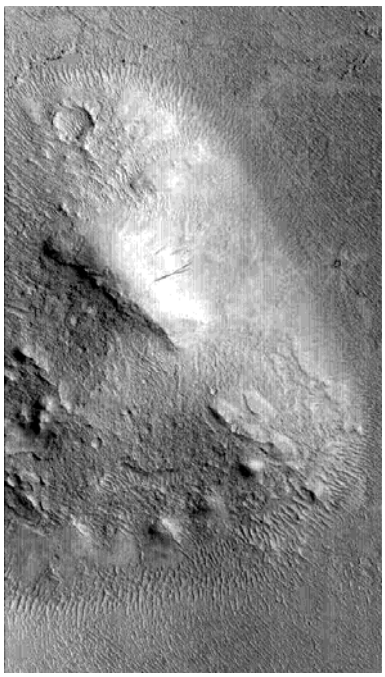

Fig.2. Almost degraded ice hill in the area of Elysium, Mars Orbiter Camera 8,11N 202,08W [5].

Fig.3 Collapsing ice formation in the area of Elysium, Mars Orbiter Camera 6,40N 201, 20 W [3].

Hydrogeological photointerpretation and their comparison with similar Earth structures allows to suggest that alimentation artesian infrapermafrost waters and presence of corresponding feeders [6].

The height of hills on fig. 1 makes no less than several hundreds meters. This is fully ten times larger than the size of pingo, described earlier in northern middle latitudes [7].

The most probable mechanism of a raising of water on such height can be its pressure in the freezing subsurface reservoirs. Process of freezing of water is stretched in time in connection with increase of mineralization of residual solution. For this reason "pressing out" water from bowels of the Mars in hydrolaccoliths has a high mineralization.

In the course of ice formation on the surface the remaining water in surface channel accumulates even more salt. These brines can press out on the surface, forming mentioned above streaks and slopes of hydrolaccoliths probably consist of mineralized ice.

The dark coloring of streams may be related to the soaking of a mat coat and formation on a surface of the time ice colored by dissolved matters, such as, for example, iron or organic. The light coloring pertains to the caps of hydrolaccoliths. Presumably, it is an ice consisting of water which has desalinated during the freezing.

Total volume of four cones visible on fig. 1 is at least 3 cube kilometers. If this ice had been pushed from the closed freezing talik, than tailk whould have originally contain no less than 33 cube kilometers of liquid water.

Relating the structures at issue to the topographic map of Mars we can see that the areas of Aeolis and Elysium belong to a big depression, which stretches in sublatitudinal direction for 1,700 kilometers between 10^0 of southern latitude and 20^0 of northern latitude. This depression is 1-2 thousand meters lower than surrounding uplands of Terra Cimmeria and Elysium Mons [8]. This is one of the biggest depressions on the planet and, in our view, may be an artesian basin.

Inside hydrolaccoliths there are reservoirs of liquid water, which periodically burst on the surface. Caps of hydrolaccoliths, in all probability, consist of the fresh ice.

Process of formation of hydrolaccoliths evinces the presence of significant storage of artesian water in vast depression areas situated between Terra Cimmeria and Elysium Mons heights.

The exploration of the liquid water of hydrolaccoliths in search for life-forms, in our opinion, has the most scientific interest.

References: [1] Jet Propulsion Laboratory, California institute of technology NASA, Photojournal: Mars global Surveyor mission, PIA08087: Aeolis Buttes. [2] Department of Planetary Science, Lunar and Planetary Laboratory, 2007, Recent Landslide in Zunil Crater (PSP_001764_1880): Credit: NASA/JPL/University of Arizona. [3] Sullivan R., et al. (2001). *JGR 23*, 607-633. [4] Jet Propulsion Laboratory. California institute of technology NASA. Photojournal: Mars global Surveyor mission, PIA09030, fig.4: Why the New Gully Deposits are Not Dry Dust Slope Streaks. [5] Malin. Space Science System, Mars Global Surveyor MOC image gallery. MOC narrow-angle image M 15-00155. [6] Kudryavtzev V. A., (1978), Geocryology, University of Moscow, p.240. [7] Colin M., et al. *GR letters, vol/35*, l04201, 2008. [8] U.S. Department of the interior U.S. geolodgical survey Topografic Map of Mars, 2003.