ABOUT ONE FEATURE OF MARS ASTHENOSPHERE

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Many planets of Solar system, among them the Earth, the Mars, and also the Moon have obvious morphological asymmetry of a surface. Most brightly this asymmetry is expressed on the Mars, surface of which is dismembered by means tectonic border at two hemispheres (fig. 1). There are the tectonics passive – southeast "continental" hemisphere, and the tectonics active northwest – "sea" hemisphere. In equatorial area of an active hemisphere there are 4 extinct volcanoes with height from 15 up to 25 km, the largest on Mars and in all Solar systems. The surface of a passive hemisphere is raised above a level of active hemisphere on 4-5 km. She is richly covered by large craters with the diameter of tens - hundreds kilometers. The surface of a sea hemisphere is mainly represented by smooth plains. Quantity of her craters is not large [1].

Craters of continental and sea hemisphere differ not only by quantity, but also by a different structure and formation time [2] and also by function of sizes distribution [3, 4].

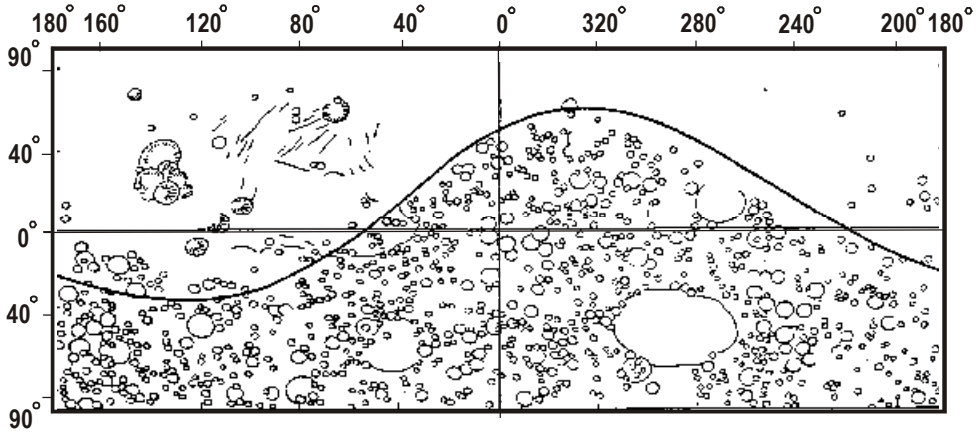

Fig.1. Asymmetric structure of the Mars surface. The line shows the border of active and passive (continental) hemisphere of Mars. She separates his areas with a different number of craters. The border between these hemispheres is obtained as a trace of section of a spherical Mars surface by a plane inclined to an axis of Mars rotation on a corner 35°.

The specified features of distribution of Mars craters may be explained by fall on the planet of two different types of cosmic bodies [3]. The first are asteroids and comets of Solar system, and the second – comets of the Galaxy. The first body's type is falling quite regularly all time and forming craters mainly in an equatorial zone of Mars. The second body's type bombards a planet through each 20 ÷ 37 million years in rather short epochs (~1-5 million years) of the Sun stay in jet streams and spiral branches of the Galaxy [4].

Owing to inclination of the ecliptic plane to the galactic plane on corner 60°, the area bombarded by comets moves over planet surface with the period of orbital movement of the Sun in the Galaxy ~223 million years [4]. In consequence of modern position of the Sun on galactic orbit three last bombardments of the Solar system by galactic comets took place basically in southern hemisphere of planets. In particular, on Mars, as we suppose, it has resulted in abrupt asymmetry of his southeast and northwest hemisphere.

Galactic comets basically are consisted of water ice and other frozen gases. Comets nucleuses have density of ~1g/sm^3, and their diameter, the weight and energy accordingly are 0.1÷3.5 km, 10^9÷10^{14} kg and 10^{20}÷10^{25} J [7]. During one bombardment ~10^4-10^6 galactic comets may fall on the Mars, on the Earth and others planets. In result on planets without a gas environment or with very rarefied atmosphere as at the Mars, the surface sites bombarded by galactic comets completely are sated with large craters. The density of craters here reaches the theoretical limit is 100 craters in diameter of ≥10 km on

area 1 million km^2 [3].

In gas environments of planets a nucleuses of galactic comets intensively evaporate. They lose of mass and are decreasing in size [7]. As a result of this process a craters of comets even on Mars with his strongly rarefied atmosphere have diameters systematic less, than on the Moon completely deprived of a gas atmosphere (fig. 2).

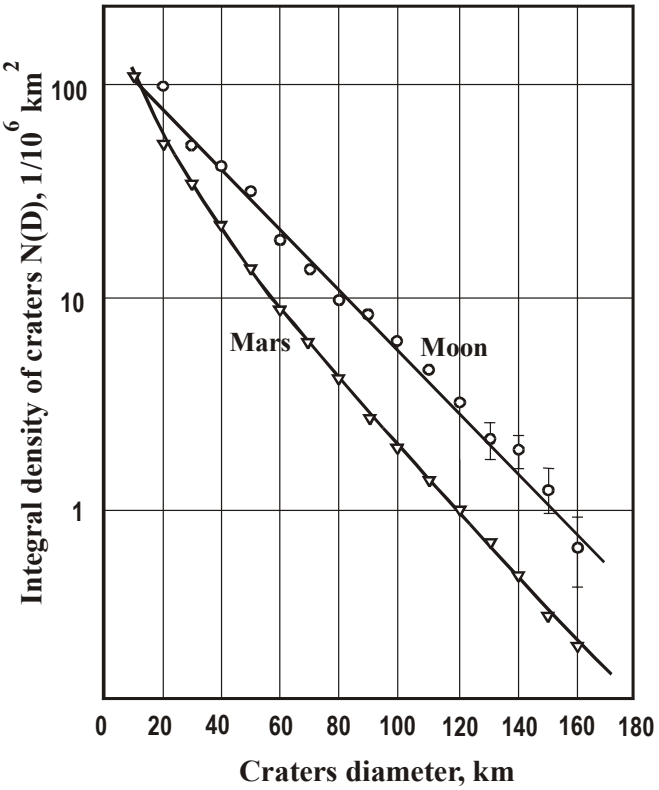

Fig. 2. Comparison of integrated craters distributions for continental hemispheres of the Mars and the Moon completely sated by comets craters.

The differences in craters distributions of the Mars and the Moon in the field of the big sizes can be explained by reduction of a comets nucleuses diameter approximately on 300 m owing to their evaporation in a Martian atmosphere. Surplus on Mars of small craters in comparison with the Moon is produced by destruction of a comets nucleus in the planet atmosphere [7].

Much denser, than at Mars, gas environments of the Earth and the Venus are practically impenetrable for galactic comets [3]. In dense atmosphere of these planets galactic comets inevitably perish with formation of a hypersound shock wave to which the basic energy of galactic comets is given. At this case after of achievement by a wave of solid planetary surface huge kinetic comet energy goes not on creation of a crater, and may be spent mainly for warming up and fusion of big local zones of rocks deeply under impact place [9]. On the Earth these zones directly display themselves as magmatic cameras. Under thin ocean plates such cameras may exist during of tens - hundreds millions years. These cameras deliver big volumes of lava on surface of modern ocean bottom and participate in construction of submarine mountains [10].

Mars in this respect, obviously, differs from the Earth and the Venus. The big part of comets energy here is spent for craters formation, and her essentially smaller part is transferring to shock wave. Besides in conditions of the Mars an influence of shock waves on a lithosphere, apparently, is not so concentrated as on the Earth and on the Venus and a shock waves energy basically goes into heating Martian astenosphere. Thus laves outpouring on a Martian surface, as supervision testifies, has the subordinated character and obviously concedes to scales of this phenomenon on the Earth and the Venus.

Whereas falls of galactic comets on planet are very intensive, and a conduction cooling of an astenosphere has very small speed, this should create strong swell of the Martian surface, which has undergone comets bombardment.

According to calculations which are similar executed in [10], for an explanation by this mechanism

of the difference in heights of continental and sea hemisphere of Mars, it is necessary to assume that astenospheric layer of significant thickness should be under continental hemisphere. Thickness of this layer may be ~100÷250 km in dependence on a degree of his substance smelting. This estimation coincides with size of a layer astenosphere under continents of the Earth [11]. Occurrence on the Mars such astenosphere may be connected to his bombardments by galactic comets in Cenozoic.

So at moving the Sun in The Galaxy galactic comets bombard serially [12] as southern as well as northern hemisphere of Mars, the astenospheric layer may migrate in a body of a planet, both its continental and sea hemisphere through half of galactic year may exchange place.

This opportunity pulls together the Mars and the Earth especially, because on our planet continental plates gather periodically together, forming supercontinents near South Pole [13,14], exceptionally into the epochs when galactic comets bombard her southern hemisphere.

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