IRON ABUNDANCES IN REGOLITH AS THE COSMOGONICAL INDICATOR OF EVOLUTION OF THE MOON.

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Introduction. The chemical composition of lunar rocks became known in detail after delivery to Earth of samples from selected areas of the lunar surface. But in order to provide characteristics not only of individual sites, but also the global data, need to use the remote spectral methods.Chemical elements such as Si, O, Fe, Ti, Al, Ca and Mg are essential elements in the composition of lunar rocks. Often element contents are converted into the contents of the corresponding oxides, for example, SiO2, FeO, TiO2, Al2O3, CaO and MgO.Information about the content and distribution of these and other elements on the lunar surface was obtained by methods of remote spectroscopy, optical, neutron, gamma and X-ray filming.The spatial resolution of available data varies but, nevertheless, their comparison and joint use is possible.Processing of data sent from aboard the spacecraft «Lunar-Prospector», gives results of global studies of chemical composition of the lunar surface.These results were obtained using airborne gamma-ray spectrometer and alpha particle spectrometer.In particular, more accurately able to determine the content of iron (Fe) and titanium (Ti) in the frozen lava of volcanic melts. Their concentration was different for different parts of the surface morphology.

Interpretation. Expeditions of American astronauts to the Moon (1969-1972 gg.) --landing of the Soviet automatic lunar stations «Luna-16, -20 and -24» (1970-1976 gg.) delivered to the ground lunar soil - these remarkable experiments have led to the emergence of new science - Moon mineralogy.[2] On the content of radioactive isotopes was established by the age of lunar rocks. The oldest of them, the study found uranium-lead method, formed 4.46 billion years ago. Similar results gave the use of strontium method. But almost is the same (4.6 billion years old) age of the oldest Earth rocks and meteorites. So, it was then, about 4,5 billion years ago formed the solar system, including Earth, Moon, and the body fragments that arrive to us in the form of meteorites. [3] Analysis of lunar minerals will help to understand that ,what are the differences between continents and seas on the moon. It was found that the sea covered with volcanic rocks, mainly basalts. [4] They have a round shape, smooth surface, the relative youth, which speaks not only radioactive analysis, but also a relatively small number of craters formed by impacts of large meteorites. All the shows ,the «Mare» - the result of immense outpourings of lava from the bowels of the Moon, caused by small asteroids' impacts on the surface. [5] Radioactive analysis showed that most of the mare (Mare Vaporum, Mare Serenitatis, Mare Tranquillitatis, Oceanus Procellarum) formed 4 billion years ago. Several younger Imbrium: since its inception was 3.87 billion years. Probably, in this period the moon fell out the remnants of the swarm of bodies, from which formed the Earth and Moon. [6] After processing the spacecraft «Lunar Prospector», «Apollo» and «Luna», received a general map of the distribution of iron (Fig.1). The content of iron in the sea surface of the Moon is much larger than in other parts of the lunar surface. For a detailed analysis of the dependence of the iron content of the absolute age of rocks we have compiled a detailed catalog of samples of various breeds, delivered to Earth. After processing the data [1],get a correlation between iron abundances and rocks of lunar surface:

$$T \propto \frac{1}{Fe\%} ,$$

This correlation is a characteristic of marine volcanic basalt lavas, which are melting from the bowels of the Moon (absolute age) refers to the different epochs of the evolution of the lunar sphere and its surface. From the scheme in (Fig.2), it follows that the basaltic lava, had come to the fore in the later period, most enriched in iron. At the same time, the early melt basalts had a low content of iron.Assuming a general model of the structure of the lunar globe, according to which the iron content approaching the center grows, we conclude that later melts of basaltic lava reaches the surface from the deeper horizons of the lunar interior. This assumption can be verified on the basis of detailed analysis of the regional distribution of iron when compared with age formations.

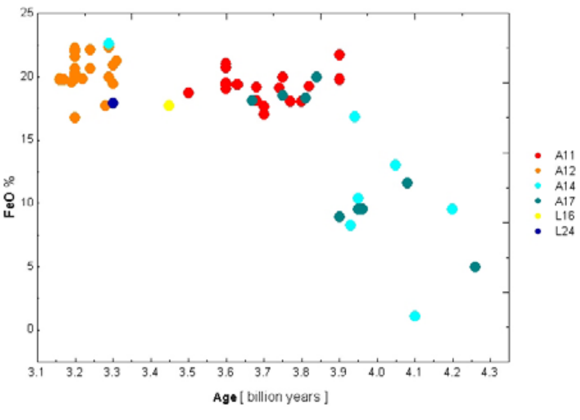

Fig.2

Melting depths and their differentiation occurred in the interior of the Moon at an early stage of evolution. Field of basalts with a low content of titanium is at depths of 200-400 km. This process can explain the reason , different content of iron and titanium at different depths [7]. This happened during the formation of basalt seas of the moon as a result of entering the surface melts from the lunar mantle 3.9-3.15 billion years ago.If we generalize the results of the study to compare the absolute age of the basalt rocks and iron content in these rocks, and take into account the above results for the three-dimensional terrain models, we can construct a generalized model of the underlying sources of basaltic lavas of different content. In the initial period of the evolution of the moon as a cosmic body to the surface leaving melts of basaltic lavas of the upper layers of the lunar mantle with low iron content - about 10%. This period of history of the Moon refers to the era of 3,9 - 4,0 billion years old. In the middle period of the evolution of the moon on the surface of basaltic lava came out with iron content of 15 - 20%. This epoch according to Fig. 2. lasted for 3,5 - 3,8 billion let.V later period of the lunar maria were formed lavas with an iron content of 17 - 22% of the deep horizons of the mantle. This happened during the 3,1 - 3,3 billion let.V result of our work, we have opened outlets of basaltic lavas of the deepest layers of the mantle with iron content up to 25% (see diagram on Fig.3). Probably, these melts are aged less than 2 billion years.

Conclusion: The basis for studying the lunar surface and the composition of the soil is study the optical characteristics of the moon by the spectral data of its telescopic and space research methods remotely, optical, neutron, gamma and X-ray spectroscopy, etc. The richest information we receive with the help of artificial satellites of the moon, as the example of research on board the spacecraft «Chang'e-1». The content of iron in the regolith can be cosmogonic indicator of the evolution of the Moon, as shown above. On the surface of the moon, the rocks with a predominance of iron (eg, ilmenite basalt) are concentrated in the lunar maria (their area is about 17% of the surface of the Moon [8]). Age of rocks is inversely proportional to the iron content. The model underlying sources of iron-bearing rocks of the Moon has a cosmogonic significance, since through their contents, we can know their age and build a model of evolution of the subsurface of the Moon.

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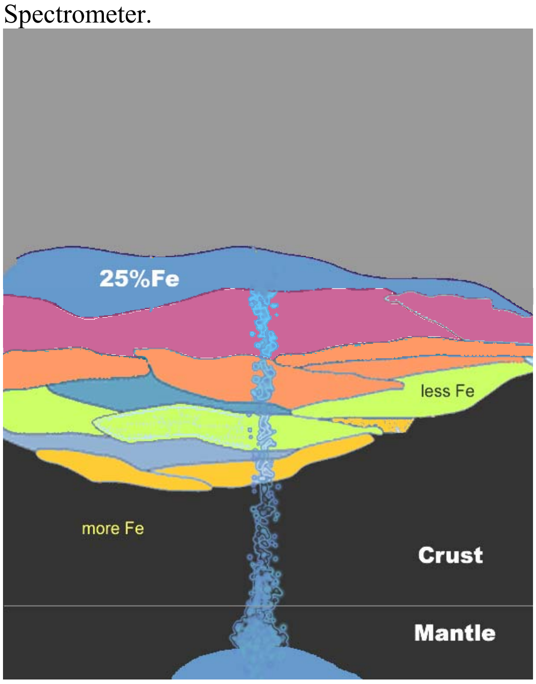

Fig.3

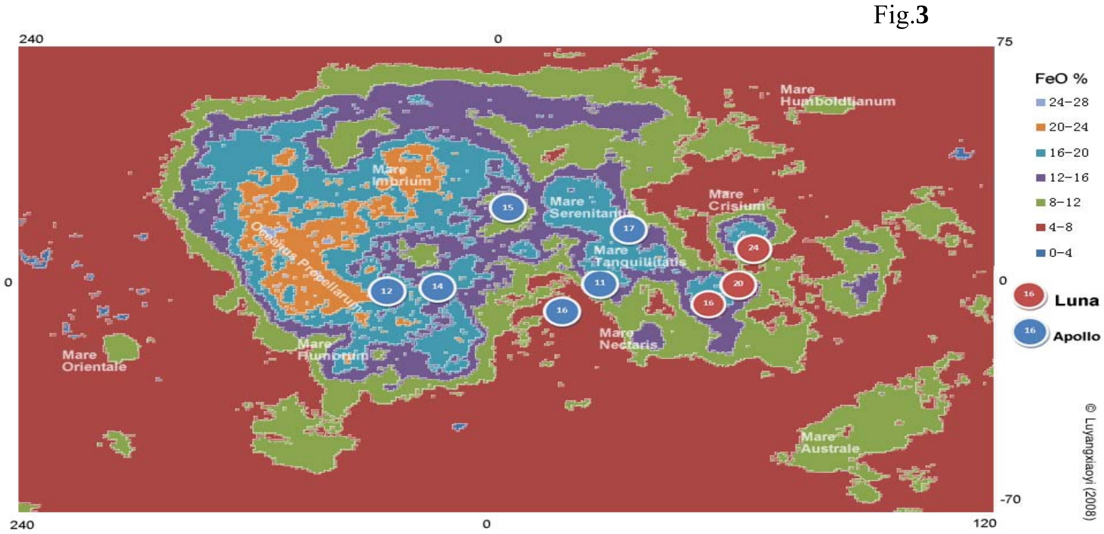

Fig.1