

SUBSURFACE STRUCTURES: PROSPECTS FOR A LUNAR BASE

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It is obvious that the establishment and the operation of a lunar base should be ensured to a maximally possible degree by natural resources and conditions on the Moon. This puts forward a number of problems of lunar studies not only within the framework of methods used at present, but also by methods which so far are not widely used.

Since the setting up of a lunar base necessarily presupposes the use of premises, i. e. closed volumes ensuring the protection of people, equipment and reserves from factors jeopardizing their preservation and vital activity and since lunar regolith ensures such protection to a large extent due to its unique properties it is very important to work out the technique and instrumentation of the search and study of subsurface cavities on the Moon the existence of which is apparently indicated by the presence of dimple craters and bridges on sinuous rilles /1-3/.

Dimple craters are usually interpreted as camouflet craters formed after the fall of a high-speed meteoric body. It is supposed that energy released during the destruction of the body rather deep under the surface ensured the formation of the cavity into which a portion of material crushed on the surface has penetrated. This determines the shape of a crater. In reality, however, material could get into the cavity which existed before the fall of the meteorite, for instance, into a lava tube opened during the fall.

As far as sinuous rilles are concerned, in cases when there are bridges the most widespread explanation of their origin presupposes that sinuous rilles are lava tubes whose roof subsequently collapsed. Within the framework of such hypothesis it is natural to consider that bridges on rilles are tube segments which did not collapse.

It is important that the walls of lava tubes as well as cavities beneath dimple craters must be melted and, thus, the sealing of their volumes is a much easier task than the creation of new artificial sealed structures on the Moon.

Of special interest is the possible detection of unbroken (closed) lava tubes or cavities which preserved the hermeticity during exogenic treatment of the surface. Lava tubes or cavities can contain gases (or condensates) of volatiles evolved in the course of lava eruptions. However, these formations are not displayed visibly on the surface. Their detection calls for the use of fine methods and, most probably, is feasible only in case of conducting wide exploration on the lunar surface. At the same time some indications of the presence of endogenic lunar gases can apparently be obtained by comparing the results of the pyrolysis of the samples of mature and immature lunar soil.

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The importance of organizing purposeful quest of natural subsurface cavities on the Moon follows from the above. Primarily it is necessary to carry out careful deciphering of pictures of the promising regions of the Moon (apparently regions of lava flows with which lava tubes are associated in terrestrial conditions are the most promising). To switch over to practical work it is necessary to elaborate methods of the detailed study of subsurface structures. These methods can be based on gravimetric **survey** with high spatial resolution, as well as the obtaining of depth **profiles** by methods of radar and seismic probing. Obtaining holographic **images** of subsurface structures in radio or acoustic waves by means of vehicles moving on the Moon's surface seems to be the most promising.

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