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**A BRIEF GEOMORPHOLOGICAL OUTLINE OF THE KARYMSKY VOLKANO**

Summary

The Karymsky region which has an area of about 2500 sq km., morphologically represents a volcanic plateau with an average height of 600 to 700 m., above which rise two active volcanoes (the Karymsky and Maly Semyachik) and about fifteen remains of volcanic structures destroyed by age. The beginning of the volcanic activity seems to refer to the end of the Tertiary; an enormous quantity of volcanogenous material, brought out to the earth's surface, deeply buries the rocks of an older age.

The geomorphological structure of the region reflects the history of the development of the country. The development of the relief was determined by prolonged periods of accumulation of the products of volcanism, which tells also on the present relief, where three geomorphological zones are distinguished: the central, the marginal and the shore zone.

The central zone presents a typical volcanic landscape.

For the volcanic structures destroyed by erosion two morphological types are established—the stellate and the arched one, reflecting their genesis and related to the predominance of an effusive and of an explosive activity. In this zone three groups of thermal springs are known.

The numerous annual eruptions of the Karymsky volcano, in the form of explosive ejections of a friable material restrict the development of vegetation and cause a rejuvenation of the relief, which disturbs the normal course of the processes of destruction. The erosional cycle is in the young stage.

Near the active volcanoes phenomena of volcanic sinkhole formation and a local predominance of the processes of ablation and deflation are manifest. Friable volcanogenous deposits cover the volcanic plateau in a thick mantle; the watertight nature of these rocks determines the hydrological regime of the zone. In spite of an abundance of precipitates (877 mm per year) most of the river valleys have open watercourses only in spring, while in summer and in autumn the zone is deprived of water; the principal rivers and Lake Karymskoyé at this time of the year are fed by underground waters, which are abundant.

The accumulative terraces of Quaternary are have been noted for Lake Karymskoyé and for the ancient lake depression, at present flowed away, whence the Zhupanova River issues.

The marginal zone embraces the slopes of the volcanic plateau to the sea; its upper boundary is related to the development of the ancient vegetation and, therefore, on the whole it may be called the forest zone. This zone has sufficiently long since come out of the sphere of a catastrophic manifestation of volcanic

activity which is stressed by the presence of beech woods and of a relict grove of Canadian fir-trees.

In the shaping of the relief the principal part is played the erosion of flowing water. The river valleys, in spite of their depth, are young; the current is rapid, with bars and falls; terraces, with the exception of the flood-plain ones, are lacking. The structure of the volcanic plateau exposed by river erosion and marine abrasion permits to establish: for the first period of volcanism of the region a predominance of effusive outpourings; and for the second that of explosive ejections. The large number of the sources of eruption, the different time of their activity and the difference in the lithological composition of the volcanogenous rocks produce the present-day large forms of the relief and the distribution of the hydrographic network.

Referred to the shore zone is a strip of the coastal-marine lowland plain composed of Quaternary deposits. This plain owes its origin to an accumulation of alluvial material carried out by the rivers from the first two zones. In the estuaries of rivers, when coming in contact with the tidal currents of the sea, this material is lacking; further on it is sorted and redeposited by the sea, forming along the basal shores a belt of alluvial deposits.

Among the fringing shores three morphological types have been noted; the deltaic plains, protected from the washout by a spit, the portions of deltaic deposits subjected to the action of the sea, with characteristic natural ramparts and bars of the fore-estuarine lagoons.

No traces of recent fluctuations of the sea have been found; with a constancy of the basis of erosion, the mobility of the shore-line is determined by the receding of the area of abrasion shores and an increase of the areas fingering the shores.