GEOMORPHOLOGY

by

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The Sümeg area lies on the southwestern margin of the Bakony Mountains and its meeting with the basin of the Marcal river. Its larger, eastern, part belongs to the southern Bakony, its western, smaller, part to the Little Hungarian Plain including the Marcal Basin.

From the geomorphological point of view the study area can be divided into the following distinct types of relief (Fig. 93):

1. In the north, it is the Rendeki-hegy that emerges above its surroundings. This hill, obliquely tilted as it is, represents a horst of what used to be the peneplain, re-modelled by pediplanation, of the Bakony, a horst now subsided to the position of a swell.
2. The Rendeki-hegy is surrounded by a slightly-dissected pediment and an abrasional platform.
3. In the western part of the study area there is the alluvial plain of the Marcal Basin.

Structure forms

The block-faulting tectonic style of the study area is reflected in its geomorphology. First of all, the morphological reflection of the faults of varying size is conspicuous. The Marcal Basin is bounded in the south, at the foot of the Mogyorós-domb, by a sharp fault. Further north, the fault continues in the basin's interior without being reflected by morphological benches. The small basin to the north of the Városi-erdő (Nyelőke) is of complex origin. It is bounded by faults both on its northern and southern margins, but denudation was also involved in its modelling. The obliquely-tilted Rendeki-hegy is also bounded by faults that are particularly steep and conspicuous in the northwest and the southeast. The Városi-erdő subarea is constituted by Mesozoic rocks that are block-faulted in a mosaic pattern and reduced by pediplanation to one and the same level. The Vár-hegy of Sümeg is an imposing horst bounded by extremely steep faults.

Planation—denudation surfaces

The origin of the level or slightly undulate degraded surfaces of the Transdanubian Central Range was earlier explained, in some of the areas studied, by abrasion (L. LÓCZY 1913), then, in terms of the Davis theory, by peneplanation and, according to the newer concepts, by tropical peneplanation (B. BULLA 1962) and pediplanation (M. PÉCSI 1969).

In the Transdanubian Central Range the following planation forms can be distinguished:

1. *Tropical peneplain remnants.* According to the tropical peneplanation theory, heavy lateritic weathering in the tropical forest and savannah zone and copious sheetwash upon torrential rains removing the products of weathering are the processes resulting in the development of vast tropical peneplains of slightly undulate surface due to selective denudation (B. BULLA 1962). Limestone and dolomite areas under such a climate undergo tropical karstification, resulting in karstic cones and pinnacles.

In several places within the Transdanubian Central Range remnants of Cretaceous to Eocene tropical karstic surfaces can be observed. Subsided to different depths, the paleokarstic surfaces owe their preservation, as a rule, to protection by an Eocene overburden. Filled with lateritic-bauxitic sediment, these karstic residues are suggestive of the contemporaneous tropical peneplanation of the Transdanubian Central Range.

The tropical karst remains are preserved only in patches within a small area. Near Sümeg, to the east of the Hárs-hegy, a few minor bauxite-filled dolinas can be observed. A little bit farther away, the bauxite mine of Nyírád has exposed a buried tropical paleokarst (open-pit mine of Darvastó).

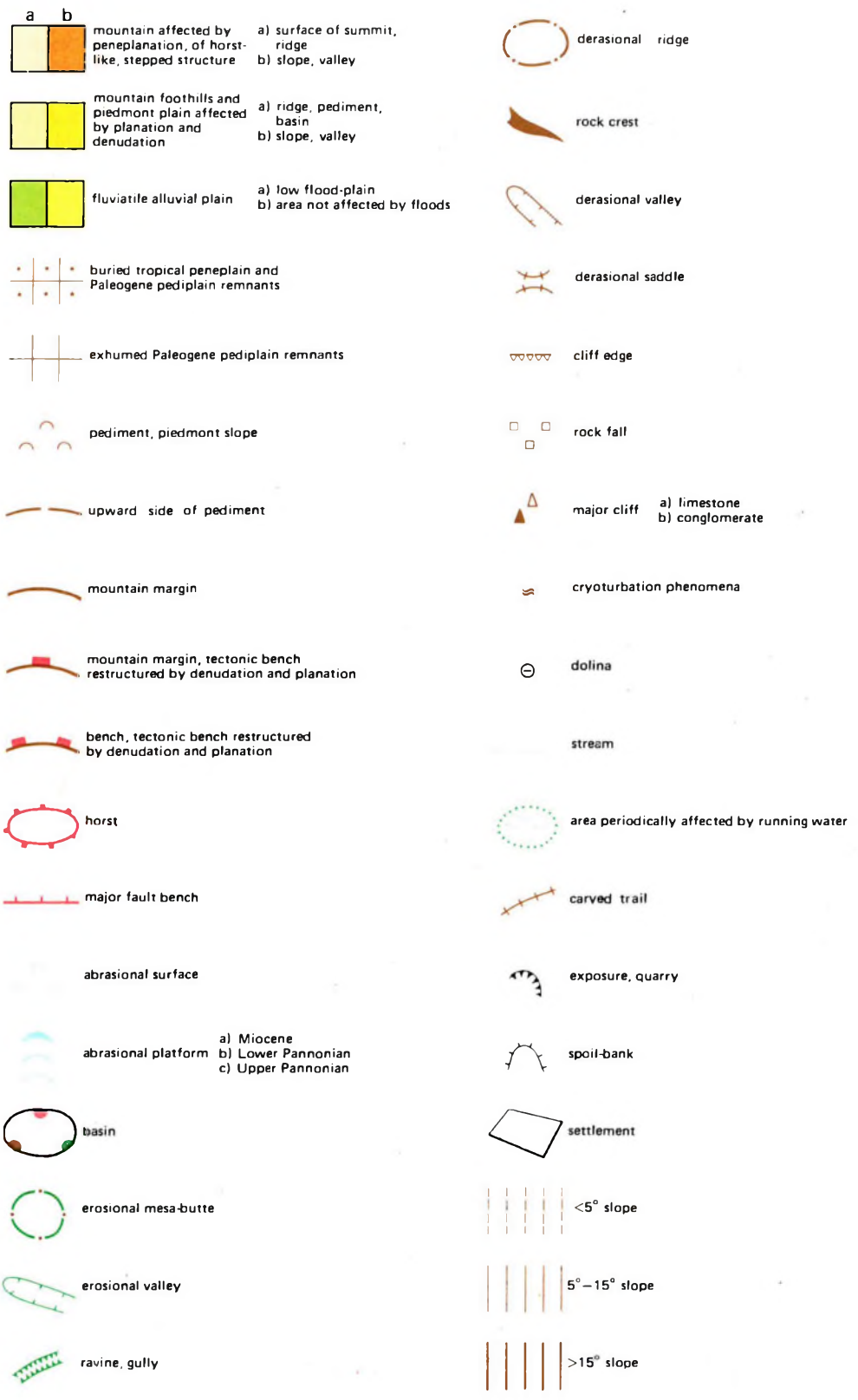

Fig. 93b. **Geomorphological map of the Sümeg area**

is an indication of the age of the abrasion. To the west of the Kopasz-domb the gravel is absent, while on the southwest margin of the Köves-domb and the Mogyorós-domb abrasional boulders, well-rounded, 10 to 40 cm in diameter, are found, resting in part on wave-worn cliffs.

The entire level of 180 to 200 m beneath the Kopasz-domb, and also to the west of the Rendeki-hegy and the Kopasz-domb used to be a continuous abrasion platform that covered an area of about 3 km^2. The Upper Pannonian sediment traceable over a distance of 300 m on the Rendeki-hegy has blanketed the abrasion platform and its neighbourhood. As a result of the uplift of the Rendeki-hegy, a process in action since the Pliocene, the Upper Pannonian and partly the Lower Pannonian sediment has been lost to erosion, a process in which the pedimentation around the hill has played a considerable role. Pedimentation has re-modelled the abrasion platform, at present the traces of both effects are observable.

On the southern and western slopes of the Vár-hegy of Sümeg, at an altitude of 220 to 230 m, wave-worn cliffs and a few abrasion pebbles occur on the hillside. Their age is Lower Pannonian (Pannonian s. str.) or possibly Upper Pannonian (Pontian). That no material removed by erosion from the Vár-hegy is found in the Lower Pannonian (Pannonian s. str.) deposists at the foot of the hill is in favour of the second.

Erosion forms

The most important erosion forms have evolved in the Marcal Basin. The river Marcal at present is flowing, incised 1 to 2 m deep, in an excavated streambed. The Sümeg-area part of the basin is covered mainly by alluvial formations. The surface of the high flood-plain, formed in Early Holocene time and flooded in more recent times only at highest water stage, emerges from an even now active low flood-plain forming an irregular system of patches. Since the time when the river was trained and a system of drainage ditches was developed, the high flood-plain has not been reached even by the highest water head. Between the high flood-plain and the pediment surrounding the Rendeki-hegy at an altitude of 150 to 160 m there is a surface which passes unheeded into the basin and which belonged to the Marcal valley in Pleistocene time. In addition to being partly reduced by erosion, the fluviatile sediments were later covered by a thin layer of slope deposit.

One of the sources of the river Marcal is found in the study area. Around the spring there are a few erosion-derasion mesa-buttes protected by a gravel blanket. These are relicts of the one-time topography into which the river Marcal has been incised.

The rest of the streams of the study area are insignificant, being incised to shallow depth in flat and broad valleys and accumulating a narrow strip of alluvium, they are flowing, for the most part, in man-made channels.

Derasion forms

Derasion is a summarizing term including all the kinds of mass-gravity movement taking place on a slope (slide, solifluction, sheetwash by rain- and meltwater, etc.). They played a role of utmost importance in modelling under the periglacial climate that prevailed in Pleistocene time, solifluction and the impact of snowmelt having been at the premium. At present, the steeper slopes of the mountains and hills are characterized by the predominance of gravity movements such as rockfall, stonefall, downslope creep of clastics and sheetwash, the less dissected and rugged topographies being mainly affected by sheetwash resulting from rainwater.

The most common landform in the study area is the derasion valley dry, lacking a permanent drainage, usually in shape of a flat bowland, when formed on harder rock, often deeper, of hemicircular cross-section. As can be generally observed, the larger valleys follow the tectonic lines. In the formation of derasion valleys not only the linear erosion responsible for the longitudinal valley form is important, but the areally-acting derasion processes producing the peculiar derasion valley form also play an important role. Linear erosion is only intermittently active, carving the valley floor and partly wearing away the derasion sediment accumulated there. The circumstances for the birth of derasion valleys are favourable in the case when the areally-acting processes play a significant role in the surface-modelling. This was the case when the area of Hungary was a periglacial terrain and it has been so in recent times since the clearing of the natural vegetation, for the felling of woods and agriculture have largely contributed to soil erosion.

In the vicinity of Sümeg the derasion valleys have densely dissected the higher topographies, particularly the piedmont slopes, but they are scarce in the deeper-situated tracts. On the plateau of the Rendeki-hegy large, steep-walled valleys have evolved. The deepest incision has been attained by the valleys of northern orientation. The southwest slopes of the hills are dissected by shorter valleys of great inclination.

The lowland and hillocky tracts are characterized by gentle forms with flat bowl-shaped valleys. Between the derasion valleys, derasion ridges, mesa-buttes have been formed. The slopes of these are modelled by derasion, at present mainly by sheetwash upon precipitation. Steep lateral crests occur on the slopes of the mountain, while on the lower levels flat ridges are observable. The flat Kopasz-domb extending in nort–south direction is an interesting form. As suggested by L. Lóczy (1913), at the junction of the NW–SE- and E–W-oriented margins of the Szőlő-hegy of Sümeg, between two parallel currents there evolved a counter-current which resulted in stagnation and the deposition of finer-grained sediment. Eventually, after the area had emerged, the easily removable sands were carried away and the argillaceous deposits making up the Kopasz-domb were left over. The idea of L. Lóczy cannot be either confirmed or refuted. Degraded and covered by a thin layer of slope deposit, the surface of the Kopasz-domb at present is the relict of a Lower or Middle Pleistocene pediment (glacis), modelled in the interspace between an Upper Pleistocene pedimentation to the west and the Nyelőke-Basin to the east. In its present-day form, it may be interpreted as a derasion ridge.

Of the minor denudation forms, stand-up rocks are conspicuous. The derasion valley incised deeply and running from the Rendeki-hegy plateau towards Csabrendek is flanked by steep rock walls. On the valley-side some stand-up rocks have also evolved. Their formation is mainly the result of fracturing and disintegration in Pleistocene time. In the Városi-erdő stand-up rocks have been carved out of quartz-conglomerates cemented probably upon hot water action ("Altar Stones").

In some exposures of clastics (quarries to the north of Sümeg, north of the Hajnal-hegy, in some road-cuts accross the Városi-erdő, on the eastern face of the bauxite open pit by the Bárdió-tag) ice-sacks and cryoturbation phenomena manifested in a frost-controlled orientation of the clastics could be observed (Plate LVII, Fig 4. and Textfig. 91, 92).

Karstic forms

The karstic forms are landforms less important, scattered in the Sümeg area. On the Mogyorós-domb, at a distance of about 300 m from the Pannonian sand pit, after extraction of the soil a karren-field was unearthed. Because of the soil cover its extension is unknown. At a distance of 600 m north-east of Surgót-major, a small dolina deepens into Cretaceous Hippurites limestone.

The scattered bauxite patches are locally observed to be underlain by relicts of Cretaceous paleokarst.

Anthropogenic forms

Consequences of human activities are observable, in varying measure though, over much of the study area. The quarries aligned on the southwest side of the Rendeki-hegy and their spoil-heaps, the gravel pits, the partly erosion-controlled 1- to 4-m-deep dirt roads incised into the sand blanketing the southern side of the mountain and the drainage ditches dug in the Marcal Basin are the most characteristic examples.

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