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Upper Pliocene and Quaternary Deposits in the Southern Foreland of the Mátra and Bükk Mountains

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Upon the correlation of data of the lignite exploratory borehole sections drilled in the S foreland of the Mátra and Bükk Mts a precise stratigraphic classification of the Quaternary sequence has been carried out . In dividing the sequence into members the differences in lithofacies characteristics and the molluscan fauna have been proved instrumental.

It has been verified the presence of both tectonic and erosion unconformity developed between the Lower and Upper Pleistocene.
Geological investigations done in the southern foreland of the Mátra and Bükk Mts were first of all devoted to the discovery of lignite deposits.

Relatively little attention was paid to the beds younger than the lignite. For this reason the present study deals with the structure and stratigraphy of the uppermost Pliocene and Quaternary sedimentary sequence offering thereby a contribution to the determination of the thickness and expectable rate of removal of the burden of lignite deposits in an area potentially suitable for open-air mining.

Stratigraphy

The bed sequence of the northern margin of the Great Hungarian Plain is shown in Table 1. The constitution, age and fauna of the Mátra - Bükk Foreland Lignite Formation are discussed in several studies. It is generally agreed that lignite deposits ranging in the S foreland of the Mátra and Bükk Mts all belong to the horizon of oscillating sedimentation of the Upper Pannonian.

The lower part of the Variegated Clay Formation of the Great Hungarian Plain and the upper part of the lignite-bearing unit are heteropical facies of each other. Where the lignite formation thickens, the variegated clay is fairly thin. Elsewhere, however, the variegated clay is thicker than the lignite deposits.

The two units cannot be sharply distinguished. The main difference between them is given by the fact that in the Variegated Clay Formation of the Great Hungarian Plain already there are no significantly thick lignite deposits and the fossil remains become rather scarce.

Unconformity. Changes in sedimentation. The lignite-bearing formation and the variegated clay each can be detected as displaying largely the same facies in the zone lying at the S foot foreland of the Mátra and Bükk Mts. Beyond this zone, however, a more varied makeup is experienced. Because of a more rugged surface, the one-time deposition also got to be more diversified.

In accordance with local paleogeographical conditions three different rock types developed: 1. eruptive rock debris accumulated at the feet of steep hillsides; 2. before the major river-mouths quartzite gravels transported from greater distances were emplaced on the plain; 3. in the gradually subsiding basins an alternating succession of clays and sands of freshwater, lacustrine and flood-plain facies were deposited.

The extension in space of the Lower Pleistocene and Uppermost Pliocene members are shown in Fig. 1. The members are laterally interfingered that is why their boundaries can be drawn only approximately.

The Visonta Reworked Volcanics Member. In the southern foreground of the Mátra and Bükk Mts, materials eroded off the mountain slopes were accumulated and redeposited repeatedly. This formation is generally called "alluvial cone" by geomorphologists. This name, however, does not reflect precisely the spatial from of the mass of sediment. As a matter of fact, this is not a fan type accumulation formed at the point of a valley where there is a decrease in gradient and showing a thinning out towards the plain. On the contrary, along the feet of the Mátra and Bükk Mts a continuous blanket came into existence with a thickness increasing, instead of decreasing, towards the south i.e. towards the basin. (Figs. 2 and 4)

The best exposure of the sequence consisting of andesite pebbles, redeposited rhyolite tuff and tuffaceous clay is offered by the Visonta Open Pit. Here, from several horizons, from the subsurface depths of 34 m and 9m (uppermost) Pliocene and Early Pleistocene fossil vertebrates were found like Zygolophodon pavlovi, Archidiskodon sp., Archidiskodon meridionalis meridionalis, Mammuthus (Parelephas) trogontherii, Bison sp., (Equus) Allohippus süssenbornensis (Vörös, 1982 in: Kretzoi M. et al. 1982).

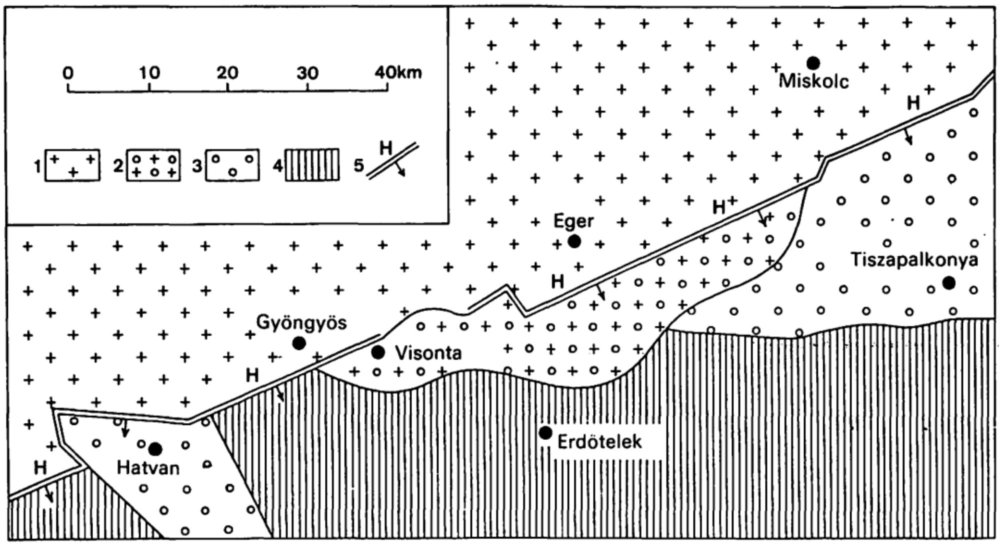

Fig. 1. Areal extent of the Uppermost Pliocene and Lower Pleistocene Members
1. Rocks older than the members referred to, on the surface, 2. Visonta Reworked Volcanics Member, 3. Tiszapalkonya Gravelly Sand Member, 4. Erdőtelek Clay and Sand Member, 5. boundary fault

The Tiszapalkonya Gravel Member. The member in concern consists of the following rocks: quartz gravel and gravelly sand transported there from more remote areas, alternating with intercalated sandy silt layers. In the region it is present in two areas: in the foreground of the Sajó-Hernád river mouth and at the Zagyva mouth near the town Hatvan.

For the description of the layer sequence of the member the depth interval ranging from 28 m to 128 m of the Tiszapalkonya key borehole is exemplified (for its location, see Fig. 1).

The *Erdőtelek Clay and Sand* Member. In the S part of the studied area this, sometimes more than 100 m thick sedimentary sequence consisting mainly of clay, silt and sand, less frequently of re-deposited rhyolite tuff and rhyolite-tuffaceous sand, is widespread.

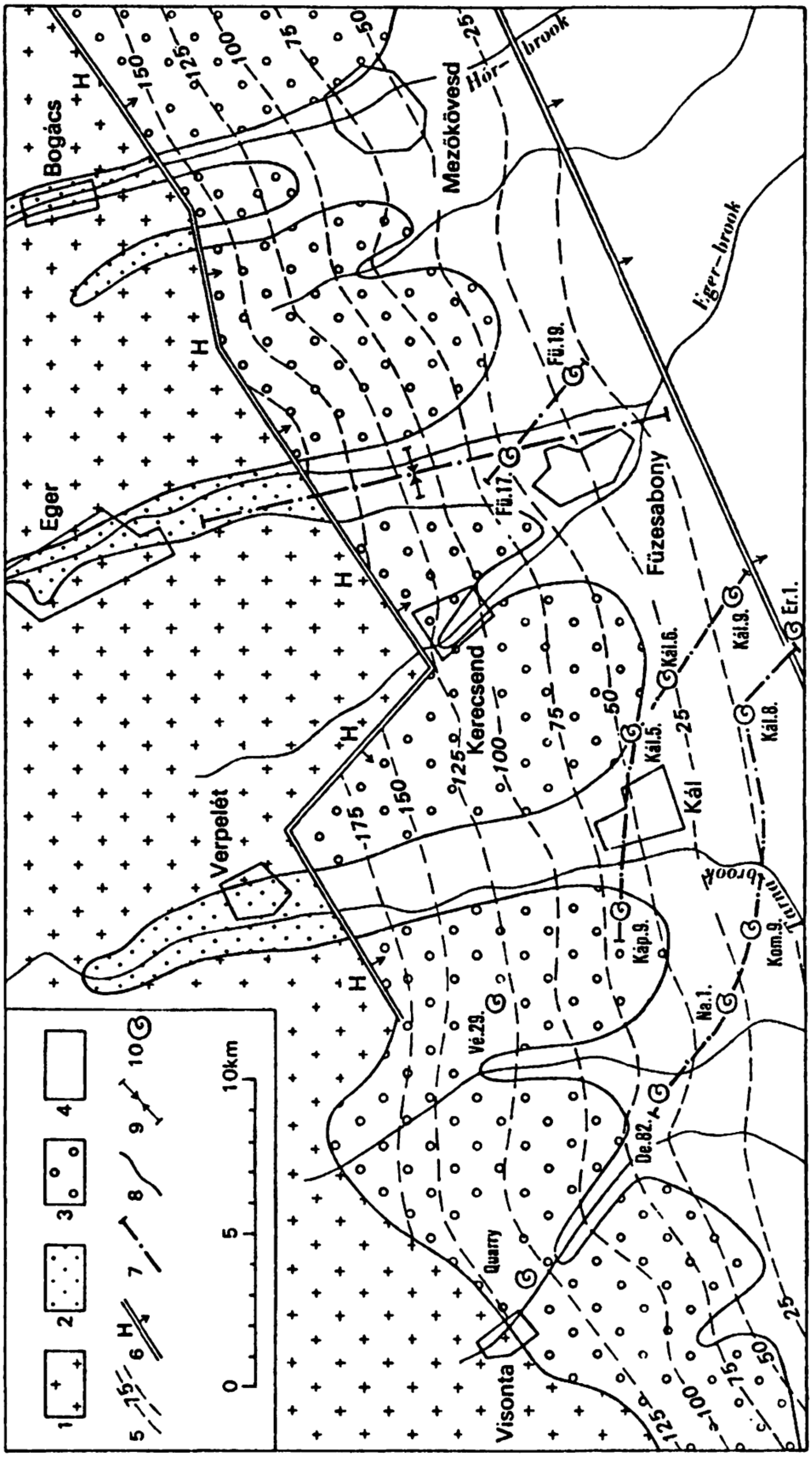
Bogács
Mezőkövesd
Hór-brook
Eger
Füzesabony
Kerecsend
Kál
Verpelét
Visonta
Quarry
Fü.19.
Fü.17.
Kál.6.
Kál.5.
Kál.9.
Kál.8.
Er.1.
Káp.9.
Kom.9.
Na.1.
Vé.29.
De.82.
0
5
10km

Fig. 2. Sketch map of the foreland of the Mátra and Bükk Mts between Visonta and Mezőkövesd
1. Areas without Quaternary deposition, 2. Sajóvölgy Gravelly Member deposited directly on Miocene rocks, 3. Visonta Reworked Volcanics Member, 4. Sajóvölgy Gravelly Member overlying the Visonta and Erd6telek Members, 5. contour lines on base of the Visonta and Erdőtelek Members, 6. fault; H: boundary fault, 7. profile direction, 8. brook bed at present, 9. intersection of the base level surfaces of the Sajóvölgy and Visonta Members, 10. localities of the more important finds of fossils

The 60-169 m depth interval of borehole Erdőtelek 1 can be considered the basic type of the member of the Mollusca-rich sequence which was analysed in laboratory in great details (Franyó 1977: 107). When studying the Erdőtelek Sand and Clay Member, E. Krolopp determined molluscs from the materials of the following boreholes: Erdőtelek 1, Kál 8, Kál 9, Kompolt 9 and Nagyút 1. The age of the Mollusca fauna consisting of aquatic and terrestrial species is Early Pleistocene.

The detailed enumeration of the fauna of more than 40 species can be found in the documentation stored in the National Geological Archives. Here only the species of greatest stratigraphic importance are mentioned: Neumayria crassitesta, the Early Pleistocene form of Planorbis planorbis, Soosia diodonta and Cepaea vindobonensis.

Figure 3 shows the sequences of the boreholes in wich Quaternary molluscs were found.

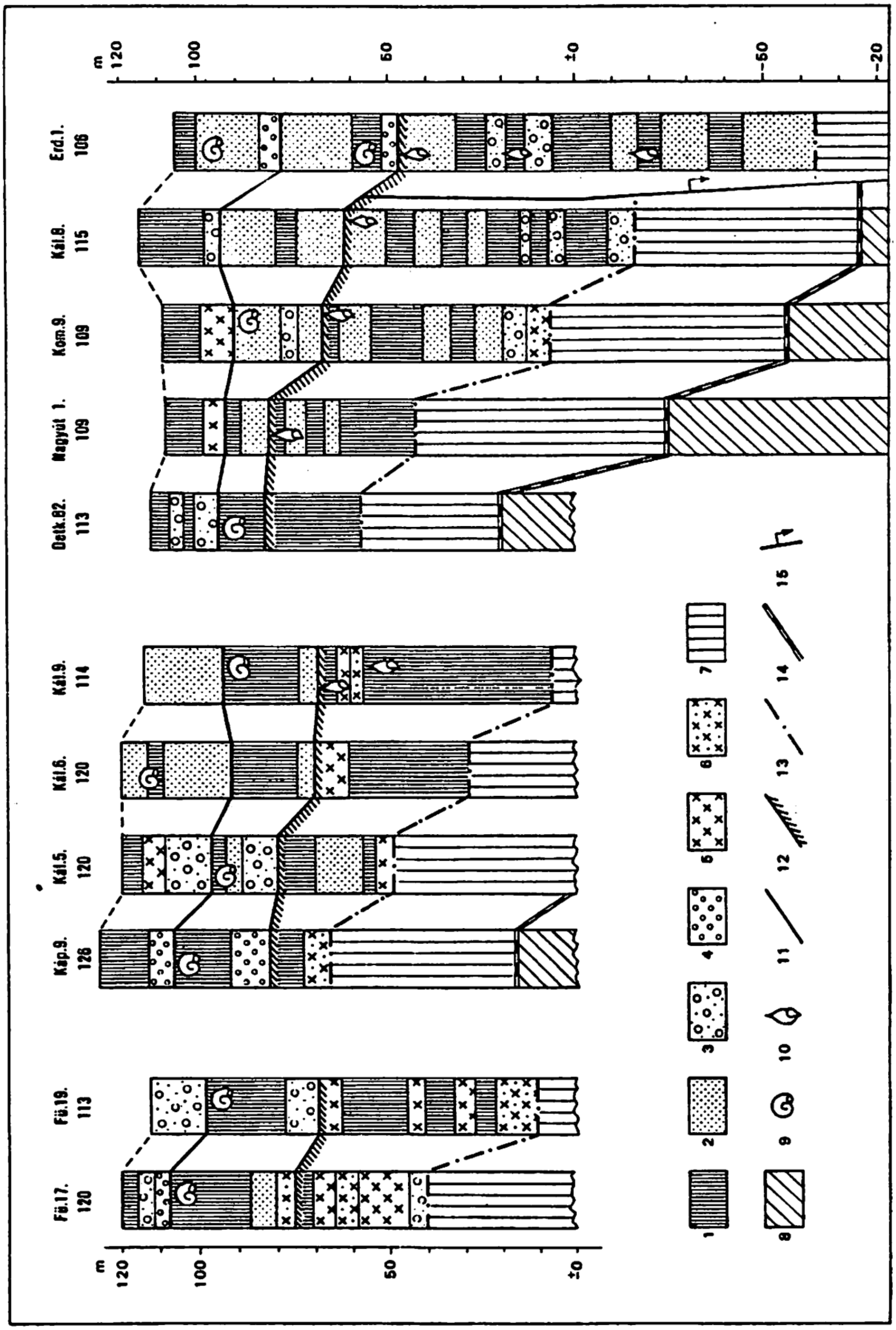
Fü.17.
120
Fü.19.
113
Kál.5.
120
Kál.6.
120
Kál.9.
114
Ostk.82.
113
Nagyút 1.
109
Kom.9.
109
Kál.8.
115
Erd.1.
106

Fig. 3. Columnar sections of Quatemary molluscan beds drilled
1. clay, 2. sand, 3. gravelly sand, 4. gravel, 5. redeposited rhyolite tuff, 6. sand with rhyolite tuff debris, 7. Variegated Clay Formation of the Great Hungarian Plain, 8. Mátra-Bükkalja Lignite Formation, 9. Late Pleistocene molluscan fauna, 10. Early Pleistocene molluscan fauna, 11. base of the upper horizon of the Sajóvölgy Member, 12. base of the Lower horizon of the Sajóvölgy Member, 13. base of the Erdőtelek Member, 14. base of the Variegated Clay Formation of the Great Hungarian Plain, 15. fault between two boreholes

Of these Erdőtelek-1 is a key borehole while the others were deepened for lignite exploration. On the basis of the fauna finds and the rock variations the boundary lines of the different members and units were traced and the cover of the lignite-bearing formation divided into four stratigraphic horizons.

So the layer sequences shown in the Figure can be correlated accordingly. It can be stated that at the end of the Late Pliocene-Early Pleistocene sedimentation tectonic movements followed and the areas elevated in the N were eroded.

The Sajóvölgy Gravel Member. Here the Upper Pleistocene and Holocene gravels and sandy gravels covering the present-day valley bed of the rivers Zagyva, Tarna, Bodrog and Hernád, meandering in the mountains can be mentioned.

After having left the mountain region and entering the plain, the alluvial deposits were spread attaining a thickness of more than 50 m at places, where the Sajóvölgy Gravel Member can be divided into two horizons. Eruptive rock detritus and redeposited rhyolite tuff can only be found scarcely in the material. Clay and sand layers can equally be found in both horizons.

From these finer-grained deposits rich Mollusc fauna was collected and then determined by E. Krolopp, from the following boreholes: Erdőtelek 1, Detk 32, Füzesabony 17, Füzesabony 19, Kál 5, Kál 6, Kál 9, Kápolna 9, Kompolt 9, Vécs 29.

Both aquatic and terrestrial species can be found in the fauna. The following species indicate a Late Pleistocene age: Columella edentula, Columella columella, Vallania tenuilabria, Trichia hispida. The Late Pleistocene age can be dated upon the absence of Early Pleistocene faunal elements, too.

Intra - Pleistocene unconformity. The intra-Pleistocene unconformity marking the base of the Sajóvölgy Gravel Member can be best disclosed in the area between Visonta and Mezőkövesd (Fig. 2).

Here the areal extent of the detritus accumulated at the foot of mountains is delimited by a tectonic line stretching in zigzags towards N. From its other side the debris cover was eroded. An other structure line striking WSW-ENE can be traced S of the villages of Mezőkövesd, Füzesabony and Kál. Along this latter fault the base level of the complex is recorded as downthrown by 50 m. The Sajóvölgy Gravelly Member, however, was not affected by the above-mentioned two dislocations. The different mode of occurrence of the piedmont detritus and the younger brook deposits are shown in Fig. 4.

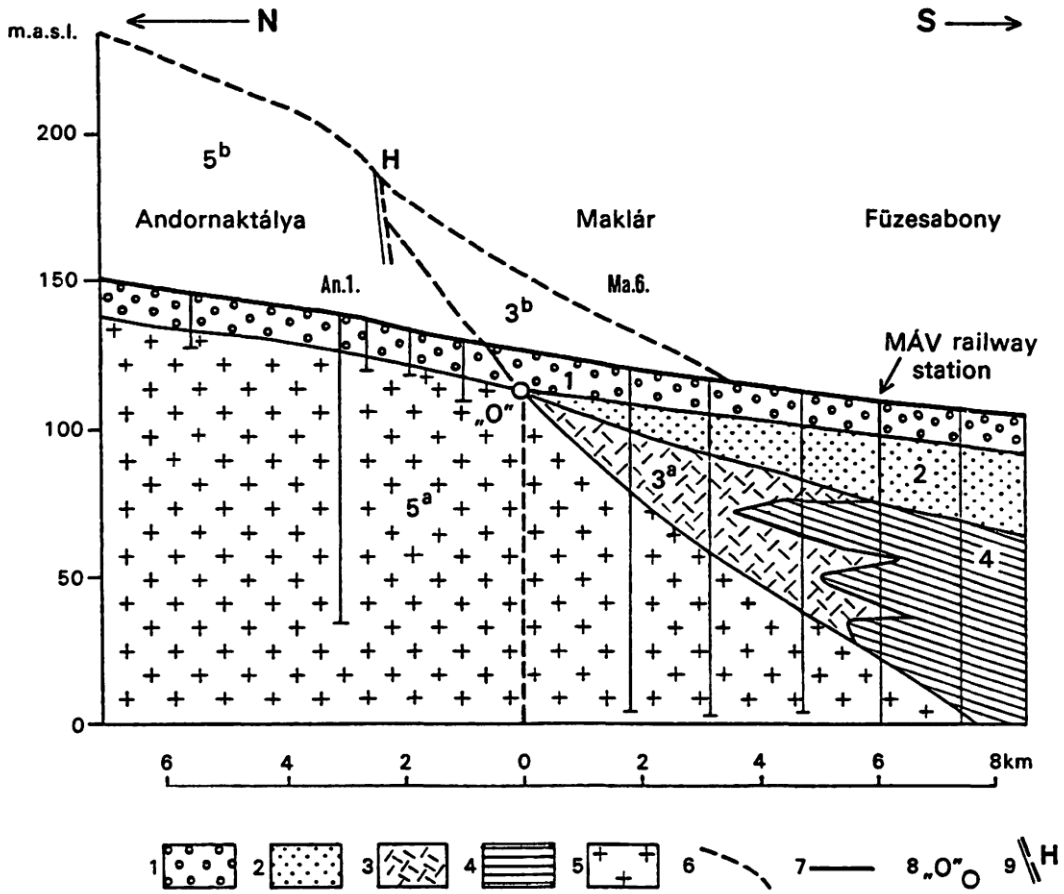

Fig. 4. Geological section of the Eger brook line between Eger and Füzesabony
1. Upper part of the Sajóvölgy Member, 2. Lower part of the Sajóvölgy Member, Ja. Visonta Member lying under the base level of valley, Jb. Visonta Member deposited on hillsides, 4. Erdőtelek Member, 5a. Earlier Pliocene nnd Miocene rocks under the base levei of valley, 5b. Earlier Pliocene and Miocene rocks on hillsides, 6. sketchy outlines of the hillsides flanking the valley, 7. present-day surface of the base of valley, 8. intersection of the base level surfaces of the Sajóvölgy and Visonta members, 9. boundary fault

In this section figure not only the beds underlying the base level of the valley but also, marked by broken line, the rocks of the hills flanking the valley on its both sides are also indicated. When comparing the two parts of the figure it turns out that the debris cover on the valley sides is elevated over the present base level of the valley. Since, however, the base of the debris blanket is steeper than the base surface of the brook deposit, the two planes intersect each other.

In the figure the point of intersection "O" shows the point wherefrom the debris blanket dives beneath the brook detritus in a southward direction.

Fig. 4 shows the valley of Eger brook from Andornaktálya to Füzesabony. The conditions are quite similar in the case of the Tarna brook between Verpelét and Kál and of the Hór brook between Bogács and Mezőkövesd.

Besides these valleys of bigger brooks there are also several smaller ones in the region. These, however, have not been cut down to the base of the piedmont debris blanket and do not transport gravel from more remote areas.

The bottom of these minor channels is covered by redeposited loess and brown forest soil accumulated above blanket of the slope-forming detritus. (The uppermost 8 m of the classic Visonta exposure described by Kretzoi and Pécsi also belongs here).

Finally it could also be mentioned that the action of the intra-Pleistocene denudation can be evidenced not only in the foreland of the Mátra and Bükk Mts but also in more distant areas. Its impact can be especially well observable in the N parts of the basins where on the older (Middle and Lower Pleistocene) deposits younger (Würmian and Holocene) fluvial beds rest with angular and erosional unconformity.

Between the Würmian and Mindelian tectonic dislocations were followed by areal erosion e.g. in the Vienna Basin (Thenius 1974), the northern part of the Little Hungarian Plain (Pospisil 1978), the southern part of the Little Hungarian Plain (Jaskó 1990), in the valleys of rivers Zagyva and Sajó, (Jaskó 1991), and in the East Slovakian Plain (Banacky 1968, Vaskovsky 1977).

Even in the central part of the Great Hungarian Plain, however, the Quaternary sedimentation was not continuous. ln the thick sedimentary sequences dated upon faunal evidences, there are significant stratigraphic gaps and boundaries marked by erosional and angular unconformities (Krolopp 1970, Kretzoi-Krolopp 1972).

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