THE CONNECTION BETWEEN TECTONICAL ENDOWMENTS AND VALLEY DEVELOPMENT ON A PALAEO-MESOZOIC BLOCK AND IN AN AREA CONSISTING OF TERTIARY MOLASSE SEDIMENTS (NE-HUNGARY)

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Abstract: We examined the relationship between structural endowments and valley development on a Palaeo-mesozoic basement complex and on a territory built up of Cainozoic molasse sediments. We made microtectonic and valley-orientation measurements. On the Palaeo-mesozoic terrain 100% of the valleys are structurally preformed, while on the molasse surfaces this value reached 85%.

Key words: geomorphology, tectonics, fault system, valley-orientation

Structural morphogenetics

Valley development and the evolution of river pattern are important questions of geology and geomorphology. The relationship between the geological and the geomorphological way of access is determined by cause and effect connections. Valley development and the evolution of river pattern are influenced by structural endowments and lithological characteristics as well, beside the principles of stream currents. Therefore, the geomorphological characteristics of a region can be interpreted only with full knowledge of tectonics. Simultaneously, the geomorphological endowments often present a basis for recognizing the tectonic characteristics.

The type of connections alters in the case of areas with different physical endowments. The tendency of stream development is determined by the situation of active neotectonic depressions and the principles of alluvial fan evolution. On this terrains, which are still under alluviation, preformation along tectonic lines have a secondary role. On the young molasse terrains that are erosional surfaces presently, structural lines and lithological endowments get a more significant role. Contemporaneously, in the case of Palaeo-mesozoic blocks the fault systems probably have a very considerable function in valley development.

We made investigations in the Uppony Mountains and on the catchment area of Hódos stream (*Fig 1*) to prove the last two statements. We did a complex structuro-geological, geomorphological and morphogenetical research combining the interpreted and statistically extended microtectonic measurements with valley-orientation analysis.

The geology of the model areas

The Uppony Mountains, which was uplifted in the Pliocene, are built up of Palaeozoic and subordinately Mesozoic rocks arranged into NE-SW strips with NW vergence, while its immediate surroundings consist of Miocene rocks (*Fig 1*). The Palaeo-mesozoic formations with imbricated structure adjoin tectonically (*Kovács, S. in Fülöp 1994*). The remnants of Miocene sediments can also be found in the summit area of the Uppony block, but the most part of it has already been eroded. The mountains are surrounded by fault systems to the NNW, N and NE while it dips gradually under younger sediments to the S and SE.

West of this region, in the catchment area of Hódos stream Tertiary molasse sediment sequences become determinative (*Fig 1*). The western part of the basin presently consists of the strongly cemented, sporadically glauconitic, Oligo-miocene members of the Pétervására Sandstone Formation, while in the eastern part Miocene schlieren-type sediments dominate (*Budinszky-Szentpétery, I. et al 1999*).

This spatial distribution is owing to the so-called Darnó fault system crossing the territory in the direction of NNE-SSW. Imbrication and basement nappe formation with distinct NW vergence are observable along this fault system (*Szalay, I. et al. 1976*) in the eastern part of the model area. In the foreground of the imbrication nappe Miocene terrains appear at first then the tectonically connected strips of the Miocene and Oligocene sediments occur indicating the tectonic dissection that accompanied the thrusting up of the basement nappe.

The NNE-SSW oriented reverse faults and the transverse ones connected to them caused the Uppony Mountains to uplift and were inherited to the younger overlying sediments as well, determining the main directions of the post-Miocene erosion. On the major part of the research area the faults preformed the current drainage pattern and the mass movements occurring on the valley slopes. Moving away from the Darnó fault system this tectonic preformation becomes less determinative.

Results of the microtectonic measurements

We made numerous microtectonic measurements on the rock formations of the region. On the basis of the appraise and the genetical interpretation of the results the following determinative elements can be defined (*Kozák, M. et al. 2002.*).

The main strike of the mountains is determined by the imbricated strips of the structural lines with NE-SW tendency, which formed during the Alpine-Carpathian convergence structure development. These structural lines are parallel with each other and represent the direction of the main faulting plane of the imbricated reverse faults.

Reverse faults were homogeneous only in certain sections of the Palaeozoic swell, thus the main structural strips were divided into parts along the transverse faults. This fact is confirmed by the data of deep drillings sank along the continuation of the mountains, supporting significant surface level differences among some parts of the Palaeozoic strip.

Beside foliation a diagonal failure fracturing system occurred in the brittle rock mass that took up the load during the strong vergence and the foldings and reverse faults ensuing from it. This fact corresponds well with the failure directions observable in rock mechanics compression-fracture tests (*Suppe 1985*).

Correlation between microtectonic measurements and valley-orientation analysis

On Figure 2 we illustrated with different lines the imbricated strips of reverse faults, the transverse faults perpendicular to them and the diagonal failure fracturing directions. We made numerous microtectonic measurements. The results of the most typical ones can be seen on the maps where rose diagrams showing the distribution of faults are represented. We interpreted the valley sections genetically on the basis of the mean values of the nearest rose diagrams.

Relying upon these findings, the main reverse, transverse and diagonal directiobns proved to have a significant role in the evolving of the valley pattern. In the Uppony Mountains 100% of the valleys run along structural lines: 35% along the front of reverse faults, 22% along transverse faults and the remaining 43% in diagonal directions.

On the Oligo-miocene terrains a bit different connections became evident. The orientation of structural lines alters to a higher degree. Moreover, in the case of loose sediments other local endowments independent from tectonics have a more considerable role in valley development (e.g. vegetation cover, the arrangement of pervious and impervious layers). This statement is also proved by the fact that the significance of derasional valleys is higher on the molasse terrains.

The most characteristic faults (reverse and transverse) of the basement complex were inherited to the younger overlying sediment sequences as well, forming a fault system. They have a significant role in valley development there, although it is evident that other factors determining erosion become more considerable (e.g. lithology, general sloping). On the molasse terrains 85% of the valleys can be connected directly to tectonic directions.

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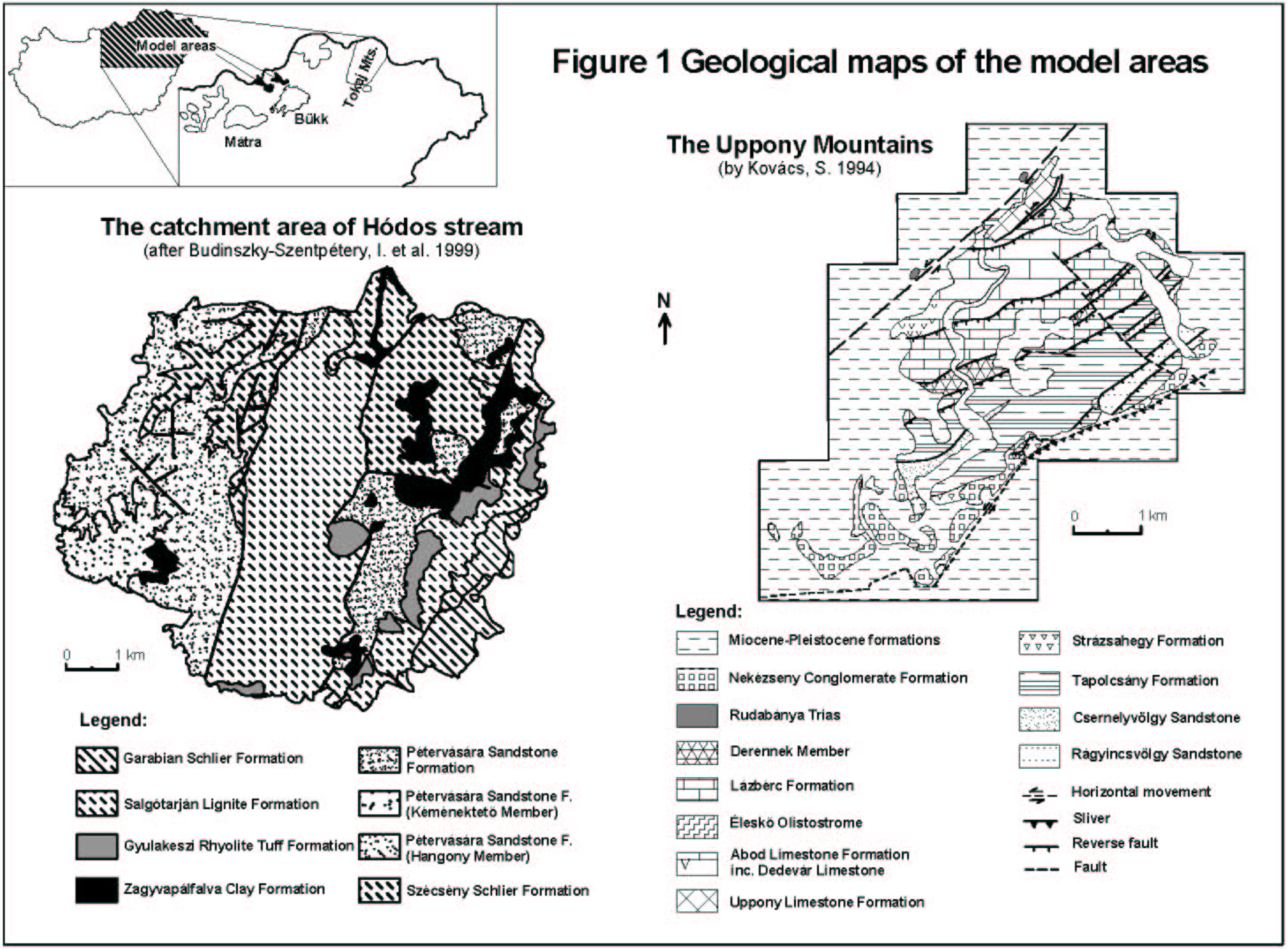
Figure 1 Geological maps of the model areas

Figure 2 The tectonic preformation of valleys on the two model areas



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