Geomorphological and geological study trail in the Medvesalja

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Abstract

Medvesalja involves the eastern pediment looking towards the Cered-Almágy basin of the Medves Region. Studying the Medvesalja provides solutions for numerous landscape development problems of the hilly basin. The paper suggests the construction of a study trail in order to exhibit the geological geomorphological values revealed by our work. The study trail enables the studying of the production of basalt volcanism in abandoned quarries. Oligocene-Miocene base rocks can be observed in deeper valleys. Numerous effects of the fluvial landscape forming can be detected. Finally direct evidence of tectonic processes is shown in the village of Tajti.

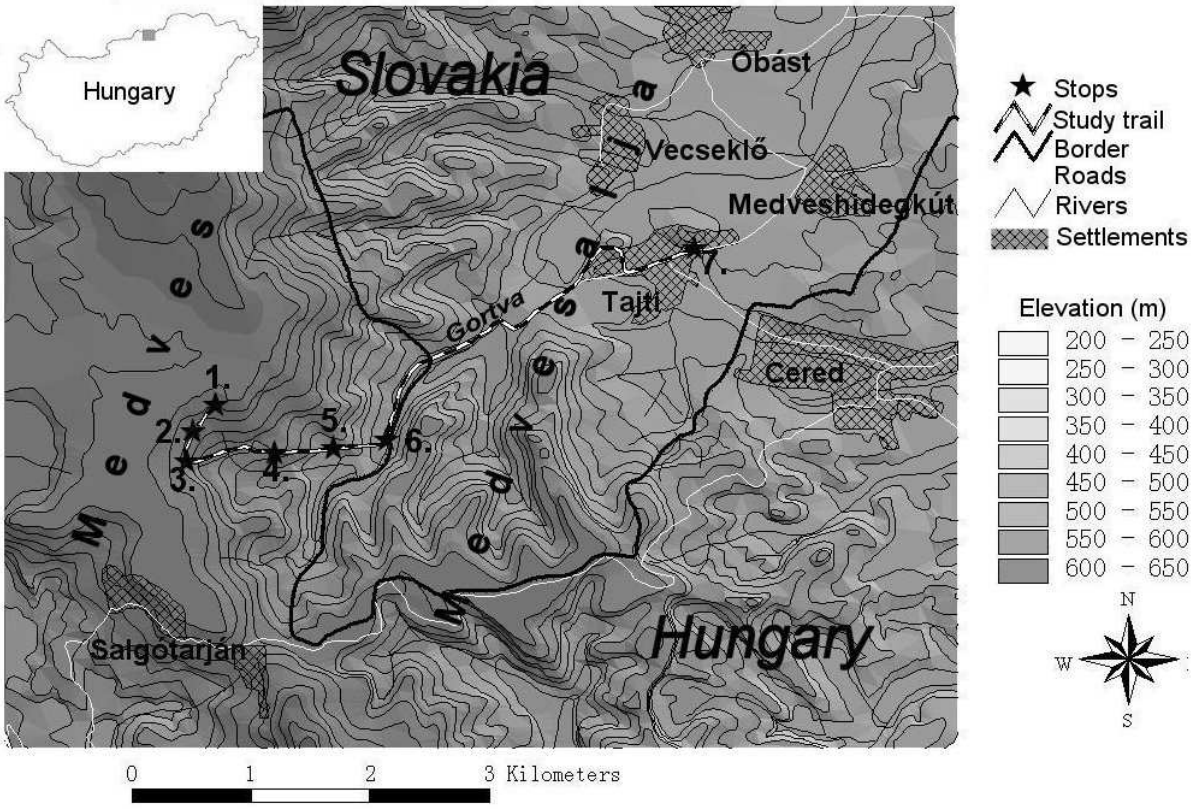

Fig 1.: Route of the suggested study trail in the Medvesalja

Location and aims

Medvesalja involves the pediment and hilly basin areas East and South of the Medves Region. This region is known to be called on several names: Hajnačka vrchovina (Ajnácskő Mountains) as part of the Čerová vrchovina (Cseres Mountains) and its eastern part Podmedvenina (Medvesalja) looking towards the Cered-Almágy basin in the Slovakian literature. In the Hungarian literature Medves involves only the Medves Uplands. In this paper we regard the Medves Region as it involves the Medves Uplands and the neighbouring territories made up by basalt volcanic rocks that are cut into two parts by the Hungarian-Slovakian border: its smaller southern part is the edge of the Cered basin involving the source

[1]region of the Tarna river; its larger northern part is the border region of the Almágy basin containing the source region of the Gortva stream (Fig 1). The watershed between the two rivers is not found along the highest tops of the area but along lower hills and even at some places valley-floor watershed also occurs (Utasi Z. 2000). The spring regions form one unit geomorphologically. Numerous interesting and important morphological value developed due to the changes in the water system, to the tectonic movements and to the variable geological conditions. This paper gives an outline of the most important geological and geomorphological values that hold evidence on the development of the area. The paper also suggests a possible study trail involving the above mentioned values and crossing the border. This region is on the periphery in both countries with weak economic conditions and difficult traffic conditions with almost uncrossable border. However, the region owns great landscape diversity presenting the possibility of tourism development. For this the development of the infrastructure and the widespread presentation of the natural values of this region is required.

Geological framework

The region is situated to the North of the Darnó line. Older rocks than the Oligocene can be found only in great depth. The next 30 million years left a thick and variable rock formation in the area. The oldest is the Oligocene Szécsény Schlieren Formation an unstratified monotonous small mica containing fish-scale-like grey fine sandy – clayey siltstone. The formation has an average thickness of 400-800 metres. It is exposed in the western part of the area in the lower parts of the deep valleys of the Medvesalja on the top of the Pétervására Sandstone Formation which forms its base. The Upper-Oligocene – Lower Miocene Pétervására Sandstone builds up most of the area. It is called Fülek Sandstone Formation in the Slovakian literature (Sztanó O. 1986). Its thickness is 500-700 metres and it can be separated into two parts. The lower larger part (Pétervására Member and Tajti Sandstone in the Hungarian and Slovakian literatures respectively) is a coarse, middle and fine grained variously hard rock with a colour ranging from grey to yellowish brown. The sandstone is often glauconitic and somewhere muscovite or biotite containing formation. Its appearance becomes heterogenic from West to East. In the base of the basalt of the Medves Region it is a well sorted thick bedded and stringed in appearance and it becomes cross-bedded with variously shaped large concretions towards East in the pediment of the Medvesalja and in the inner parts of the hilly basin. The upper thinner 50-80 metres thick Ilonavölgy Formation (Csákányóci Formation in Slovakia) is separated from the deeper Member that is exposed from under the basalt only in smaller patches by the occurrence of coarse gravel intercalations, tufite, tuff and bentonite fragments and lenses. Major outcrops of the sandstone can be observed in deeper valleys and in anthropogenic sections (road cuts). It erodes quickly as a few mm thin crust, however, it may stand as steep walls due to its strong cementation (Sztanó O. 1986). The Lower Miocene and the Pliocene Schlieren occurs in the pediment and on the hills of the inner territories of the hilly basin. Its stability is much less than that of the sandstone while its carbonate content is higher. It is more sorted away from the basalt cover and the 0.1 -1.0 mm fraction dominates its grain size.

The Pliocene basalt volcanism operated periodically both in space and time between 2.2-1.8 million years ago. (Balogh Kad.) The Medves Region can be separated into three parts based on the size, character and distribution of the volcanic forms. The southwestern part of the study are is dominated by lone eruption centres, volcanic cones and necks (Nagy-kő, Kis-kő, Szilvás-kő) elevating from the surrounding 300-400 metres high sandstone tops like islands with their 350-600 metres high peaks. The central region is occupied by the Medves

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Uplands formed by four eruption periods (two tuff producing and two lava eruptions) where the former eruption centre elevates up to 638 metres. The thickness of the volcanic cover varies between 10-160 metres depending on the unevenness of the base rocks and on the distance from the eruption centre. The northern region is also formed by lone eruption centres with lava flows starting from them but these are larger and more united than those in the southwestern part. Gortva stream cut through between the two former eruption centres (Baglyas, Ragács) where the lava cover was thinner originally. Pleistocene aeolian-fluvial sediments occur in the edges of the pediments in the middle part of the Cered-Almágy basin. Holocene alluvial sediments occupy the narrow belts along streams and a wider belt in the Bást depression.

General morphological conditions

Several levels can be separated in the Medvesalja that are determined by rock type and tectonics and erosion. The top level is found between 520-640 metres and presented by the structure surface of the basalt volcanic areas sided by steep slopes. The next level is found between 420 and 440 metres at the boundary between the Pétervására and Ilonavölgy Sandstone Formations on small humps between major streams. There is an extensive level (greatest width is 2-2.5 km) at 280-320 metres that continues on the ridge between Cered and Utaspuszta after the Gortva stream. This is covered by thick Pleistocene sediment and it can be regarded as the pediment of the Medves. The lowest level (260-255 m) is presented by the young alluvium of the Bást (Stará Bašta) depression on which uncertainty of the runoff directions can be detected suggesting that the changing of the drainage system continues even today.

Geomorphological and geological values along a suggested study trail

There is only one study trail in the Medves Region around Somoskő exhibiting the anthropogenic forms created by basalt mining. The suggested path is situated in the eastern part of the region exhibiting both anthropogenic and natural values. The numerous geomorphological values presented by the path tell the story of development of the Cered-Almágy basin. The length of the trail is 5.5 km starting in Hungary and finishing in Slovakia connecting 7 stops meanwhile. The rout is almost signed by nature as starting from just above the spring of the Gortva stream following it until the village of Tajti numerous rock formations and forms are crossed. Their order does not mean necessarily chronological order it is only topographic. Suggested stops are the followings:

1. Quarry at Tehenes

The starting point of the study trail is the quarry at Tehenes situated 530 m asl. on the eastern edge of the basalt cover directly in the level of the basalt plateau. Mining here was stopped just as in every Hungarian quarry in the Medves Region and its re-cultivation was partly completed (the quarry courtyard was evened). There is 40-50 metres between its two quarry courtyards. The height of the western one is 8-10 m and its length is 60-70 m exhibiting grey laminated basalt with homogeneous texture and with a weathering margin observed in the microscope. There is a burnt tuff intercalation between the lava beds. These types of rocks are found in most of the quarries and among the gravel of the streams as well. The eastern courtyard is smaller with a length of 30-40 m and a height of 6-7 m exhibiting a much lighter coloured laminated basalt that shows connection with a more distant quarry at

Ajnácskő. The K/Ar radiometric age of the basalts is found to be 2.2 million years (Balogh Kad.). (Photo 1.).

2. Mass movements on the edge of the basalt cover

A less known and studied but valuable field of mass movements can be observed in the lower part of the basalt cover at a height of 500-540 metres above the valley head of the Gortva 200 metres from the Tehenes quarry. The chord length of the lobate scarp of the slide group containing slides with stagey distribution above each other is 300 metres. Mass movements have stabilised by today that is marked by the 40-50 years old forest cover. Active movements may only occur at the bottommost zone. Hollow lakes formed a multilevel system once but the higher ones almost completely accumulated by today and the lower ones may have water temporarily and their vegetation is in the different stages of succession (Szabó J. 1996). Landslides on the one hand are natural the base sandstone presenting the sliding plane and on the other hand they are of anthropogenic origin as the stability of the basalt edge was decreased by basalt mining. (Photo 2.).

3. The Gortva spring

500 metres from the starting point we reach the spring of the Gortva that is situated high directly in the level of the basalt cover. The exit of the stream is marked by a permanent spring. The spring water contains high amount of sulphur and iron compounds with a characteristic smell due to the post volcanic activity. These compounds form a few mm thick cover on the bed wall and on the gravel of the stream bed. Most of the compounds are precipitated from the water after travelling 300 or 400 metres.

4. The section of the Gortva on the edge of the Medves

The trail continues on the valley floor from the spring. The Gortva stream deepened its valley at a rapid rate due to the increasing retreat from the direction of Ajnácskő and to the development of the Bást depression. Its subsequent tributary valleys could not hold the pace and turned into hanging valleys (as they retreated into sandstone built side ranges and their water supply was limited; they have water only periodically even today). The largest ones join the main valley from the left. (Photo 3).

5. The waterfall of the Gortva

The above mentioned rapid retreat explains the development of the step in the middle part of the main valley (2 km from the starting point) where a 3 m high waterfall is present at the strata boundary. The chord of the curved front of the waterfall is 6-8 m long. The upper fromationis a loose dark grey easily weatherable sandstone dominated (80 %) by fine sand (0.1-0.2 mm) and having a carbonate content of 4 %. The lower formation consists of the much harder Tajti sandstone. (Photo 4.)

6. Terracettes of the Gortva

The carrying capacity of the stream rapidly decreases and it becomes accumulating at the joining with the Szarufa valley (2.5 km from the starting point) directly above the country border. Its meanders are very well developed on the wide valley floor (10-15 m) even some over developed curves, umlaufbergs can be observed as well near the Szarufa valley. Its

terracette system is also well developed with 3-5 terracette levels positioned 1-2 m away from each other. The width of the terracettes may reach a few metres. In the second terracette level a former valley torso can be observed which turned into a hanging valley by today. This is a fine example of the classic valley development. Crossing the border the incline significantly decreases and the meandering character with the terracettes disappear. (Photo 5.).

7. The Kalic Mountain (Tajti - Tachty)

The end of the study trail is reached at a special basalt mountain within the village of Tajti in the southeastern end of the Bást basin. The smaller southern part of the Kalic Mountain is covered by colluvium making it difficult to study but the larger northern part is exposed by a former quarry. It is significant from two aspects:

One of its special interests is the fact that it is situated far away from the main basalt ridges (3-3.5 km) and at a lower level. The base of the basalts of the Medves Region is at 460-500 m here the top level is found at 310 m the quarry is situated at 270 m and the base is not visible so at least 200 metres is the difference. However, its structure and rock types (laminated basalt lava rock on the bottom with burnt tuff intercalations) are partly the same as studied on the edge of the Medves plateau and its age is also similar (2.2 million years) to the other basalt occurrences indicating similar origin (Photo 6. – Former quarry in the southern side of the Kalic Mountain). The level difference is explained by tectonic movements: a significant sinking took place after volcanism ceased. It is proved, on the one hand, by its topographic position: The Bast basin which seems to be a young depression (indicated by among others the fact that fluvial accumulation is proved by its almost completely flat surface and uncertain water system – Utasi Z., 2000) was developed between the Kalic Mountain and the Medves. On the other hand, there is a sharp fault plane on the eastern edge of the Tajti Mountain where the volcanic strata bend upward while the sandstone formations bend fan-wisely downward. (Photo 6).

Its second speciality is that the laminated basalt is found only up toa height of 4-5 metres from the quarry. On the top of it volcanic agglomerate showing chaotic orientation is found with a thickness of 10-12 metres. The size of the clasts (volcanic bombs) in the agglomerate varies in a wide range from pea size to 1-2 metres. These formations prove that the volcanism was not subvolcanic. Similar rocks can not be found elsewhere in the Medves Region. Furthermore, a loose 15-20 metres thick deposit was found on the top of the mountain that cannot be young valley deposit due to the isolated position of the mountain therefore its suggested age is Pliocene. It was probably formed during the formation of the pediment but after the sinking was ceased.

Summary

The Medvesalja cut by the Hungarian-Slovakian border still holds numerous surface development problems the solving of which is the task of a paper much larger that this. This paper deals with the evidence of a partial problem considering the possibilities of presenting the values of the studied are for the public. The paper suggests a geological-geomorphological study trail in a region that is crossed by the border therefore its construction is not possible today but it can be a reality with the vanishing of the borders within the European Union.

Photo 1.: The quarry at Tehenes

Photo 2.: Landslides on the edge of the Medves

Photo 3.: One of the hanging tributary valleys of the Gortva

Photo 4.: The waterfall of the Gortva

Photo 5.: Over developed meander in the Gortva valley

Photo 6.: Kalic mountain

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