Additions for examination of the Ceredi-basin drainage (waterway) network

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Abstract

The Ceredi-basin divided in two by the Hungarian-Slovakian border. This paper intends to provide the existence of the one-time uniform valley network running together at Zabar, and the occurence of changes in directions of water flows (captures). The analyses mean morfometric examinations covered four areas: ■ outline characteristics and flow directions of the drainage network, analysis of the thalwegs, the question of surfaces, examination of the relative relief.

Introduction

The Ceredi-basin is a lesser examined peripheral area divided in two by the Hungarian-Slovakian border, which in spite of its variegated natural values has escaped the attention of researchers up until now, with more significant examinations only having been pursued in the Medves region. This paper intends to provide additions for the Quaternary development history of the region's drainage (waterway) network, and attempts to reconstruct the last, significant change in direction.

According to the opinions of today to understand the recent development of the drainage (waterway) network, we have to go back 2-3 million years in time. At that time the Ceredi-basin formed a more or less uniform waterway network; it had a less divided up, terrain sloping to the SE, with its waters meeting in the Zabar region and the Tarna river forming from their flowing together broke through the sandstone ranges towards the lowlands. The northern and eastern edges of the basin were closed by Pliocene basal volcanic ranges (Ajnácskői-mountain range, Hajnacka Vrchovina). Later since the Sajó-valley sunk more strongly than the Hevesi-depression establishing the Tarna etching, the retreat of the ancient Gortva commenced in the northern part of the volcanic range. The break through occurred at Ajnácskő (Hajnacka) (since the basalt covering was also thinner here originally), then advancing progressively towards SW in space and time a whole series of river captures conquered all of the significant sources of the Tarna. The early obstruction of the Básti-basin also strengthened this process, since the middle section of the rivers subsided, thus its lower sections became dry beds. All of this was described by Székely András (1954, 1958), however he did not provided concrete evidence. This paper intends to confirm these assumptions with morphometric methods. Morphometry in general does not provide decisive evidence, but supplemented by other examinations, much data pointing in the same direction can strengthen our assumptions.

The most unambiguous evidence would be if basalt gravel were to be found in the ridge between the Tarna and the Gortva; namely, at present this area does not obtain water recharge from the Medves (due to the Básti-basin), thus the presence of basalt gravel would undoubtedly certify the flow-through of the Medvesalja stream at that time. Up to now unfortunately discovery of gravel has not been successful, thus we are left with indirect verification.

Positioning of the small region

The Ceredi-basin appears in literature as a new concept. Its definition as a small region is justified by its strikingly outlined character, its well definable limits, and (one time) hydrographic unity. In actual fact a basin hilly range is in question, where the relative relief is

a maximum of 80-100 m/km^2. It is of dual division, divided in two in the NE-SW direction by the ridge between the Tarna-Gortva.
a, Its northern part belongs to the Gortva gathering ground, the central part of which is the early subsidence area of the extensive Básti-basin (Bastianska Kotlina). In the SE direction it is bounded by the ridge between the Tarna-Gortva with a steep lip, its northern and western boundaries are provided by the Medves, and its continuation, the Ajnácskői-mountains (Hajnacka Vrchovina) (these are Pliocene basalt volcanic ranges of 500-600 m average height), and to the East is closed by a lower sandstone area.
b. Its southern part is in actual fact the Tarna valley, which widening out at Zabar created the so-called Zabar-hollow. Here the direction of the river changes from W-E to N-S, and with a narrows, breaks through between the inter-Upper-Tarna-Zagyva-hills bounding the area to the South and the Heves-Borsodi-hills. (Both are made up of upper-Oligocene sandstone) (Fig 5.)

The topographic divide between the two rivers runs on the ridge between the Tarna-Gortva in the basin's central part, and its height relative to the bed of the valley is on average 60-80m, but in some places is significantly lower than this (for more details see the analysis of the drainage network-outline).

Methods

The analyses presented in the article were made based on mapping measurements, supplemented with terrain observations. The basic map was a 1 : 50000 scale topographical map prepared by digitalisation with Autocad 14 software, with 20 metres between altitude lines (in the figures they are less closely spaced to make them easier to study). For constructing the longitudinal profiles of the rivers I used a 1 : 25000 scale topographical map, and the profiles of bed bottom height above sea level of streams over 5 km long were constructed with readings made every 100 metres, similarly with Autocad 14 software.

For the maps of relative relief and the connecting maximums and minimums, the altitude data readings - matching the topographical map's kilometre grid - were made on a 1 x 1 km grid. The maps were prepared with contour line process with the Surfer 7.0 programme.

Examinations

The morphometric examinations covered four areas, which were the following:

- outline characteristics and flow directions of the drainage network,
- analysis of the thalwegs,
- the question of surfaces,
- examination of the relative relief.

1, The drainage network's contour, supplemented by examination of the direction of the valleys, almost immediately provides the supposition that the rivers arriving from Medvesalja, at one time met at Zabar. The valleys in their initial sections unambiguously display this SW centripetal direction, however when leaving the mountains they immediately pour into the SW-NE directional Gortva. This arrangement in itself still does not prove the Gortva’s captures, but if in our imagination we extend the valleys, we find the continuation of the valleys on the Básti-basin side. At present there are either just small streams in these continuations, or they are dry valleys, but they are relatively wide and deep compared with the recent surface forming processes (Fig. 1.). The supposed one-tine valleys, moving from East to West are the following:

- Ickás northern stream - valley under the Mise-mountain,
- Csoma - Utas-stream branch valley (- Utas-stream),
- Nagy-stream (Velky potok) - Bakófalva (Bakov) - Utas-stream branch valley (- Utas-stream),

■ Dobfeneki-stream's initial section - Utas-stream.

This latter is the most interesting, and according to Székely A. (1958) this was the one-time main valley. The path of the Dobfeneki-stream is rather irregular: having its source to the South of Almágy (Bemerky Jablonec), a few hundred metres from a smaller breakthrough of the Gortva, then contrary to the general flow relations of today, advances to the S in a wide valley, then making an enormous bend, turning to the N, empties into the Gorta a few hundred metres north of its source.

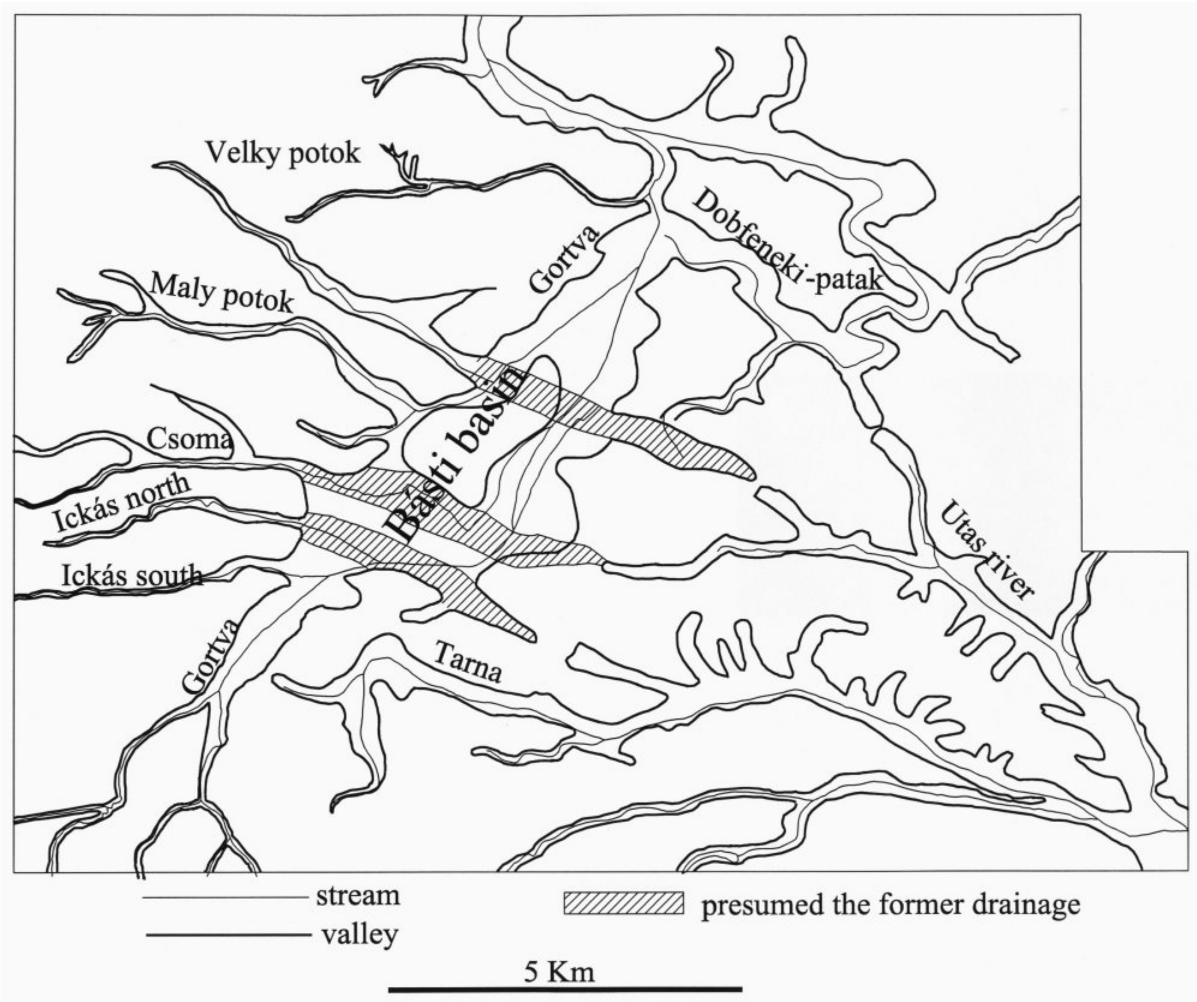

Fig. 1. The drainage system of the Ceredi basin

2. *The subsidence of the Básti-basin* and the change in the drainage network arising from this, is supported by analysing the thalwegs of the larger waterways in the Medvesalja (Fig 2.). It is known that if the erosion basis level falls, then this appears in the form of a *break* at the *thalweg*, which with the passing of time (if we regard the further suppositions as unchanged) flattens out, just as the regression evens out the difference. Naturally there could be other causes of this break (e.g. epigenetic valley development), but in the area examined by us, the petrographical characteristics in the critical area can be regarded as homogenous. Besides the several smaller breaks in the thalwegs of the streams leaving Medvesalja and running in a south-eastern direction, a bigger one can be clearly observed, in every case at 300-320 m above sea level, evidencing well the one-time subsidence of the erosion basis (Básti-basin) level. The Tarna does not fit into this picture, the curve of which starts with a short convex section (which is generally characteristic of the early sections), then continues with an almost straight, uniform slope. (The Tarna is only depicted as far as the Zabar-

hollow!) However, precisely this exception strengthens our supposition, namely that the *Gortva with its many captures, conquered the Tarna sources.* If we compare this break position with the topographical map, we can see that at the change in character of the section, the direction of the river also changes significantly: changing from S-N to W-E. From all this we can conclude that the present main tributary was at one time just an insignificant branch, which became the main branch after the loss of the other more significant source branches. All this is supported by the height conditions: the Tarna approaches the Gortva most closely at the change in direction, the divide ground's relative height is only 4 m. A definite break can similarly be observed in the community of Almágy, on the lower section of the Gortva (which is depicted as far as Ajnácskő). The river leaves the Básti-basin area here, but still remains within the curve of the Ajnácskő-mountains, and its fall increases from 2‰ to 10‰ on a section of a few hundred metres. This also evidences the increase in capture, that is to say, firstly the river just broke through the basalt contour, and later passed into the Básti-basin.

The lengthways section of one of the supposed one-time valleys is shown in Figure 4. We can still find constant water flows at present in the Velky-potok and the Utas-stream valleys, their fall is SE, while a derasional valley with fall in a direction opposite to this, runs towards Bakófalva. If in our imagination we join the initial point of the break in the thalweg with the bottom section of the one-time valley, then the continuity is striking. (Naturally the descent is no longer so "clear" as at one-time, because the erosion still actively deepens the valleys of the source branches at present, while in the deserted valley sections, the process has slowed down strongly because of the termination of additional supplies of water.)

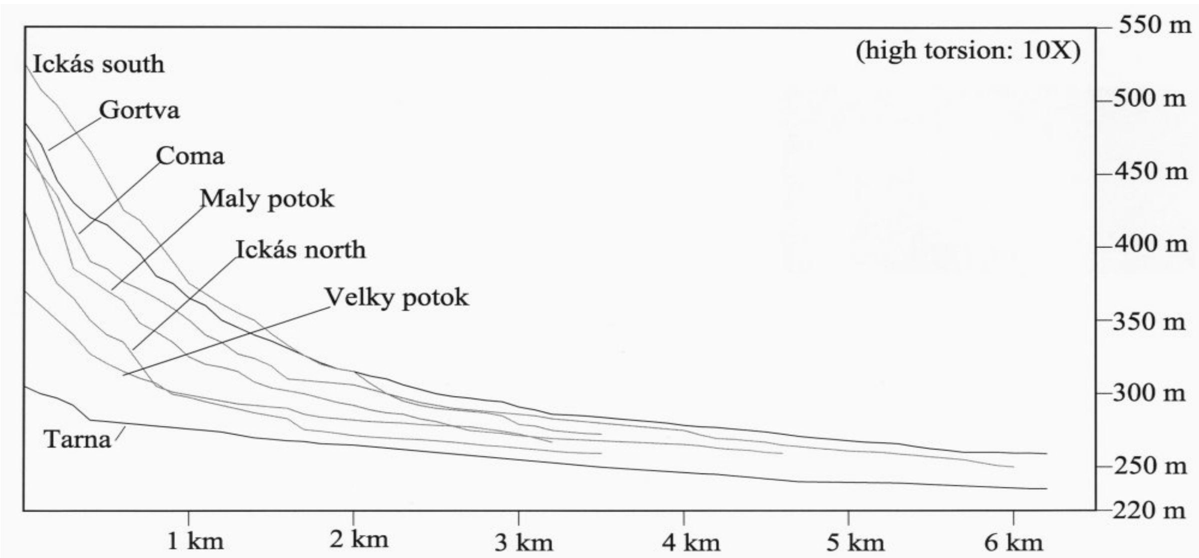

Fig. 2. Thalwegs of the streams of Medvesalja

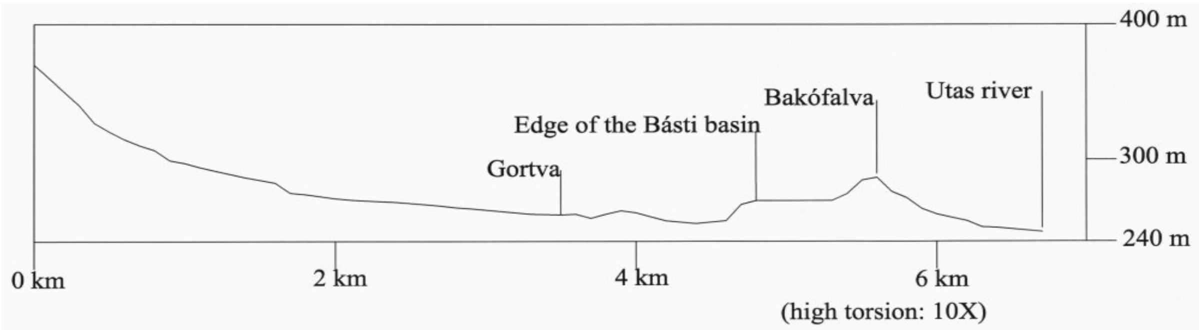

Fig. 3. Longitudinal profile along the Velky potok Bakófalva line

3, At this point the question of *levels* is connected in. The Medvesalja can be divided into 6-7 height levels, among which the most extensive is that between 300-320 m, which is marked by the grey colour on the contoured map (Fig. 4.).
The Básti-basin is surrounded by this extensive *surface 300-320m above sea level,* which although broken up by the outflowing streams, but has remained in wide bands between the valleys. In connection with the thalwegs it can be observed that the start of the above mentioned fault and the last mentioned surface are positioned at generally the same height (the surface is slightly higher). It could already be seen in figure 4. that the Básti-basin slopes rise gently in steps in the NW direction, while it is bounded in the SE direction by steeper steps of 30-40 m relative height (Pic. 1.)

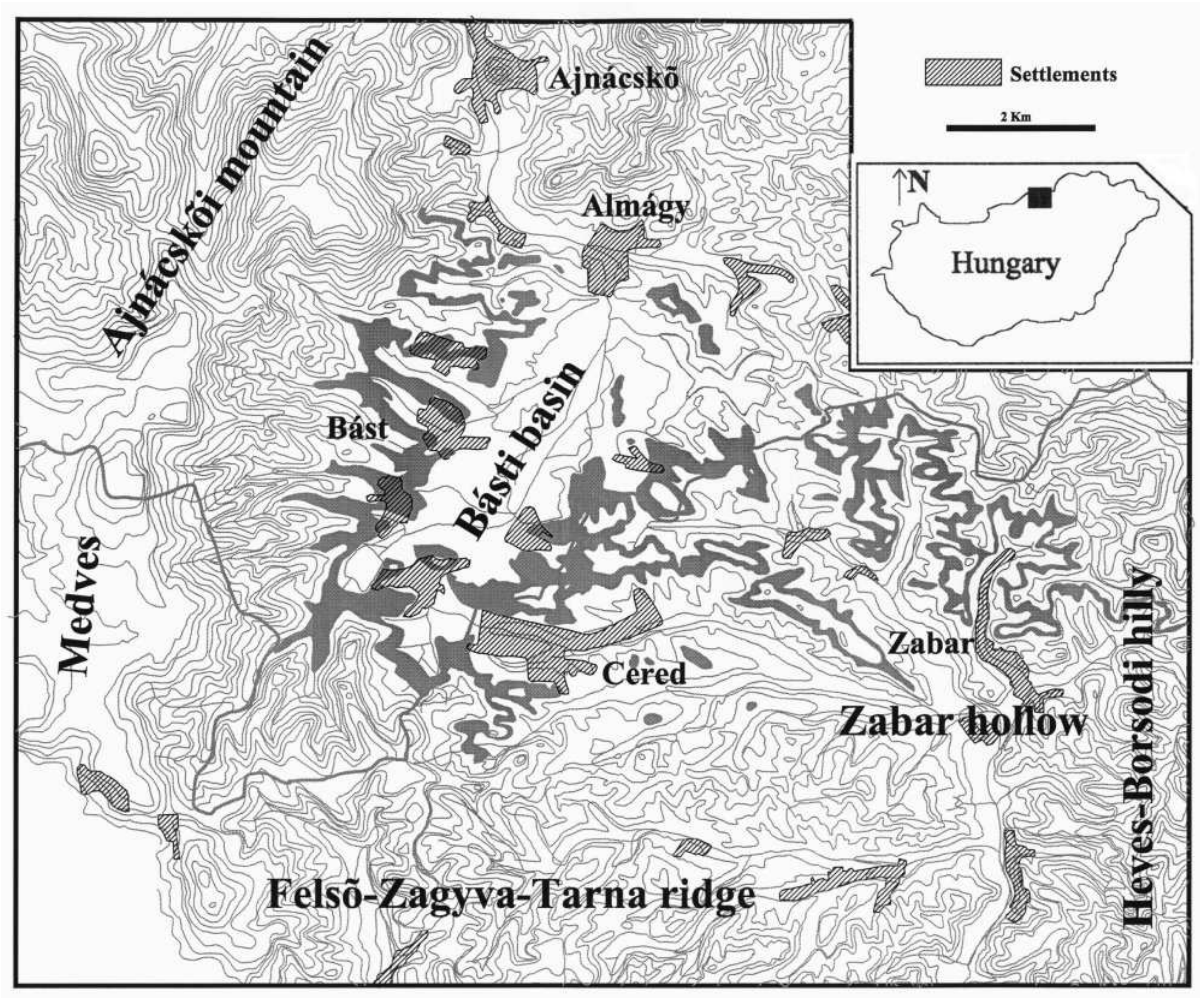

Fig. 4. Topography of the Ceredi basin

Summarising the altitude conditions we obtain the following picture: in the south-eastern foreground of Medvesalja, lies an extensive surface safeguarding the remains of the one-time basin-plane, which slopes down relatively gently into the young subsidence of the Básti-basin. Advancing further to the SE, in the direction of the one-time drainage, the one-time basin-plane can similarly be found on the ridge between the Gortva-Tarna, which breaks off with a steep lip in the north-west direction. The NW side is broken up by derasion valleys, while to the south-east it is characterised by erosion valleys with a slight slope. Larger derasion valleys are only found on the left bank of the Tarna's middle section (of 50-100 m maximum length.

Pic. 1. The steep eastern edge of the Basti basin
(In the background to the north the Básti basin, behind it the Ajnácskő mountain can be seen)

4, Looking at the relative relief map (Fig. 5.) he ambiguous situation is also striking, where its value in the water divide ground area is rather low (80-100 m/km^2), which indicates a low degree of erosion and hardly any dividing up. We find the minimum values along the sides of the two rivers, and the maximum value is obtained at the lips of the Ceredi-basin.

A 30-40 m level difference can be observed between the two low lying areas determining the present drainage directions (Básti-basin, Zabari-hollow) (the Zabari-hollow is the lower). A contour line map was constructed based on the lowest points in 1 km^2 units of area, which is described as a minimum map. (With a similar procedure, the maximum map was also prepared based on the highest points.) On the SE part of the minimum map, a concentric arrangement can be well seen, which in accordance with the recent drainage conditions, points towards Zabar.; and this pattern is continued towards the Básti-basin, although here the strong subsidence disturbed the regular arrangement. (Fig. 6.)

We obtain a different pattern on the maximum map: the ridge between the two low areas almost disappears, and the one-time main direction of slope is outlined even more clearly, which similarly points towards Zabar. The highest sections maintain the one-time surface heights and the younger etchings only divided these up, but the lowering of these is much slower, so the original state could be reconstructed. (Naturally the young subsidence of the Básti-basin is disturbing here also.) (Fig. 7.)

Summation

All the evidence supports the assumption of Székely András, namely the *existence of the one-time uniform valley network running together at Zabar, and then the occurrence of changes in directions of water flows (captures).*In my paper I have attempted to give a review as to how, using for the majority morphometric methods, the suppositions relating to development history of a given area strengthened (or refuted), and what assistance can be provided for quantitative analysis of the relief. Naturally the evidence listed here are not sufficient in themselves, but the many results indicating the same direction, of course supplemented by examinations carried out on site, can strengthen our assumptions.

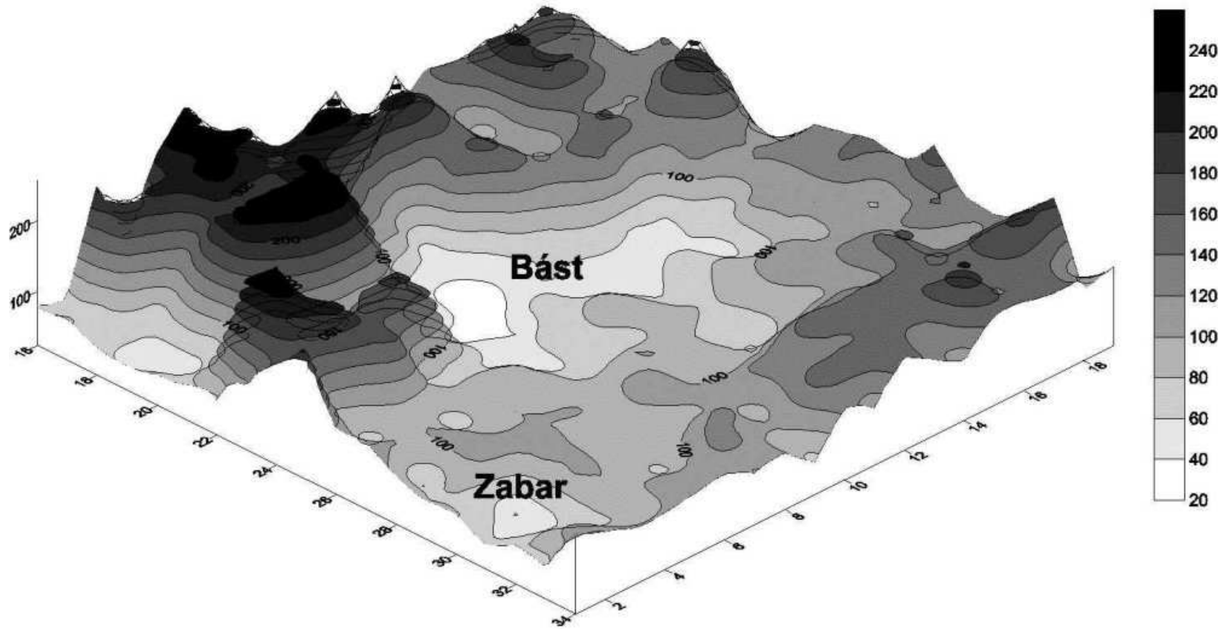

Fig. 5. Relative relief of the Ceredi basin (m/km^2)

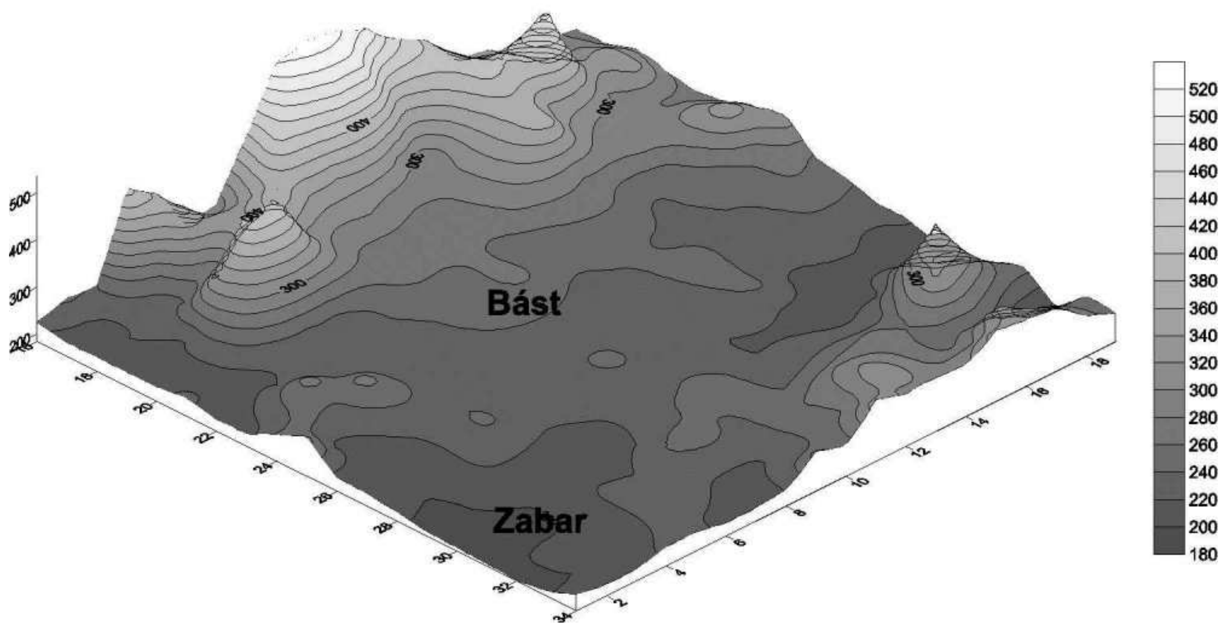

Fig. 6. Minimum map

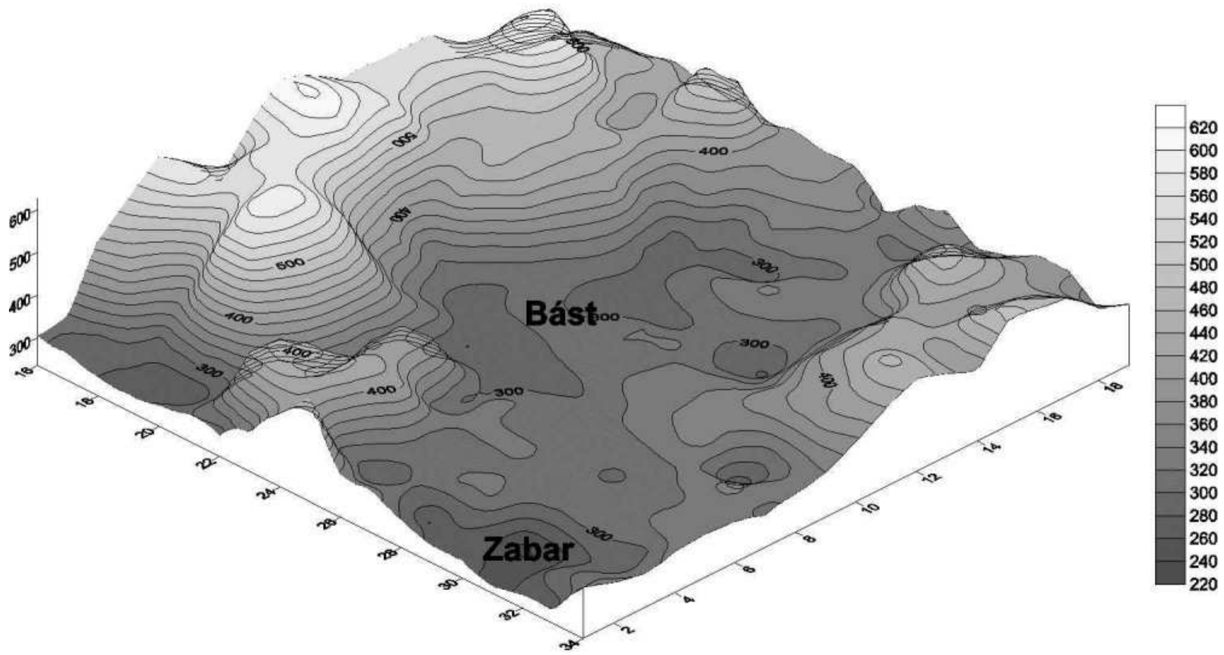

Fig. 7. Maximum map

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