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MORPHOMETRIC ASPECTS OF CÂRCINOV BASIN (CÂNDEŞTI PIEDMONT)

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ABSTRACT. – Morphometric Aspects of Cârcinov Basin (Cândeşti Piedmont). The basin of Cârcinov Valley is situated in Cândeşti Piedmont, being one of the tributaries of Argeş River which ensures the drainage for an area of approximately 202.7 km. The altitude becomes lower and lower from the North of the region (742m) to the South (225m) where it flows into the Argeş River. The most important part of Cârcinov basin is represented by hypsometric values between 400-500 m, namely 28.60% of the analysed area. The analysis of the relief fragmentation provides an important geomorphologic clue regarding the dynamics and distribution of the shaping processes from different time stages, data that will be taken into consideration within the process of sustainable development of the researched area.

The degree of the relief fragmentation, with values included between 0-200m/km^2 is the result of some complex causes and conditions as for instance: the setting of the basic level in general and of the local one, the slope, the neotectonic movements, etc.

The inclination of the sides defines different categories of sides: with small slopes, between 0 and 2 degrees which characterize little inclined grounds in the neighborhood of water meadows and small rivers, with middle slopes between 16-17 degrees which are found on the most important part of the area of Cârcinov Basin and with steep slopes under 27 degrees which are met on the fore sides of the terraces and fields.

The exposure of the sides determines a certain caloric behaviour of the soil with implications on the regime of humidity, geomorphologic processes and, last but not least, on the agricultural utilization and exploitation. The way the network of rivers is organized represents one of the factors that condition the character of the relations between different current morphogenetic processes which are, most of them, subordinated to the drainage down the sides or in hydrographic channels of different size orders.

Keywords: *Cândeşti Piedmont, Cârcinov, slopes, hypsometric values, energy of the relief.*

1. INTRODUCTION

In the existing geographic literature, one cannot cite a work whose object of study is exclusively the natural environment of Cârcinov hydrographic basin. However some references have been made to different problems which appear within this basin. The documentation on the studied sector is based on some works of some specialists well known at national level as well as a series of cartographic materials. Thus, the history of the research is short, the bibliographical list being scanty. Moreover, the available data do not refer exclusively to the researched zone. Nevertheless there are

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some geographers and geologists who dealt closely with wider areas which encompass Cârcinov basin too. The geographic research of Cârcinov Basin represents a work related to a less studied hydrographic basin. The study of the hydrographic basin of Cârcinov River, which we started in 2000 and continued with a huge interest between 2008 and 2012 is a crowning of all the efforts tangentially made by some specialists. It is more valuable due to the fact that this region is rather little studied. Consequently, the analysis of the influence of the physical and geographical factors on the area drainage and water accumulation in the ground water layer will lead to a better understanding of the peculiarities of this territory with a view to taking some right decisions regarding the territorial development and the management of the water resources.

The studied unit, Cârcinov Basin of Cândeşti Piedmont (fig. 1) has an area of 202.75 km^2. This is inclined from the North on a length equal to 37.75 km^2 and a medium width of 6.12km (max.l = 9.25 km and min.l = 3 km). Analysing the topographical charts, we noticed that globally the area of Cândeşti Piedmont inclines from the North to the South. Thus, the maximum height of 744.6 m is found on the Perilor Hill (Valea Mare village, Dâmboviţa County, the place where Valea Mare, a tributary of Cârcinov springs from) and 742 m is the height of Pietrelor Hill (Cândeşti Deal village, Dâmboviţa county, the place where Cârcinov springs from), heights that coincide with the northern limit of the studied unit (fig. 2).

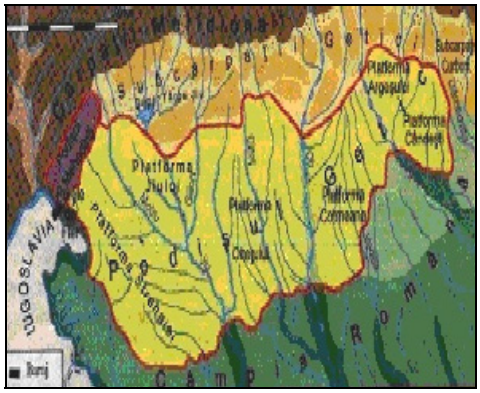

Fig. 1. Cândeşti Piedmont.

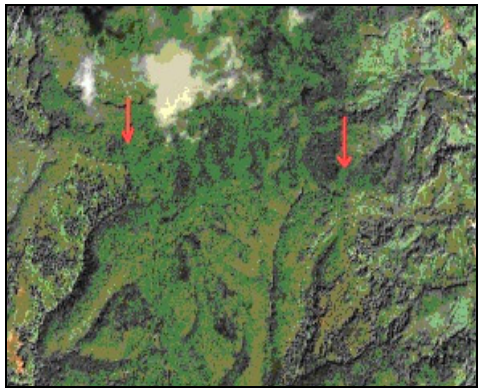

Fig. 2. The Perilor Hill and the Pietrelor Hill.

Among the rivers that spring and enlarge within the boundaries of Cândeşti Piedmont, Cârcinov is the most important both for its length and for the area of its hydrographic basin. Starting from Beleţi to the North, Cârcinov Valley bifurcates, both its branches having the same name, Cârcinov. Due to this fact, the necessity of a specific name for each valley was felt. Thus, the branch that springs from under the Stones Hill and flows through the east side of Cândeştii de Deal and then through Boţeşti and Dobreşti was named the Eastern Cârcinov and the branch that has its origin under the Dealul Corbului (599 m) and flows through Negreşti was named the Western Cârcinov. The Eastern Cârcinov is the most important branch in terms of length and area. It springs from the northern extremity of Cândeşti Piedmont, more exactly from the point named Dealul Pietrelor (742 m) and its tributary on the right, Valea Mare, has its origin under Dealul Perilor (744 m), the highest point of the region. The

unit in which Cârcinov Valley is encompassed is not only a morphologic element or a morphohydrographic corridor but it also offers to the interested one a complex landscape with intense morphodynamics. After the research done so far we discovered that Cârcinov stream developed on a friable, predominantly sandy geologic bedrock.

The minimum elevation of 225 m is found in the zone where Cârcinov Valley intersects with Argeş water meadow (on the watershed on the right of the mentioned stream) (fig. 3).

This difference of level of almost 520 m is the result of the positive movements more and more noticeable towards the foot of the mountain that took place in the region during the Quaternary. But the analysis of the elevation also reveals that the area of Cândeşti Piedmont inclines in the northern zone from East to West with almost 40 m, whereas in the southern zone it is inversely inclined, from West to East, with almost 180 m. These differences of levels are also the result of the vertical tectonic movements during the Quaternary.

Fig. 3. The confluence of Cârcinov with the Argeş.

Cârcinov stream evolved on a friable predominantly sandy geologic bedrock. The valley has specific climatic conditions imposed by the channeling of the air masses among it, by a various layer of soils and by a vegetation made of a mixture of species specific to the steppe as well as to the forest of zonal type and of those specific to the water meadows. Cârcinov Valley shows, from the economic and geographic point of view, some features that differentiate it from the whole Cândeşti Piedmont: advanced settlements, widely used ways of communication, diversified agriculture due to the various landforms and soils. From this blending of the natural and anthropogenic elements there appeared a geographic complex or landscape whose analysis should emphasise, first of all, the connections that exists among its components. This main purpose is the one which subordinates the necessity of finding the elements that differentiate it from the valleys and the dividions from the East or from the hills in the western side of Argeş County, units by which Cârcinov Valley is flanked.

The northern zone, where Boţeşti is situated too, is the most suitable for such an analysis. It interweaves the morphostructural elements specific to the entire basin. At the same time, it is individualized by its lithology and by the monoclinal structure of the Pliocene flanked sands in the North and by the Quaternary gravels in the South.

A similar differentiation can be noticed from the pedological, biogeographical and climatic point of view. To the North of the village Boţeşti, within Cândeşti Plateau, the forest grown on grey soils prevails and to the South of the city of Topoloveni the steppe influences are very strong, a fact which can be easily deduced from the medium multiannual amount of precipitation that in Piteşti and Topoloveni is below 500 mm. Thus the middle zone of Cârcinov Valley remains a zone of transition of forest steppe type.

The presentation and interpretation of the morphometric data are important for the rural and urban development of the researched area, allowing the practicians to achieve the sustainable development and planning of the analysed territory, foreseeing ad avoiding certain geomorphologic hazards and risks.

The multi-stage layout from North to South of the relief of Cârcinov Valley is shown on the hypsometric map where we notice six classes of hypsometric values included among the extreme altitudes of this area (200 m and above 700 m).

The village of Boţeşti is situated in Cândeşti Piedmont, the eastern subdivision of the Getic Plateau. The maximum altimetric elevation from this unit is 557 m and the minimum one 380 m in the Eastern Cârcinov water meadow. The level difference of 177 m for this area sustained by the prevailingly friable petrography explains the high erosion potential and the dynamics of the landslide processes.

2. MATERIALS AND METHODS

In the present study we used the topographic maps 1:50000, 1983 version, which offered the detailed representation of some morphometric parameters. On this ground the hypsometric map, the slopes map, the sides exposure map and the fragmentation depth map were achieved, maps that we considered sufficient for the hypsometric characterization of the researched basin.

3. RESULTS AND DISCUSSIONS

While elaborating the hypsometric chart of Cârcinov Valley starting from the topographic chart 1:50000, I noticed that the specific hypsometric curves are those of 700 m, 600 m, 500 m, 400 m, 300 m. The curve of 700 m is situated in the northern part of the unit, including a small area of 0,85 km^2 which represents 1%.

The 600m curve is situated nearby the 700 m curve advancing and drawing back along the water threads/streams and encompasses a area of 14.5 km^2, namely 7.4%.

The 500m curve includes a area of 44 km^2, namely 18.25%.

The 400m curve includes a area of 66.5 km^2, namely 28.60%.

The 300m curve includes a area of 56.7 km^2, namely 27.12%.

The rest of 30.20 km^2, namely 17.26% is situated under 300 m.

The most important part of Cârcinov basin is represented by the hypsometric values between 400-500 m, namely 28.60% from the analysed area which coincides with the biggest part of the hilly relief, followed by the values between 300 m and 400 m (27.12%), specific to the central-south part. Within the water meadow area the most important is the value of 200-300 m (approximately 17.26%) from the area of the basin (fig. 4).

By calculating the density of the relief fragmentation and from the analysis of the spatial distribution of its values we obtain the morphogenetic features regarding the evolution of the hydrographic network and of the intensity of the linear erosion

processes in interrelation with the lithological and biopedoclimatic conditions existing at the local level. The density of the relief fragmentation for Cârcinov Basin has values between 0.1km/km^2, the highest values of the relief fragmentation density 3.1-4 km/kmp insularly appear in the analysed perimeter (their area is 8 km^2, respectively 4% from the basin's area). In the northern part the fragmentation density is between 1.1 and 3 km/kmp, a fact that is explained by a big confluence relation which in its turn is justified by the relief's energy going up (att the contact with the morphostructural units) and by the presence of the friable rocks.

The first sector mostly laps over the south part of the unit and the rest is represented all over the unit in proportion of 23.74%, namely 49.5 km^2.

The second sector is met on the whole area predominating in the central north part in proportion of 37%, namely 76.5 km^2.

The third sector predominates in the central part. It represents 35%, namely 68.7 km^2.

The fourth sector is weakly represented within the unit and it represents 4%, namely 8 km^2 (fig. 5).

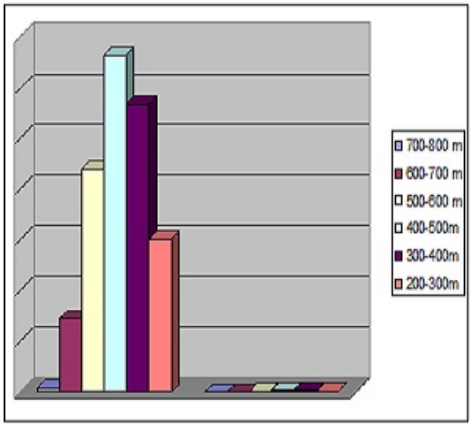

Fig. 4. The hypsometric values diagram.

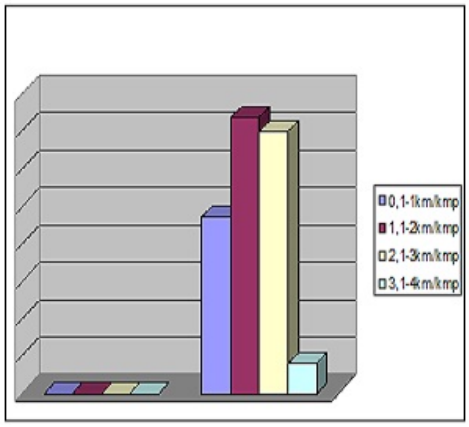

Fig. 5. The relief fragmentation density diagram.

The analysis of the relief fragmentation density offers us an important geomorphologic clue regarding the dynamic and repartition of the shaping processes from different periods, data which will be considered in the process of sustainable systematisation and development of the researched zone. The depth of the relief fragmentation shows the depth to which the vertical erosion reached, sustained by the lithological-structural conditions, being conditioned by the general or local erosion. This geomorphologic element plays a significant role in the process of rural and urban systematisation and planning because, depending on the degree of relief depression, some types of engineering work will be carried out. For example, the evaluation of the ground in order to build roads, and of the characteristic elements: cuts, fills and their cutting slopes (suitable for drippings, gappings and landslides) will accordingly to the values of the relief energy in the area that was chosen for development.

The map of the relief energy (fragmentation) emphasises the degree of depression of the Cârcinov Valley from which we can deduce its way of evolution (the intensity of erosion, the valley adaptation to the structure, the behaviour of the rocks in relation with the fluvial erosion, etc). In the village of Boţeşti the depth of the relief fragmentation records values between 51 m (Grecilor Valley and the Eastern Cârcinov) and 150 m (insularly on the two streams).

Although the lithological conditions are the same, the action of deepening of the valleys took place according to a series of causes. We notice four characteristics of the zone: a greater depth of the fragmentation to the north of the 700 m curve with values of 180-200 m/km^2 and with values of 180 m/km^2 to the south of the 600 m curve which represents 4 km^2, namely 2% of the territory.

a) a smaller depth of the fragmentation than the first is met along the main arteries all over the area, with values between 101-150 m/km^2 representing 13 km^2, namely 6.9% of the territory.

b) the widest area in the zone is characterized by a relief energy with values between 51 and 100 m/km^2, representing 67 % of the territory.

c) a depth of fragmentation between 0-50 m/km^2 representing 27.75 km^2, namely 23.18%.

In conclusion one can maintain that the degree of the relief fragmentation is high enough with values between 0-200 m/km^2 and it is the result of some complex causes and conditions among which: the setting of the general basic level and of the local one, the slope, the neotectonic movements, etc. (fig. 6).

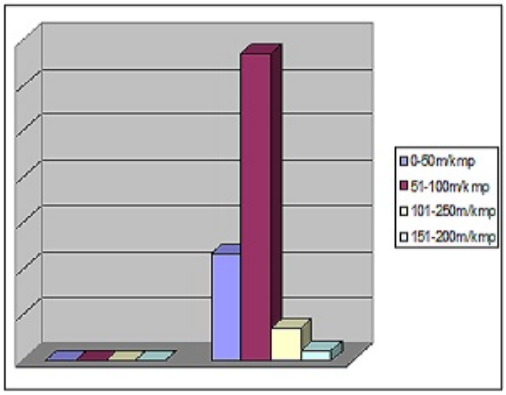

Fig. 6. Relief fragmentation diagram.

Analysing the slopes map one notices a differentiation between the values of declivity in the valley sector of the researched area and those recorded in the adjacent sectors, the hills and the hillocks in the plateau unit.

For the map of the slopes we calculated the slope angles and found that their value reaches 27 degrees. But this slope is not uniform. For the researched zone I noticed, after analysing the map of the slopes, that the value of the slope angles is high enough on the front side of the terraces and fields and lower at the level of the watersheds and water meadows. Within this unit we distinguished eleven categories of slopes which influence in different ways, from a space to another, the processes of relief shaping.

The high values of inclination of the sides represent a premise for the starting of the gravitational processes among which the most active ones are the landslides. Beside these, washings and linear erosion under various forms (dripping, gapping, torrents) are also frequent.

Landslides are phenomena that were remarked along Cârcinov Valley as far back as the first part of our century. Among these we can mention in mod those on the sides of the Potop Valley and of the Eastern Cârcinov. According to the intensity and the resulting forms the landslides of the sides of Cârcinov Valley and of the tributary valleys are phenomena that involve the shifting strata to a great depth. In the receiving basins of the torrents and on the fore side of the sides we meet superficial landslides affecting the reduced areas (Fig. 7).

Fig. 7. Landslides – Boțești village.

4. CONCLUSIONS

The morphometric parameters have a special importance in evaluating the general morphology of a region but also in evaluating the morphogenetic potential of a certain region. In our case the analysis of the morphometric parameters shows a decrease of the morphogenetic potential in the upper basin of Cârcinov towards the lower basin, a fact that is illustrated by the frequency and intensity of the current geomorphologic processes from the middle and upper basin.

The inclination of the sides strongly contrasts with the even appearance of the watersheds and with the flat one of the valley bottom. The variety of the landforms in the case of the valleys, the origin, the intensity of movements and their amplitude, the energy of the relief, the age and the variety of the absolute altitude of the piedmont back sides lead us to distinguish three geomorphologic regions within Cândești Piedmont: the northern zone with a lot of structural forms, the central and south-western zone with landslides, alluvial cones and few terraces and the south-eastern zone characterized by the development of the terraces and by the reduction of the slope processes.

The anthropogenic activity which affects mainly the water meadows as well as the watersheds and the sides generated a series of microforms of a great variety represented by lakes, gravel plants, holes, ditches, roads, etc. The sand and gravel banks are exploited in the minor bed of Cârcinov, the clay is used for bricks and terracotta production and the artesian waters from Priboieni village are used for irrigation and in households.

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