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THE RIVER BASIN OF IARA, CONSIDERATIONS ON THE ENERGY AND HORIZONTAL FRAGMENTATION OF THE LANDFORMS

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ABSTRACT: *Geographic information systems allow mapping and various and complex analyses of geographic components. The quantitative and qualitative results of depth and density analysis of fragmentation find their use in a wide range of areas, from road and rail systems building, to forest and land developments.*

Key words: *Iara Basin; energy; fragmentation; density of drainage; Landform energy;*

Introduction

This study presents the results of the analysis of two very important morphometric indicators, specific to the quantitative geomorphology. Quantitative data obtained can be used in qualitative and hydrological geomorphological studies on the spatio-temporal evolution of leakage parameters.

The area for which this analysis of the density of fragmentation and landform energy is carried out overlaps the basin of the Iara valley, a tributary of Aries to the left side.

According to Horton-Strahler classification, this basin has the V order and it is situated on the eastern flank of the Gilău-Muntele Mare Mountain (Figure 1).

The geological composition of the area is

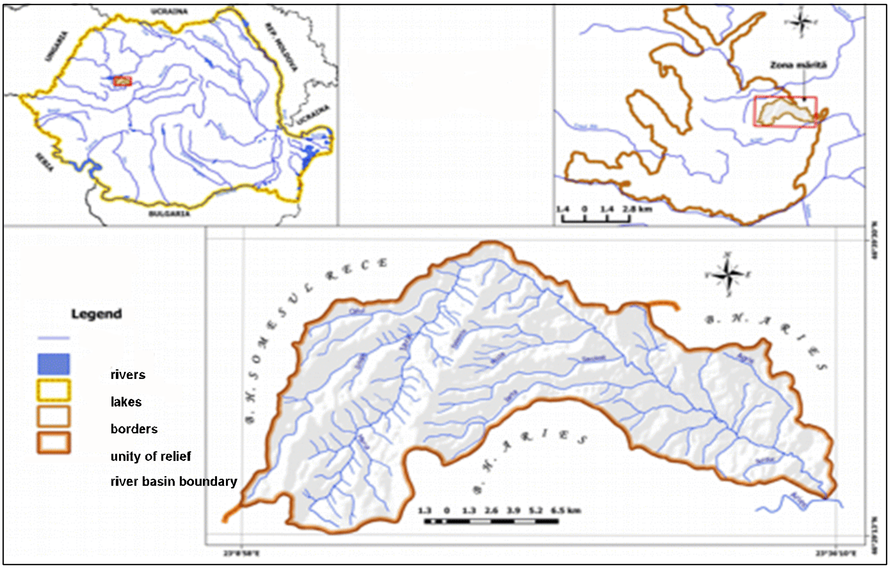

Fig. 1. Geographical position

due to the predominance of the hard rocks (granite, andesites, amphibolites, subshrubs, paragnaises, micashistes) characteristic of the Great Mountain area and less of soft rocks (conglomerates, clays, etc.) which characterizes the Iara Depression (Figure 2).

In fact, as we will highlight in this study, the petrography of the area is the decisive factor in the spatial evolution of the density and energy of fragmentation.

The altitudinal range of the hydrographic basin falls in values that oscillate between 1825.8m (Mount Mare) and approx. 350-400 m in the area of the Iara Depression.

As it can be seen from the hypsometric map, more than two thirds of the basin surface overlaps over the mountainous area, a fact that is particularly important in spatial and temporal evolution of different geomorphological, hydrological or bio-pedo-climatic processes (Fig.3).

Problem Description

The density of the horizontal fragmentation of the landform (Grigore, 1979, Ungureanu, 1989) or the drainage density is the ratio of the hydrographic / drainage network length to the surface unit (generally km²), expressing the degree of horizontal fragmentation of the landform; and the landform energy highlights the relationship between the geological composition, the basic local level, on the one hand, and the degree of deepening / erosion of the hydrographic network, on the other hand.

The lithological, tectonic and long-lasting development have underpinned the present aspect of the landform, imposing special morphological, hypsometric features, which in turn represent the support of the drainage network organization.

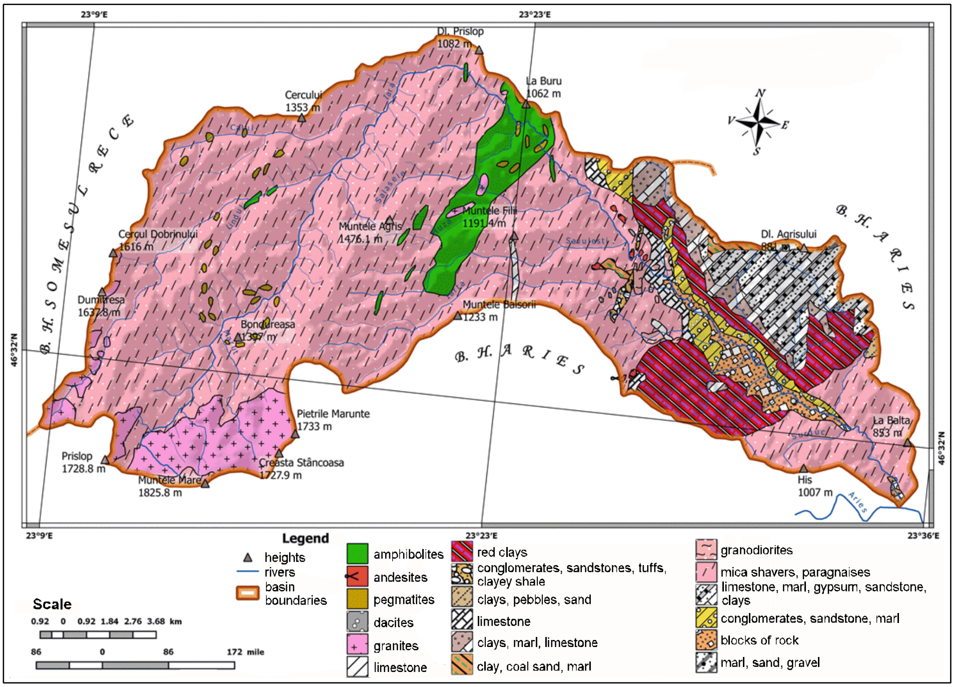

Fig. 2. Geological map

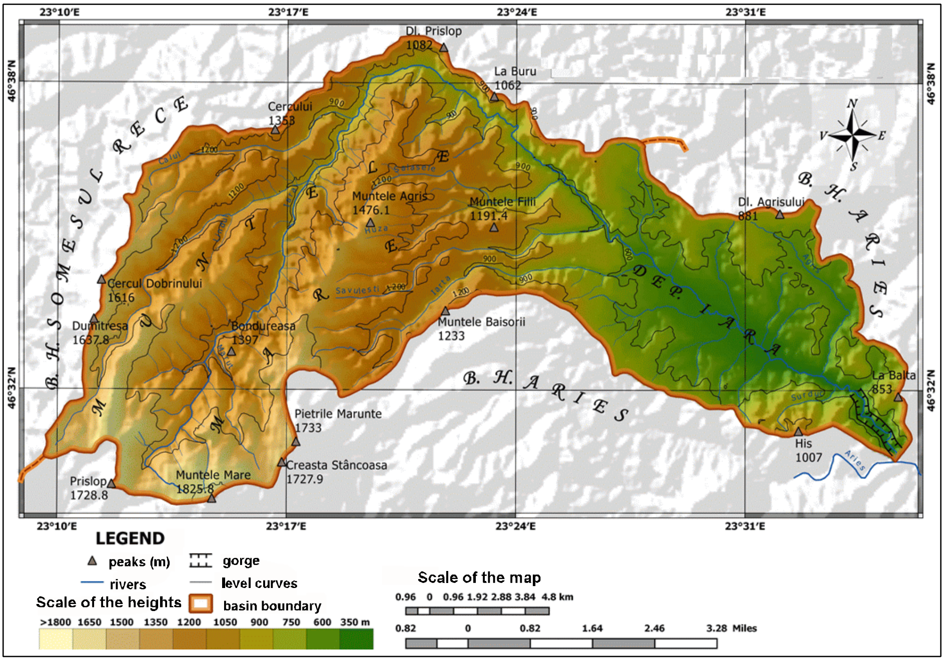

Fig. 3. Hypsographic an hypsometric map

Obtained results

A) Density of drainage

The morphometric studies of river basins differentiate this parameter as follows: drainage density and hydrographic network density. The first quantitative parameter refers to the totality of permanent and temporary watercourses, and the second refers only to the segments of permanent watercourses. In order to obtain the quantitative information necessary to determine the quantitative values of the hydrographic network density (length / number of segments) it is necessary to vector all the permanent segments of the hydrographic network using large and very large scale maps, and for the determination of the drainage density values, it is necessary to map out on the field all organized drainage systems starting from the smallest (gullies, holes) and to the torrential ones.

This parameter specific to the quantitative geomorphology reveals the degree of fragmentation of the relief imposed by the lithological, tectonic substrate, the variety of landforms and the types of specific geomorphological processes. For the Iara hydrographic basin, we record morphologically and lithologically the existence of some areas specific to the mountainous area with a massive young massif with deep, young valleys and high density at altitudes between 1200 m and 1600 m where the density values oscillate between 1 , 5 km / km2 and over 2.5 km / km2 (Figure 4).

Within these perimeters, the hydrographic network achieves both strong fragmentation and strong vertical erosion imposed by the low local base level determined by the relatively low altitude of the Iara Depression.

At altitudes above 1600 m, the low density values (<1.0 km / km2) are specific to the higher leveling platform Fârcaş-Cârligata, at the bottom of which Iara and its tributaries have their sources. The area of the Iara Depression records on a large part of its surface, low densities of the

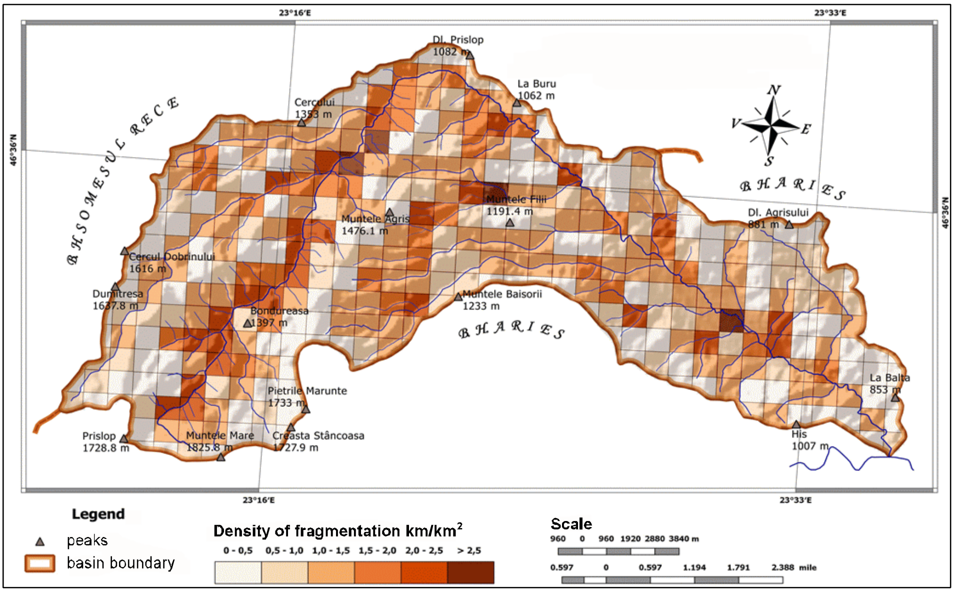

Fig. 4. Density map

permanent hydrographic network, with values ranging from 0.5 km / km2 to 1 km / km2. On the other hand, one can notice a high-density area of over 2 km / km2, which represents a real "water gathering market" corresponding to the confluence zone of the Iara valley with the tributaries Almăşeni, Capra, Făget, Agriş, Cacova etc., a grafted area almost central to the Iara Depression.

The percent density values are shown in FIG. no. 4. Thus we find a predominance of high density areas of between 1.0 and 2.0 km / km2. These geographic areas, where these high values of the parameter are recorded, account for 47% of the total river basin.

In fact, the analysis of the 1:25 000 topographical map highlights that an intense fragmentation of the territory is directly proportional to the density of the river segments. From a morphometric point of view, there has been ascertained a close connection between the density of the hydrographic network and the frequency of the water courses on a certain territory, the physical-geographic characteristics.

For the Iara river basin, the physico-geographic conditions imposed by the lithology of Muntele Mare Massif (Massif granite, Granodiorites, subshrubs, Paragnaises) and the soft deposits of the Iara Depression, determined a variation in the values of water courses frequency. Thus, the mountainous area has specific high values, while the depression corresponds to low values. In brief, the use of this geomorphological parameter helps to express the degree of dissection in the horizontal plane of the morphological surfaces within a territory, as a result of the modeling of the landform and its partitioning by the action of the exogenous factors.

B) Landform energy

The result of the investigation of this parameter is the landforms energy map (Figure 5). In this way we obtain valuable quantitative data showing the peculiarities of the deformation, in close correlation with the intensity of current geodynamic processes, with visible effects in the degree of evolution of the landforms.

For the water catchment area of the Iara valley, there has been found the existence of values ranging from 30 to over 500 m / km2.

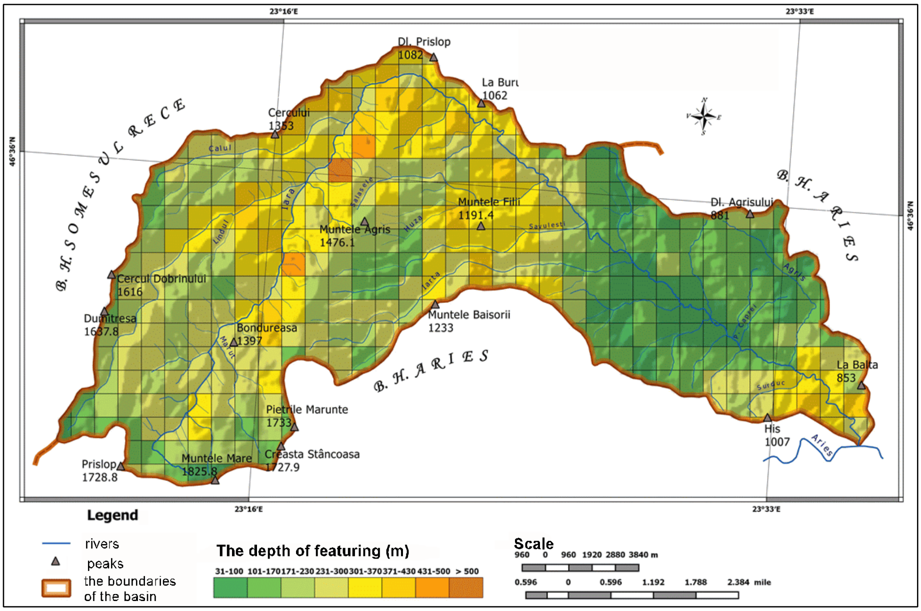

Fig. 5. Energy map

These values are determined by the geological composition of the Muntele-Mare Massif and the contact area with the Colinar Depression of Transylvania, which includes the Iara Depression.

Thus, in the mountainous area, one can notice the predominance of the low and medium values, specific to the Măguri-Mărişel erosion platform, where the erosion speed is slowed by the hardness of the geological substratum made of granite, granodiorite, subshrubs, paragneisses etc.

Also, values below 100 m / km2 predominate in the Iara Depression, where the substratum is predominantly made up of the soft structures specific to the Plateau of Transylvania. The maximum values of 350-450 m / km2 are recorded in the middle of the basin, , where the local base level specific to the depression zone imposed an erosion and thus a strong deepening of the river so that the minor bed is located opposite the main interfluvial peak, at altitudes of 800-900 m; this peak separates Valea Ierii from the tributaries that have their springs on the eastern slope of the Great Mountain. At the same time in the confluence area with Arieşul, the values of the parameter are large because the Iara river has grafted its bed over a narrow area where a crystalline massif emerges and stands out through great energy and geodesy and for this reason Iara created an impressive gorge (figure 6).

In percentage terms, most over 60% values are specific to areas/fragments with depth of fragmentation exceeding values of 100 to 200 meters. Thus, more than 75% of the water catchment area is very fragmented (Figure 7), because it overlaps the mountain ridge of the eastern area of the Gilău-Muntele Mare Mountains. The lowest values of fragmentation depth are found in the area of the Iara Depression, where the soft rocks did not impose such great energy.

The second area with reduced landform energy is found on the interfluvial peak separating the upper course of the Iara Valley from the area of the sources of the tributaries on the left (Huza, Săvuleşti, Iarta etc.), where the Magi-Mărişel leveling surface occupies an appreciable extent , and the predominance of granites and granodiorites imposed a massive, heavy aspect.

Fig. 6. Valea Ierii gorge

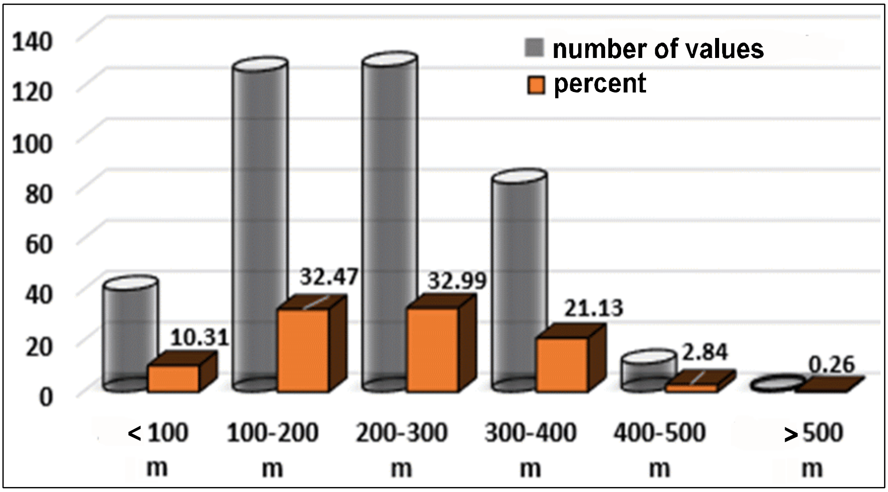

Fig. 7. Percentage of fragmentation

Conclusions

This study is a short study of applied geomorphology which aims to present aspects of hypsometry determined by GIS technology. The quantitative analysis of the horizontal and vertical fragmentation of the landforms, the practical issues addressed, hopefully will make this work a practical tool and a database of real use for the local and regional authorities in order to achieve a sustainable arrangement of this geographical space, by taking concrete and effective measures.

In fact, the water catchment area of the Iara valley is of great importance from the tourist point of view due to the climatic resort and the numerous hostels located in the proximity of Cluj-Napoca, which can lead the local authorities to modernize the road and public infrastructure so that along with the physical-geographic features of mountain and depression area, it should become a true oasis of relaxation, whether in the hibernation or the summer season.

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