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# CONSIDERATIONS REGARDING THE NUMBER OF TERRACES IN THE AREA OF *SARMIZEGETUSA REGIA*

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**Abstract:** In the archaeological literature it has often been emphasized that the area of *Sarmizegetusa Regia* was the most densely populated in the whole of pre-Roman Dacia. Since the earliest archaeological investigations undertaken in the Orăştie Mountains, numerous anthropogenic terraces, most of them dating from antiquity, have been observed, but only in recent years it has become possible to start recording them accurately.

The present article analyzes LiDAR data in order to obtain a more accurate picture of the number of terraces laid out in Dacian antiquity, primarily at Grădiştea de Munte – *Sarmizegetusa Regia*, but also in its vicinity, up to Costeşti – Cetăţuie, including the massifs delimited by the tributaries of the Grădişte Valley.

At the same time, the main natural and anthropogenic factors that have affected both the number and the surface areas of the terraces from antiquity to the present day are reviewed.

**Keywords:** *Sarmizegetusa Regia*, Dacian fortresses, terraces, LiDAR, topography.

## A UNIQUE ARCHAEOLOGICAL LANDSCAPE

When arguing that the road leading to the ruins of the Costeşti – Blidaru fortress was dating from antiquity, D. M. Teodorescu remarked that “on it [the Blidaru hill] you stumble upon ancient remains at every step”.<sup>1</sup> We believe that this phrase could actually be considered a *motto* for the entire area of the capital of the Dacian kingdom, Grădiştea de Munte – *Sarmizegetusa Regia*.

The presence of numerous Dacian, but also Roman vestiges in the “Hunedoara Mountains” was noted by the professor from Cluj right from the first field surveys he organized in 1921. The observations he made in the field, together with the information he identified (especially with the help of his assistant Alexandru Ferenczi) in various sources from the 19<sup>th</sup> and the beginning of the 20<sup>th</sup> century, led D. M. Teodorescu to identify three main groups of settlements and fortifications in this area: I. the Costeşti group; II. the Grădiştea Muncelului group; III. the Luncani group.<sup>2</sup>

In the following decades, the systematic archaeological research, but also the investigations such as trial trenching and archaeological topography studies have constantly enriched the repertory of discoveries in the Orăştie Mountains, the general picture being eloquently summarized by Ioan Glodariu in the late ‘80s: “nowhere else in the ancient Dacian lands

<sup>1</sup> TEODORESCU 1923, 10.

<sup>2</sup> TEODORESCU 1923, 7.

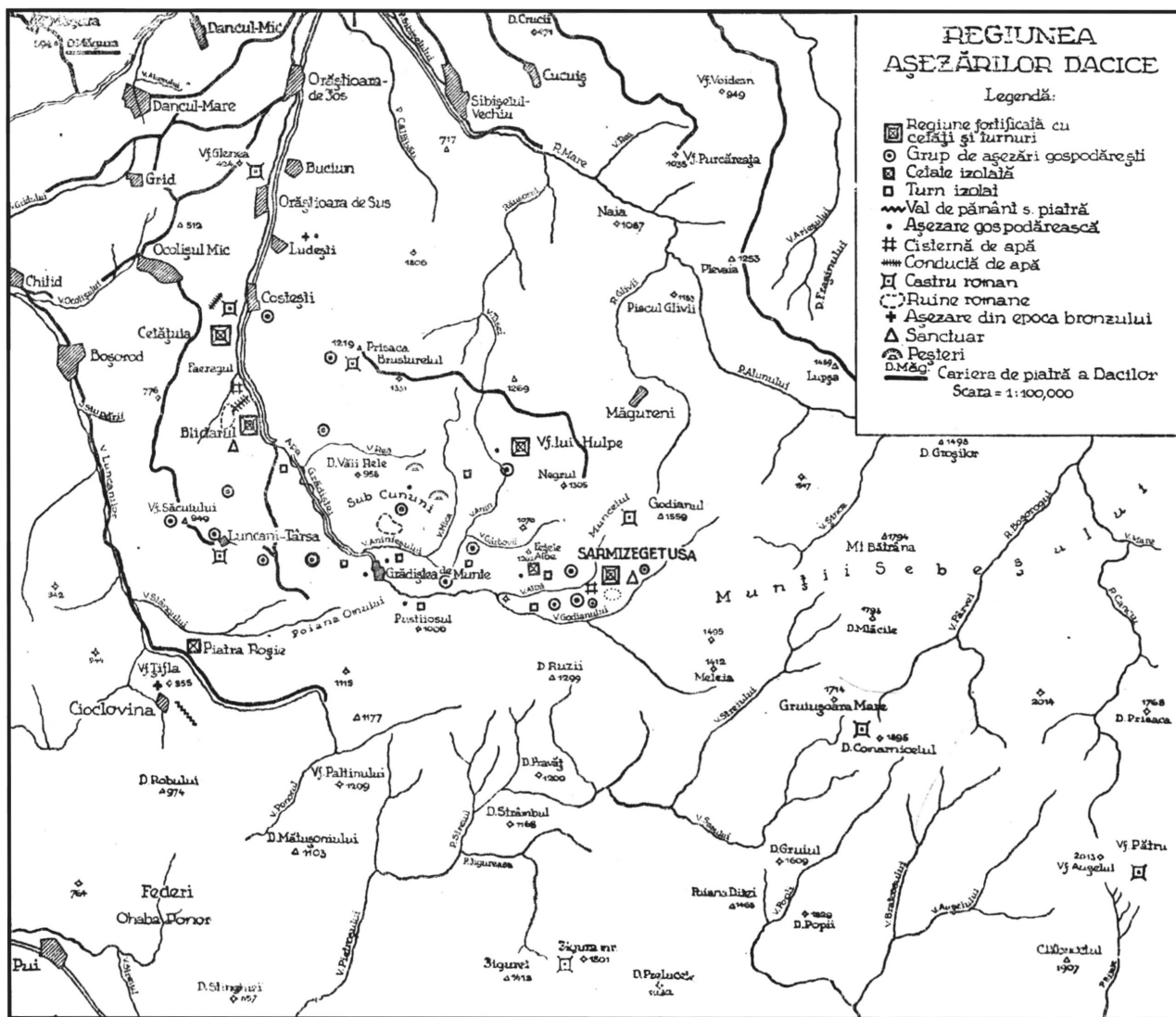


Fig. 1. Settlements and fortresses in the Orăștie Mountains (after DAICOVICIU 1964).

is there such a concentration of so many and important monuments”.<sup>3</sup> Gradually, the toponyms used by the locals for the various mountainous or quasi-mountainous places became well-known in the archaeological literature because, in the absence of the ancient names, the specialists adopted them to indicate concentrations of terraces and ancient vestiges, interpreted as Dacian settlements (Fețele Albe, Gerosul, Pustăiosu, Sub Cununi, Fața Cetei, Rudele, Meleia and so on), the case being the same for the locations where traces of ancient habitation of lesser extent have been found (Dosul Brăiței, Cioaca lui Alexandru, Terasa Hârban etc.).

The repertory of antiquities for the area in question was realized, for the most part, in two main stages. The process consisted of both the identification of new sites with vestiges and the “inventorying” of terraces within already known settlements, while in other cases, information from the 19<sup>th</sup> century was verified in the field through test trenching. The first stage consisted of multiple surveys and trenching during 1943–1944, the results of which were published in 1951, in the first chapter (“Studiul topografic al așezărilor”/“The topographic study of settlements”) of the work signed by

<sup>3</sup> GLODARIU/IAROSLAVSCHI/RUSU 1988, 5.

Constantin Daicoviciu and Alexandru Ferenczi.<sup>4</sup> The second phase lasted from 1953 until 1965,<sup>5</sup> most of the vestiges having come to light in the period between 1956 and 1960.<sup>6</sup> The results were initially included in archaeological research reports,<sup>7</sup> being published later in a series of articles and books (Fig. 1).<sup>8</sup>

**THE NUMBER OF TERRACES**

During the previously described endeavors, some essential aspects of the ancient Dacian habitation in the Orăștie

<sup>4</sup> DAICOVICIU/FERENCZI 1951, 5–66.  
<sup>5</sup> At Grădiștea de Munte – *Sarmizegetusa Regia*, the identification of the terraces distributed along the entire hill began in 1950; the same type of surveying was done concomitantly at Fețele Albe – DAICOVICIU *et alii* 1951, 121–124; DAICOVICIU *et alii* 1952, 303–306; DAICOVICIU *et alii* 1953, 180–187; DAICOVICIU *et alii* 1954, 151–152.  
<sup>6</sup> DAICOVICIU 1964, 111.  
<sup>7</sup> DAICOVICIU *et alii* 1953, 187–190; DAICOVICIU *et alii* 1954, 152–154; GOSTAR/DAICOVICIU 1959, 380–385; DAICOVICIU *et alii* 1959, 349–350; DAICOVICIU 1960, 315–317; DAICOVICIU *et alii* 1962, 473–475; DAICOVICIU 1973, 81–85.  
<sup>8</sup> DAICOVICIU 1964, 111–123; GLODARIU/IAROSLAVSCHI/RUSU 1988, 44–173; DAICOVICIU/FERENCZI/GLODARIU 1989, 174–223.

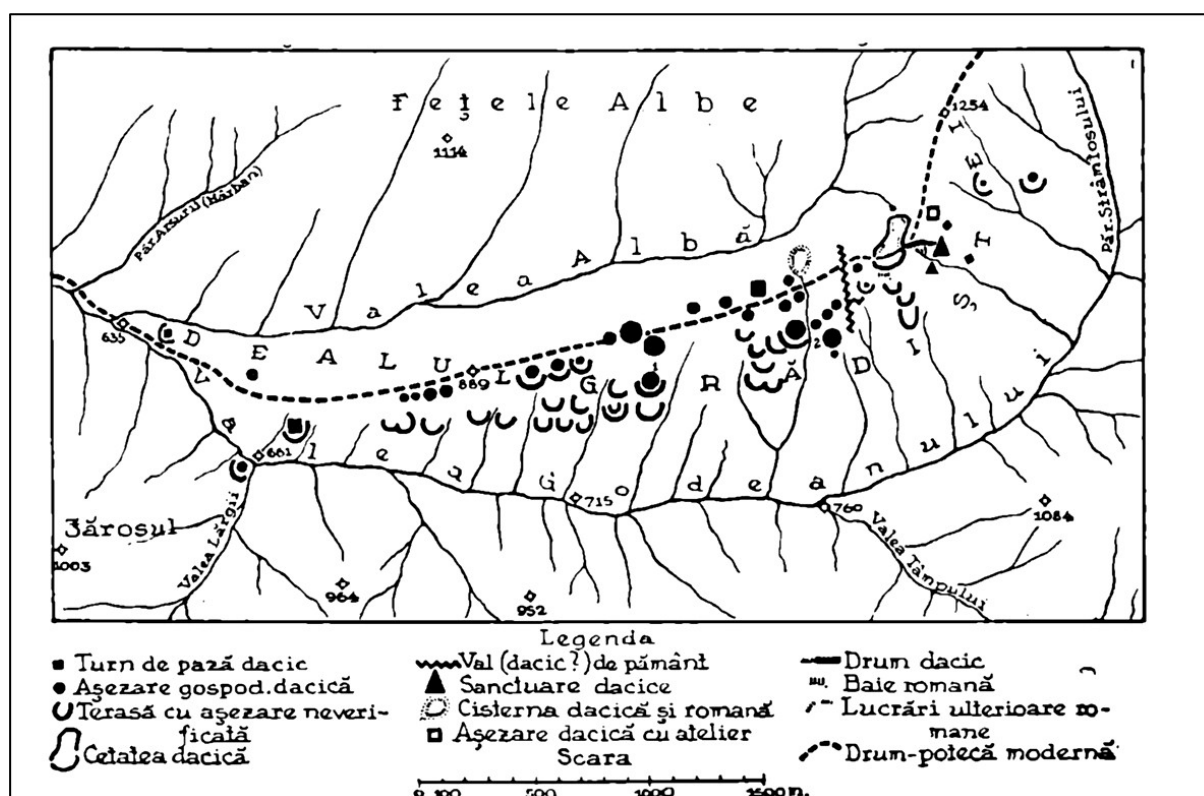


Fig. 2. "Sketch of the settlements on the Grădiște Hill" (after DAICOVICIU *et alii* 1951).

Mountains were beginning to emerge. In the following paragraphs we will mention only those relevant in the context of the present work, the particularities of the settlement in the region being, of course, much more numerous.

The first of them refers to the exceptional proportions of the ancient habitation, already intuited in the 19<sup>th</sup> century, but now substantiated by systematic research (if we define as major landmarks the settlements of Grădiștea de Munte, Costești and Lunca – Pietra Roșie, which mark the area with the highest concentration of ruins, we reach an area of about 150 km<sup>2</sup>).

The second aspect is the fact that the remains belong to a single system of fortifications and settlements, which is both complex and well-articulated, with Grădiștea de Munte at its epicenter.<sup>9</sup>

Last but not least, archaeologists have underlined another important feature of the settlement of the Dacian capital area, namely that the mountainous landscape was intensely anthropized by the creation of a huge number of terraces. Until recently, the number of terraces was difficult to estimate for the whole area, for reasons mainly related to the high degree of afforestation, the mountainous relief (which is often difficult to reach), and the absence of appropriate techniques/logistics. With a few notable exceptions (Costești – Cetățuie, Costești – Blidaru, Fața Cetei, Fețele Albe), the efforts to identify and record the terraces were focused on *Sarmizegetusa Regia*, a phenomenon that is understandable, given that from the very beginning of its research it became clear that it is the largest and most important settlement in Dacia.

<sup>9</sup> The hypothesis had already been proposed in the early 19<sup>th</sup> century – JAKÓ 1966, 115.

Thus, a first "inventory" of the terraces of *Sarmizegetusa Regia* was made in 1951, the result being summarized as follows: "In total, more than 50 habitable terraces were found, of which 29–30 were verified as having actually been inhabited. And out of those over 20 yet unverified terraces, many may have been inhabited, but it is certain that we have not been able to establish absolutely all the inhabitable terraces, their number being, undoubtedly, much higher" (Fig. 2).<sup>10</sup> The hypothesis proved to be correct, and in subsequent campaigns other terraces were identified, one of the archaeologists noting, in the late '70s, the presence of more than 250 anthropogenic terraces arranged on the southern, sun-exposed slopes of the hill, with a total length of ca. 4.5 km.<sup>11</sup>

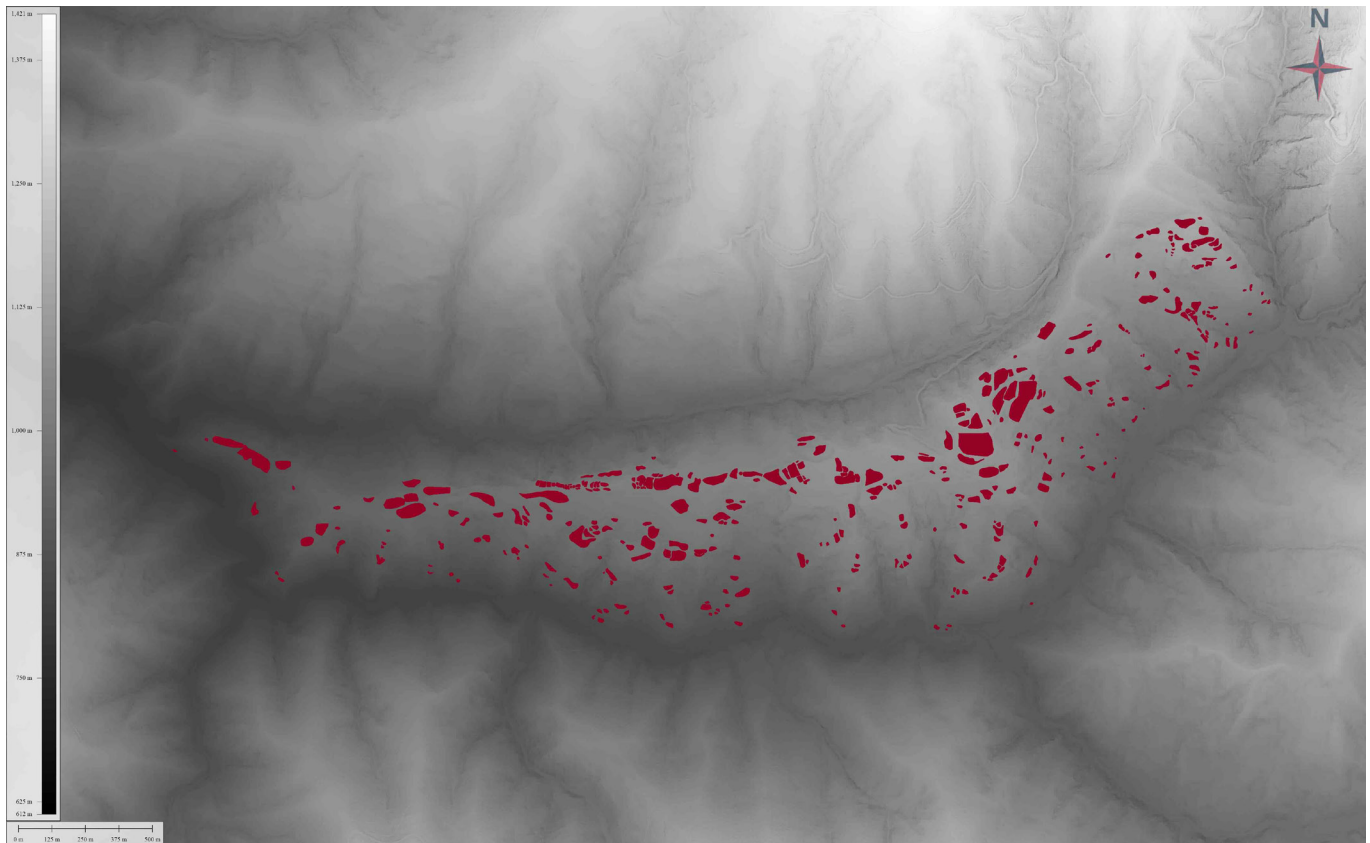
It was not until 2006 that Ioan Glodariu and Ioan Rus initiated the topographic survey of *Sarmizegetusa Regia*, the mapping of the terraces in the civil quarters of the capital being the main objective in the first stage. The results were significant, as 262 terraces were identified, measured and mapped for the first time, in the western and eastern civil quarters respectively. In addition, the terraces from the central area of the settlement, pertaining to the fortification and the sanctuary, were surveyed in 2012.<sup>12</sup>

A substantial contribution regarding the extent and complexity of the Grădiștea de Munte – *Sarmizegetusa Regia* site pertains to Ioana Oltean and her collaborators who, in the context of the production of a BBC documentary, were able to obtain a Digital Terrain Model of the site using LiDAR

<sup>10</sup> DAICOVICIU *et alii* 1952, 304.

<sup>11</sup> FERENCZI 1977, 74; several estimates of the number of terraces at *Sarmizegetusa Regia* can be found in the literature ("over 70", "over 100", "over 200"); see GLODARIU 1983, 47; FLOREA 1986–1987, 88.

<sup>12</sup> FLOREA 2017, 363.



**Fig. 3.** Dacian terraces identified at Grădiște de Munte – *Sarmizegetusa Regia*.

scanning of an area of about 100 km<sup>2</sup> which included the Grădiște Hill.<sup>13</sup> These datasets allowed the identification of new ancient structures (ramparts, road segments, and Roman camps) and of many more ancient terraces than were previously known. A recent estimate indicated that there are ca. 430 terraces and “house platforms”.<sup>14</sup> At the same time, multiple models for terrain analysis have been proposed, which brought into discussion aspects such as mobility, visibility, and housing density.<sup>15</sup>

In recent years, the National Agency for Cadastre and Land Registration (ANCPI) has provided researchers with datasets including LiDAR, that can be used to model the landscape where the Dacian fortresses and settlements in the Orăștie Mountains are found.<sup>16</sup>

Although the resolution of the Digital Terrain Model (DTM) obtained by processing the data obtained from ANCPI is lower in comparison with that of the model used in the above-mentioned studies, by corroborating it with the topographic surveys, the archaeological data, and our own observations and measurements in the field,<sup>17</sup> it became possible to map in detail the terraces of the Grădiște Hill and the rest of the area in question. In the following paragraphs we will

<sup>13</sup> OLTEAN/HANSON 2017, 434.

<sup>14</sup> OLTEAN/FONTE 2019, 257.

<sup>15</sup> OLTEAN/FONTE 2019, 251–261; OLTEAN/FONTE 2021, 1–17.

<sup>16</sup> <https://geoportal.ancpi.ro/portal/apps/webappviewer/index.html?id=3f34ee5af71c400396dda574fd0d53274>

<sup>17</sup> In recent years, the members of the research team of the archaeological site “The Dacian Fortresses of the Orăștie Mountains” have undertaken several activities related to archaeological topography, among them being the identification and / or confirmation in the field of new(found) terraces, both at Grădiște de Munte and in the surrounding area. We estimate that they will be completed within the next two years.

only point out the main results of our endeavor, although the obtained information is, of course, much more complex.

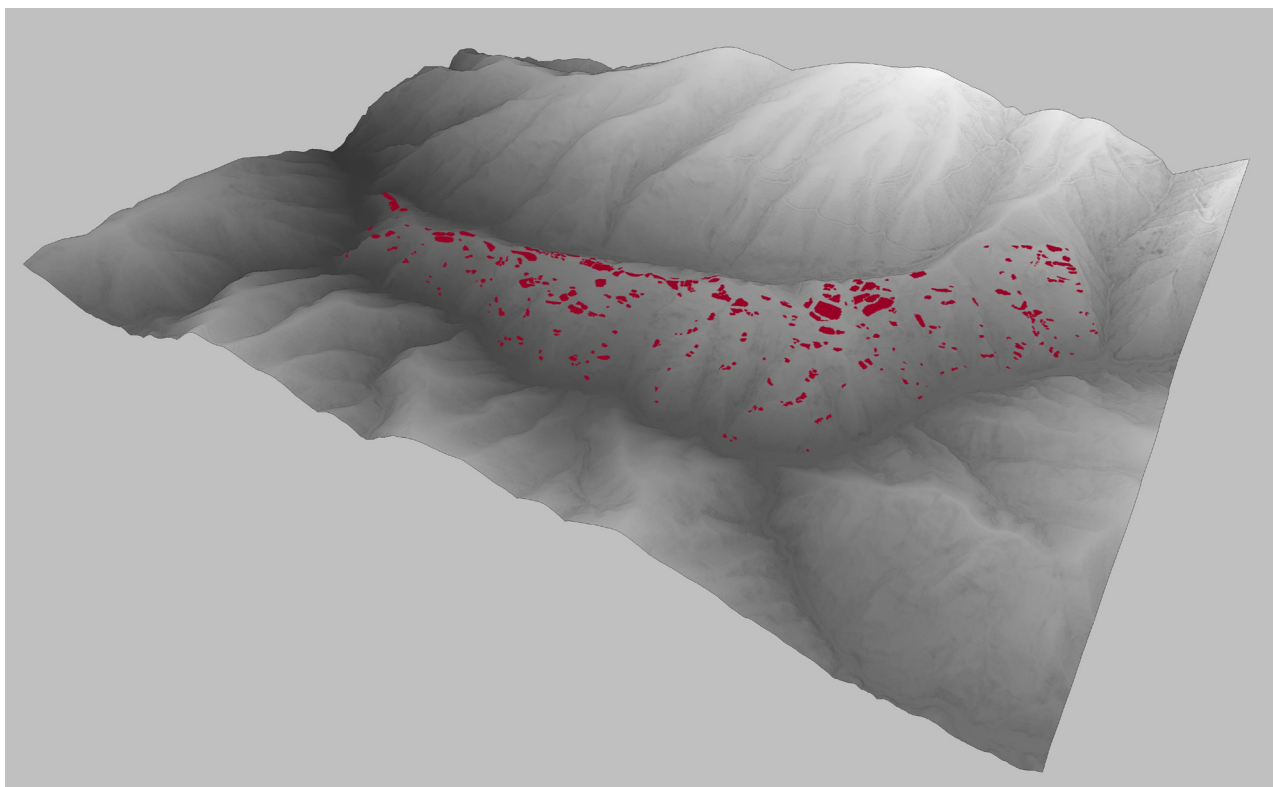
Thus, the first result is the identification of 373 terraces, arranged predominantly on the southern and south-eastern slopes of the hill, as it was often emphasized in the literature (Fig. 3–5). If we distribute them according to the division of the settlement proposed by Constantin Daicoviciu, then 232 terraces would belong to the western civil quarter, 110 – to the eastern civil quarter, and the rest would pertain to the sacred area and the fortification.<sup>18</sup>

A second relevant result is related to the surface area of the terraces. The mapping shows that an overwhelming proportion (245, *i.e.* more than 65%) consists of terraces with a surface area below 500 m<sup>2</sup> (Fig. 6). Only 72 terraces have an area between 501 m<sup>2</sup> and 1000 m<sup>2</sup>, while for another 56 terraces an area of more than 1000 m<sup>2</sup> was recorded.<sup>19</sup> The smallest of the terraces have an area of up to 50 m<sup>2</sup> (some of them are as small as 30 m<sup>2</sup>), among the most eloquent examples being a few terraces located at the eastern edge of the settlement. At the opposite pole, there are Terraces IV, inside the fortification, and XI, within the sanctuary, with a surface area of about 10000 m<sup>2</sup> and 8500 m<sup>2</sup> respectively.

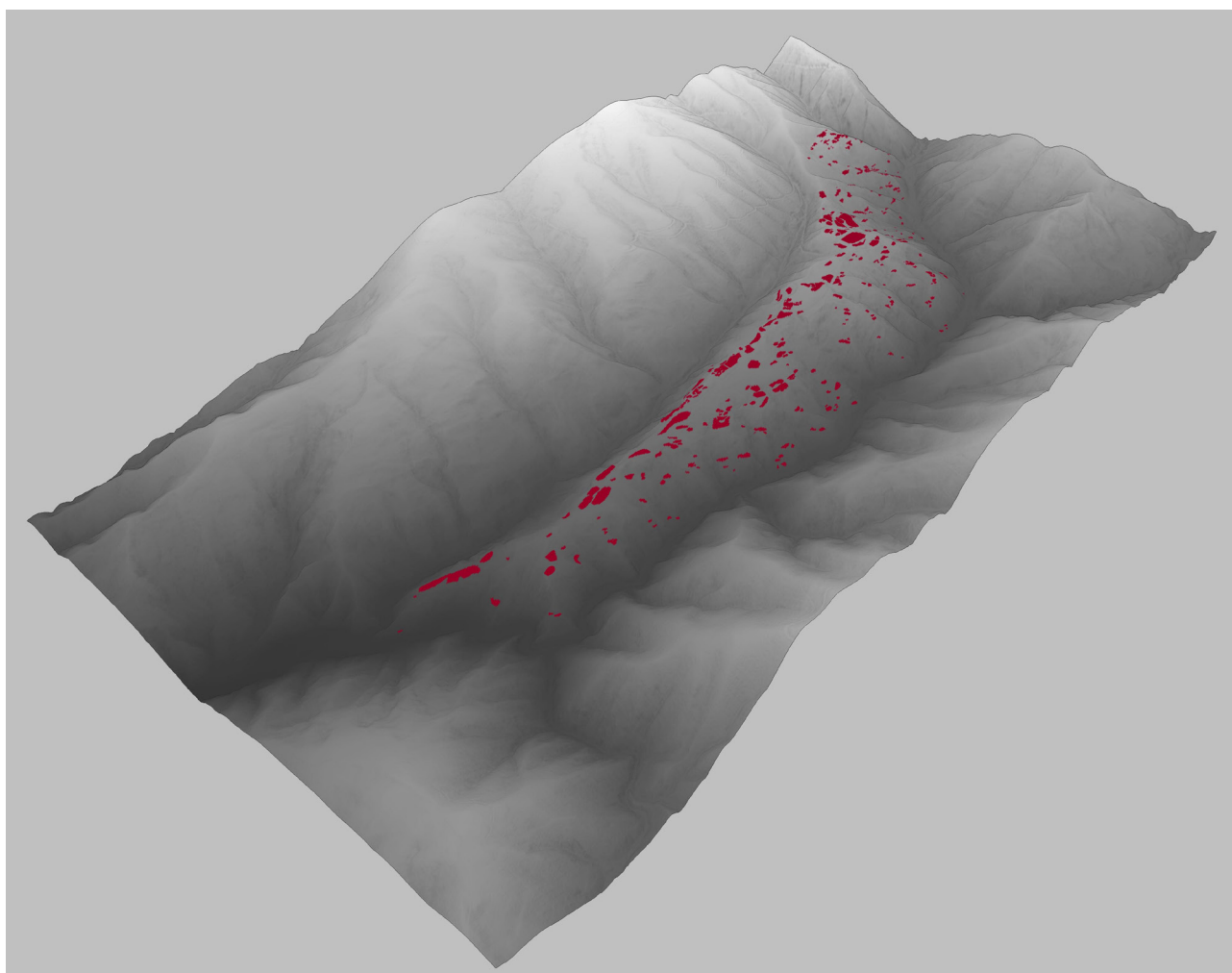
In this context an important clarification is necessary: for reasons that will be explained below, neither the number of terraces nor their surface areas should be considered as absolute values.

<sup>18</sup> According to new topographic and archaeological data, the sacred area and the fortification have more terraces than was proposed at the middle of the last century.

<sup>19</sup> The percentage may vary slightly, because the limits of the terraces, as they are today, are hard to record with a high degree of accuracy.

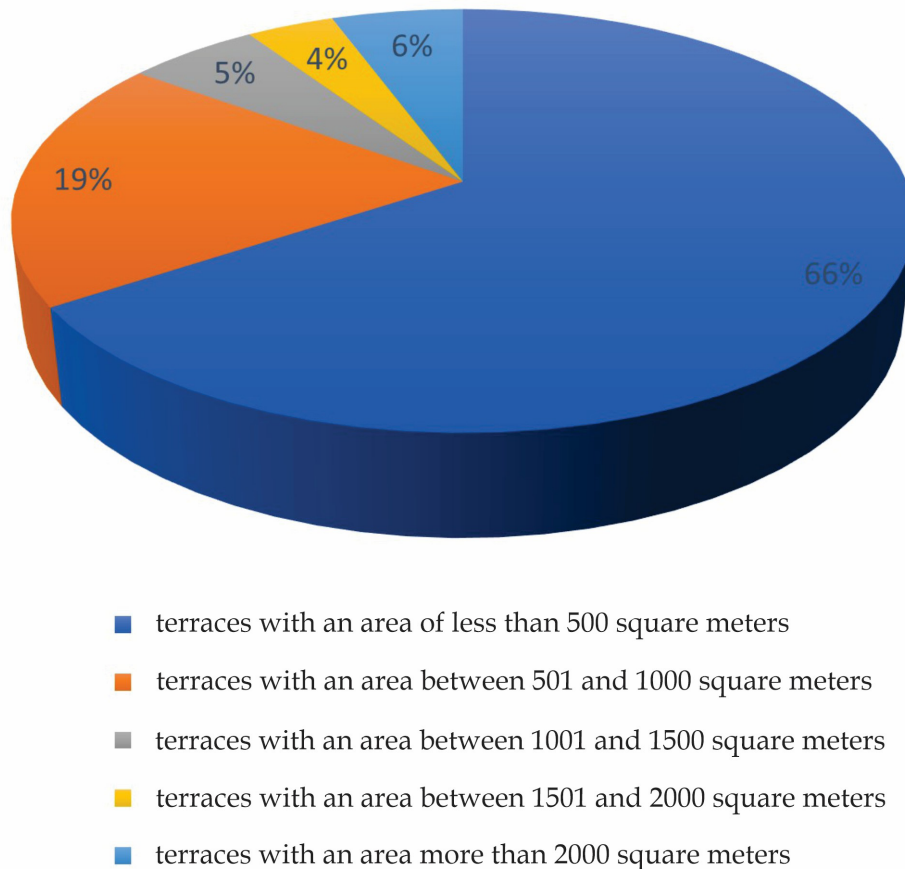


**Fig. 4.** Dacian terraces identified at Grădiștea de Munte – *Sarmizegetusa Regia*.



**Fig. 5.** Dacian terraces identified at Grădiștea de Munte – *Sarmizegetusa Regia*.

## Classification of terraces according to surface area



**Fig. 6.** Classification of surface areas of the terraces identified at Grădiștea de Munte – *Sarmizegetusa Regia*.

The exact number of terraces existing in the last phase of the settlement of Grădiștea de Munte – *Sarmizegetusa Regia* (in the first years of the 2<sup>nd</sup> century AD) is, at present, difficult to specify. A careful analysis of the terrain, be it directly in the field, or based on LiDAR data, reveals several areas of considerable size within the settlement that were affected by large landslides that occurred sometime after the ancient period. For example, two of the landslides that are located in the eastern civil quarter affected an area of more than 50 000 m<sup>2</sup>, while another one, found in the western civil quarter – an area of at least 30 000 m<sup>2</sup>. In both cases, the phenomena resulted in the “rupture” of some parts of the ancient terraces and, in all likelihood, in the disappearance of others entirely. Many other (and much smaller) landslides are visible at various points on the hill.<sup>20</sup>

This phenomenon should also be taken into account when carrying out various types of spatial analyses, otherwise there is a risk of major errors. In one of the recent articles it is noted that the Kernel density “analysis does not support the extension of the main settlement to include the small cluster at Căprăreăța, to the northeast of the hillfort at *Sarmizegetusa Regia*, previously assumed to be part of the main settlement”.<sup>21</sup> In fact, two of the landslides described above led to the disappearance of some terraces

that were located in the median zone of the eastern civil quarter, and thus the core of terraces at Căprăreăța was “separated” from the rest of the settlement. If interpreted correctly, the archaeological and topographic data show beyond any doubt that the terraces on the eastern side of the hill, including those at Căprăreăța, belonged to the settlement of *Sarmizegetusa Regia*.

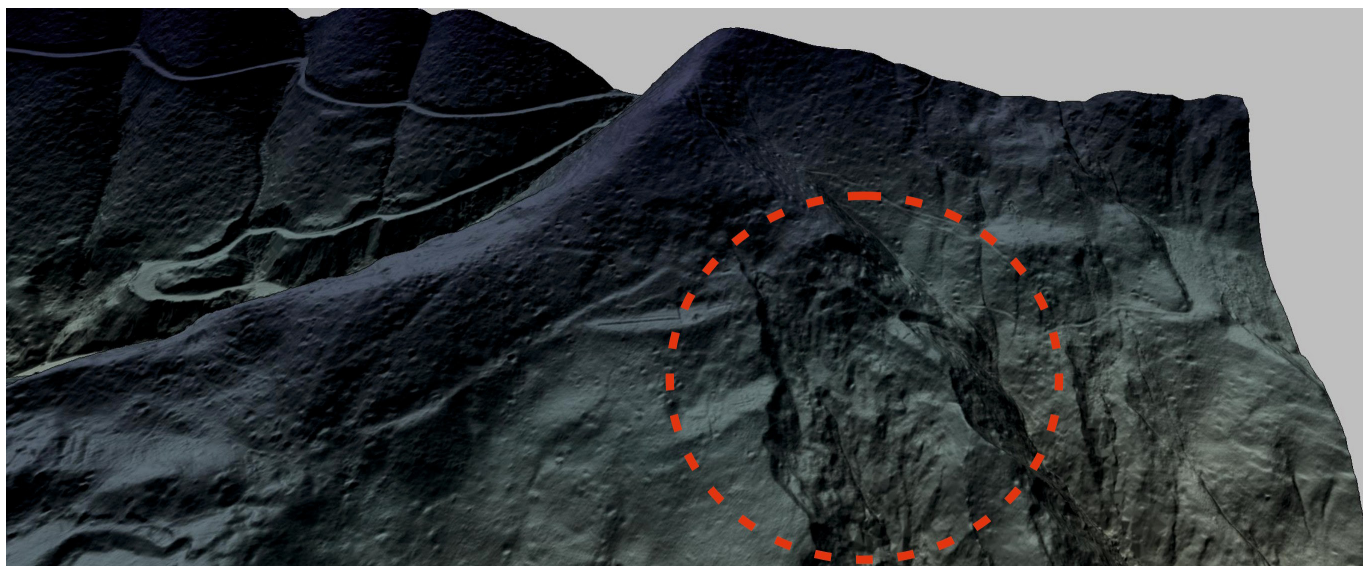
Landslides also caused the shrinkage of some terraces, a phenomenon visible in various locations within the ancient settlement. Eloquent examples are to be found in the eastern civil quarter, ca. 300 m from the sanctuary (Fig. 7), as well as in the western one, near the “terrace with painted pots” (as it was called in 1952),<sup>22</sup> where it is easily visible that larger or smaller parts of some terraces are missing.

The natural phenomena are not the only ones that changed the shape and surface area of some of the terraces, as the anthropogenic factor also had an impact that cannot be neglected. We are referring here first and foremost to the sacred area, where the restoration works carried out in 1980, but not only then, led to a considerable reduction in the surface area of the IX<sup>th</sup>, X<sup>th</sup> and XI<sup>th</sup> terraces. In the civil quarters, the forest roads made in the second half of the last century crossed a number of terraces, making it difficult to establish the ancient boundaries of some of them.

<sup>20</sup> Landslides are still common today, the phenomenon being exacerbated by global warming.

<sup>21</sup> OLTEAN/FONTE 2019, 257.

<sup>22</sup> DAICOVICIU *et alii* 1953, 180–187.



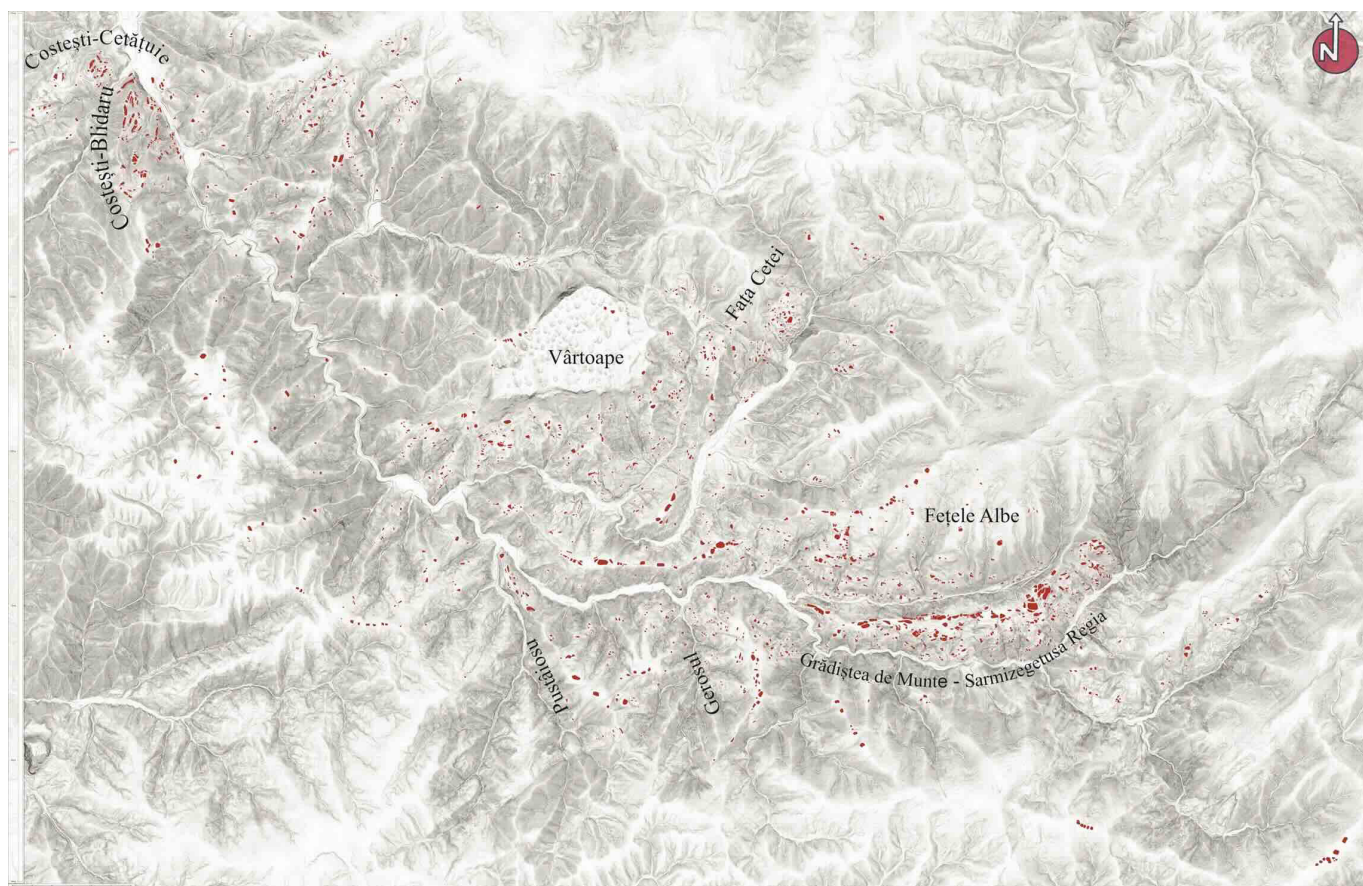
**Fig. 7.** An example of ancient terraces affected by landslides (INP LiDAR image).

## FINAL REMARKS

The extension of the mapping of the ancient terraces, based on the previously described data, up to Costești –

In the mentioned area c. 1500 terraces have been identified,<sup>24</sup> but in this case the number should also be considered only close to the ancient reality (Fig. 8).

Similarly to the situation observed for Grădiștea de Munte



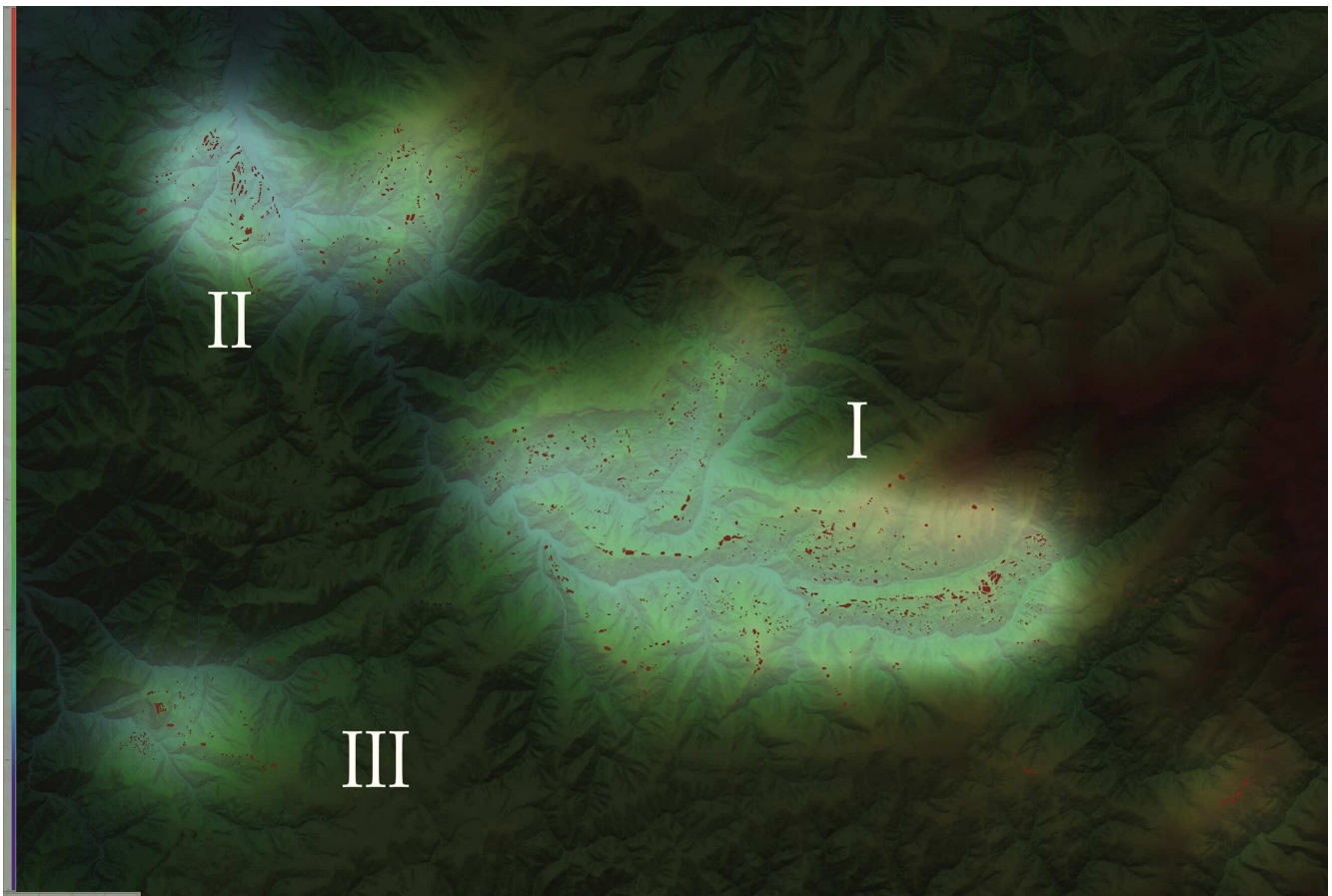
**Fig. 8.** Dacian terraces identified in the area of *Sarmizegetusa Regia* (Grădiște Valley).

Cetățuie and including the massifs delimited by the tributaries of the Grădiște Valley, allowed us to obtain a clearer picture of the Dacian settlement in this part of the Orăștie Mountains.<sup>23</sup>

<sup>23</sup> The Dacian settlement extended beyond Costești – Cetățuie, but there

the landscape was used in different ways – DAICOVICIU 1964, 123.

<sup>24</sup> The number also includes the “plateaus” on mountain ridges where ancient remains have been observed, even though some of these were set up differently compared to the more or less steep hillslope terraces. However, groups of stepped terraces, similar to those cut into the slopes, have been evidenced; a good example is the group of terraces in the north-western corner of the Vârtoape Plateau.



**Fig. 9.** The main clusters of Dacian terraces in the Orăștie Mountains

– *Sarmizegetusa Regia*, both natural (mainly landslides and erosion caused by mountain torrents) and anthropogenic factors have produced important changes in the number of terraces and their surface. For the latter type of factors, we mention here:

- significant parts of ancient settlements are overlapped by modern and contemporary ones; a relevant example is the area now called Costești – Deal, where dozens of ancient terraces are occupied today by households or are used for agricultural purposes;

- the forest roads that have crisscrossed almost all the hills and have often damaged ancient terraces;

- the development of the embankment for the “Orăștie – Grădiștea Muncelului industrial railway line”, that started during the Second World War and which has affected, to a greater or lesser degree, some Dacian towers and terraces found at the base of the fortress of Costești – Blidaru, but not only there.<sup>25</sup>

In spite of all this damage to the terraces, the extent of ancient habitation is evident, Dacian vestiges being identified on almost every hill along the Grădiște Valley and its tributaries. A relevant indication in this respect is the number of areas with concentrations of more than 100 terraces: Fețele Albe (c. 240), Sub Cununi – Cornul Pietrei (c. 168), Costești – Blidaru (c. 140), Costești – Deal (c. 110). In other parts of the analyzed area where the terrace concentrations are smaller, the number of terraces is still significant: 97 at Gerosul, 92 at Pustâiosu, 52 at Fața Cetei. Just as in the case

<sup>25</sup> DAICOVICIU/FERENCZI 1951, 7, 27.

of Grădiștea de Munte – *Sarmizegetusa Regia*, the terraces with a surface area below 500 m<sup>2</sup> are predominant (almost 70%).<sup>26</sup>

The mapping of the terraces in this area reveals another significant aspect of the Dacian habitation, partly observed several decades ago. We refer here to the outlining of two large groups of terrace concentrations, the first one related to Grădiștea de Munte – *Sarmizegetusa Regia*, and the second one to the fortresses of Costești – Cetățuie and Costești – Blidaru. If we extend the area under analysis, we can observe a third nucleus, represented by the terraces in the proximity of the Luncani – Piatra Roșie fortress (Fig. 9).<sup>27</sup>

Not only does the image resulting from the mapping of the terraces bring back into discussion an older idea (which was recently reevaluated with the use of LiDAR data) according to which the Fețele Albe would have been part of *Sarmizegetusa Regia*,<sup>28</sup> but it also allows us to hypothesize that other places (first of all Gerosul and Pustâiosu, Muncelul Hill, and even the hills on either side of the Anineș Valley) could be considered as having been a part of the Dacian capital. However,

<sup>26</sup> In a recent article it was wrongly postulated that most of the terraces in the Orăștie Mountains have an area between 500 and 1000 m<sup>2</sup> – PEȚAN 2023, 210.

<sup>27</sup> These concentrations would correspond, at first sight, to the groups of settlements and fortifications identified by D. M. Teodorescu almost a century ago, as mentioned at the beginning of this paper – TEODORESCU 1923, 7; for other proposals regarding the grouping of the settlements from the Orăștie Mountains see DAICOVICIU/FERENCZI 1951, 5–66; DAICOVICIU/FERENCZI/GLODARIU 1989, 174–227.

<sup>28</sup> DAICOVICIU/FERENCZI/GLODARIU 1989, 81, n. 11; OLTEAN/FONTE 2019, 257.

even though the topographic argument is very important, it is insufficient, because the confirmation of such a hypothesis also requires the (re)analysis of the archaeological data, but that is the subject of a different study, work which is still in progress.

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