

## DACIAN FORTRESS APOULON - HISTORICAL-CARTOGRAPHIC CONVERGENCES

Mircea SĂLCUDEAN, Eng., „1 Decembrie 1918” University of Alba Iulia, Romania  
salcudean.mircea@uab.ro

**Abstract:** *In this paper, systematic archaeological research was approached in order to build in the GIS environment the altimetric numerical models of the lands subject to archaeological research at the Apoulon Fortress. The research at the Apoulon Dacian Fortress began in 1960 and were started by Gh. Anghel, and the data used in the project were taken topographically in the 2005, 2006 and 2007 campaigns. The database created is constantly used by researchers in order to arrange, preserve or rehabilitate the archaeological heritage and historical monuments and therefore must always be updated. The use of modern GNSS and GIS technologies was used to take over and process the information from the field. The advantages of this systematic research would benefit both the institutions dealing with real estate in our country and the public interested in research and the history of discoveries.*

**Keywords:** *Archaeology, GNSS, GIS, Digital Elevation Model, Maps, Slope, Aspect*

### 1. Introduction

The approached topic is part of the geomatics issue, being related to the establishment of modalities that can offer solutions in the generation of altimetric numerical models of the terrain using topographic data.

The fortress from Piatra Craivii, identified by some researchers as the ancient Apoulon, is located near the village of Bucerdea Vinoasă, on a ridge between the valleys of Cricăului and Bucerzii. From the fortified peak, the access to this region was monitored, the dimensions of the fortified area being 67 m x 36 m. It was surrounded by walls with a thickness of 3 meters, today being visible the northwestern part of the massif. The construction technique of the walls is different from the one used in the case of the fortresses from the Orăștiei Mountains. It is said that this is the last Dacian fortress, where Decebalus withdrew, as it was the strongest of the Dacian fortifications, built in a unique style by Greek craftsmen.

The first researches at Piatra Craivii were started by Gh. Anghel in 1960. Under the guidance of I. Berciu, several anthropogenic terraces were discovered and researched together with the fortification of the important Dacian center, identified as the ancient Apoulon.



Fig.1 Anthropogenic terrace

Archaeological campaigns have led to the partial unveiling of an important archaeological site, with a historical evolution that includes places from the Late Eneolithic / transition period to the Bronze Age (Coțofeni culture), Middle Bronze, Latène and early and Middle Ages. The sanctuaries are similar to those at Grădiștea Muncelului. In 2005 new researches were started, with the aim of clarifying the character of the dwelling and the stratigraphy on the 5th terrace and conducting surveys on a series of terraces that were not investigated or that benefited from an unsatisfactory presentation and the beginning of the erection. topographic features of the site.



Fig.2 Plinths from the archaeological research (internet source)

In 2006, archaeologists discovered two round limestone plinths belonging to a building that is circumscribed by a Dacian sanctuary.

The plinths have the classic dimensions, like those in the Orăștiei Mountains, being larger than those discovered so far at Piatra Craivii (diameter 0.55 m, height 0.22 m).

The 2007 campaign continued the research of the temple on the Bănuțului terrace, arranged on the eastern side of the massif, with the dimensions of approx. 60 x 14 m, temple identified during the excavations of the previous campaign.

## 2. Materials and Methods

The Digital Elevation Model (DEM) is an ordered table of numbers that represents the spatial distribution of altitude values measured above an established altimetric level. Altimetric values can be values of some points in the field or can be average altimetric values of some parts of the analyzed field.

Unlike DEM, the Digital Terrain Model (DTM) represents the spatial distribution of a characteristic or parameter that is related to the studied terrain.

In a spatial database, areas can be represented as:

- points with an irregular spatial distribution;
- cells with equal surfaces (GRID);
- digitized level curves;
- irregular triangles (TIN).

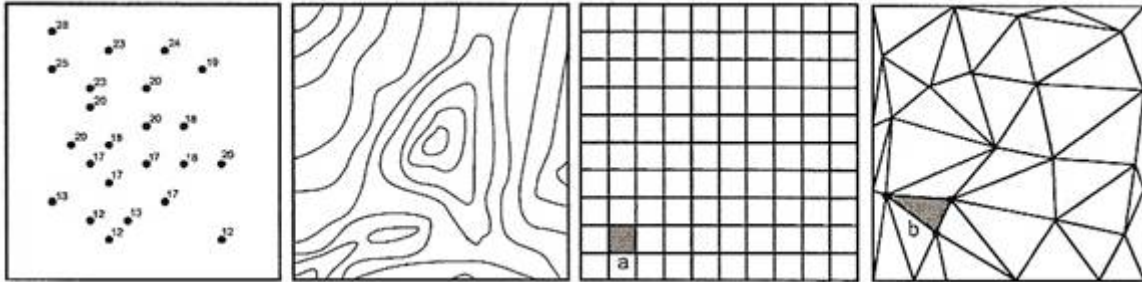


Fig.3 Representation of surfaces in a GIS system

Virtual perspective images of a three-dimensional model can be made by changing the perspective of the observer to obtain a complex cartographic panel of the site. For this, the ArcScene application will be used, which allows visualizing the data in 3D and highlighting the geomorphological aspects of the archaeological site.

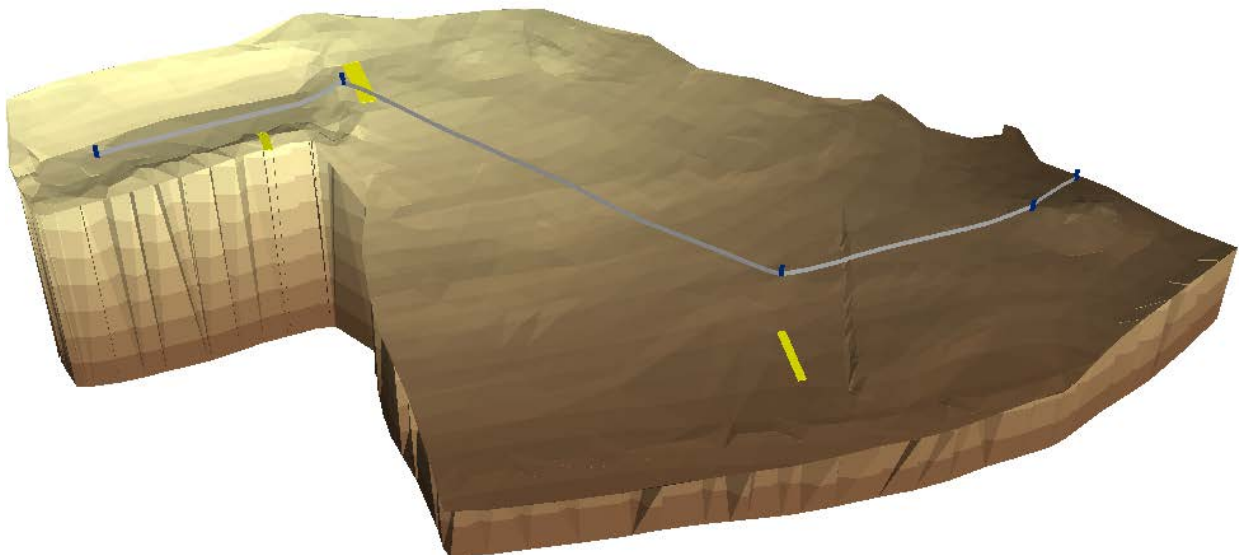


Fig.4 3D model of the archaeological site

The profile was created on the background of the TIN model, on the Southwest - Northeast direction, the purpose being to be able to observe the linear variations of the relief, respectively the elevations that increase from the value of 918m to 943m.

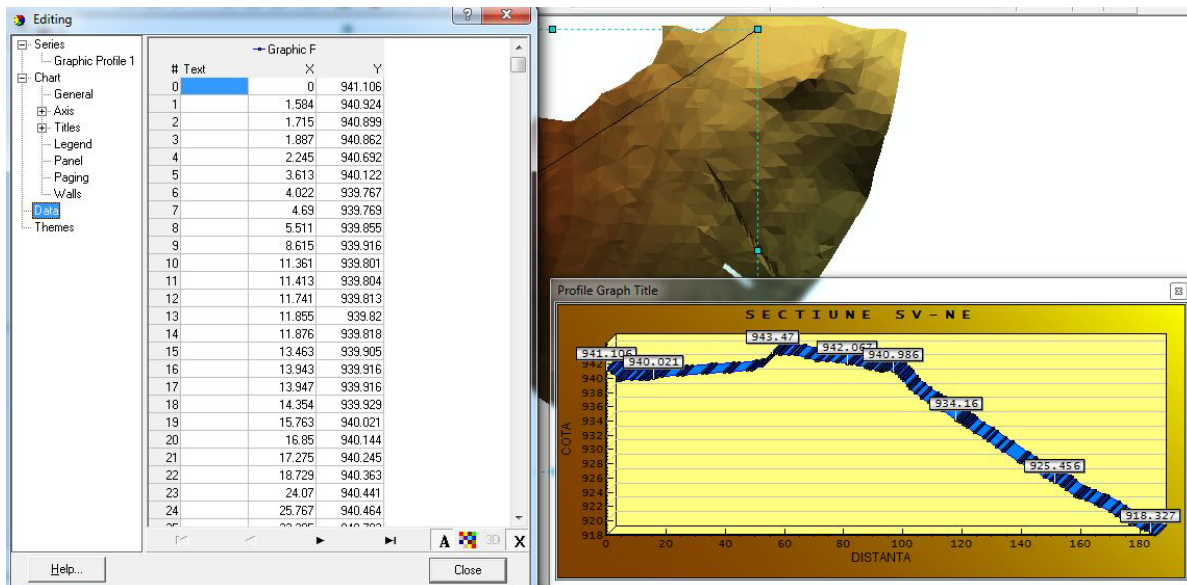


Fig.5 Visualization of the geomorphological profile with SV-NE orientation

Another important highway for generating the geomorphological profile was built in the S-N direction. An increase from elevation 912m (in the southern part of the site) to elevation 922m can be observed in this profile, and from elevation 922m to elevation 914m (in the northern part of the site).

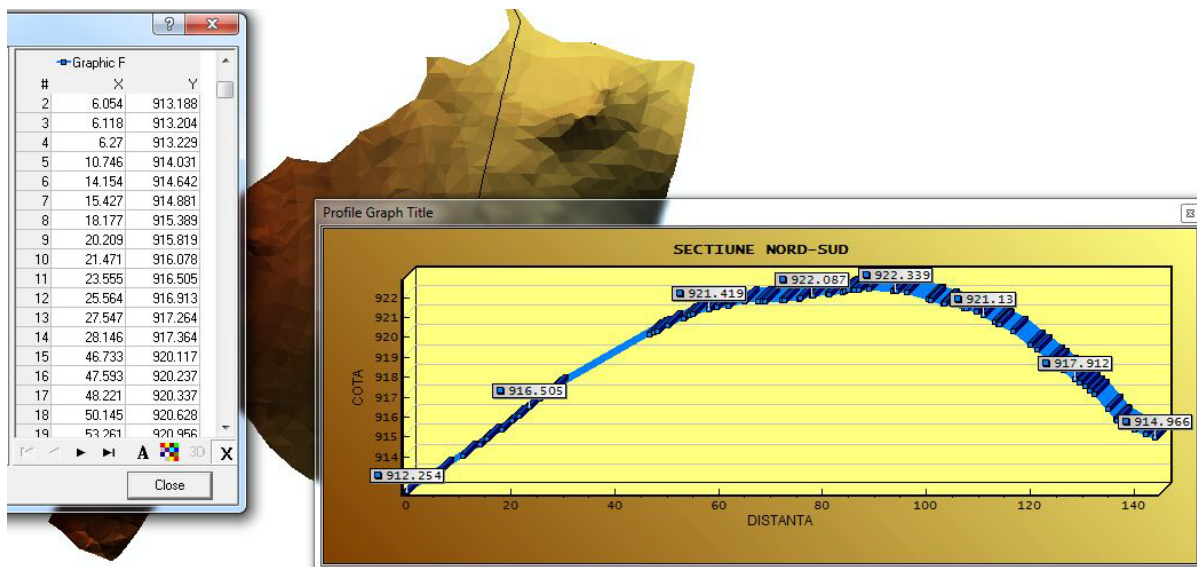


Fig.6 Visualization of the geomorphological profile with S-N orientation

Determination of slope orientation highlights the orientation of the slopes that are found at the level of the archaeological site Apoulon (Piatra Craivei). Based on the generated plan, it was wanted to determine the orientation towards the sun of the area on the 5th terrace, the area where the main sanctuary is located.

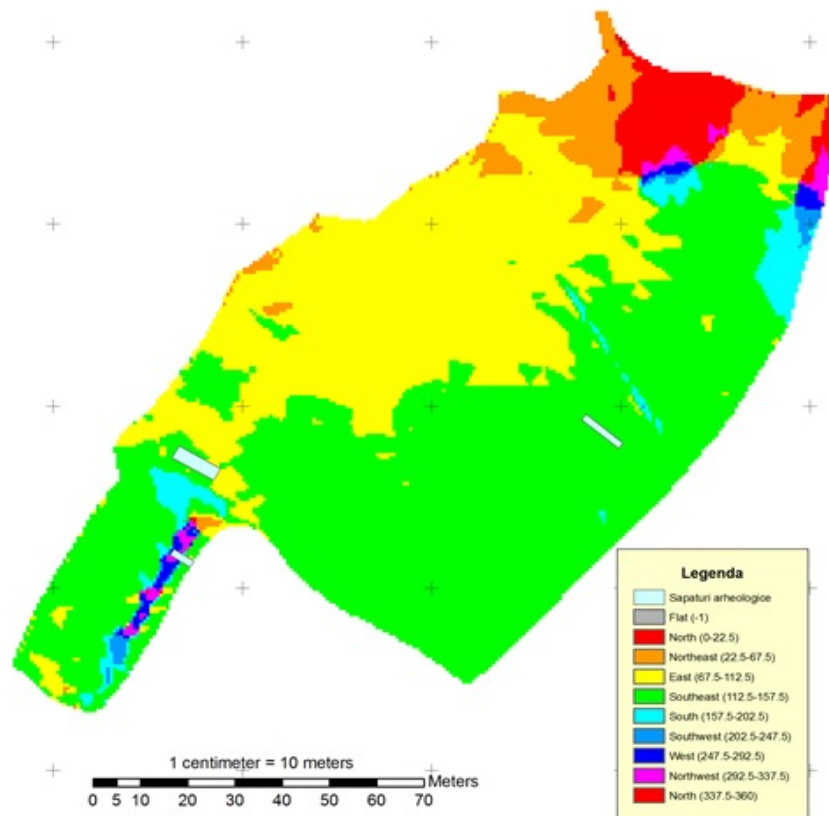


Fig.7 Determining the orientation of the slopes on the Apoulon archeological site (Piatra Craivei)

### 3. Results and Discussion

Following the research carried out, it results that the Sanctuary is oriented in the NNW-SSE direction. This orientation is also found in the Coastal Citadel, the sanctuary being located on the highest position with NV-SE orientation, with 4 alignments of 15 drums each, N-E orientation of 20 degrees. It is believed that the sanctuary is dedicated to the Triad and the priest who served in this sanctuary probably also had the position of ruler of the fortress and lived in the Tower. This configuration is also found in the area of the archeological site of Sarmizegetusa, more precisely in the 3rd Sanctuary, which was dedicated to the God Jupiter and the Triad. It is the largest sanctuary in this sacred precinct and has a rectangular shape. Apparently, it was dedicated to the triad of Jupiter, Juno and Minerva, similar to the Capitoline triad.

### 4. Conclusions

The paper presents modern techniques for storing and processing data related to the archaeological site, using the most appropriate tools to obtain a 3D model, which can then be exploited for the analysis and interpretation of natural and anthropogenic relief. The creation of the three-dimensional model helps both to develop a database and to analyze the data obtained in order to systematize the research in the site area. The paper did not focus only on an in-extenso database but sought ways to interpret information with topographic and historical content, seen as a unitary whole.

From the content of the paper it is clear that GIS techniques are a necessary tool for the inventory of national heritage. Unfortunately, compared to other European countries, Romania

is currently far behind in terms of information centralization and access to information, due to lack of education in the field, the courses being very rare and expensive. EU integration implies new perspectives for the development of the field of GIS solutions and will offer many other opportunities to grow in this field. The growing need for collaboration between various organizations will raise the issue of "orthogonal" expansion of geospatial data.

GIS products have a wide range of applicability, providing the cartographer and the specialist in archeology, modern working techniques that complete the historical side, offering a new approach to the analysis and interpretation of information resulting from archaeological discoveries.

## 5. References

1. *Borșan, T - Archaeological topography and GIS. Theoretical foundations and practical applications, Risoprint Publishing House, Cluj Napoca, 2015;*
2. *Breazu, M., Borșan, T., Maican, I. - Applications of modern techniques and methods in archaeological rescue research - Digital topography, Patrimonium Apulense IV, 2004;*
3. *Breazu, M., Borșan, T., Maican, I. - Geodezo - topographic - cartographic basic notions used in Archaeological Topography, Sargetia, Nr. XXXI, 2004;*
4. *Florea, D. - Digital cartography - general notes, PC Report, Issue 21, June, 1994;*
5. *Gerbach, A. - Ausgrabung Heute. Methods and techniques of field welding, Stuttgart, 1998.*