

„ALEXANDRU IOAN CUZA” UNIVERSITY OF IAȘI

FACULTY OF HISTORY

DOCTORAL SCHOOL

THE SPATIAL ANALYSIS OF THE HUMAN HABITAT FROM  
THE BEGINNING OF BRONZE AGE TILL THE END OF  
MIDDLE HALLSTATT. CASE STUDY: FĂLTICENI PLATEAU

PhD Thesis Abstract

Scientific supervisor

Prof. univ. dr. Octavian Nicolae BOUNEGRU

PhD Student

Alexandru-Marian GAFINCU

IAȘI

2015

## Table of Contents

Introduction	5
I. Geographical characteristics	12
II. Cultural and chronological frame	22
III. A short history of research	46
III.1. The local archaeological objectives research	46
III.2. The usage of GIS analysis in archaeology	55
IV. Methodological considerations	57
IV. 1. Introduction into GIS	57
IV. 2. The GIS system components	58
IV. 3. The GIS functions	59
IV. 4. <i>Raster</i> and <i>vector</i> data structures	60
IV. 5. Morphometric indices	61
IV. 5. a. <i>Elevation</i>	61
IV. 5. b. <i>Topographic Position Index</i>	61
IV. 5. c. <i>Slope</i>	63
IV. 5. d. <i>Solar exposure</i>	63
IV. 5. e. <i>Wind shelter</i>	64
IV. 5. f. The distance to closest water source	65
IV. 6. Spatial analysis methods	65
IV. 6. a. Density estimation	65
IV. 6. b. Viewshed analysis	67
IV. 6. c. Cost surface and least cost path analysis	71
V. The catalogue of discoveries	76
VI. The spatial analysis of Bronze Age and Early and Middle Hallstatt settlements	129
VI. 1. Morphometric indices analysis	132
VI. 1. a. <i>Elevation</i>	133
VI. 1. b. <i>Topographic Position Index</i>	137
VI. 1. c. <i>Slope</i>	142
VI. 1. d. <i>Solar exposure</i>	147
VI. 1. e. <i>Wind shelter</i>	152
VI. 1. f. The distance to closest water source	161
VI. 2. The spatial analysis of the settlements	168

VI. 2. a. Density estimation	168
VI. 2. b. Viewshed analysis	173
VI. 2. c. Cost surface analysis	186
VI. 2. d. Least cost path analysis	203
VII. Habitat models in Bronze Age, Early and Middle Hallstatt	216
Final considerations	233
The list of the figures, the tables and the illustration	237
Abbreviations	241
Literature	242
Appendices	260
Tables	261
Illustration	287

## Introduction

On a national and international scale, in the last period, it is desired the preservation, as much as possible, of the archaeological sites, which encouraged the growth of the analysis methods which don't require intrusive investigation. The present paper is trying to identify aspects of the relationship between man and the natural environment through spatial analyses, thus combining archaeological, geographical and statistical data.

The spatial analysis is using different types of qualitative analysis and process the information of the geo-referenced entities in order to identify the relation between them and to obtain new datasets. The human habitat represents the territory within which the community carries out its daily activities. It goes beyond the actual living space, including areas where the individual performs economic activities or areas intended for circulation.

Thus, the expression "spatial analysis of human habitat" designates various techniques used to analyze the spatial data to identify the characteristics of human settlements locations and areas in their proximity. The geographical features had a major impact on the behaviour of prehistoric communities. Through this kind of analyses a series of patterns and habits can be identified, especially the information related to the place to settle, the exploited natural resources and the relations between contemporary communities.

Choosing a time period for the analysis is important and must consider aspects of the required time span, financial and human resources, the volume of published information and the purpose of the study. The span between Early Bronze Age, where the transition period from the Neolithic to the Early Bronze Age was added, and Middle Hallstatt was selected because the aim of the study is to highlight the changes in the human behaviour if the communities which replaced each other or coexisted in the study area. Also, such an interdisciplinary approach which aims to explain the prehistoric habitation during the mentioned period has not yet accomplished for the East-Carpathian area. The cultural and the economic specifics of these cultural groups have created habitation patterns at a macro scale and some forms of adaptation to specific geographical microzonal scale.

As this paper aims to pursue prehistoric behaviour changes, the study area, the Siret-Suceava – Moldova interfluvies, has chosen precisely because of the regional geographical characteristics which influenced the decision of the human groups from the analyzed chronological span. The acquaintance with the geographical features and with the archaeological discoveries from the study area started from 2011. From this moment,

field surveys were performed to identify prehistoric settlements in the field. At the beginning, the area was poor in sites, but in time, during investigation, new archaeological sites were discovered, a substantial part being presented in this paper. Also, the field surveys conducted so far intended to understand the relation between the prehistoric settlements and the landforms.

## Objectives

This study is an interdisciplinary approach where methods from geography and statistics were used to explain, as much as possible, the behaviour of human groups that populated the geographical area mentioned above.

The main objectives fall within the specific scientific directions of environmental studies, aiming in particular to identify common features of habitation from the Bronze Age and Early and Middle Hallstatt. For this purpose programs which gives the possibility to view satellite images were used (Google Earth), the analyzes were conducted in Global Mapper, ArcGIS and SagaGis software and the information obtained was displayed as maps, charts and tables. In order to enhance the outcomes from each type of analysis, the results were used to identify, through statistical analysis and mapping, the common features of the settlements location, the relationship between the community and the natural resources and the relationship between contemporary settlements.

The preferences for certain landforms and the economic characteristics cause the emergence of distinct patterns of habitation and exploitation of resources which can be identified through spatial analyzes.

## Research method

The GIS programs provide means to estimate the relationship between man and environment and between contemporary communities. The fusion between the geographical data, recorded for the proximity of the settlements, the characteristics of the discoveries and the socio-economic specific of each community provides an overview about the Prehistoric adopted behaviour. The spatial analyzes, performed in special software, offered the possibility of using macro data to obtain information on the geography of the area in which the archaeological sites are located. The morphometric indicators values were

extracted from maps of elevation, topographic index, slope, solar exposure, wind protection, to which was added the values of the distance to the nearest water source. The relations between contemporary communities and areas controlled and/or exploited were identified through viewshed analyzes, density estimation, cost surface and cost path analysis. For each investigation method histograms and maps were made, which were used to observe common characteristics of contemporary cultural groups for the entire geographical area or the existence of differences recorded regarding the climatic and topographic features.

The spatial analysis performed in GIS software is an important tool to identify behavioural constants of old communities. This method of analysis is trying to create an overview about prehistoric community's actions, to explain the observed phenomena in large spaces or the existence of adaptive models according to the environmental conditions.

### The paper structure

The thesis structure was determined by versatility of the subject, a detailed presentation of geographical, cultural and method was required, a database of discovered sites and the specific analysis method.

The first chapter discusses *The geographical particularities* of Fälticeni Plateau, where a special attention was paid to the characteristics which influenced the cultural groups to settle in the study area. Environmental factors with a major impact, topography, climate, soil resources, flora and wildlife were presented in detail and the general directions of settling were outlined.

Second chapter, *Cultural and chronological framework*, aims to present the main attributes of the cultural entities and the chronological boundaries for each period. It is important to present in detail issues concerning the topographical preferences, the methods of house construction and their relation with the fireplaces, economy and exploited resources. These issues can provide information to support some ideas achieved through spatial analyzes.

The chapter *Short history of research* presents the main papers which contain information about the discovery of archaeological sites and the studies concerning landscape archaeology. This section does not have an exhaustive goal, the sum of the papers used in the thesis are listed in the *Literature* section.

In the *Methodological consideration* chapter each analysis technique used in this paper was presented in detail, which can be used in an upcoming research. In this section are presented all the stages of each analysis, the required data sets, the expected results and methodological restrictions.

The *Catalogue of discoveries* includes all the archaeological sites where Bronze Age and Early Iron Age artefacts were discovered. The preparation and improvement of this repertoire involved several steps. First of all, the information about each settlement were collected from the specialized literature (articles, monographs studies, repertories) and the online data-bases (RAN) and structured into individual sheets. Since this kind of analysis requires the precise place of the settlements location, field surveys were performed to identify in the field the sites recorded in the *Catalogue* and to discover new ones.

The settlements included in the *Catalogue of discoveries* are the support for the sixth chapter *The spatial analysis of Bronze Age and Early and Middle Hallstatt settlements*. For each period, Early Bronze Age, Middle Bronze Age, Late Bronze Age, Early and Middle Iron Age, the recorder discoveries were analyzed using specific methods provided by the GIS software. The results are presented and synthesized as maps, graphs and tables, and the macroregional characteristics are accounted for each period and geographical area.

The synthesis chapter, *Habitat models in Bronze Age, Early and Middle Hallstatt*, aims to combine the results from the spatial analysis with the geographical and cultural characteristics. With this data the reasons for settling only in certain areas were explained, habitat model were suggested and the relation between contemporary settlements was draw.

In the *Final consideration* section the main result are presented, with emphasis on interdisciplinary approach and further research, to validate the hypothesis identified during the analyzes.

At the end of this paper a list of *Abbreviation* and *Literature* are added, which includes all the studies cited, followed by an *Appendix* where the morfometrical values and maps used in this research are listed.

## Conclusions

The research of the archaeological discoveries, through geographical and statistical methods, provided some information to explain the behaviour of the Bronze Age, Early and Middle Iron Age communities.

This thesis was developed in several steps, each with a different degree of difficulty, but all the same important for the performed research.

In the first stage, a settlements catalogue was written which includes all the archaeological discoveries from the chronological framework mentioned above. For all the sites from the database were gathered information about location, cultural and chronological affiliation, the landform and the position according to the hydrographic catchment.

Second step consisted in field surveys which had the purpose to locate the sites, a vital information for this kind of analysis. Among all the settlements (130), only 75 were identified in the field, 23 representing personal discoveries. During the field trips data about the geographical characteristics were collected. Some of the empirical observations provided information about the landforms favoured by human groups with particular habitudes, which were used to discover or identify archaeological sites.

After the settlements were mapped different types of analysis were performed to obtain morfometric and spatial values concerning the inhabited areas. The elevation, topographic index, slope, solar exposure, wind protection and the distance to the closest water source were the key elements which influenced the community to settle in a certain space. The graphs based on the values of each morfometric index allowed us to identify different habits for each cultural entity and the comparison between them.

The low slopes, the exposure to the light and heat, and the small distance towards the water source are specific features of the areas where sites are located. Only the Early Bronze Age settlements were established in a dominant position, and only a few of the Early Iron Age have the same characteristics.

Regarding the relation between sites and wind protected areas, it was recorded that, at least for some chronological periods, the settlements exposed to the wind blow are in the proximity of the ones which are protected. This situation is different from region to region, aspect that indicate the seasonal usage of the exposed settlements, meanwhile the permanent inhabited area was located closely, protected by winds, providing shelter for the entire community during winter.

The distance to the closest water source remains low in all periods, with a difference recorded for Late Bronze Age settlements, where was observed the preference for the junction areas, where swamps appear. Also, it was noticed the lack of discoveries in the proximity of the large rivers, precisely to avoid the flooding of the inhabited space

Density mapping allowed the identification of areas densely inhabited and zones where only to a few discoveries are known. In general, the most populated areas are the upper

basin of Șomuzul Mare and the perimeter between the first terrace and upper terrace of Siret river, areas rich in resources which attracted the agro-pastoral communities. For Middle Bronze Age and Early and Middle Hallstatt the median area of the geographical zone is poor in discoveries, which may suggest the existence of a buffer zone between Monteoru and Costișa- Komariv communities and between Grănicești and Corlăteni cultural aspects.

The dynamics of colonization indicates a preference for certain areas with distinct characteristics depending of the specific social and economic of each of them. If in Early Bronze Age most of the settlements were located in high places, during Middle and Late Bronze Age this positions are abandoned, being favoured the lower landforms. At the beginning of the Early Iron Age some of the high elevation areas are repopulated, but most of the settlements are still located on lower grounds.

The visual area from settlements overlaps the territory where the resources of soil, vegetation and water supply exist, needed for the subsistence economy and daily activities. Also, in the visual area there are large portions of the rivers and streams valleys, probably to assure the surveillance and the control of these travelling routes. The crossvisibility is a main characteristic only in Early Bronze Age, while, for other periods, this characteristic is recorded only local, in areas with low elevations and high densities.

For a small community, the resources available in a territory within an hour's walk were more than enough. In the proximity of the settlements productive soils and large pasture areas are found, so the individuals were not forced to travel long distances in the search of resources.

Corroborating the information from analyzes with the archaeological and geographical ones allowed us to identify some parts of the behaviour of the Bronze Age and Early and Middle Iron Age communities. It can be stated that the human groups from these periods follow a set of strict rules when are settling down. Surely there are some exceptions, but these aspects can be influenced by the topographical characteristics, climate and the existing resources.

## Selective literature

ANDRONIC Mugur, BATARIUC Paraschiva-Victoria

1990-1991-1992 *Contribuții la cunoașterea evoluției habitatului uman în zona limitrofă a orașului Suceava*, în: Suceava, XVII-XVIII-XIX, Suceava, 1993, p. 9-24.

ASĂNDULESEI Andrei

2012 *Aplicații ale metodelor geografice și geofizice în cercetarea interdisciplinară a așezărilor cucuteniene din Moldova. Studii de caz*, lucrare de doctorat, mss., Iași, Biblioteca Facultății de Istorie.

CHIRICA Vasile, TANASACHI Marcel

1984, 1985 *Repertoriul arheologic al județului Iași*, vol. I-II, Iași.

CONOLLY James, LAKE Mark

2006 *Geographical Information Systems in archaeology*, Cambridge University Press, Cambridge.

CUCOȘ Ștefan

1992 *Contribuții la repertoriul arheologic al județului Neamț*, în: Mem. Antiq., XVIII, Piatra Neamț, p. 5-61.

EMANDI Emil Ioan

1974 *Cercetări arheologice în bazinul superior al Șomuzului Mare*, lucrare de diplomă, mss., Iași, 1974, biblioteca personală A. László.

FLORESCU Adrian C.

1991 *Repertoriul culturii Noua-Coslogeni din Români. Așezări și necropole*, în: CCDJ, 9, Călărași.

GAFINCU Alexandru

2014 *Cercetări de suprafață în bazinul mijlociu al Șomuzului Mare*, în: ArhMold, XXXVII, București/Suceava, p. 229-247.

2015 *Some thoughts on settlement patterns. Late Bronze Age habitat in the Șomuzul Mare basin*, în: SAA, 21 (1), Iași, p. 9-24.

GAFFNEY Vincent, STANČIČ Zoran

1991 *GIS approaches to regional analysis: a case study of the island of Hvar*, Oxford.

GHEORGHIU Eugen, LUPU-BRĂTILOVEANU Nicolae

1992 *Podișul Sucevei*, în: *Geografia României*, vol. IV, București, p. 459-487.

- Haidu Ionel, Haidu Călin
- 1998 S.I.G. *Analiza spațială*, București
- MICLE Dorel
- 2011 *Un model practic de aplicare a topografiei și cartografiei arheologice în analiza spațială a habitatului rural post-roman din Dacia de sud-vest între sfârșitul secolului al II-lea și începutul secolului al V-lea p. Chr.*, Editura Excelsior Art, Timișoara.
- MICLE Dorel, MĂRUIA Liviu, STAVILĂ Andrei
- 2012 *ArheoGis: un sistem integrat de manageriere a patrimoniului arheologic național*, Editura Excelsior Art, Timișoara.
- NICULICĂ Bogdan Petru
- 2005 *Considérations sur la période moyenne de l'Âge du Bronze dans le Plateau de Suceava. Le complexe culturel Komarow – Costișa – Bjalj-Potik*, în: SAA, X-XI, 2004-2005, Iași, p. 61-68.
- 2006 *Epoca mijlocie și târzie a bronzului în Podișul Sucevei*, lucrare de doctorat, mss., Iași, Biblioteca Facultății de Istorie.
- 2007 *Considerations concernant le début de l'âge du bronze sur le territoire du département de Suceava*, în: CC, (S.N.), 13 (23), Suceava, p. 13-47.
- ȘTEFAN Maria-Magdalena, ȘTEFAN Dan, CAVRUC Valeriu
- 2012 *ArheGIS : arheologie digitală și spațială : Manual teoretic și exemple de aplicare*, Brăila.
- TEODOR Dan, IONIȚĂ Ion
- 1967 *Cercetări arheologice în Podișul Sucevei*, în: ArhMold, V, Iași, p. 309-325.
- URSACHI Vasile, HORDILĂ Domnița, ALEXIANU Marius, DUMITROAIA Gheorghe, MONAH Dan
- 1992 *Cercetări arheologice de suprafață pe valea Siretului, la nord de municipiul Roman*, în: MemAntiq, XVIII, Piatra Neamț, p. 145-172.
- URSULESCU Nicolae
- 1973 *Așezările omenești de pe teritoriul Sucevei până în secolul al VI-lea*, în: Suceava, III, Suceava, p. 47-61.
- WHEATLEY David, GILLINGS Mark
- 2002 *Spatial Technology and Archaeology. The archaeological applications of GIS*, Taylor & Francis, New York.
- ZAHARIA Neculai, PETRESCU-DÂMBOVIȚA Mircea, ZAHARIA Eugenia
- 1970 *Așezări din Moldova. De la paleolitic până în secolul al XVIII-lea*, București.