

International Cartographic Association  
 Commission on Cartographic Heritage into the Digital

*17th ICA Conference*

# Digital Approaches to Cartographic Heritage

*Thessaloniki*

24-26 May 2023

*hosted by the*  
 Laboratory of Cartography  
 & Geographical Analysis  
 (CartoGeoLab) AUTH

## Conference Abstracts

*Venue*  
 Museum of Byzantine Culture

*Editors*

Angeliki Tsorlini

Chrysoula Boutoura



International Cartographic Association  
Commission on Cartographic Heritage into the Digital  
**17th ICA Conference Digital Approaches to Cartographic Heritage**  
Thessaloniki, 24-26 May 2023

### Conference Abstracts

Editors: Angeliki Tsorlini, Chrysoula Boutoura  
Thessaloniki: AUTH CartoGeoLab



The Abstracts volume is part of the Conference Proceedings distributed to all registered participants of the 17th ICA Commission Conference 2023

To order digital copies of the Conference Proceedings  
Contact the AUTH CartoGeoLab:  
atsorlin@auth.gr, boutoura@auth.gr

The 17th Conference of the series *Digital Approaches to Cartographic Heritage* is organised by the ICA Commission on Cartographic Heritage into the Digital in Thessaloniki, Greece, 24-26 May 2023, in partnership with the AUTH - Aristotle University of Thessaloniki, supported by the MAGIC - Map & Geoinformation Curators Group.

17th ICA Conference “Digital Approaches to Cartographic Heritage: <http://cartography.web.auth.gr/ICA-Heritage/Thessaloniki2023>

ICA Commission on Cartographic Heritage into the Digital: <http://cartography.web.auth.gr/ICA-Heritage>

AUTH Laboratory of Cartography and Geographical Analysis: <http://cartography.web.auth.gr/cartogeolab>

## Contents

### SESSION I

- Chalkidou S., P. Tokmakidis, P. Patias, O. Georgoula, A. Arvanitis** Identifying lost cultural heritage assets from historic town planning maps. The case of Thessaloniki, Greece 4
- Pagkalidis A.-P., M. Psarogiorgos, A. Tsorlini** Studying the development of the city of Florina from its liberation in 1912 until today based on historical town plans, maps and orthophoto maps 4
- Delli G., G. Malaperdas** Samos, a terra incognita? The byzantine landscape through cartographic and textual sources 4
- Zentai L.** Re-thinking early digital thematic atlases: Atlas of Central Europe 5

### SESSION II

- Vardakosta I.** Effective management of geographical information in Map/GIS Libraries 5
- Shawa T.** How to make large collections of map sets accessible online 5
- Dodsworth E., M. Wieland** Delving into the Archives: Studying geographic and cultural landscape changes using cartographic and textual data 6
- Ammann O.** Acquisition and provision of electronic thematic maps at ETH Library: Experiences and results from the pioneer project 6

### SESSION III

- Gkadolou E., E. Charitoudi, N. Meyer** Digital Humanities tools for linking historical maps collections: A case study from the British School at Athens 6
- Ungvári Z., M. Gede, H. Krizsán, K. Rapcsán, Z. Kuris, A. Beszki** Interactive name index of old virtual globes 7
- Irás K., I. Faragó** Updates on the Atlas of Medieval Settlements of the Hungarian Kingdom 7
- Hormes S.** Cartographic time machine 7

### SESSION IV

- Tsorlini A., C. Boutoura, E. Livieratos** Studying the geometric properties and the thematic content of the two maps of Greece by Pierre Lapie (1822, 1826) 8
- Van Egmond M.** Maps with a Message: Charting, interpreting, and disseminating of knowledge about Missionary Cartography (ca. 1850-1950) 8
- Kiss E., H Herold** Monitoring land change on national scale 9
- Koukoletsos T., G. Nikas, D. Loisos, P. Grigoriadis** Mapping the Greek Army at the 1st Balkan War: Challenges and mismatches 9

### SESSION V

- Galambos Cs., G. Nikas, Z. Bartos-Elekes, G. Timár** The Habsburg geodetic surveys of the Balkans (1873/75) and the early topographic maps of Northern Greece 10
- Kiss E., M. Klöffler, G. Timár** Schmitt's Map: The combination of French and Austrian surveying expertise in Southern Germany 10
- Timár G., P. Musyimi, S. Appel** Projection analysis and georeference of the 1:2M Africa map by Régnaud de Lannoy de Bissy (1891-1902) 10
- Gede M.** Georeferencing Tabula Peutingeriana 11

### SESSION VI

- P. Patias, T. Roustanis, K. Klimantakis, D. Kaimaris., S. Chalkidou, I. Christoforidis** A workflow for validation and evaluation of a Dynamic Content Management System for cultural events 11

<b>Magyari M.</b> Systematizing written records for the creation of a spatiotemporal database concerning the all-time settlement network of Transylvania	11
<b>Tassopoulou M., G. Pozoukidou</b> Were ancient cities resilient? A study using historical maps to identify and evaluate sustainable urban planning throughout Greece’s ancient and Early modern history	12
<b>Barontini S., B. Bettoni, M. F. Hanif, H. Mohammad, M. Peli, R. Ranzi</b> Mapping ancestral irrigation techniques in the Mediterranean basin and Central Asia for a climate based analysis	12

## Abstracts

### SESSION I

24 May 2023 17.30-18.45

# CHALKIDOU S., P. TOKMAKIDIS, P. PATIAS, O. GEORGOULA, A. ARVANITIS *Thessaloniki*

*Aristotle University of Thessaloniki, School of Rural and Surveying Engineering*

#### **Identifying lost cultural heritage assets from historic town planning maps-The case of Thessaloniki, Greece**

Thessaloniki, Greece has a long and uninterrupted history as a major urban centre. The city has been a place of residence and trade for a variety of different cultural and ethnic populations namely Greek, Muslim, and Sephardic Jews, following the millet system i.e. each religious community was located in distinct neighbourhoods and had its own societal and economic infrastructure. A map reproduction of 1906 based on a tax census report performed by the Ottomans reveals this organizational structure of the city and depicts the location of several urban heritage sites. Additional, historic town planning maps of 1937-1939 that have been retrieved and scanned from the Municipal Constructions and Urban Planning Directorate will be used to provide insight into the city's heritage at the time. Finally, a spatially enabled web application and a geographic dataset containing all the currently listed heritage monuments will be used to verify the location and existence of these heritage assets at present time.

The goal of this research is to focus on the use of historic town plan maps to identify and geolocate places of heritage (cultural, industrial, religious, etc) in the city of Thessaloniki, Greece. Through the comparison of the data extracted from the map sheets of 1906 and 1937-1939, we can identify the CH assets that have been lost or destructed over the past 100 years, but also retrieve their location in the present urban fabric. The study of these maps is also correlated with important dates in the city's recent history that triggered major changes in its form and population composition.

# PAGKALIDIS A.-P., M. PSAROGIORGOS, A. TSORLINI *Thessaloniki*

*Aristotle University of Thessaloniki, Laboratory of Cartography and Geographic Analysis – CartoGeoLab*

#### **Studying the development of the city of Florina from its liberation in 1912 until today based on historical town plans, maps and orthophoto maps**

Florina is a city of 17.000 citizens in Western Macedonia region. The city plan of Florina is the first organized and innovative map since the liberation of the city. It is the oldest map of the city, and it was prepared in the frame of a group of infrastructure works in entire Greece. The aim of the map was to organize the city, to arrange the riverbed, to settle the building blocks and intersection of the streets, adjusting at the same time the construction restrictions and terms. This city plan is the same for the last one hundred years, with just some modifications or rearrangements at specific places. It was created from the French Engineer Alfredo Leguillon and its preparation started in 1914 but it was originally released in 1918 and approved by the king of Greece at 19.05.1919.

In this study, we study particular areas of interest throughout the entire city, and we will follow their development the last one hundred years with the help of historical maps and topographic diagrams, which are actually modified versions of the initial city plan, produced and issued by the relevant departments of Urban Planning of Municipality of Florina, comparing at the end the development of each area with its current situation appeared on orthophoto maps. Taking into consideration the rapid development of the last hundred years, we could easily spot the change of priorities throughout the city, for example the improvement of the road network which is used by cars and not by wheeled carts. Moreover, we could spot the differences in the administrative and commercial centre of the city, which has changed many times. We could find that the central square of the city, Omonoia Square, was not part of the first city plan and it was later added to it. Furthermore, we could study the arrangement of the riverbed and its streams and their modification in some parts to avoid problems caused in some areas by floods. Through this research, it was also possible to check changes in special characteristics in the areas of interest, influenced by the human factor or to study the toponymy of certain places. All this information is combined on a GIS application, giving the opportunity to the researcher to study the development of the city of Florina and its structural changes on the city planning during the last century.

# DELLI G., G. MALAPERDAS *Athens, Kalamata*

*National & Kapodistrian University of Athens | University of The Peloponnese*

#### **Samos, a terra incognita? The byzantine landscape through cartographic and textual sources**

The byzantine topography of Samos is being studied for the first time as a result and in the context of the ongoing archaeological research. Evidence so far indicates to a densely populated island heavily engaged in trade, equipped with fortifications. It also seems that the wealth and power the island enjoyed is linked to the geomorphology of not only Samos but also of the island complex that the latter belongs. The study is supported by maps created by travellers

from the 15th to the 18th century. However, the relatively more crucial and significant information derives from more recent maps like the British Aegean Islands, developed for intelligence reasons before World War II. Reading those maps not only reaffirms the position of medieval sites, but also in some cases results in the discovery of new ones, based on the old, non-surviving nowadays, toponyms. They also contribute to the broader understanding of the landscape prior to the industrial revolution, since they point out to old water currents as well as agricultural areas, places of inhabitation, quarries, and ports. In addition to the symbols and depictions of various monuments, the imprinting of historical toponyms on old maps can provide useful information for historical and archaeological research. The entire work showcase how researchers can derive new data from old maps through the specific case study of the mapping of an entire island, that of Samos.

# ZENTAI L. *Budapest*

*ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics*

### **Re-thinking early digital thematic atlases: Atlas of Central Europe**

The preservation of cartographic heritage can cover a wide range of cartographic products. In the early days of digital cartography, GIS capabilities were relatively limited. The Atlas of Central Europe, produced (re-created) by our institute in 1993, is a digital facsimile version of an atlas produced for decades between the two world wars. The original atlas was printed in very difficult conditions (shortage of paper and ink) in early 1945 in Hungary, in a country already partly occupied by the Soviets, in small number of copies and poor quality. And although the printing plates were preserved, the printing technology had improved so much that it would have been pointless to print the original version of the atlas as a real facsimile. Unfortunately, the original data did not survive, so in the early 1990s, although the use of GIS software for processing was considered, it was not possible at all in the end due to a lack of original data in digital form (they have not even preserved in paper form thanks to war conditions). So, using general graphics software, we reproduced the atlas, greatly improved graphically so that it was much easier for the costumers to use it. Nowadays, thirty years later, GIS software is much better suited to professional cartographic visualisation, but the lack of data used to produce the thematic atlas is of little use.

Today, the digital publication of the 1993 publication as a printed atlas is being considered. There is also a partial solution to the lack of data, because in recent years many analogue publications have been digitised, so that an increasing number of contemporary statistical publications are available in digital form, also as databases, but even data not yet available in electronic form can be produced using data mining methods. This makes it increasingly realistic to prepare and publish the original atlas as a geoinformatics database, an interactive web-based atlas.

## **SESSION II**

**25 May 2023 14.00-15.15**

# VARDAKOSTA I. *Athens*

*Harokopio University Library & Information Centre*

### **Effective management of geographical information in Map/GIS Libraries**

The effective management of geographical information is essential for many organizations and especially for Map/GIS Libraries which play a crucial role in providing access to a wide range of geographical data (print and digital) and tools for analysis and visualization. However, managing map and GIS collections can be a challenging task for librarians requiring careful consideration of data quality, and metadata interoperability in order to fulfil their purposes.

This paper aims to discuss the importance of Map/GIS libraries in providing access to various geographical data and tools for analysis and visualization. It will explore various topics related to Map/GIS collections including organizing spatial data, creating and maintaining metadata, and ensuring data quality. Significant Map/GIS collections regarding their catalogue records will be highlighted. In addition, emerging trends and technologies will be explored. One important topic that the presentation will cover is interoperability achievement through cooperation in the management of geographical information. Overall, the paper intends to provide valuable insights into effective Map/GIS management.

# SHAWA T. *Princeton, NJ*

*Princeton University Library*

### **How to make large collections of map sets accessible online**

Many map libraries have large collections of map series and they have developed different workflows to process and make those maps accessible to their users. I recently developed a workflow to process topographic map sets that would allow us to convert paper to digital maps and then automatically georeference all the individual sheets and

publish them on our Portal. This new workflow allows our users to view all sheets of a topographic map set as individual map sheets and also combined as a mosaic map. The same mosaic map can be added to any GIS software packages that can open WMTS or XYZ services. The new workflow allows our users not only to view individual sheets on our Portal, but also to download individual map sheets with or without georeferenced information. The recently developed workflow has helped me achieve one of the goals I have had for our Library's Map and Geospatial Information Center, that is to convert paper maps to geographic data, so we are able to integrate our collections of paper and digital maps with our geospatial data.

In this presentation, I will describe how we catalog map sets, automate the georeferencing of scanned maps, and organize the files in hierarchy before the scanned and georeferenced map sheets are uploaded on our server, as well as how we make the uploaded resources accessible on our Digital Maps and Geospatial Data Portal and Library online catalog.

# DODSWORTH E., M. WIELAND *Waterloo, Ontario*  
*University of Waterloo*

### **Delving into the archives: Studying geographic and cultural landscape changes using cartographic and textual data**

Historical resources offer amass information and evidence about days past. Textual information often captures accounts of memories, experiences, stories, and facts. Illustrated or graphical information display scenes, landscapes, and infrastructure, while cartographic drawings or prints often depict or capture a moment in time.

Intertwining graphical representations of places with textual data avails details and organizes historical facts about places, people and the interconnection between them.

In this paper, the authors share the work they have completed creating a historical database of pre-and-post-war settlers, inventors, entrepreneurs, and laborers. Their sprawling businesses have impacted the small city, changing the geographic and cultural landscape of it. By using historical resources, the authors have developed modern historical maps to tell the story of the history of the city and their people. Thematic analysis will be discussed, including covering business types, longevity, and loss due to urbanization and transportation development.

# AMMANN O. *Zurich*  
*ETH Library*

### **Acquisition and provision of electronic thematic maps at ETH Library: Experiences and results from the pioneer project**

The ETH Library in Zurich has observed a declining demand for printed maps and an increasing demand for electronic maps over the years. This trend was also confirmed by a survey conducted in 2018 at ETH Zurich's Department of Earth Sciences and Institute of Cartography and Geoinformation. In response, the ETH library initiated the pioneer project e-maps with the aim of acquiring and providing thematic maps in digital form to its users.

As part of the project, selected government providers in multiple countries were asked how and under what legal conditions their products can be procured in electronic form to make them available online to users. Such maps must be available in a minimum resolution of 256 dpi, as a raster or vector graphic, and georeferenced.

A web server solution was set up for previewing and downloading the electronic maps. It allows maps in various file formats to be displayed and restricts access to the IP range of ETH Zurich depending on the product's license model. Whenever possible, the maps are made available under open licenses. The electronic maps are catalogued in the library system Alma with a link to the presentation and download solution.

The same infrastructure is used to provide digitised and georeferenced historical maps from the ETH Library's collection. In contrast to the e-rara platform, where some of these maps are already available as JPEG and PDF, they are provided as georeferenced TIFF files (GeoTIFF) in the new offering.

This talk will shed light on the project's inception, results, and perspectives.

## **SESSION III**

**25 May 2023 15.30-17.00**

# GKADOLOU E., E. CHARITOU, N. MEYER *Athens*  
*British School at Athens*

### **Digital Humanities tools for linking historical maps collections: A case study from the British School at Athens**

The British School at Athens holds a collection of over 1500 maps from the 17th century to the present day. The collection is predominantly based on army reconnaissance starting with the Austrian Staff Maps from the 19th century, followed by the British Army maps of Greece from the 1st and 2nd World Wars, culminating in the recent

Greek Army maps. The collection includes the British Admiralty Charts from the 19th century and subject specific maps such as geology. Currently, a set of tools and methodologies from the digital humanities community are being explored in order to support the linking of the digital cartographic material with other digital resources of the School and the web publishing of data. This paper presents the first results of this attempt that has as ultimate goal to highlight the value of linked open data in enhancing the search capabilities of a digital collection and in promoting it to the wider public in an alternative more flexible manner.

# UNGVÁRI Z., M. GEDE, H. KRIZSÁN, K. RAPCSÁN, Z. KURIS, A. BESZKID *Budapest ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics*

### **Interactive name index of old virtual globes**

The Virtual Globes Museum (VGM) is a globe digitising project running since 2007 at the Institute of Cartography and Geoinformatics, ELTE Eötvös Loránd University. More than 170 terrestrial and celestial globes are available on its website, (<http://vgm.elte.hu>) making it one of the largest online globe collections worldwide.

This paper introduces an interactive gazetteer on a subset of the collection. 30 earth globes, representing the past 180 years of Hungarian globe production (starting from 1840), were selected, and their toponyms had been organized into a geodatabase. A search engine combined with a Cesium.JS powered virtual globe helps browsing the data. Users can search the database in seven name categories: oceans and seas, capes, rivers, lakes, ocean currents, waterfalls, and settlements. Gazetteer entries include the original name (appearing on the globe), the recent Hungarian and English name of the object, its location and the globe the name appears on. The virtual globe on the interface lets users to overlay feature class layers upon the digitised globe surface, facilitating to examine the differences of these globes as well as the changes of a name through time. The largest and most recently added category, settlement names, are also combined with the CShapes dataset (created at ETH Zürich) containing contemporary country borders, therefore not only the settlement but also its country in the respective time period is highlighted. The gazetteer can be found at <http://terkeptar.elte.hu/vgm/gazetteer>.

# IRÁS K., I. FARAGÓ *Budapest ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics*

### **Updates on the Atlas of Medieval Settlements of the Hungarian Kingdom**

In 2021, we presented our Atlas of Medieval Settlements of the Hungarian Kingdom as a running project of the Institute of Cartography and Geoinformatics of ELTE Eötvös Loránd University. This special atlas had two important roles. First, it has been an exclusive cartographic contribution to the celebrations of the 800-year long existence of the fundamental, historical document of the Hungarian statehood, the Golden Bull. Second, the four-year long process of preparations provided a safe “sandbox” for dozens of our students to practice different roles of teamwork in this large historic-cartographic-geoinformatic project.

In 2022, the Atlas was published, and in this presentation, we would like to show the elements that were completed after our last presentation in 2021. In total, the Atlas consists of 64-page spreads in scale 1:200 000. Besides historical and cartographic chapters, eight additional maps of the Carpathian Basin and of the Hungarian Kingdom in scale 1:2.000.000 complete the work. These maps of original vegetation, unregulated hydrography, historical toponymy, and varying administrative systems and boundaries from the 11th century to 1526 (Battle of Mohács, after this defeat, most of the Hungarian settlements in the central region of the Kingdom vanished during the c. 150 year long Turkish rule) provide natural and administrative background of the topic. The Digital Index of the atlas is based on the large, geoinformatic database of the project and is accessible via Internet.

In our presentation, we would like to show the outcome of the project “Atlas of Medieval Settlements of the Hungarian Kingdom”, i.e. the Atlas in its final shape and its final content.

# HORMES S. *Lübeck Kartdoku - non-profit association for cartographic documentation*

### **Cartographic Time Machine**

Putzger's Historical World Atlas, which was first published in Leipzig in 1877, is considered a standard work of historical cartography even beyond Germany. The current 105th edition contains almost 400 maps on world history at scales ranging from 1:100 million to 1:1 million, in some cases also 1:50,000 (historical city cartography).

However, due to the wealth of information offered and the complexity of such an undertaking, no attempt was ever made on the part of the publisher to offer the contents of the Putzger in an interactive online version. Projects of other institutions and organisations (e.g. Euratlas, Ostellus) to offer interactive historical maps on the internet also stop at the scale threshold of 1:1 million which leads to the fact that only relatively inaccurate overview maps appear there.



The accuracy and richness of detail of historical official maps up to about the middle of the 19th century allows their georeferenced readout or digitalisation and consequently a relatively precise reconstruction of the boundaries of historical territories, historical event locations as well as routes and paths with a targeted accuracy of about 10 metres. But even maps, bird's-eye views or vedute from the time up to Waldseemüller, Mercator and Münster provide valuable information in this respect. The targeted accuracy of 10 metres naturally decreases as the past recedes.

The aim of the "Interactive Historical Atlas" project is to create an atlas portal that is freely accessible to all users, with various up-to-date background maps that allow a continuous zoom run at different points in time or epochs in the scale ranges 1:10 million to 1:5,000. As a result, it would be possible, for example, to zoom continuously from an overview of the territorial development of the Ottoman Empire to the sieges of Vienna in 1529 and 1683 at street level.

In addition, the positions of important historical but demolished buildings can be reconstructed on the basis of historical maps and projected with attribute information onto current maps so that they provide information about historical events (e.g. Berlin's Kroll Opera House - used after the Reichstag fire for so-called parliamentary sessions from 1933 to 1942). Urban development phases, international areas of tension and territorial changes can also be visualised and explained in an easily understandable way.

## SESSION IV

26 May 2023 10.00-11.15

# TSORLINI A., C. BOUTOURA, E. LIVIERATOS *Thessaloniki*

*Aristotle University of Thessaloniki, Laboratory of Cartography and Geographic Analysis – CartoGeoLab*

### **Studying the geometric properties and the thematic content of the two maps of Greece by Pierre Lapie (1822, 1826)**

In late 18th and early 19th century, especially during the period of the Greek Revolution (1821-1829), which led to the establishment of the Modern Greek state (1830), the French interest for the cartographic representation and the mapping of the broader area of Greece were very intense. Important cartographers such as Choisseul Gouffier providing new geospatial data and descriptions for the area of Greece through itineraries and measurements and Barbié du Bocage with his semi-topographic map of Peloponnese (1803-1807) and of Greece for general use (1810-1811) contributed to the data collection and depiction of the territory of Greece on maps.

Among those was also Colonel Pierre Lapie, a geographic engineer at the French *Dépôt de la Guerre*, who constructed two important maps in 1822 and 1826, depicting territories of today Greece. Lapie's maps are also belong to the category of semi-topographic maps, with the first one, printed in 1822 under the title 'Carte Générale de la Turquie d'Europe' in fifteen sheets and in scale 1:800.000, depicting the European territories of Ottoman empire and the second one, printed in 1826 under the title 'Carte Physique, Historique et Routiere de la Grèce' in four sheets and scale 1:400.000, focused on the area of Greece, mainly the central and southern part of modern Greece. In this paper, we study and analyse digitally the geometric properties and the thematic content of Pierre Lapie's two maps of Greece comparing them to each other and to modern counterparts.

# VAN EGMOND M. *Utrecht*

*Utrecht University Library*

### **Maps with a Message: Charting, interpreting, and disseminating of knowledge about Missionary Cartography (ca. 1850-1950)**

Within Protestantism, missionary maps emerged with the establishment of the first professional missionary societies just before 1800. Their heyday was between about 1850 and 1950, but they are still relevant today, circulating amongst the thousands of organisations and NGOs that are active in global mission and humanitarian aid.

Among scholars, missionary maps have attracted very little attention. To this end, at Utrecht University a missionary map project was launched in 2019 to chart, interpret and disseminate knowledge about missionary cartography. In line with this project a digital exhibition was set up in 2020, presenting a selection of Protestant missionary cartography, mostly Dutch but also British, American, German, and Belgian. The exhibition shows a variety of maps, such as world maps, maps for children, colonial maps, atlases, and maps of exploration. All these maps are in possession of the Utrecht University Library Special Collections Department. The goal is to extend the selection with maps from other institutions and create a more systematic overview of mainly Dutch, missionary cartography. This will offer insights in the perceptions, usage, and even geopolitics of these maps.

The paper sheds light on the historical backgrounds of missionary geography in general, and missionary cartography in particular. It will also show how missionary maps were deeply entangled with the imperial enterprise and (religious) education. The discipline of missionary cartography developed during the 19th century as a form of mature

thematic cartography, with distinctive features such as the use of specific colour patterns. Some striking examples from the digital exhibition will illustrate this development of a genre, which is still alive and kicking.

# KISS E., H HEROLD *Frankfurt am Main, Dresden*

*Federal Agency for Cartography and Geodesy (BKG) | Leibniz Institute for Ecological Spatial Research (IOER)*

### **Monitoring land change on national scale**

Climate research, as well as other Earth System Science (ESS) disciplines, requires time series data over long periods of time. The land use component, and especially anthropogenic land change, plays an important role here, especially since the beginning of the Industrial Revolution in the 18th century. Over the last few decades, a separate field of research has emerged in this area, the so-called Land Change Science or Land System Science.

The Federal Agency for Cartography and Geodesy and the Leibniz Institute of Ecological Urban and Regional Development (IOER) are conducting a joint project for monitoring the land cover change. The most important and in many cases only data source for this task are cartographic depictions of the Earth's surface in the form of archived topographic map series from different time periods. Where applicable, other data sources including forest maps and remote sensing data will also be considered.

The georeferencing and classification of topographic maps from different time periods form the basis for these comparative analyses, the results of which can be used for research purposes. The analysis process is only economically feasible in an automated way due to the large amount of data. The spatial and temporal analysis and comparison of the very different cartographic material face numerous challenges. These range from the procurement of the maps, through semantic matching, to licensing rights that are not always clarified. Special attention has to be paid to the visualisation of the uncertainty of the results. As this is a relatively young and developing field, there are no easily applicable concepts for effective solutions yet.

The collaborative project will attempt to develop methods that meet the challenges while providing data that can be used for decision-making. The aim of the project is to determine the extent to which the land cover in Germany has changed from the beginning of the 19th century until today.

A particular objective is to provide reliable information for the renaturation of former peatlands areas. Documenting the continuity of forest cover is also an important research objective, as the age of woodland plays an important role in the efficiency of carbon sequestration.

The project is currently in the feasibility study phase, in which three sample areas (in the federal state of Saxony) are being investigated.

# KOUKOLETSOS T., G. NIKAS, D. LOISIOS, P. GRIGORIADIS *Athens*

*Hellenic Military Geographical Service (HMGS) | Army History Directorate (AHD)*

### **Mapping the Greek Army at the 1st Balkan War: Challenges and mismatches**

Military History and Cartography sciences share some common ground. Cartography typically provides maps describing the landscape before the battle occurs. Afterwards, Military History describes the battle's conduct and developments, using corresponding battle plans and maps. On the occasion of the 110th anniversary of the end of the Balkan Wars (1912-1913), we would like to highlight two aspects of our research. The first one covers the contribution of Greek military cartographers to Greek success in the Balkan Wars. This includes the creation of triangulation networks, which were necessary for military operations, the creation of accurate maps and the justification of Greece's claims during the diplomatic negotiations that followed. Based on field measurements, the Greek Military Cartographic Service (former HMGS) composed the 1:75.000 map series of the border area in Thessaly, in association with the Austro-Hungarian Military Geographic Institute. These maps, the first ones of such a large scale in Greece, were printed in Vienna and comprised the topographic basemap during the war.

The second aspect is the presentation of a digital method to study the battles of the aforementioned Balkan Wars, in the framework of Military History Science. Using GIS, a battle plan is transformed from a simple sketch diagram into an interactive map. The resulting multi-layered geospatial pdf format is a commonly used pdf file, but with additional spatial capabilities. This allows the user to gain a better understanding of the battle's conduct, by combining terrain, historic map and battle information layers. By extending the method to cover the thirty-four battles of the First Balkan War, new challenges and perspectives appear, providing valuable feedback and evaluation of the use of GIS methods in Military History on the one hand, as well as a fuller spatio-temporal picture of the War on the other.

**SESSION V****26 May 2023 11.30-12.45**

# GALAMBOS Cs., G. NIKAS, Z. BARTOS-ELEKES, G. TIMÁR *Budapest, Athens, Cluj-Napoca*  
*Mineral Property Registry Department, Regulated Activities Authority, Budapest | National & Kapodistrian University of Athens | Babeş-Bolyai University, Cluj-Napoca | ELTE Eötvös Loránd University, Department of Geophysics and Space Science, Institute of Earth Sciences*

**The Habsburg geodetic surveys of the Balkans (1873/75) and the early topographic maps of Northern Greece**

Partially in the frame of the Middle European Degree Survey, the Austrian military topographic service surveyed the European part of the Ottoman Empire, between 1871 and 1875. The surveys, allowed officially by the Ottoman authorities, were conducted by astronomical observations and chronometric measurements to estimate of the astronomical coordinates of some basepoints in towns and in valleys. These data were completed by observations providing the azimuth of lines to mountain summits. Coordinates of these peaks were later calculated by triangulation. The results of the surveys are stored in the Military Archive of the Austrian State Archives in Vienna; the pages, concerning the points in Greece are published in these contributions. Besides, we make an attempt to find correlations of these astronomical originated (not adjusted) coordinates and the later 1:50k and 1:200k Greek and 1:75k Austrian maps of Northern Greece.

# KISS E., M. KLÖFFLER, G. TIMÁR *Frankfurt am Main, Düsseldorf, Budapest*  
*Federal Agency for Cartography and Geodesy (BKG) | Facing-the Past | ELTE Eötvös Loránd University, Department of Geophysics and Space Science, Institute of Earth Sciences*

**Schmitt's Map: The Combination of French and Austrian surveying expertise in Southern Germany**

Schmitt's 1:57600 scale map of Southwestern Germany is an interesting masterpiece of cartographic history. It was produced twenty months' period at the very end of 18th century, covering South Germany to Koblenz, Fulda and Coburg to north and Vorarlberg and Salzburg to south. The georeference of the map product was performed in the frame of MAPIRE, basis of quadratic fit the map mosaic to UTM32N zone. Central and western part of Schmitt's map follows the Cassini triangulation chains of early 1760s, while the NE part is covered by the supplementary survey of Staržinsky & Sarret (StS), few years before the map completion. We performed the georeference of the StS sketches and it occurred extremely good fit assuming the Cassini grid. The StS survey precisely covers the NE part of the later Schmitt map, connecting Cassini's Rhine and Danube chains to the „island-like” ones near Bayreuth and Wuerzburg-Coburg. Since Staržinsky was an officer of the Habsburg Generalstabquartier, all of these indirect indications points toward that the StS survey and the earlier Cassini surveys were both applied as the „geodetic basis” of the Schmitt's map. Knowledge about the applied field technology, however, makes this conclusion a bit controversial. As in the earlier Josephinische Landesaufnahmen, only the graphic triangulation on coupled measuring tables was used, which provided sufficient accuracy at smaller distances. It seems that the first Cassini triangulations were integrated into the detailed topographic surveys also along the Main River; for the surveys outside the triangulation network, however, the proven graphic triangulation along the noon lines (meridians) was applied, which is difficult to maintain in rugged and mountainous terrain.

# TIMÁR G., P. MUSYIMI, S. APPEL *Budapest, Milwaukee, WI*  
*ELTE Eötvös Loránd University, Department of Geophysics and Space Science, Institute of Earth Sciences | American Geographical Society Library, University of Wisconsin-Milwaukee Libraries*

**Projection analysis and georeference of the 1:2M Africa map by Régnault de Lannoy de Bissy (1891-1902)**

The 1:2000000 scale map of Africa, consisting of 63 sheets is a nice summary of humanity's knowledge of Africa at the end of the 19th century. According to the literature, the map system has the 'meridional orthographic' projection, with the central meridian 10 degrees East of Paris (cca. 12 degrees and 20 minutes from Greenwich). No datum data is found, however at this scale, it is less important indeed for any georeferencing work. However, defining an orthometric projection with the central meridian of 12 degrees 20 minutes leads to unacceptably high errors of the georeference of the sheets of this map product. That is why we embarked on another solution. As a contemporary German map product (the 1:4 million scale 'Habenicht map') has a 'Flamsteed' projection, we tried this for the French series. The Flamsteed projection is called sinusoidal in modern GIS applications. The georeference with the sinusoidal projection was much more convincing, resulting us a conclusion that the real projection of the French map product is also the 'Flamsteed' or sinusoidal projection, with the projection centre at the crossing of the Equator and the meridian 12.33333 degrees East of Greenwich. However, georeferencing using this projection provides the remaining errors: They have a magnitude of up to some 10 kilometres far from the centre, providing the hint that the size of the Earth was supposed to be slightly different from the applied 'Google Sphere'; it shall invoke further scale analysis of the map product. We are seeing errors of a completely different nature in Central Africa, far from the coast. The

interior of the continent was only partially surveyed along traverse lines with geodetic accuracy at that time. These errors are therefore part of the knowledge conveyed by the map at the end of the 19th century.

# GEDE M. *Budapest*

*ELTE Eötvös Loránd University, Faculty of Informatics, Institute of Cartography and Geoinformatics*

### **Georeferencing Tabula Peutingeriana**

Tabula Peutingeriana is a copy of an ancient roman road network chart. Its georeferencing is not possible the traditional way as no map projection matches the geometry of this product. However, as it is topologically correct, it is still possible to estimate the geographical position of any map points and vica versa. This paper investigates how can this connection be visualised on an interactive web map. The Talbert database of names, and the geolocations from omnesviae.org were used for the project.

## **SESSION VI**

**26 May 2023 14.00-15.15**

# PATIAS P., T. ROUSTANIS, K. KLIMANTAKIS, D. KAIMARIS, S. CHALKIDOU, I. CHRISTOFORIDIS

*Thessaloniki*

*Aristotle University of Thessaloniki, School of Rural and Surveying Engineering | School of Informatics | School of Spatial Planning and Development*

### **A workflow for validation and evaluation of a Dynamic Content Management System for cultural events**

DigiOrch is an ongoing research project where the embedded Dynamic Content Management System, by utilizing the augmented reality technology, presents multimedia data such as texts, photos, videos and 3D Models to the end-user by “superimposing” them on mobile devices screen, providing extra information on a smart leaflet.

The system has been implemented by IT engineers and is subsequently validated and evaluated at a TRL 5/6 level during a musical concert, which took place in December 2022 at the facilities of the State Conservatory of Thessaloniki. The scope for this is to identify both technical problems as well as problems identified by the average user of the API.

The paper elaborates on the validation and evaluation protocols according to usability, learnability, understandability, operability, and attractiveness of the developed system. Both Analytical (Cognitive Walkthrough, Pluralistic Walkthrough, Heuristic Evaluation, etc) as well as Empirical (experimental methods: Performance Measurement/Thinking Aloud Protocol, inquiry methods: Focus Groups/Questionnaires) evaluation methods have been used, as described in relevant literature.

# MAGYARI M. *Budapest*

*Eötvös Loránd University*

### **Systematizing written records for the creation of a spatiotemporal database concerning the all-time settlement network of Transylvania**

The modern-day Transylvania, which, besides Transylvania itself, includes the historical regions of Banat, Crişana and Maramureş as well, has always been a diverse and multilingual territory. According to this, the settlements in this part of today’s Romania, appearing in the written records starting from the end of the 9th century, have possessed numerous name variants throughout history.

There are historical gazetteers available that compile the written mentions of certain settlements in this area, and consequently allow keeping track of the existence and name shifts – sometimes along with changes in the legal status and administrative affiliation – of the localities, these, however, are not spatial databases, in fact they are not even databases, but textual enumerations. In addition, none of them covers the present settlement network of Transylvania (ca. 5000 localities) entirely, let alone the currently non-existent settlements.

Taking this into consideration, this research aims to systematize the information present in these gazetteers in form of a spatiotemporal database, that can be processed with the help of GIS software and hence serve as a background material for the long-term objective of this project: a web map enabling the visual representation of particular changes in the settlement network of modern-day Transylvania, with special regard to the different name variants of the localities.

This paper focuses on setting up the core database of this material, through identifying the settlements, noting their general characteristics (e.g. first written mention), and determining their geographical position with the help of historical cartographic sources among others.

# TASSOPOULOU M., G. POZOUKIDOU *Thessaloniki*  
*Aristotle University of Thessaloniki*

**Were ancient cities resilient? A study using historical maps to identify and evaluate sustainable urban planning throughout Greece's ancient and Early modern history**

Greece has a long history of creating new cities and founding new communities while under siege by several conquerors, including the Romans, Ottomans, Venetians, and the most recent Axis occupation during WWII. Under these circumstances, ancient cities were often reorganized under the influence of each conqueror's urban planning principles. At the same time, major historical events in the 20th century, including the Asia Minor Catastrophe, led to the relocation of thousands of people within the Greek borders and the establishment of numerous settlements on the mainland. Apart from these momentous events, natural disasters and other economic, social, and environmental crises were also crucial factors leading to population movements and the creation of new settlements. Within this framework, it becomes obvious that cities' functional and spatial organization are a continuous and complex process, while urban form depends mainly on the era a city was created and the natural constraints of its landscape.

The literature review on the use of the concept of resilience in urban planning highlights the emphasis on the various aspects of urban resilience, while it is widely recognized that the structural and functional organization of cities plays an important role in achieving the resilience of urban areas.

This project aims to identify and evaluate the sustainable development principles of Greek settlements throughout history by utilizing different cartographic methods and data, including historical maps, aerial images, and additional socio-economic data using modern cartographic visualization techniques (i.e., GIS dashboard and big data management). The scope of this study is to explore the value of these historical representations and how this information can also contribute to the establishment of urban resilience in modern cities.

# BARONTINI S., B. BETTONI, M. F. HANIF, H. MOHAMMAD, M. PELI, R. RANZI *Brescia*  
*University of Brescia, Department of Civil, Environmental, Architectural Engineering and Mathematics (DICATAM)*  
*| Department of Economics and Management (DEM)*

**Mapping ancestral irrigation techniques in the Mediterranean basin and Central Asia for a climate based analysis**

Ancestral irrigation techniques refer to a corpus of ancient irrigation practices and water management techniques that became traditional for the populations which used them, and that are still in use today to some extent. Most of these practices are structurally sustainable, being based on the respect of the water cyclical availability, and resilient, as they proved of being able to react to extreme climatic conditions. The important role historically played at shaping the landscape and the settlements, at mitigating the water scarcity and at allowing the irrigated agriculture also in arid and semiarid climates, is such that they became a cultural heritage for the populations and an important link between Humans and the environment. Now these techniques stand at a crossroads of their history, between the rediscovery and the acknowledgment of their importance as a climate regulating agent, on one side, and the abandonment in favour of modern ones, on the other side.

In this work, as a cartographic frame for an extensive literature review, aiming at assessing the state of the art regarding the present interest of the scientific community on these practices, we propose a thematic map of the techniques classification and distribution in the Mediterranean basin – which is a hotspot for the climate change – and Central Asia, thus covering all the Ptolemaic ecumene. Although limiting the analysis at this restricted area, this particular aspect underlines that the importance of these practices goes beyond their local usage, because they were spread by skilled workers' migration and, where they arrived, they were mostly assimilated as an exogenous tradition. In view of investigating the relationship between the presence of the techniques and the local climate, the thematic map was superimposed to classical climatic descriptors, i.e. De Martonne aridity index, Johansson continentality index, and Köppen–Geiger climate classification.



