



Humans and environmental sustainability: Lessons from the past ecosystems of Europe and Northern Africa

14th Conference of Environmental
Archaeology 2018

Modena, 26-28 February 2018



Edited by
Assunta Florenzano, Maria Chiara Montecchi, Rossella Rinaldi

UNDER THE PATRONAGE OF



CEA2018

This e-book includes the 61 long abstracts of oral presentations (41) and posters (20) presented at the three-day CEA2018, the 14th Conference of Environmental Archaeology. The LPP-Laboratory of Palynology and Palaeobotany of Department of Life Science, interdisciplinary biological center of the University of Modena and Reggio Emilia, organized the meeting in Modena (26-28 February 2018), in the historical and recently restored San Geminiano building. The scientific contributions were presented in 8 talk sessions and one poster session. Multidisciplinary *ABG Archaeo-Bio-Geo* studies on environmental reconstructions and palaeoecological research involving analyses of archaeological survey, human and animal bones, sometimes integrated to isotopic or molecular data, remote sensing and GIS, are reported in this e-book. Botany is the prevalent biological field contributing to environmental reconstructions, with analyses on plant macroremains, non-pollen palynomorphs and pollen, and with studies on flora and vegetation changes. Study areas are mainly centered on European countries, Mediterranean and Northern Africa, including five abstracts on Sahara, while two contributions concern South America.

The 1st Conference, called “The Archaeobotanical work group”, was organized in 2005, and was a working group round-table meeting between experts on environmental studies and archaeologists of the Czech Republic. Then, the meeting became an annual conference with more and more attendants from other countries. In 2017, the 13th CEA took place in Nitra, Slovakia, and was for the first time outside the Czech Republic. In Italy, the CEA2018 has been especially rich of presentations and interdisciplinary approaches, with many countries represented as study areas and participants coming to Modena. Titles and list of co-authors show an unexpectedly rich number of contributions to the Environmental Archaeology by Italian specialists joining colleagues from the Czech Republic, Poland, Norway, Sweden, Greece, Spain, France, Switzerland, Austria, Germany, Serbia, Slovakia, Republic of Macedonia, United Kingdom, United States of America, and other countries.

The congress was under the patronage of the project SUCCESSO-TERRA (on sustainability and the Bronze age in the Po plain-N Italy) and of the network BRAIN-Botanical Records of Archaeobotany Italian Network (<https://brainplants.unimore.it/>). Basic sponsorships were given by the Botanical Society of Italy, the Italian Institute of Prehistory and Protohistory, the scientific association Society of Naturalists and Mathematicians of Modena, the Superintendence of Bologna, Modena, Reggio Emilia and Ferrara, Civic Museum of Archaeology and Ethnology of Modena, with municipality of Modena and the Emilia Romagna Region. Besides the SUCCESSO-TERRA project mentioned above, financial support was provided by Fondazione Anna Maria Catalano ONLUS and CEDAD-Centro di DATazione e Diagnostica. We acknowledge all the projects, institutions and associations, the international scientific committee, the local organization committee and the Centro Interateneo EDUNOVA - Centro E-learning di Ateneo who contributed to the success of the conference.

*Anna Maria Mercuri
February 2018*

Contents

Presentation

SESSION 1

DETECTING HUMAN IMPACT: THE ABG (ARCHEO-BIO-GEO) RESEARCH

- Mauro Cremaschi* 2
Settlements, Crops, Woods. Land use and resources in a changing environment at the time of the Terramare (XVI - XII century BC, N Italy)
- Stefano Remo Luigi Campana, Ken Saito* 8
Emptyscapes: filling an 'empty' Mediterranean landscape mapping the archaeological continuum
- Ladislav Smejda* 16
Recent surveys of ancient human impact on soil chemistry in Messara Plain, Crete
- Alessandro Panetta, Valentina Pescini, Roberta Cevasco, Nicola Gabellieri, Carlo Montanari, Diego Moreno* 19
Towards an Environmental Resources Archaeology, escaping from site (and 'off-site')
- Petr Pokorný, Petr Šída, Lucie Juříčková, Michaela Ptáková, Jan Novák, Přemysl Bobek* 22
1st millennium BC forest ecosystem transformation in Bohemian sandstone areas: Were humans involved?

SESSION 2

DETECTING HUMAN IMPACT: THE ABG (ARCHEO-BIO-GEO) RESEARCH

- Emanuele Vaccaro, Michael MacKinnon, Anna Maria Mercuri Mercuri* 26
Cultural landscape and local economy in central Sicily: Philosophiana between the Roman and Middle Byzantine periods
- Assunta Florenzano* 30
Palynological approach to pastoral activities reconstructions in S Italy: a palaeoecological contribution to support biodiversity awareness
- Mauro Rottoli, Michele Bassetti, Nicola Degasperi, Nicoletta Martinelli, Roberto Micheli* 33
Agriculture, forestal resources and Late Neolithic daily life at the pile-dwelling site of Palù di Livenza (NE Italy)
- Roberto Micheli, Michele Bassetti, Federico Bernardini, Nicola Degasperi, Vanni Lughì, Mauro Rottoli, Lisa Vaccari, Franco Zanini* 36
Chewing tar at the Late Neolithic pile-dwelling site of Palù di Livenza (NE Italy)
- Jitka Kosňovská, Věra Čulíková, Veronika Komárková, Adéla Pokorná, Jaromír Beneš* 41
Structure and useful plant dynamics on Prague Castle: archaeobotanical and ethnohistorical perspective

SESSION 3

LONG-TERM ENVIRONMENTAL RECONSTRUCTION FOR LANDSCAPE MANAGEMENT

- Yannick Miras, Michela Mariani, Paul M. Ledger, Léo Chassiot, Marlène Lavrieux* 45
Holocene vegetation dynamics and land-cover estimates in Auvergne: key tools to landscape management

<i>Reyes Luelmo-Lautenschlaeger, José-Antonio López-Sáez, Sebastián Pérez-Díaz</i>	48
A mid-mountain landscape shaped during fourteen centuries in the heart of Toledo Mountains (central Iberia): the Bermú peat bog record	
<i>Chiara Molinari, Carlo Montanari</i>	51
The disappearance of cultural landscapes: the case of wooded-meadows in the Ligurian Apennines (NW Italy)	
<i>Alessandra Benatti, Marie Bal, Philippe Allée, Giovanna Bosi, Anna Maria Mercuri</i>	55
The past plant ecosystems of Northern Apennines inferred from soil charcoal analysis	
<i>Lisbeth Prøsch-Danielsen, Christopher Prescott, Erik Daniel Fredh</i>	58
Land-use change and exploitation of outfield resources at the Høg-Jæren plateau, SW Norway, during the last 6500 years	
<i>Tomasz Kalicki, Mariusz Chrabąszcz, Igor Maciszewski, Paweł Przepióra</i>	60
Impact of the Lusatian culture on landscape of last glaciations area: a case study from the upper Drwęca river basin (N Poland)	
SESSION 4	
NORTHERN AFRICA ARCHAEO-ENVIRONMENTAL CHANGES	
<i>Savino di Lernia, Isabella Massamba N'Siala, Anna Maria Mercuri, Andrea Zerboni</i>	64
Etaghas: an unprecedented evidence for agricultural landuse in the hyperarid central Sahara	
<i>Kathleen Nicoll</i>	68
"Mind the Gap" to Reconstruct Patchy Records of Archaeology & Environmental Changes in the NE Sahara	
<i>Rocco Rotunno, Rita Fornaciari, Michela Boscaini, Anna Maria Mercuri, Savino di Lernia</i>	72
Herding Barbary Sheep in Early Holocene Sahara	
<i>Monika Baumanova</i>	75
(Pre)colonial urban sustainability in coastal Africa: environmental and social aspects	
SESSION 5	
MEDITERRANEAN ARCHAEO-ENVIRONMENTAL CHANGES	
<i>Erica Rowan</i>	78
Adding fuel to the fire: Archaeobotanical evidence for olive pomace use at Roman Utica	
<i>Carlo Beltrame, Alessandra Forti, Michele Maritan, Antonella Miola, Paolo Mozzi, Alessandro A. Rucco, Andrea Vavasori</i>	81
Multidisciplinary research in naval archaeology: the shipwreck of Santa Maria in Padovetere (Ferrara, N Italy)	
<i>Arthur Glais, José-Antonio Lopez-Saez, Laurent Lespez, Zoï Tsirtsoni, Pascal Darque</i>	83
Contributions of a multiscale approach to human-environment relationships reconstruction, around the tell of Dikili Tash (Greece)	
<i>Goce Naumov</i>	86
Dryland Tells in Wetlands of Macedonia: Pelagonia and the site of Vrbjanska Čuka as case study	
<i>Jaromír Beneš, Goce Naumov, Tereza Majerovičová, Kristýna Budilová, Ivana Živaljević, Vesna Dimitrijević, Jiří Bumerl, Veronika Komárková, Jaromír Kovárník, Michaela Vychronová, Sofija Stefanović</i>	91
Onsite Bioarchaeological Knowledge of the Neolithic settlements in the Balkans: The case of Vrbjanska Čuka, a tell-site in Pelagonia, Republic of Macedonia	

SESSION 6

RECONSTRUCTING PAST LANDSCAPE: FLORA INSIGHTS FROM ARCHAEOLOGICAL SITES

- Adéla Pokorná, Petr Kočár, Veronika Komárková, Tereza Šálková, Pavla Žáčková, Zdeněk Vaněček* 95
 Growing diversity of archaeophytic flora as a consequence of progressive habitat diversification in Central Europe
- Adriano Stinca, Massimo Ricciardi* 99
 The wild vascular plants buried by the 79 AD eruption of Vesuvius
- Alessia D'Auria, Gaetano Di Pasquale* 101
 The recent history of cypress (*Cupressus sempervirens* L.) in Italy: archaeobotanical data from the Ancient Campania
- Claudia Moricca, Laura Sadori, Alessia Masi, Lia Barelli, Raffaele Pugliese* 105
 Archaeobotanical analysis of a pit in Santi Quattro Coronati, Rome
- Federica Maria Riso, Rossella Rinaldi, Stefano Vanin, Donato Labate, Giovanna Bosi* 107
 Multiproxy approach for the analysis of the Roman funerary ritual in *Mutina* (N Italy)
- Marlies Außerlechner, Andreas Putzer, Klaus Oeggl* 110
 Bronze and Iron Age pit-fillings of high-alpine burnt offering sites

SESSION 7

INTERDISCIPLINARY METHODS FOR ENVIRONMENTAL ARCHAEOLOGY INTERPRETATION

- Gianluca Quarta, Lucio Calcagnile* 115
 AMS Radiocarbon dating for the study of past ecosystems: consolidated tools and recent developments
- Federico Lugli, Anna Cipriani, Giulia Capecchi, Stefano Ricci, Francesco Boschini, Paolo Boscato, Stefano Benazzi, Annamaria Ronchitelli* 117
 Human mobility across the Last Glacial Maximum: enamel Sr isotopes from Grotta Paglicci (S Italy)
- Pietro Minissale, Saverio Sciandrello* 119
 Insights on some East/South Mediterranean species in Italian Flora: natural presence or Greek/Phoenician heritage?
- Marta Mariotti Lippi, Anna Maria Mercuri, Bruno Foggi* 121
 "Mediterranean forest": towards a better definition for vegetation history
- Mark Robinson, Jonas de Souza, Iriarte Jose* 124
 Human-induced spread of 'Araucaria' forest out of their natural range in the southern Brazilian highlands
- Jose Iriarte* 127
 What can pre-Columbian polyculture agroforestry systems tell us about sustainable Amazonian futures? Tales from Amazonian Dark Earths and the 'Geoglyph Builders'

SESSION 8

ENVIRONMENTAL SUSTAINABILITY IN A CHANGING WORLD: LESSONS FROM THE PAST

- Scott Mensing, Irene Tunno, Anna Maria Mercuri, Elda Russo Ermolli, Laura Sadori, Edward Schoolman, Gianluca Piovesan* 131
 Historical ecology and sustainable forest management: revealing key periods in the landscape transformation of the Italian peninsula
- Filippo Brandolini, Mauro Cremaschi* 133
 Medieval environmental changes and flood management in the Central Po Plain (N Italy)
- Mauro Paolo Buonincontri, Pierluigi Pieruccini, Carmine Lubritto, Giovanna Bianchi, Gaetano Di Pasquale* 137
 The beginning of new farming system (mid-9th century AD): local fire events and vegetation changes in southwestern Tuscany
- Valentina Pescini, Alessandro Panetta, Nicola Gabellieri, Roberta Cevasco, Carlo Montanari* 143
 The Environmental Resource Archaeology (ERA) approach: Punta Mesco case study (Liguria, NW Italy)

POSTER SESSION

- Mauro Cremaschi, Anna Maria Mercuri, Giorgio Baratti, Federico Borgi, Filippo Brandolini, Stefano Costanzo, Michele Degli Esposti, Ilaria Isola, Elena Maini, Guido Stefano Mariani, Angela Mutti, Noelle Provenzano, Eleonora Regattieri, Paola Torri, Giovanni Zanchetta, Andrea Zerboni* 147
 The site of San Michele di Valestra: new evidence of Apennines exploitation during the Bronze Age (XV–XII cent. BC, Northern Italy)
- Anna Maria Mercuri, Assunta Florenzano, Eleonora Rattighieri, Elisa Furia, Paola Torri, Mauro Cremaschi* 150
 The palaeoenvironmental reconstruction of the Terramara Santa Rosa di Poviglio from the Bronze Age to the XVIth century AD (SUCCESSO-TERRA project)
- Eleonora Clò, Marta Mazzanti, Paola Torri, Maria Chiara Montecchi, Anna Maria Mercuri, Mauro Cremaschi* 152
 First palynological data from the “Vasca Inferiore di Noceto”, an artificial mire of the Bronze age in the Po Plain
- Rossella Rinaldi, Barbara Proserpio, Elisabetta Castiglioni, Mauro Rottoli, Marta Bandini Mazzanti, Giovanna Bosi* 155
 Seeds/fruits data from the "Vasca Superiore di Noceto", an artificial mire of the Bronze Age in the Po Plain
- Giovanna Bosi, Paola Torri, Anna Maria Mercuri, Rossella Rinaldi, Maria Chiara Montecchi, Assunta Florenzano, Marco Marchesini, Marta Bandini Mazzanti* 157
Mutina splendidissima: archaeobotanical data reveal the history of a town
- Marta Bandini Mazzanti, Giovanna Bosi* 160
 Wetland plants from archaeological sites of Ferrara (Emilia-Romagna, Northern Italy)
- Maria Chiara Montecchi, Eleonora Rattighieri, Paola Torri, Assunta Florenzano, Daniele Dallai, Emanuele Vaccaro, Anna Maria Mercuri* 161
 The environmental perspective from the Late Antique archaeological context of Villa del Casale and *Philosophiana* (central Sicily)
- Anna Maria Mercuri, Eleonora Rattighieri, Rossella Rinaldi, Assunta Florenzano, Emanuele Vaccaro, Kimberly Bowes* 166

The plant landscape of Roman Tuscany and the Peasant Agricultural Strategies in the Cinigiano area	
<i>Andrea Bertacchi, Neva Chiarenza, Monica Baldassarri</i>	168
Archaeobotanical finds from the Brina medieval castle in the lower Magra valley (La Spezia - Italy): first results	
<i>Francesco Ciani, Lorella Dell'Olmo, Marta Mariotti Lippi, Bruno Foggi</i>	173
Land cover and land use change in the archaeological sites of the Prato province (Tuscany, Italy)	
<i>Ivana Pravcova, Petra Houfkova, Jan Horak, Adela Pokorna, Tomas Besta, Jan Novak, Tomas Klir</i>	176
The dynamics of non-forested area in Ore Mts.: An effect of a short-lived medieval village on local environment	
<i>Lenka Parvoničová</i>	178
Archaeological evidence of <i>Pinus halepensis</i> , <i>P. brutia</i> and <i>P. pinea</i> in Ancient Thrace	
<i>Michaela Latkova, Mária Hajnalová, Pavol Eliáš (jun.)</i>	180
On the question of the grapevine cultivation origin in Moravia	
<i>Mariano Ucchesu, Marco Sarigu, Oscar Grillo, Alessandro Usai, Gianfranco Venora, Diego Sabato, Gianluigi Bacchetta</i>	184
Could seed image analysis be helpful in the archaeobotanical studies? The case of <i>Vitis</i>	
<i>Marco Sarigu, Mariano Ucchesu, Oscar Grillo, Alessandro Usai, Ignazio Sanna, Carla del Vais, Guy d'Hallewin, Giovanna Bosi, Gianluigi Bacchetta</i>	188
Image analysis technique for the identification of archaeological 'Prunus' fruit-stones of Sardinia	
<i>Diego Sabato, Leonor Peña-Chocarro</i>	191
New tool for identification of Mediterranean plant diaspores	
<i>Sławomir Chwalek, Tomasz Kalicki, Marcin Frączek, Paweł Przepióra, Piotr Kuształ</i>	195
Environmental conditions of ancient Paphos and the region - geoarchaeological research in SW Cyprus	
<i>Cristiano Vignola, Alessia Masi, Laura Sadori</i>	198
Stable isotope analysis between archaeology and palaeoenvironment: the case of Arslantepe (Turkey)	
<i>Andrea Zerboni, Kathleen Nicoll, Mauro Cremaschi</i>	201
A geoarchaeological perspective on human-environmental sustainability in arid lands of North Africa	
<i>Rita Fornaciari, Anna Maria Mercuri, Laura Arru, Savino di Lernia</i>	203
Archaeobotany and ancient biomolecules from the Early and Middle Holocene wild cereals in central Sahara	
List of Authors	207
Keywords	219

Medieval environmental changes and flood management in the Central Po Plain (N Italy)

Filippo Brandolini¹, Mauro Cremaschi¹

¹Dipartimento di Scienze della Terra “Ardito Desio”, Università degli Studi di Milano, Italy

Email address: fibrandolini@gmail.com

Keywords: *geoarchaeology, geomorphology, medievalage, DEM*

Introduction

The Central Po Plain at the right side of the Po River is characterised by depressions that can be defined as floodplains or back swamps. In the Italian literature, they are also known as “*Valli*” (i.e. Valleys) or, before a few centuries of ground reclamation, as “*Valli-Paludi*” (i.e. Valley-Marshes). The *Valli* landscape has a long-lasting connection with the development of the Po Plain and the anthropic activities of land and water management for agricultural purpose. During the Roman times the Central Po Plain was a well organised cultivated land, but around the 5th century AD, in corresponding to a cooling climate phase, vast farming areas became marshy. The alluvial plain aggraded quickly, and Roman road and ditches were often buried under fluvial and palustrine sediments. The swamps dominated the landscape of the area until the Renaissance when large-scale land reclamation works started. This study aims to reconstruct the evolution of the palustrine environment and its mutual interaction with human activities during the Middle Ages.

Materials and Methods

The research area is located North of the city of Reggio Emilia, in Emilia Romagna region. Two backswamps called *Valle di Gualtieri*, and *Valle di Novellara* are located in this portion of the Central Po Plain (Fig. 1). This study has been performed using both geomorphological tools and archaeological-historical data. Making use of the software QGIS 2.18, we have elaborated a Digital Terrain Model (DTM) and a 3D model of the research area. The landforms detected have been dated and contextualised thanks to archaeological (Bottazzi et al. 1995) and historical records (Affò 1792; Cantarelli 1882).

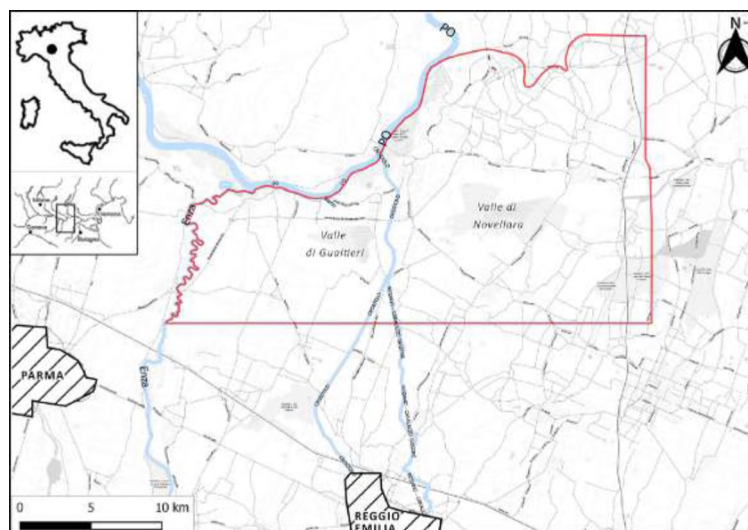


Figure 1 - Research area (OSM modified by F. Brandolini).

Results and Discussion

The multidisciplinary approach allowed us to shed new light on anthropogenic activities related to land and water management in the post-Roman landscape.

The historical documents report that local communities exploited the swamps as food resources (fishing and gathering) and waterway (commercial transports) between the 5th and 10th century AD. Nonetheless, their physical boundaries are not clear. The superimposition of the regional soil map to the 3D model shows that the clayey and silt-clayey soils are concentrated in the lowest areas detected in the DTM, giving us reasonable limits for the Medieval swamps. The most interesting data about anthropogenic activities in the Medieval environment concern the northern limit of the *Valle di Novellara*. According to the DTM, this backswamp is delimited at North by the ridge of the so-called Tagliata Canal. In the current literature (Cremaschi and Marchesini 1978; Castaldini 1989; Castiglioni et al. 1997; Castiglioni and Pellegrini 2001; Cremaschi and Nicosia 2012) the Tagliata Canal is considered as a Proto-historic Po ridge characterised by crevasse splays on both sides; but geomorphological, archaeological, and historical data suggest a fresh interpretation. First, the distribution of archaeological sites in the study area shows an absence of Bronze Age and Roman Era findings (Fig. 2). This suggests that the accretion of Tagliata Canal ridge occurred after the collapse of the Roman Empire. Historical chronicles report that the Tagliata Canal was artificially cut in 1218 for a commercial purpose; the new canal constituted a bypass of the Po River from Guastalla to Reggiolo for the city of Cremona. Moreover, medieval chroniclers reported that the opening of the Tagliata Canal had negative implications for the environment with frequent floods in the surrounding farmland between the 13th and 14th centuries AD (Cantarelli 1882). The geomorphological analyses show interesting details about the shape of the Tagliata Canal. In the new DTM, the morphology of Tagliata Canal ridge seems to be more complex than what represented in Castiglioni et al. (1997) (Fig. 3). The crevasse splays, in fact, show unusual elongated small ridges not compatible only with natural fluvial crevasse splays.

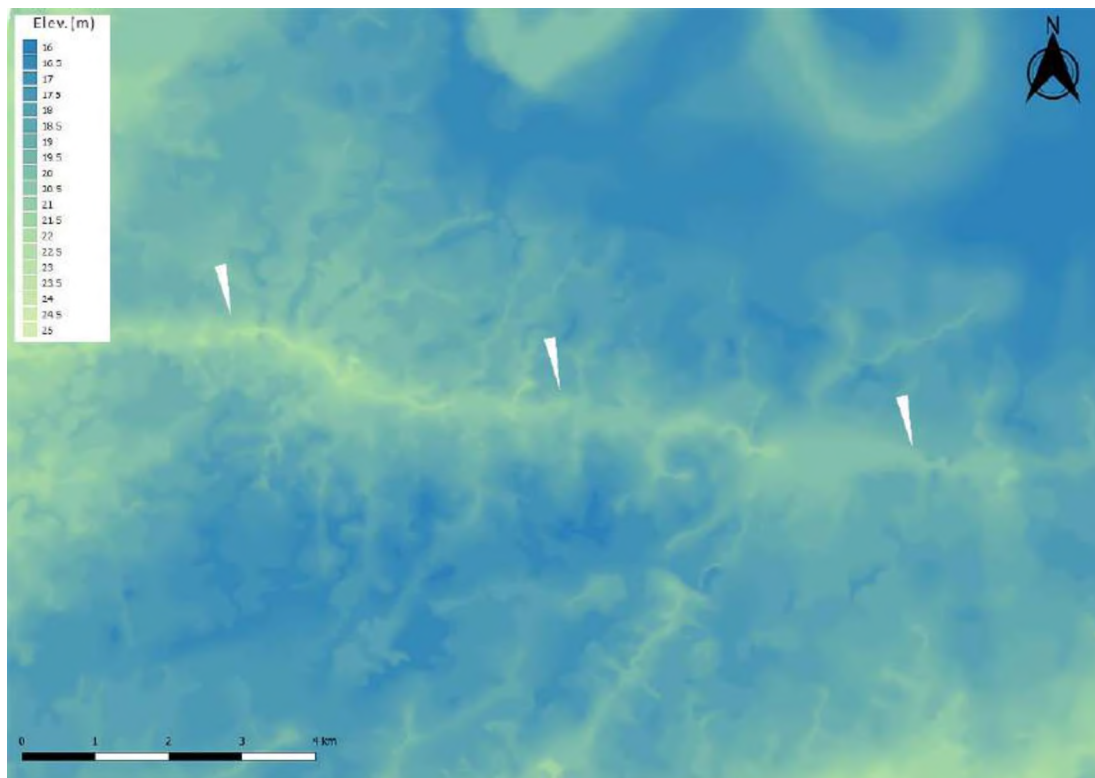


Figure 2 - Tagliata Canal ridge in the DEM (white arrows).

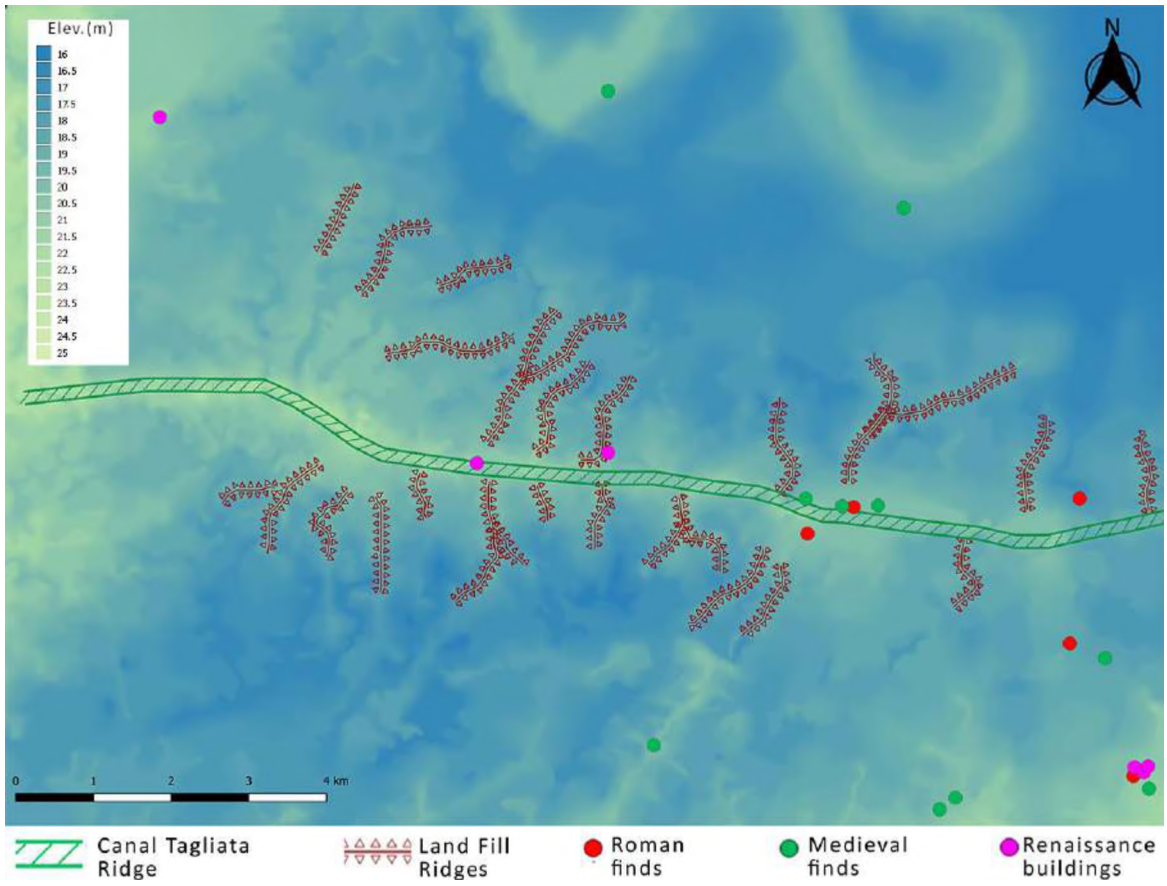


Figure 3 - Tagliata Canal ridge: archaeological data and geomorphological landforms.

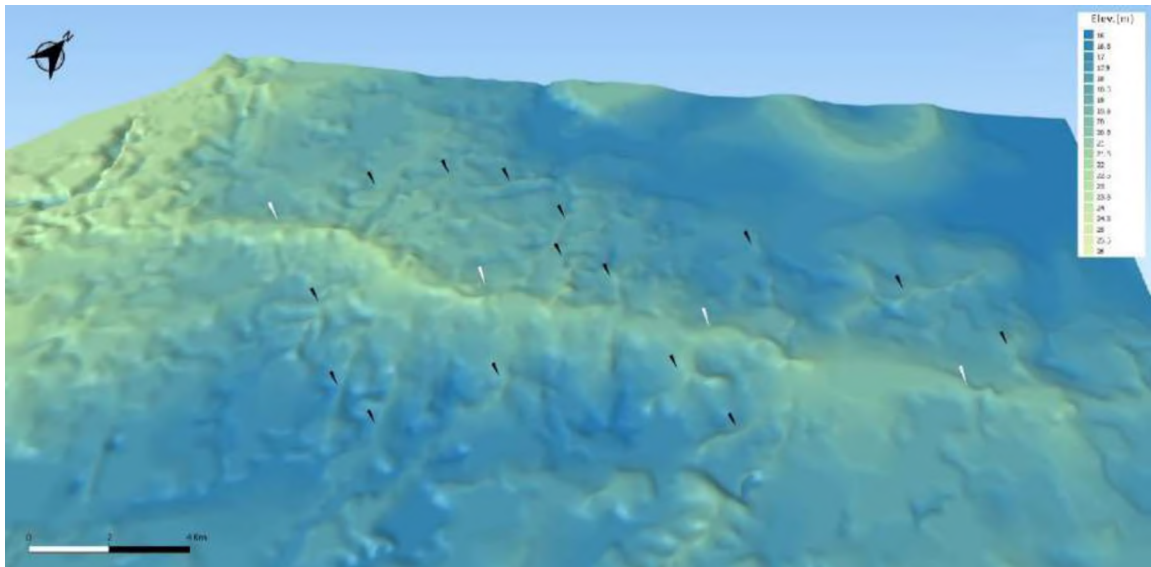


Figure 4 - Tagliata Canal in the 3D model: the Canal ridge (white arrows) and the land fill ridges (black arrows).

In historical documents there is a possible explanation for their genesis: the chronicler Affò (1792) reports that until the 16th century AD, people of Guastalla were allowed to breach the river and Canals levees in a situation of high, muddy discharge. This practice had the effect to fill the swamps with sediments obtaining new farmland. The elongated shape of those unusual landforms could be the results of the landfill reclamation practices described in the historical records. In the geomorphological literature, similar anthropogenic landforms have never been reported: we propose to define those elongate crevasse splays as “Land-fill Ridge” (in Italian, *dosso per colmata*) (Fig. 4). Those landforms are likely to be the results of flood management practices made by the local communities who exploited the fluvial sediments to reclaim new cultivable fields in place of swamps in Middle Ages and since Renaissance.

Conclusions

This study, supported by geomorphological, archaeological and historical data, identifies a new genesis for the Tagliata Canal ridge which landform shape developed in Middle Ages. First, the opening of this Canal had effects on the landscape evolution with frequent floods (crevasse splays), but later its sediments have been exploited by humans for land reclamation purpose (land fill ridges). The geomorphological landforms of the Tagliata Canal constituted an example of sustainable human land and water management in the Central Po Valley during Middle Ages.

References

- AFFÒ, I. 1792: Storia di Parma, Parma.
- BOTTAZZI, G., BRONZONI L., MUTTI, A. 1995: Carta Archeologica del Comune di Poviglio 1986 -1989. Poviglio 1995.
- CANTARELLI, C. 1882: Cronaca di fra Salimbene parmigiano dell'ordine dei Minori, Parma.
- CASTALDINI, D. 1989: Evoluzione della rete idrografica centropadana in epoca protostorica e storica. In: Estratto da Atti del Convegno Nazionale di Studi - Insediamenti e viabilità nell'alto Ferrarese dall'età romana al medioevo. Cento 1987.
- CASTIGLIONI, G. B., AJASSA, R., BARONI, C., BIANCOTTI, A., BONDESAN, A., BONDESAN, M. 1997: Carta Geomorfologica della Pianura Padana. 3 Fogli alla scala 1:250.000, Sheet 2/3.
- CASTIGLIONI, G. B., PELLEGRINI, G. B. 2001: Note illustrative della Carta Geomorfologica della Pianura Padana. Supplementi di Geografia Fisica e Dinamica Quaternaria 4, 328-421.
- CREMASCHI, M., MARCHESINI, A. 1978: L'evoluzione di un tratto di pianura padana (prov. Reggio e Parma) in rapporto agli insediamenti ed alla struttura geologica tra il XV sec. a.C. ed il sec. XI d.C. Archeologia Medievale 5, 42-562.
- CREMASCHI, M., NICOSIA, C. 2012: Sub-Boreal Aggradation along the Apennines margin of the Central Po plain: geomorphological and geoarchaeological aspects. Geomorphologie 2, 156-174.