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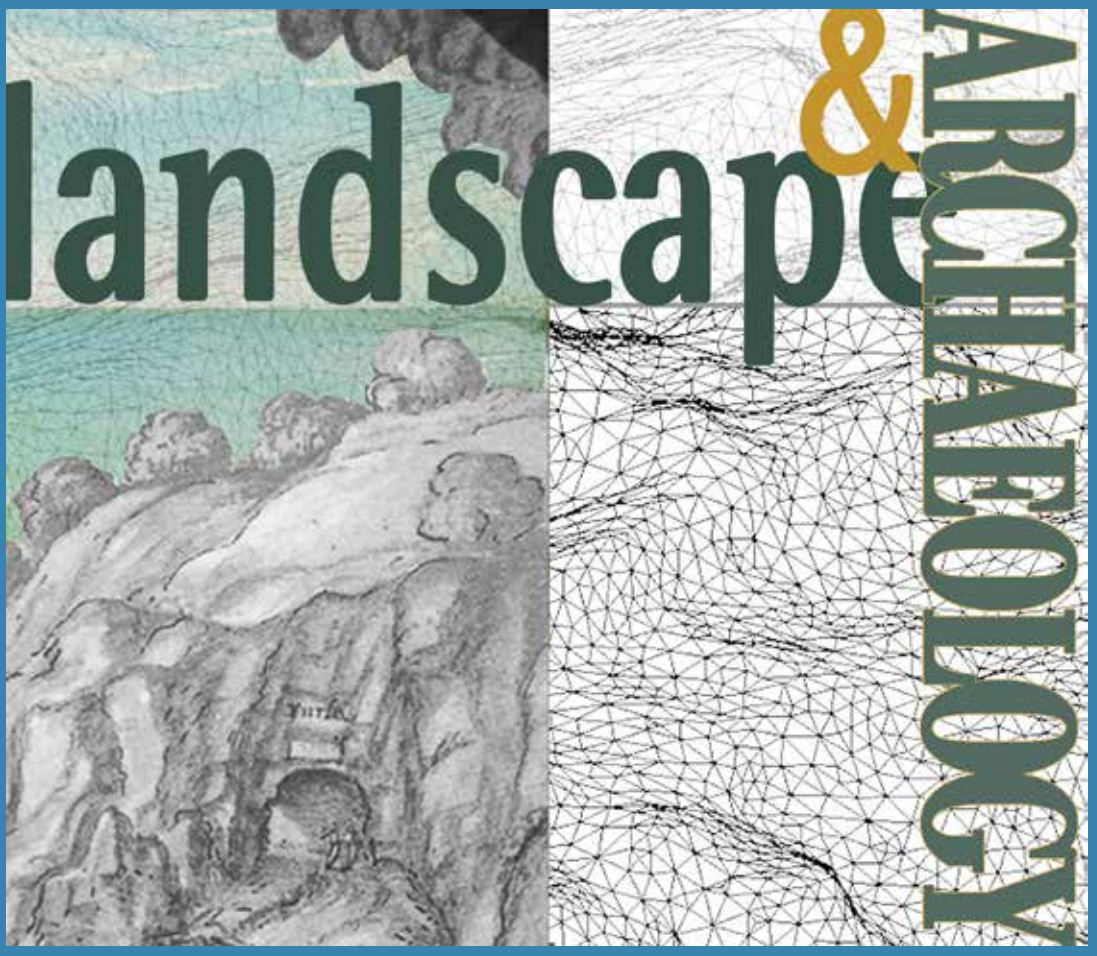

CENTRO STUDI VITRUVIANI

UNIVERSITÀ POLITECNICA DELLE MARCHE

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1506 UNIVERSITÀ DEGLI STUDI DI URBINO CARLO BO

Summary

A Promenade in Rupestrian Landscapes of Cappadocia. Survey, Notes and New Technologies

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1. The rupestrian culture framework

'Living in caves' is still present in many parts of the world, at all latitudes, with different climates and different types of soils. It has continuity in time, places and involves all social layer. Climatic factors, integration or mimesis of the landscape architecture are all elements that characterize the rock architecture and that enhance the economy based on the use of local materials, the variety and treasures of the living space and the play of light.
The study of ancient habitations, carried out almost exclusively by historians and archaeologists, has increased only in the last decades with the interest for its technical and design features. Only the energy crisis of the last years, has led technologists and scholars of the built environment to take an interest in the rock heritage and in particular to study the passive methods of conditioning air and bioclimatic solutions adopted in the ancient "houses of man". In addition, the collapse of many areas has focused the attention on rupestrian sites of multidisciplinary operators for the environment.
The cultural unity of rupestrian settlements was, in some cases, damaged or destroyed, but its relevance as open air eco-museums has never been underestimated, despite anthropogenic deterioration and erosion caused by time conditions.
Recently, the attention was focused on urban settlements, on their different typologies, and on subterranean shelters. These structures are certainly less monumental than churches, but they are more numerous and more extensive and, perhaps, sometime more ancient. (Bixio et Al, 2002; Crescenzi 2012)
Common requirement of the rupestrian sites are the geological and morphological characteristics that have allowed and still allow the excavation of rocks to create spaces for daily activities. As you can see in the five sites examined by the project EU CRHIMA-cinp, the characteristics of the rocks are due to volcanic eruptions that have sometimes deposited soft materials (such as tuffs like in Cappadocia and Santorini) or water sedimentation. All of which resulted in deposits of limestone, sandstones (in Italy) or gypsum (in France), even if there are cavities dug in hard rocks, too, like gneiss, schist and granite (Triolet, 2013)

2. Recognized importance of rock heritage in areas of research

In the countries of the Mediterranean area are considerate Rupestrian Heritage landscape Site.
– the Göreme National Park and the Rock Sites of Cappadocia (1985):

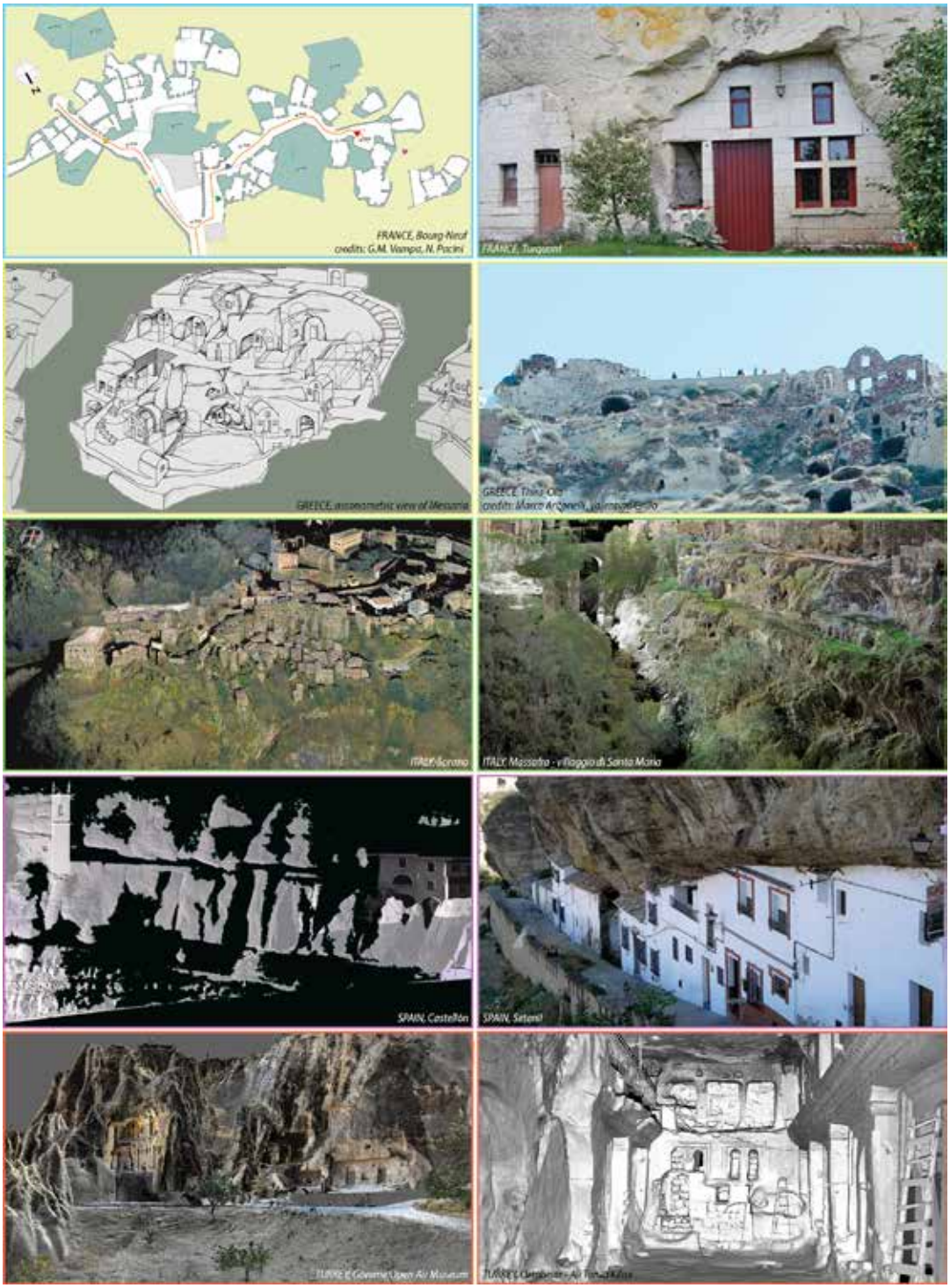

Fig. 1. Rupestrian heritage in the some Mediterranean region.

– The "Stones" and the Park of the rupestrian Churches of Matera (1993)
– Loire Valley between Sully-sur-Loire and Chalonnes (2000)
The research unit of the DIDA, particularly within the PRIN, dealt with some areas in Italy and Turkey.
– In Italy, especially in Puglia, there aren't specific legislative instruments for the rupestrian heritage, so the institutions shall use the regional laws for natural parks equipped to protect and promote the environment of rock valleys.
There are several parks proposed in the Ionian Area, with promise of promotion and funding that waiting the approval.
– In Tuscany and Lazio, in the sector "Land of Tufi", the rock Etruscan testimonies are particularly valued and protected. To these belongs the Archaeological Park of Sovana.
The area of Cappadocia in Turkey has a wealth of valuable buildings and settlements almost infinite and not even all known.
In 2015 it was discovered the cave city of Nevsehir, ancient Nyssa.
The settlement, in use until the early 20th century have preserved the integrity of the landscape. However with the abandonment and with the over construction of masonry buildings, the change of peoples settled and the loss of "knowledge" for the respect of the territory, have in just a century accelerated the lost and the use of land. The protection of territory and works not deemed worthy, or cave churches with frescoes valued by European scholars (French, German and Italian, in the last decades Americans and Japanese) and the amazing underground cities, unfortunately, not yet subject to a check for quality of interventions.
Restorations carried out in unlikely figuratively and structurally way will end up destroying the haunting beauty rock for a kitsch-picturesque. It has been lacking care for maintenance use and slowly it is accelerating the lost of cultural testimonies. This is what happened to many of the villages in the European countries.
However, their valorization is in progress, the economic and touristic development and the growing awareness of citizens of cultural stakeholders are proposing developments of conservation and specimens enhancement which bodes well for the knowledge and appreciation of the rock culture.

3. The project framework

The two projects Crhima CINP ((European cultural Project) and PRIN (2010-2012, Relevant National Interest Research Projects) have created a network involving the existing Open Air Museums and Rupestrian Culture Parks, as well as researchers of interdisciplinary areas
This network will contribute to the knowledge, development and protection of rupestrian Cultural Heritage and their less developed regions.
Subject of the research, it carried out by UniFI-DIDA researchers, is centred on survey, especially on a digital documentation carried out using 3D laser scanners for the architecture as well as about the natural landscape rock of the settlement structure.

So they has been created the first complete and detailed documentation about some interesting areas, in Puglia and in Turkey, allowing the first studies on the urban characters of this archaeological sites.
The two projects are promoted from their web sites, http://www.rupestrianmed.eu (UniFI) and http://www.museovirtualecappadocia.it (UniTus),
The creation of websites and its contents has asked and will require major work that will be used to safeguard the heritage of 'living the rock' which is at risk of destruction.
The research activities and websites, based on the important contribution made by survey, the graphic restitution and visual documentation, that they integrate the scientific, humanistic and technological knowledge, they will enhance for supporting the open-air museum and rupestrian landscapes, and also to make they virtually accessible and enjoyable to all users.
The rupestrian settlements concern the landscape and a the common heritage of European culture, they are the display of an ancient and sustainable "way of life" and an anthropical and natural habitat for life.
Discover and showcase this culture, its virtual musealisation will be an authoring tool to prolong the life of art and biodiversity of rock landscapes and even an instrument of formation and growth of social consciousness for the respect of the environment, considering common good.
Sometimes, the rupestrian settlements valleys are the only natural resource within a city, it built with the criteria of maximum exploitation; the eco-museums, in their own sites, are threatened with depletion and complete destruction due to human exploitation and natural phenomena.
Therefore the innovative proposals for a virtual museum are needed not only to encourage and to develop the tourism, to meet the new demands for user interaction and digital cultural heritage resources, but also to preserve and to enhance tangible and intangible values inside the settlements.
The troglodyte architecture, rupestrian or underground, is an heritage cross of the contemporary "subdiva" culture, implemented over time with variations and is connected to all cultures. The cultural synergies have brought to attention of the "rupestrian culture", a parallel culture and not different from that contemporary.

4. Surveys and notes of the research areas

Surveying and documentation in Cappadocian sites were performed with different methodologies and field work: a few hours hike through in Ihlara, expeditious and instrumental survey for some monuments in Ortahisar historical suburb, and a comprehensive and scientific approach to the area near the Open Air Museum in Goreme.

4.1 Ihlara valley

Ihlara Valley (Fig. 2) is probably one of Turkey's most stunning natural landscapes. A hike through the canyon has been an opportunity to see and quickly gather information on way of life more than 1,000 years ago.

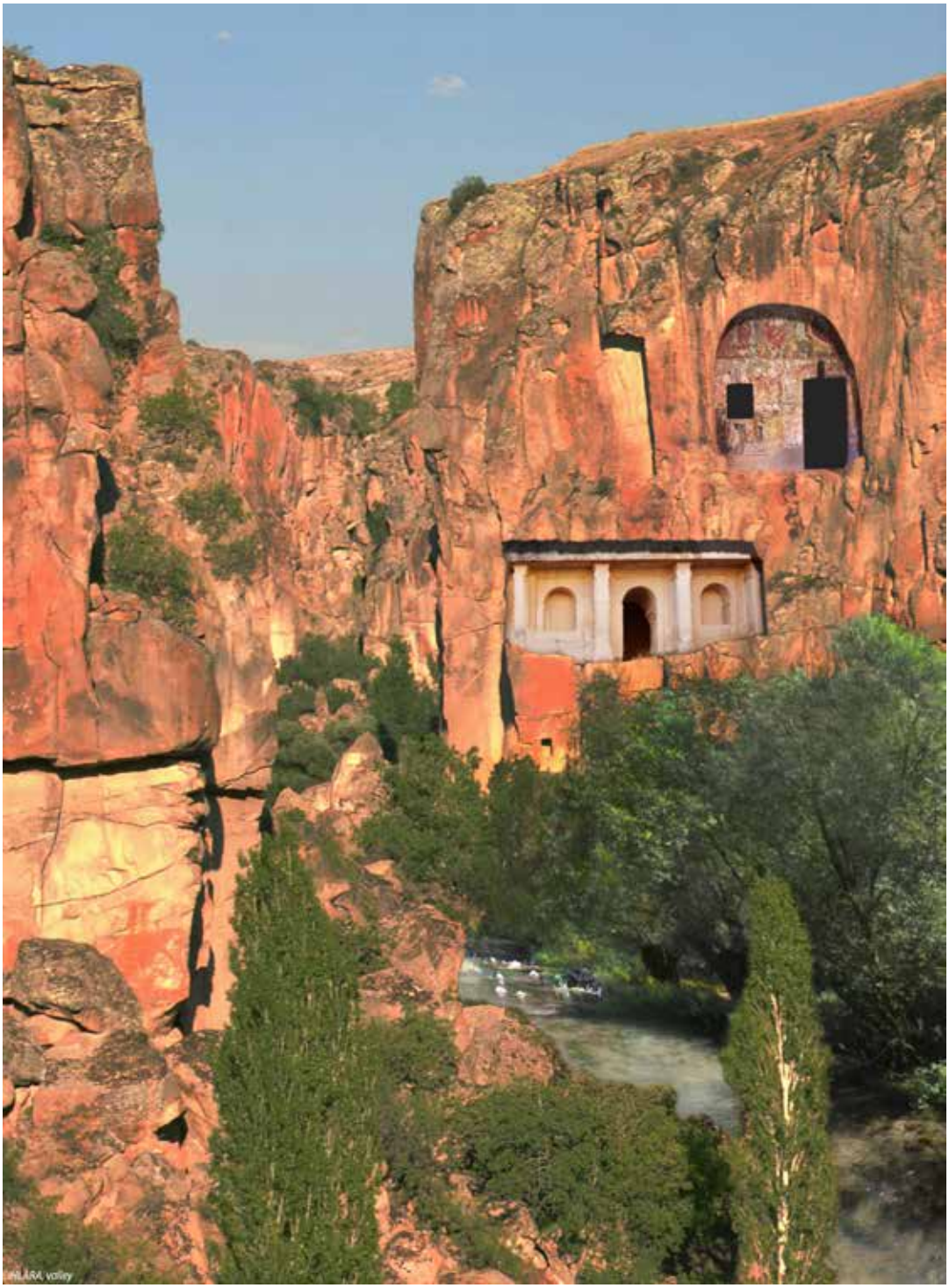

Fig. 2. Hilara valley. Real and patched lendscape of Melendez River. (by C. Crescenzi)

In contrast with the scenical dusty expanses of the rest of Cappadocia, only 49km (30 miles) south of Nevsehir, the austere landscape of the Ihlara Valley reveal itself like a 15km long fissure, the gorge was 100 meters deep. The bottom of canyon, nourished by Melendez River, is verdant with vegetation supporting village life much as it did centuries ago.
The canyon is home to over 100 churches and it is estimated 4,000 dwellings sculpted into the soft rock front of the valley; this has led to believing that the valley was home to a large community of people for many centuries.
The churches, some they are difficult to reach, are date from the 8th or 9th century while the decorative frescoes are date to a post-Iconoclastic period, between the 10th and 13th centuries.

4.2 The settlement of Ortahisar

The town of Ortahisar (Fig.3), selected for the workshop activities of the CRHIMA-cinp project, is located between Nevsheir and Ürgüp.
Currently, Ortahisar is composed of four neighborhoods, the oldest ones being Eski/Atik Mahalle and Yeni Mahalle. Most of the heritage buildings are situated in those two areas. The historical suburb of Ortahisar develops mainly on the terraces of its canyons.
The people, accustomed to the harshness of the territory, have been able to turn the rough conditions of this habitat in their advantage by finding innovative solutions and developing, in the early twentieth century, an extensive use of the stone material.
In fact, the quality features of the carved houses into the rock testify the skilful carving of their inhabitants. Often at entrance of habitations there is a cistern for water collection while inside there are wall cabinets, niches for oil lamps or for the ceramic containers support, fovea or other useful elements for the daily activities.. We can find rich houses with the common room overlooking the open spaces, having beds and sofas with detailed worked armrests collocated in front of finely crafted fireplaces or chimneys carved in large reception rooms. We also find storage rooms or craft activities rooms. (Crescenzi C., 2015)

4.3 The plateau between of Göreme and Kılıçlar valleys

In Turkey The PRIN project focused on the area of Göreme (Fig. 4)
In addition to the landscape of the Göreme Open Air Museum, the survey of UniFI focuses on the surrounding valleys of Göreme and Kılıçlar.
The objective is the realization of a comprehensive study of all the painted churches in this area, consolidated by a research based on the indissoluble union between the natural landscape, the urban planning carved, monuments and decorative art. The project aims at helping to improve their knowledge to a deeper understanding of civil and religious functions, carved rock buildings and the stages of development of the cave settlement.
The original plateau was eroded; their rocky buildings collapsed and they are partially buried by their own ruins. The urban-territorial infrastructure that is best preserved is the singular water system of the valley Kılıçlar still functioning, surveyed in association with the CSS of Genoa.

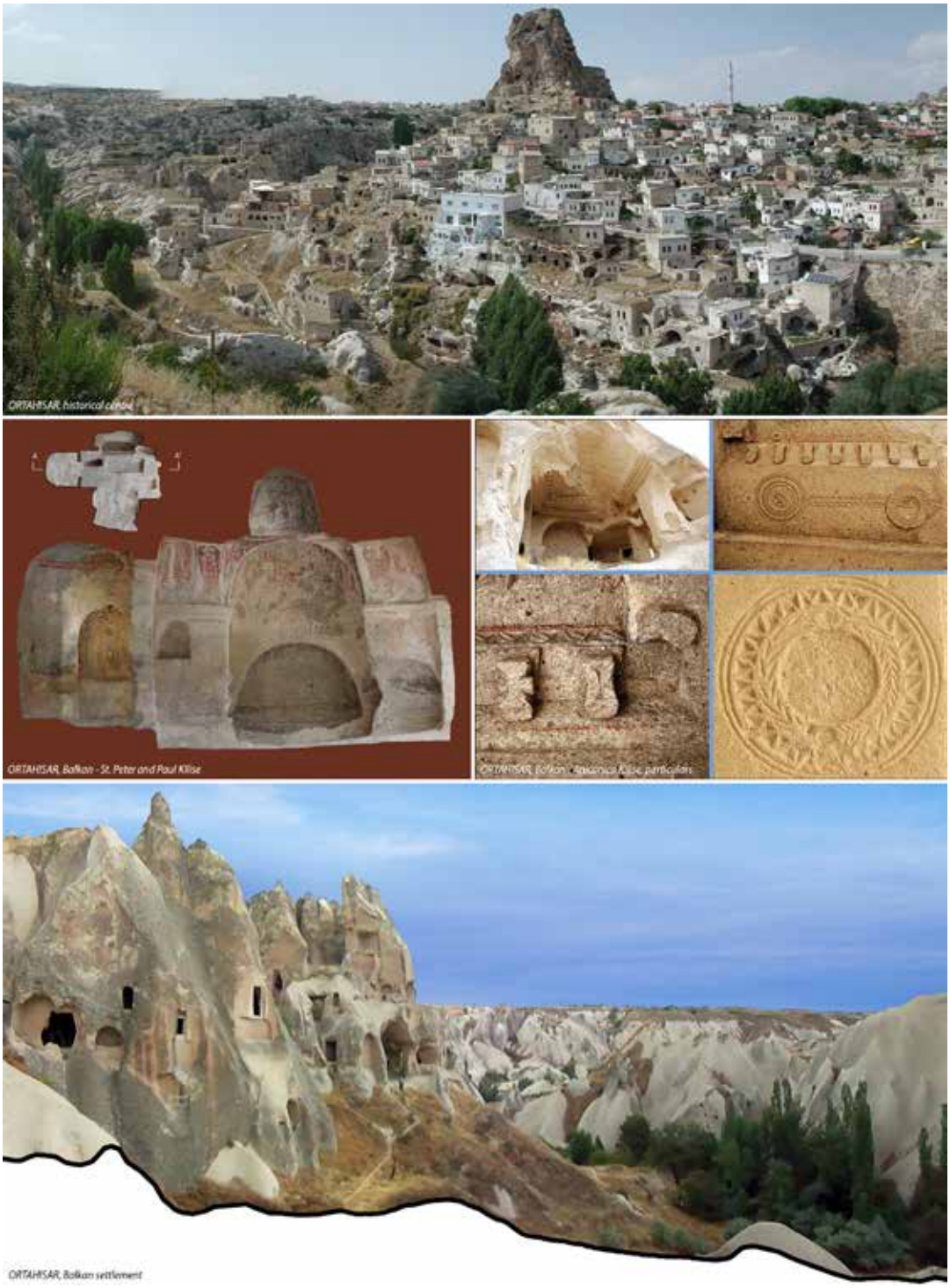

Fig. 3. Ortahisar. Rupestrian village and a its landscape in the area, expeditious survey (Crescenzi 2012)

Several churches are present in the research area, they are the first buildings surveyed thanks to some researcher; for this we can divided the study area is into "insulated" that are made up of an ancient integrated system for living, worship, farming and defensive activities, and they have been identified with the name of the church dug in the same rock complex.
In addition to Tokalı kilise, it is the World Heritage site, we find the complex of St. Eustace, St. Daniel and the Aniconic church, the Théotokos (9 Göreme), the Meryem Ana (27 Göreme), anonymous churches and other chapels (Fig. 5); they have been documented and investigated by interdisciplinary experts.
The settlement has two types of defensive systems: 1) buildings for the community; they have a linear distribution with entrances and multiple escape ways, they are located on the Göreme and Kılıçlar valleys front; we find traces of this type in the complex of St. Eustace, which is sited on the ridge; 2) structure for the individual or family defence and for a short time; vertical or defensive structures, like St. Daniel pinnacle.
The activities, which were common "field work", were carried on among DIDA-UniFi, Disbec-Unitus and CSS, in they took place in the large area upstream of Tokali Kilise (Church of the buckle); it is one of the most beautiful churches in the Göreme Park, a World Heritage Site since 1985.
In this meaningful collaboration, the creation of 3D digital models, starting from an accurate digital survey, is aimed to display the paintings in the excavated churches that host them, allowing a deeper and clearer knowledge of the rupestrian habitat in all of its components.
It will also be very useful for the realization of innovative instruments of fruition, suitable for a presentation of the rupestrian monuments and pictorial decorations scientifically correct and diversified according to different communication levels: virtual reality installations and other multimedia products for the visitors of Open Air Museum.

Notes

The amount of data has been collected in just 21 working days to three research teams involved in photography, in the videos and laser scans.
The ease of Faro Focus, with its low weight and small size, it has allowed us to detect tunnels and steep slopes difficult accessibility. The Surey the Faro Focus has been integrated with the an environmental scale survey with a scanner Riegl VZ400, to T.O.F. technology, that can achieve and measure objects at a distance of 600 m from the instrument.
In case of objective environmental difficulties, has been integrated with the expeditious archaeo-speleological survey. The alignment of 3D point clouds showed the complexity of the underground settlements, some near to the collapse and closed to the public.
Valuable work of the integrated 3D and photographic surveys have allowed the interpretation of the urban structural systems, these have been show with the canonical forms, videos, virtual tours and dynamic records.

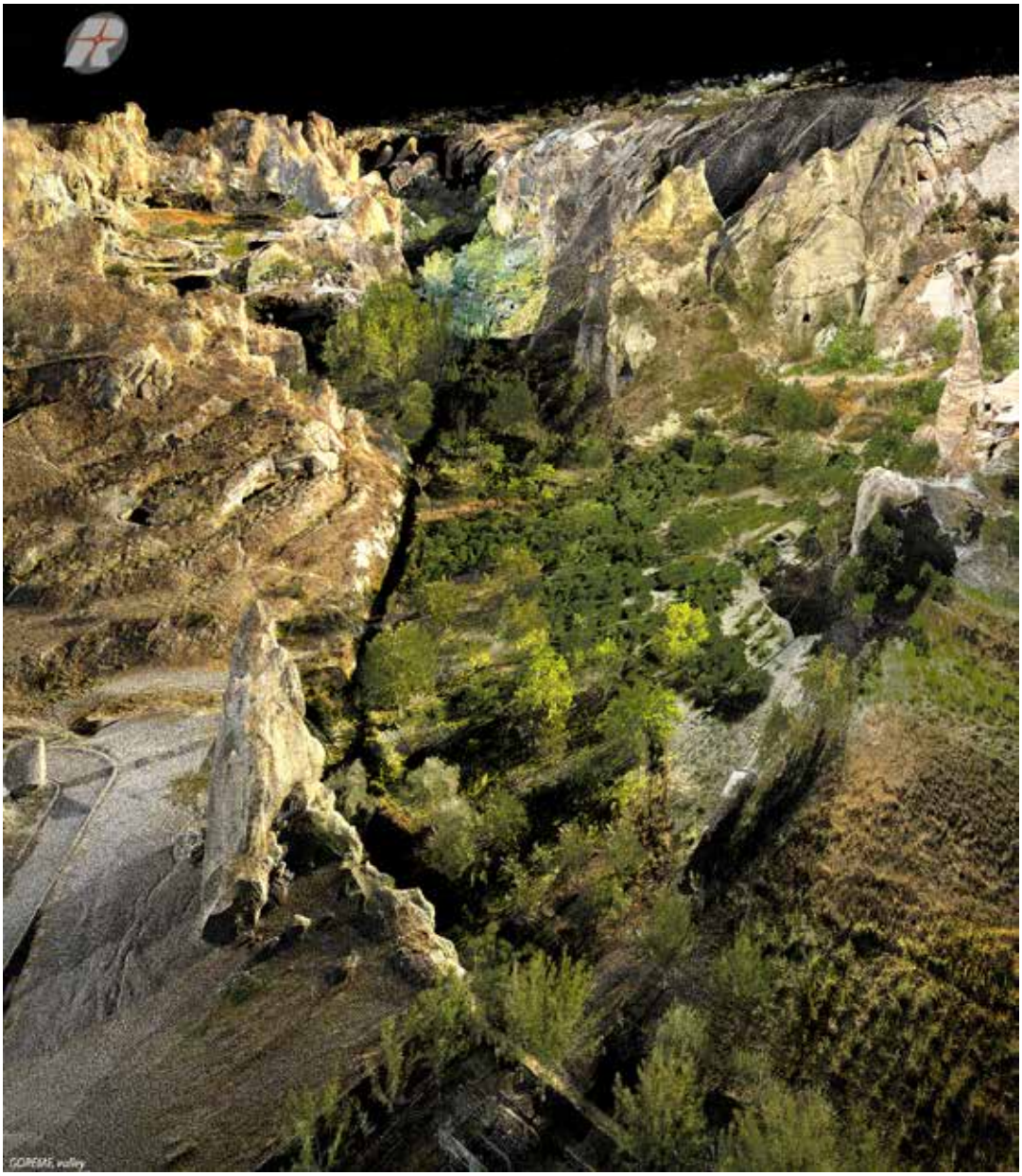

Fig. 4. Göreme valley. The research area on the Byzantine settlement in Göreme valley, previously called Mantiane and Korama, and the Macan and Avcılar during Turkish period, is divided into two parts: the first is the natural exedra of the Open air museum, with a dozen of churches with the refectories; the second is the plateaeu between the Valley of Göreme and Kılıçlar where several rock pinnacles include Tokali kilise, and numerous other rupestrian chapels [Jolivet-Lévy, 2015] . The landscape survey , an environmental scale , has been carried out with a scanner Riegl VZ400 (survey participants: C. Crescenzi, C. Giustiniani, G. Tarabella and F. Tioli; elaboration data F. Tioli); the architectonical survey integrates the landscape one. PRIN 2010-2013, UR UniFI-DIDA

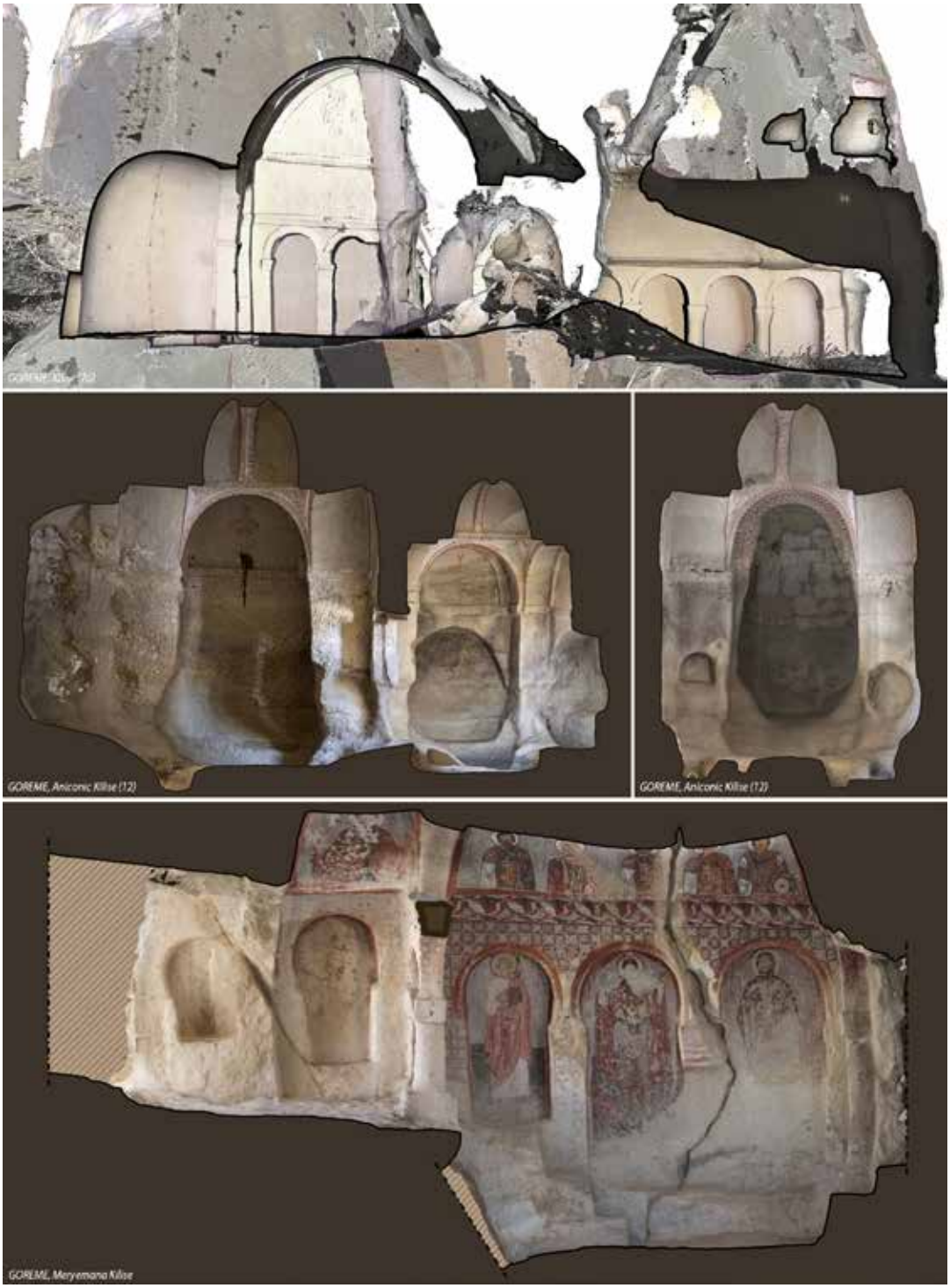

Fig. 5. Göreme. Sections of some chapels (Elaboration: fig. 1, from point clouds S. Stantione; 2-3 from photogrammetrie A. Notarstefano) PRIN 2010-2013,UR UniFI-DIDA

Acknowledgments

The activity carried out is part of the studies initiated in 2007 and treated in the European Project CRHIMA-cinp (2010-12), coordinated by UniFI – DIDA, chef C. Crescenzi, participants countries: Italy, -France, Greece, Spain and Turkey. 2010- 2012.
The same studies were treated also in PRIN 2010-11 (2013-2015), coordinated by UniTUS, of which UniFI-DIDA is UR (Unit research). UR UniFI – DIDA chief C. Crescenzi, researchers: M. Scalzo. G.Verdiani; partecipants PHD F.Tioli, S. Di Tondo; PHD st. C. Giustiniani; survey: arch. S. Menconero, A. Pasquali, arch. j G.Tarabella; st.T. Pignatale, A.Leonardi, elab. data: arch. A. Notarstefano, st.s: A. Charalambous, A. Manghi, S. Nardoni, T. Pignatale, S. Stanzione, E.Vannacci.

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