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RELIGIOUS BUILDINGS IN ORTAHISAR (TURKEY). THE SURVEY OF THE COMPLEX OF SAKLI AND ALI TORUN KILISE

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Abstract
The city of Ortahisar located in Cappadocia (Turkey) is one of the rock sites included in the UNESCO list in the 1985. The rupestrian city is integrated with the walled buildings and it is interesting for the types of residential and religious buildings. Ortahisar is one of the sites proposed by the EU project CRHIMA-cinp, funded by the Culture Programme 2010/2012. The Centre offers hospitality to religious structures, significant from the architectural and artistical standpoints. The report proposes a description of some of the places of worship, and the survey of the complex of Sakli Kilise and Ali Torun. The Sakli Kilise, a Greek cross inscribed, is equipped with a narthex with large crosses carved. Ali Torun has a single nave, it is interesting for the subdivision and the decoration of the walls with pilasters. The digital survey, realized by 3D laser scanner, made possible to produce the first complete and detailed documentation of the settlement and the first dimensional studies of the complex.
Keywords: rupestrian architecture, 3D modelling, rupestrian church, Ortahisar, Cappadocia.

Riassunto
La città di Ortahisar, situata in Cappadocia (Turchia), è uno dei siti rupestri inclusi nella lista UNESCO del 1985. La città rupestre, integrata con quella costruita in muratura, presenta interessanti tipi di edifici residenziali e religiosi. Ortahisar è uno dei siti proposti dal progetto UE CRHIMA-cinp, finanziato dal programma Cultura 2010/2012. Nel centro urbano si trovano strutture religiose significative per la qualità architettonica e le peculiarità artistiche. La relazione propone una descrizione di alcuni dei luoghi di culto, e l'indagine del complesso della Sakli Kilise e Ali Torun. La Sakli Kilise, a croce greca inscritta, è dotata di un nartece con grandi croci scolpite. Ali Torun, a navata unica, è interessante per la suddivisione con paraste delle pareti e per la loro decorazione aniconica. L'indagine digitale, realizzata esclusivamente con laser scanner 3D essendo gli edifici completamente bui, ha reso possibile la prima documentazione dettagliata dell'insediamento accessibile e i primi studi dimensionali del complesso.
Parole chiave*: architettura rupestre, modellazione 3D, chiesa rupestre, Ortahisar, Cappadocia.*

Introduction

The research project

The work here presented was organized by the unit DIDA (Department of Architecture, UNIFI, Florence). The unit has a significant long experience in the field of research and action on the rupestrian architecture.

This work is the prosecution of the previous experiences developed inside the European CHRIMA-cinp Project (Cultural Rupestrian Heritage in the Circum Mediterranean Area Common Identity, New Perspective), completed in 2012 and included in the PRIN 2010-2011(Italian National Project Relevance).

The PRIN project was approved in 2013 by the Italian Education, University and Research Ministry, for a 3-year work to heart the study, investigation and documentation of these rupestrian monuments with a project called "Rupestrian art and habitat in Cappadocia (Turkey) and in central and southern Italy. Rock, excavated architecture, painting: between knowledge, preservation and enhancement".

The research contributes to the promotion of a common cultural area, the development of cooperation between the creators, operators and cultural institutions. It also promotes interest in the rediscovery of the rock villages that characterize many countries in Europe and the Mediterranean, the memory of very interesting layers of tangible and intangible assets which risk to be compromised or destroyed permanently.

The project aims at improving knowledge of the village of Ortahisar, for a deeper understanding of the civil and religious functions, alongside the parallel studies carried out in the territory of Cappadocia in collaboration with other researchers.

Within this work, the proper documentation, the digital survey and photography, together with other research methods, are the fundamental basis for the understanding, conservation and enhancement of the anthropogenic environment.

The current paper focuses on the city of Ortahisar, considered one of the significant centers of Cappadocia and still poorly studied.

The goal is to achieve a thorough study of all the architectural sights in this area, but from a consolidated research, in indissoluble union between the natural landscape, urban planning, monuments and decorative art.

For this particular article, we focused on survey, study and description of two churches aniconic as examples of the earliest forms of aggregation of the district.

Fig. 1: general view of Ortahisar (photo C. Crescenzi).
Fig. 1: panoramica di Ortahisar (foto C. Crescenzi).

The settlement of Ortahisar

Location and historical notes

The town of Ortahisar, selected for the workshop activities of the CRHIMA-cinp project, is located in Cappadocia (Turkey), between Nevşheir and Ürgüp.
Ortahisar owes its name to its geographical location: "Castle in the middle", a mighty rock formation that rises vertically up to 100 meters from the plateau (Fig.1). The man has carved the interior and has transformed the rocky peak in a fortress located between Başhisar, "the first castle" and Üçhisar, "the terminal castle".
Its Byzantine name was Ποταμìα, perhaps after the two rivers on where it is located (http://it.wikipedia.org/wiki/Ortahisar). Indeed, Ortahisar's historic center develops mainly on the terraces of the valley Selim Bağ and more specifically at its confluence with the river Garip Bağ/Atlık, tributary of Kilizirmak.
According to the scarcely documented information for this town, Ortahisar together with Başhisar, Uçhisar e Niğde, was conquered by Izhak Pasha in 1460. In the course of history it changed administration several times: in 1761 it was governed by Ürgüp, while in 1894 the citizens of Ortahisar asked to be administered by Arapsun, due to the inadequate government policies of Ürgüp, only to return to its governorate in 1911. Finally in 1916 Ortahisar became independent (Crescenzi C.).

Description of the settlement of Ortahisar

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 historic center 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 houses carved into the rock witness the skillful carving of their inhabitants. The houses often have at their entrance a cistern for collection water while the interiors present wall cabinets, niches for oil lamps or for the support of ceramic containers, 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 placed in front of finely crafted fireplaces or chimneys carved in large reception rooms. We also find storage rooms or rooms for craft activities. (Crescenzi C., 2012, Fusun Alioglu E. et al. 2012).

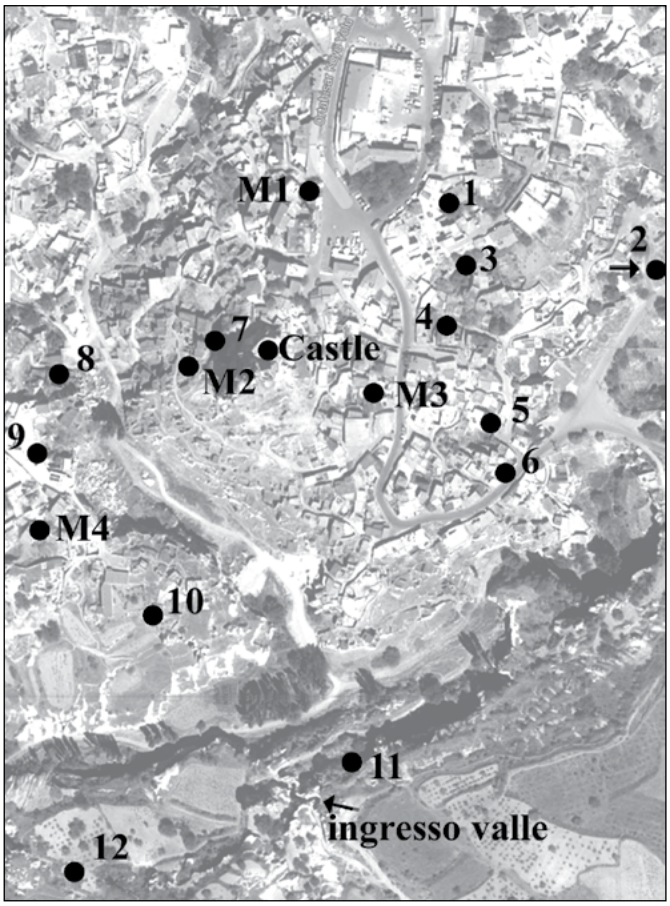

Fig. 2: location of religious buildings. 1) Hairm 2) Ishak castle 3) anonymous 4) anonymous 5) Ali Torun 6) Saklı 7) anonymous monastic complex 8) anonymous monastic complex 9) monastic complex, Nino or Bayirli 10) Cambazlı or Aşağıbağlar 11) anonymous Chappelles 12) Corisba M1) Abdioğlu Mosque M2) Çukur Mosque (rupestrian) M3) Alaadin Mosque (rupestrian) M4) Ali Reis Mosque.
Fig. 2: localizzazione dei siti religiosi.

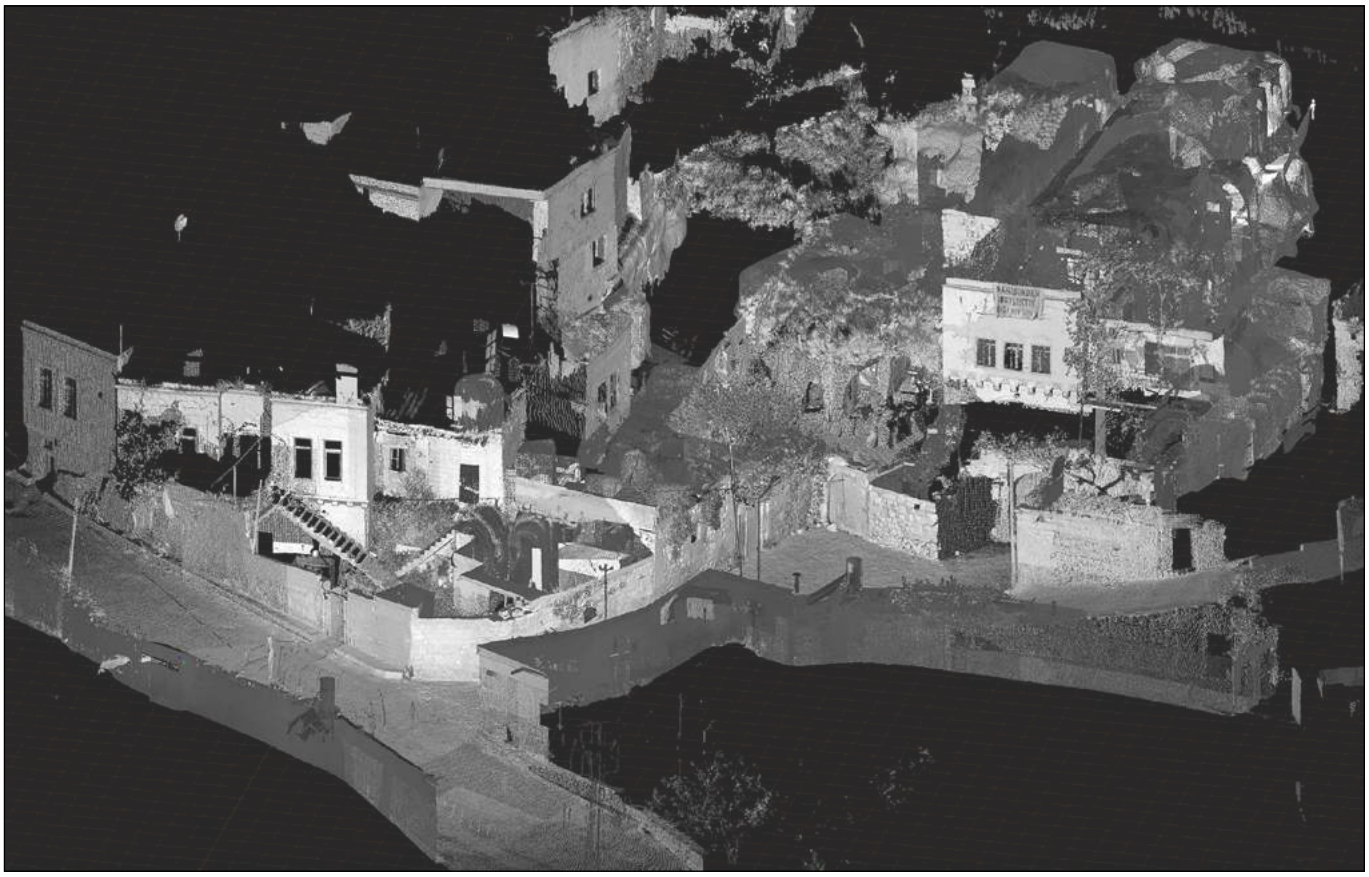

Fig. 3: Saklı and Ali Torun Kilise. Axonometric view of the complex. Point clouds.
Fig. 3: Saklı e Ali Torun Kilise. Vista assonometrica del complesso. Nuvola di punti.

Some religious buildings
Since the V century, the area of Ortahisar housed religious communities. These included religious structures of great architectural and artistic value: much is still to be studied and "discovered". Since the religious structures had been incorporated in private houses that were restructured during the migration of the early XX century, the heritage of worship places has suffered destruction and transformation.

Monasteries and churches in Ortahisar District Eski / Atik Mahalle
Anonymous 7 (coord. 38.620052; 34.864001 WGS84).
Along the first path at the base of the castle and on the West front, there is a monastic complex of considerable size (Fig. 2).
The front is highly compromised, and has suffered considerable collapses. The sculptured wall is probably the vestibule which disengaged the various buildings. In the remaining part, it is still possible to read a partition of the environment highlighted with slightly protruding pilasters, which stood out from the arch dividers of the possible barrel vault. It is likely that the partition was in five parts as that of the vestibule of Hallaç or Şahinefendi (Crescenzi C., 2012).

District Yeni Mahalle
Nino Kilise (coord. 38.618884; 34.862827 WGS84)
The small funerary chapel, also named Nino Kilise (Church), is part of a large monastic complex that is now in ruins for an ongoing restructuration.
The small chapel, though wrongly used and partially damaged, has preserved part of its iconographic cycle; it has a Greek cross plan, the arms of which contain some carved tombs. The central dome is declared by diamond pendentives that originally were painted, but now they are a kind of support for the beams which support a floor realized in wood and stones, and occludes the paintings of the dome.
The triumphal arch, entirely painted, lodges on its left a niche used to contain the sacred vessels.
Another, located at the left of the previous, is now destroyed: one of the walls suggests the presence in the past of a double register and the partition of other wall. (Crescenzi C., 2012; Jolivet-Levy C, 1991).

The Corisba (coord. 38.617; 34.863432 WGS84)
The monastic village is situated on the cliff of the valley delimiting the Ortahisar settlement on its southern side.
The facade is divided into three plain lunettes with geometric capitals; the entrance is on the central space, which is the widest and highest. All the lunettes are arched with small circular windows at the top.
The front is completed by a simple cornice decorated with ochre diamonds. The entrance or the window of the narthex was on the right side. It was decorated with red geometrical drawings on a white background; it has an inscribed Greek cross plan: the arms are barrel vaulted, and they enclose a dome on pendentives. The corner bays are cross vaulted: small lintels or simple cornices underline the border between different

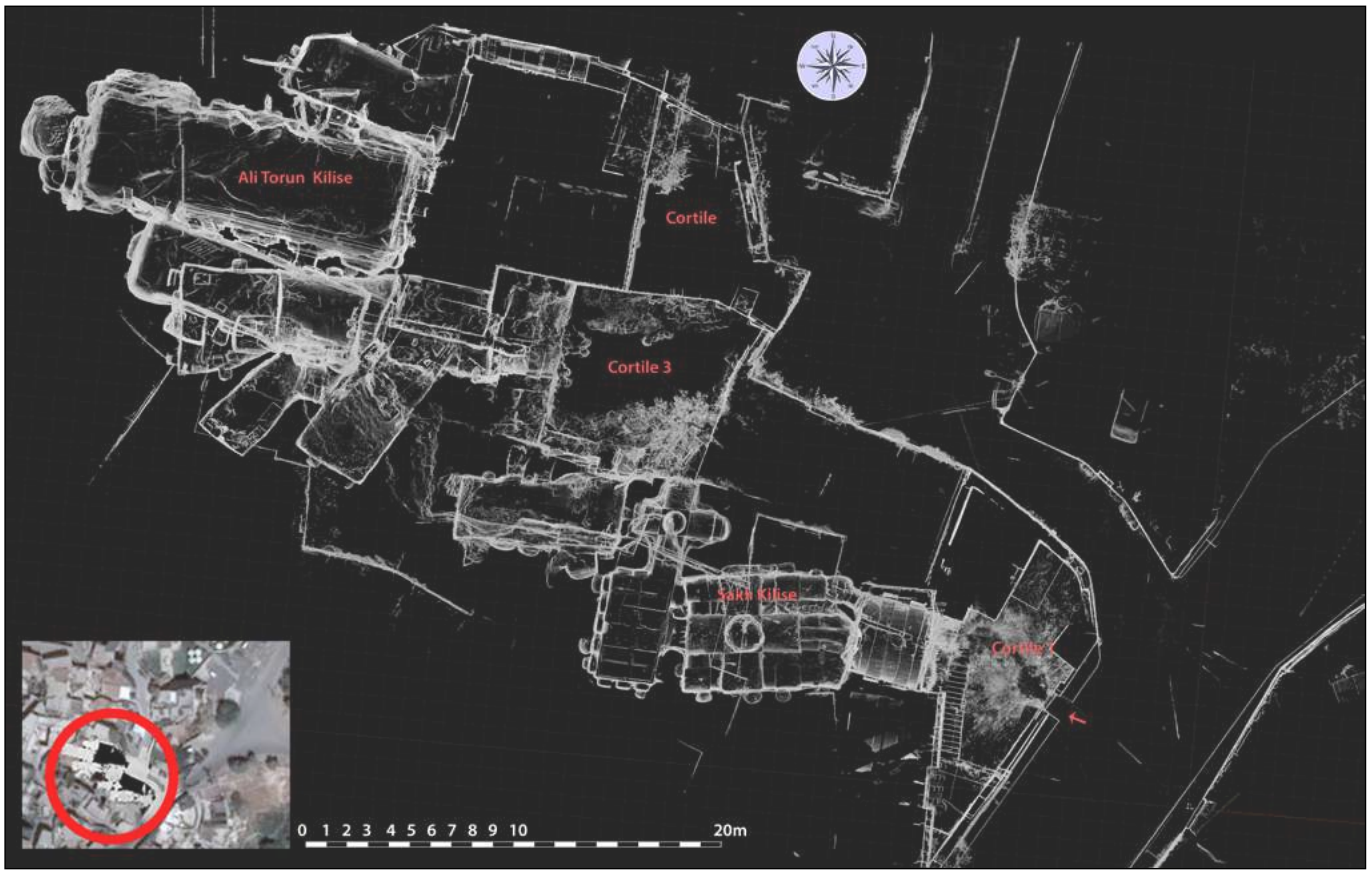

Fig. 4: settlement of the Saklı and Ali Torun Kilise. Point clouds, silhouette.
Fig. 4: insediamento della Saklı e Ali Torun Kilise. Nuvola di punti, silhouette.

surfaces. The pillars have geometric capitals in shape of truncate pyramids.
The presbytery, excellently made, has a plain ceiling divided into two spaces by a moulded cornice. It is decorated with three plain medallions and *clipei* with carved crosses. Other *clipei* with crosses in relief are at the intersection of the arms and at the corners of the narthex; the ceiling is faded, but the red dye of the ochre is still visible in some parts. The capitals on the back wall correspond to the pillars of the presbytery, and they seem to sustain a missing entablature. They may also be a testimony of the architectural variations in time.
The second narthex has been heavily reworked; it is on the southern wall of the central space, and it might have been realized later breaking down a wall with three niches surmounted by arches. There are still traces of these arches on the wall and on the ceiling; the southern side of the narthex contains wall niches and a floor tomb.

Monasteries near Ortahisar
The Hallaç Monastery (coord. 38.632327; 34.869779 WGS84)
Hallac Monastery is located N-NE of the Ortahisar village, in the area between the roads connecting Nevşheir to Ürgüp and Yolu, and the one connecting Ortahisar to Nevşheir.
The court has partially oxidized pink and cream walls and it is cut into a spur limited by a crown of brown cones. The complex has an open courtyard on the S side on which now seven rooms are open on the ground floor, and others at on second level. The original core was probably a closed court which was accessed by a narrow passage on the SE edge; the S front was probably closed by small cones eroded by the time (Crescenzi C., 2012, Rodley L., 1985, Jolivet-Levy C, 1991).
Today, the court disengages four entrances: to the N there is a three rooms complex, which is located at the bottom, while at the top there are the openings of unvisited rooms; a church is located to the E, with an inscribed cross plan with a funerary narthex; on the E side, at the top, there are entrances to the house of the monks, which were successively used as pigeon house; to the W, there are an inscribed cross plan large square room and a second room, probably used as a kitchen.

Pankarlik (coord. 38.618926; 34.876171WGS84)
The Pankarlık is out of the village, in the countryside, off the road 2 km from Ürgüp, in the Susam Bayırı valley. It is part of one of the most ancient settlement of the area, and it was realized in a huge rock mass. It has a rectangular single nave with a plain ceiling. The entrance has been heavily reworked, and it is surmounted by the original double lancet window. The front of the apse has been heavily reworked too, probably when the floor was lowered.
The traces of housings on the apse corners testify the presence of a wooden iconostasis. The remaining walls contain pictorial cycles from different ages. The traces on the floor and on the walls reveal that the architectural plant was modified many times. The nave gives access

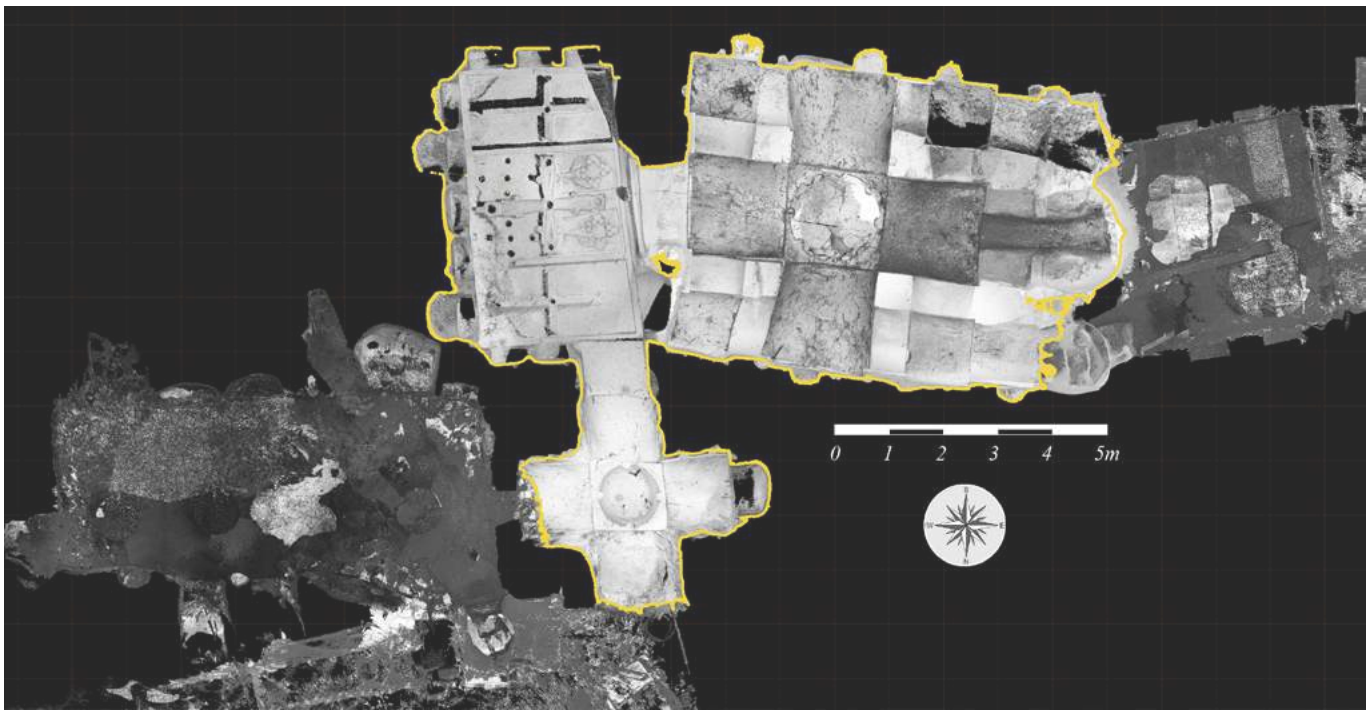

Fig. 5: Saklı Kilise. Bottom view of the vaults.
Fig. 5: Saklı Kilise. Vista in proiezione ortogonale delle volte.

to the funerary *parecclesion*. The inscriptions in the *parecclesion* and other elements of the nave suggest that it was built in the VI century, while the pictorial cycles were realized in the IX century.

Two churches of the Balkan's Monastery (coord. 38.612434; 34.85335 WGS84)
Saints Peter and Paul. The Kilise of Saints Peter and Paul in Balkan is a funerary one, with *arcosolia* carved out of the walls and ditches that extend to the entire floor area. It has a Greek-cross plan and its centre is crowned by a frescoed dome, which is raised on a simple frame square base.
It dates back to the VIII-IX centuries, because it preserves important remains of iconoclastic decoration around the arches, at the base of the dome and especially on the walls.
After the iconoclastic period, it was enhanced by a rich pictorial decoration, which was ruined in its largest part by recent aggressions of Islamic fundamentalists.

Aniconic. A second Greek-cross in Balkan is absolutely without iconic paintings, which clearly witnesses that it has been carved during the VIII-IX centuries, right in the middle of the iconoclastic period.
The interest for this arises from its decorative reliefs, generally constituted by medallions surrounded by engraved frames with compact geometric patterns repeated in fake entablatures. the central field there were crosses with equal-length arms, some of them now lost of the fury of the chisel. A beautiful palm with bunches of dates is carved on one of the entrance's doorposts.
The palm is also a recurring motif in the decoration of the brackets that support or adorn the fake entablatures; these brackets are sometimes configured with a cross of expanded arms, or bear similar engraved crosses or palm leaves.
It is likely that this very sophisticated and delicate sculptural decoration, light as lace, made it impossible, even after the iconoclasm, to cover the walls with plaster for frescoes.

Rupestrian Mosques in Ortahisar
There are two rupestrian mosques in Ortahisar (Çukur Cami and Alaaddin Cami), situated at the Eski/Atik Mahalle (Old Neighborhood) (Fusun alioglu e. et al. 2012).

Çukur Mosque (38.620462, 34.863745 WGS84)
Çukur Mosque is situated between two stepped streets on a slopes of the castle. It is a structure with multi-spaces. The Mosque has three gates and it has two parts: the first section as a cave, and the other as a masonry. The later was built adjacent to the old mosque from its W wall.
The construction date of the mosque in masonry is uncertain. The plan characteristics indicate to the XIX century. The main space of the Mosque is divided into two naves elongated in N-S direction. The mihrab is off centre to the E. Each nave is covered by a pointed vault. The minaret in a baldachin form is situated at the NE corner, which is identified as kiosk type minaret.
The rupestrian Mosque, is constructed by carving out the E rock block. The main space is in rectangular form.

Alaaddin Mosque (38.619649, 34.865207 WGS84)
The building is in Camii Atik (Old Mosque)

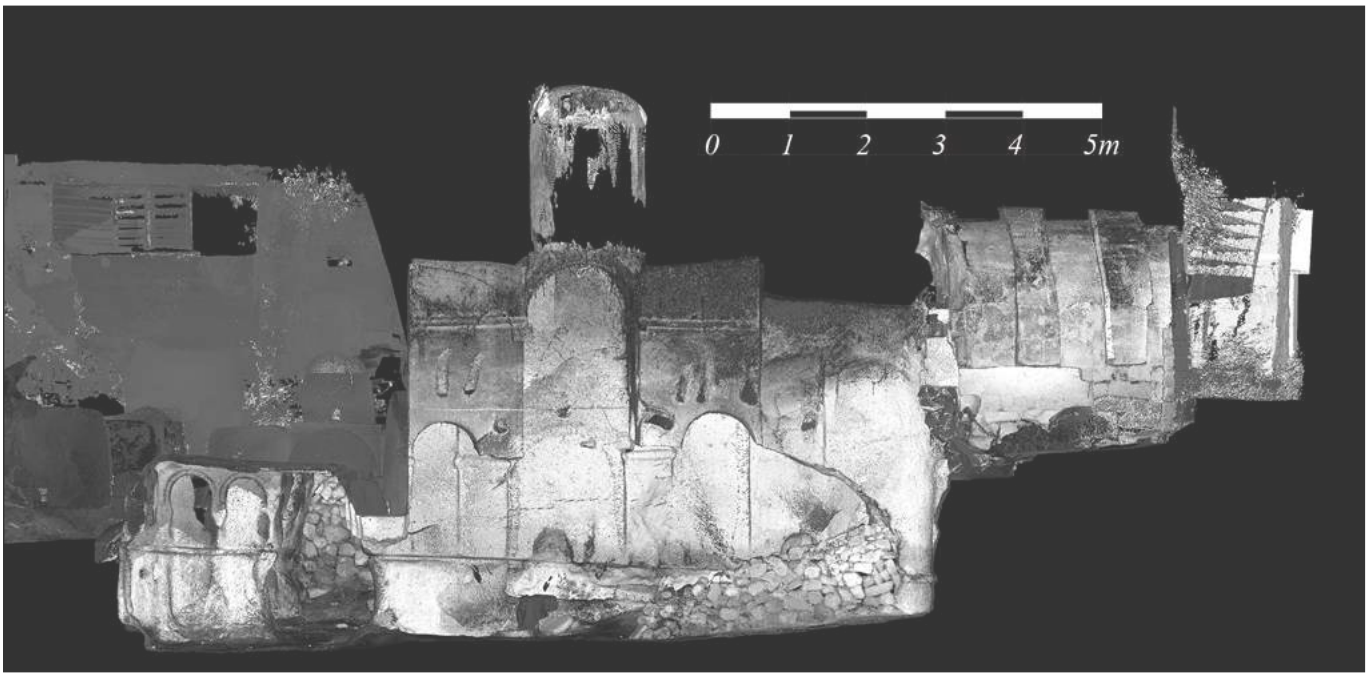

Fig. 6: Saklı Kilise. Longitudinal section of the central nave, the N face.
Fig. 6: Saklı Kilise. Sezione longitudinale della navata centrale, fronte N.

Neighbourhood. The complex is composed of two parts, one in masonry building and one rupestrian. Both building are built on top of a lower structure, which was carved into the rock.
The Ottoman inscription gives H.1274/ (1857) as the date of the oldest building. Anyway, it is considered that this building replaced an earlier one; and with salvaged materials from the previous buildings. That's why it is difficult to date it. The ancient rupestrian structure has an irregular shape, with parts of it filled with masonry walls.

The survey of Saklı Kilise and Ali Torun Kilise complex District Eski / Atik Mahalle
Following the road that starts from the municipal park, in front of the castle, and that leads to the look-out, right after the public springs, on the left side of the road and before crossing the bridge, there are two beautiful sacred buildings concealed by surrounding walls. Both buildings could be dated to the iconoclastic period and could be part of a single monastery. The complex, inhabited until 2012, is now uninhabited; in 2013 the complex passed on to the three heirs of the original owner (Fig. 3-4).

The Saklı Kilise (coord 38.619419, 34.866077 WGS4)
After crossing the small courtyard of a private home and a room, barrel-vaulted with rouleaux arches, we have access to Saklı or Gül Kilise by an opening in the wall of the altar, on the left of the apse (Crescenzi C., 2012).

The church
It has an inscribed Greek cross plan, and is perfectly oriented to the E. It has a considerable height (4.78 m compared the amplitude of the trapezoidal spans of the arms of the cross. These have turned a conical section, slightly splayed outward and upward, and seem to form a three-dimensional reinforced cross. The cross-vault in the key reaches a height of 4.7845 m; its spans are trapezoidal and their average amplitude in plan are as follows: the basics about 1.81 m and 1.97 m, the heights along the longitudinal axis are approximately 1.75 m.
The central dome has a quadrangular base (1.8 m - 1.86

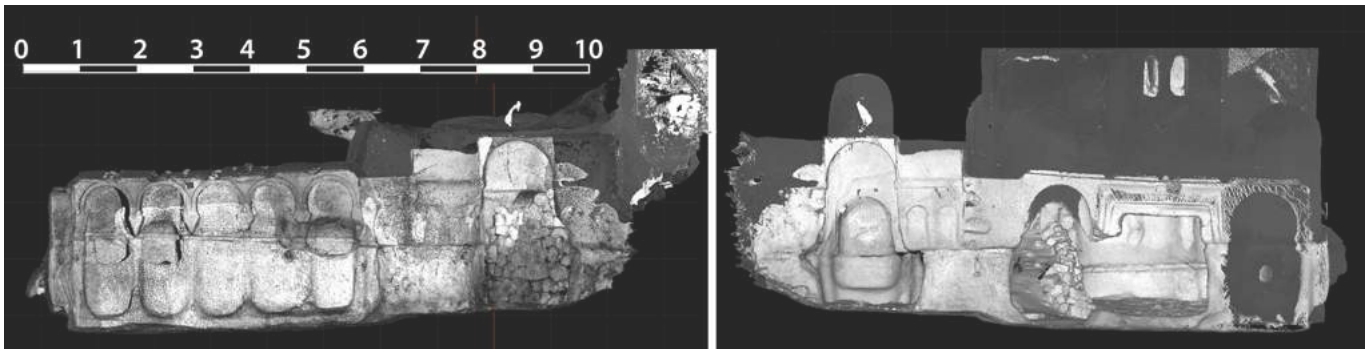

Fig. 7: the E and W sections of the narthex and of the chapel of a Greek cross.
Fig. 7: sezione E e O del nartece e della cappella a croce Greca.

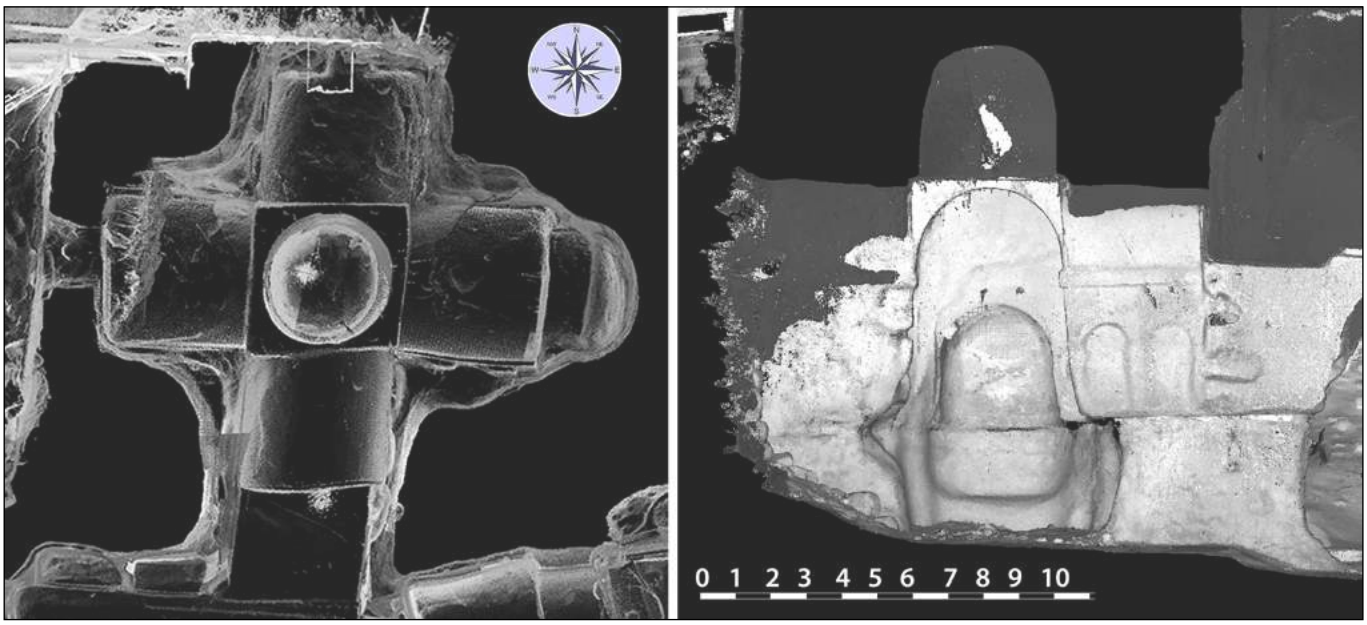

Fig. 8: greek cross Chapel.
Fig. 8: cappella a croce Greca.

m); the triangular pendentives make up the octagonal perimeter. The cornice of its base is characterized by corbels (h. 0.102 m that mimic the support of the tambour (h. 1.48) and possible columns, similar to those carried in a small chapel's Ali Bay at Göreme valley or as those drawn in "the 4 Devils" in the Kılıçlar valley. On the NE pendentive a cross with falcate base and enhanced arms is visible.
The pillars have a square remarkable section; they have been cut at the base of the angular arches. On the intrados of the arches of the side spans the residual the red lines that mimic stone blocks. It is likely that over the entire vault there was the same decoration.
The central apse is introduced by a passage (triumphal arch) barrel-vaulted, wide 1,75 m, deep 0.9 m, high in key, from our building line (height 4.35 m); with an arch ring nut framing the central apse (23 cm). In keystone, the rock has been cut and the bottom wall of the apse has been destroyed. Even the side apses were destroyed at the bottom; the diaconicon has been compensated in masonry.
The four angular spans are barrel vaulted. On the W wall, in the central span, at 3.2075 / 10.25 overlooks, with a small mullioned window, a compartment built into the narthex, in front of the APSE.
A wide door (1.57 m) communicates with the narthex (5.07 m x 2.86 height 2.41 m) (Figs. 5-6).

Narthex
The E wall of the narthex is articulated in three parts: the entrance is framed with geometric frames and is flanked by two blind niches, that partly destroyed the bottom. The W wall has five blind niches, while E only three are at the N and S walls; specifically, the N has two blind ones, and in the third there is the passage for the small building of a Greek cross (Figs. 5-6-7).

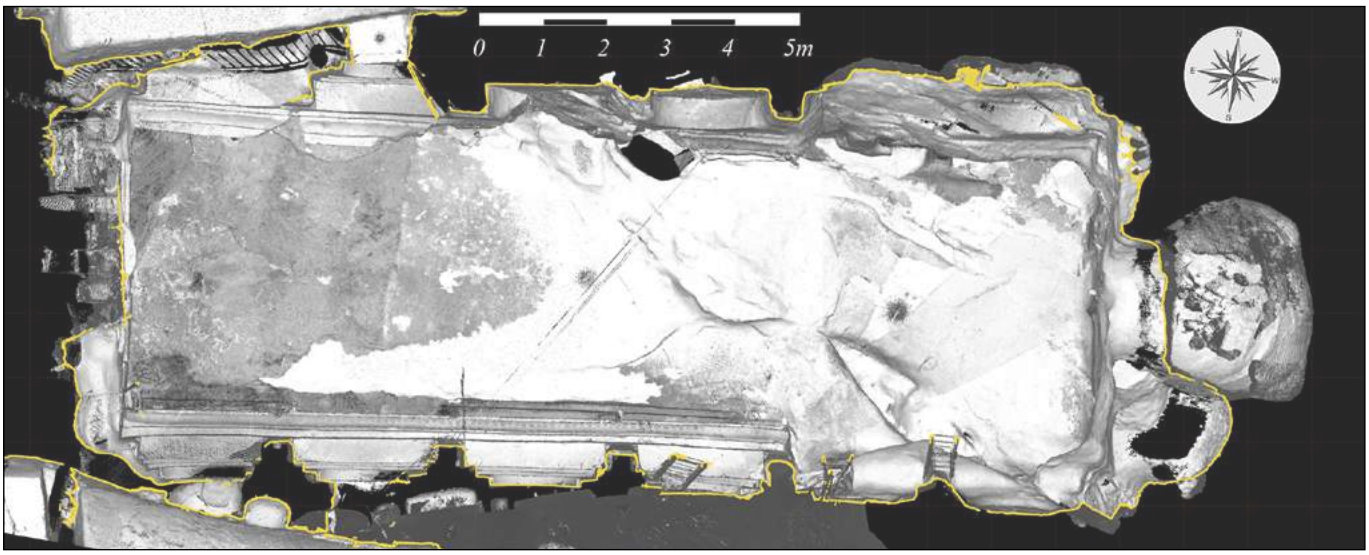

Fig. 9: Ali Torun Kilise. Bottom view of the vaults.
Fig. 9: Ali Torun Kilise. Vista in proiezione ortogonale delle volte.

Fig. 10: axonometric section view of the hall church and the chapter house.
Fig. 10: spaccato assonometrico della chiesa e della sala capitolare.

The niches are detached from a *subsellium* (height 0.2 m), and are enclosed by overpassed and framed arches (arrow 2.30 m).
Pilasters (height 1,935 m), bases (height 0.20 m) and capitals(height 0.20 m) are much eroded.
The flat ceiling of the narthex is divided into three panes that enclose just as many crosses in bas-relief. The lateral crosses are all simple in their form: they have a double profile and the intersection of the arms is carved out a small hemisphere or *cuppella*.
The central cross is sculpted with great care; a frame with small floral elements borders the arms. These are trapezoidal, decorated with triangular elements and *cuppelle* placed at the intersection and the top of the arms.
In each of the upper panels of this cross, at a lower level, is sculpted a cup that still contains a cross with arms polylobate; in the panels below, there is still a cross figured five *cuppelle* (Fig. 5) (Bixio R., De Pascale A., 2012).

Greek-cross chapel
The passage NE of the narthex leads into a small building with a Greek cross (3.9 x 3.9 m, height 2.51 m) (Figs. 5-7-8). A small apse (width 0.84 m, depth 0.81 m) is oriented to the E. Twinned niches were carved on the walls of the arms (0.31 x 0.63 m), some still visible. In the central span (1.076 x 1.07 m), on a small circular frame, the tambour (diameter 0.96 m, height 0.45 m) and the hemispherical dome (height 0.473 m) are set.
The N arm is walled, and a small ramp leads to the courtyard 3 (Fig. 8). The W arm communicates with a vain (8 x 2.8 m), placed at a height of 1.2 m, higher than the chapel; the two original passages are currently blocked.

Ali Torun Kilise (coord. 38.61953; 34.86604 WGS4)
Outside the Saklı Kilise, in the area closing the path to the NW, an high wall with a particular entrance arch surrounds the courtyard, leading to the Ali Torun Kilise (Fig. 3) (Crescenzi C., 2012).
Crossing the courtyard that surrounds a private house, and some built up and carved spaces, you enter the church. The church of particular beauty and majesty, has a single nave (about 5.3 x 15.2 x h. 6.8 m) (Fig.9). It is aniconic with some notable architectural decoration; unfortunately it is in bad condition because of the improper reuse of the structure and the water's infiltration.
The roof of the nave is free from constructions that occlude the rocky facade, and the apse part is located under the street. The height is divided in two architectural orders; the lower, in turn, is divided by blind niches with double pitch compared to the superior one. On the basement there are residual traces of subsellium and a further raised element from which starts the pedestal of the pilaster (Fig. 10).
The pilaster (height 3.3 m) seems constituted by: a pedestal (height 54.2 cm) whose width seems to drop to re-join the frame level that enclose the niches; a basement (height 21.7 cm); a shaft; a plain fillet (17 cm) decorated by green triangles bordered in red, that enclose rock rhombuses; and a geometrical capital (49.1 cm). The capital has flat bottom with a bas-relief frame, in the concave sides is decorated with small volutes. The decoration is green. The entire capital recalls a stylized cross. Similar elements, most detailed, can be

Fig. 11: trabeation: section of profile, photo of decoration and bottom view.
Fig. 11: trabeazione: sezione del profilo, foto della decorazione e prospetto.

found in the roof of the aniconic of Balkan.
The architraved pilasters divide the longitudinal wall in 6 parts. Their wheelbases have different distance ranging from 1.96 to 2,42 m, the total depth is about 74 cm constituted by: the thickness of the pilasters (40.8 cm); the thickness of the double frame (12.1 cm), decorated by triangles till the height of the niche; the depth of the bottom niches (width from 1.48 to m 1.26 m, height 2.5 m, depth 8.2 cm), which is closed on the top by an arch (ray 71.2 cm, arrow 89.3 cm), closed by a ring 12,5 cm decorated with green rhombuses. In two of this niches, the penultimate that front themselves towards the ESE bottom wall, are located the two accesses of the church (Fig. 9).

The prominent trabeation (Fig. 11) (depth about 39 cm) divides the walls with a double architectural order. The elements are disintegrated. It is constituted, starting from the top to the bottom by: a band decorated by opposite black triangles highlighted by a double groove red line, which is set to the superior order; plain fillet; cyma recta decorated with a double black battlement; cyma recta (or convex surface) monochrome plain fillet; frieze decorated with diamonds. Each frame in the superior order includes twin blind niches; their arches are based on small capitals. The pilasters are surmounted by a simpler trabeation which decorates the plane roof.
The pillars are composed by pedestal, shaft with cut

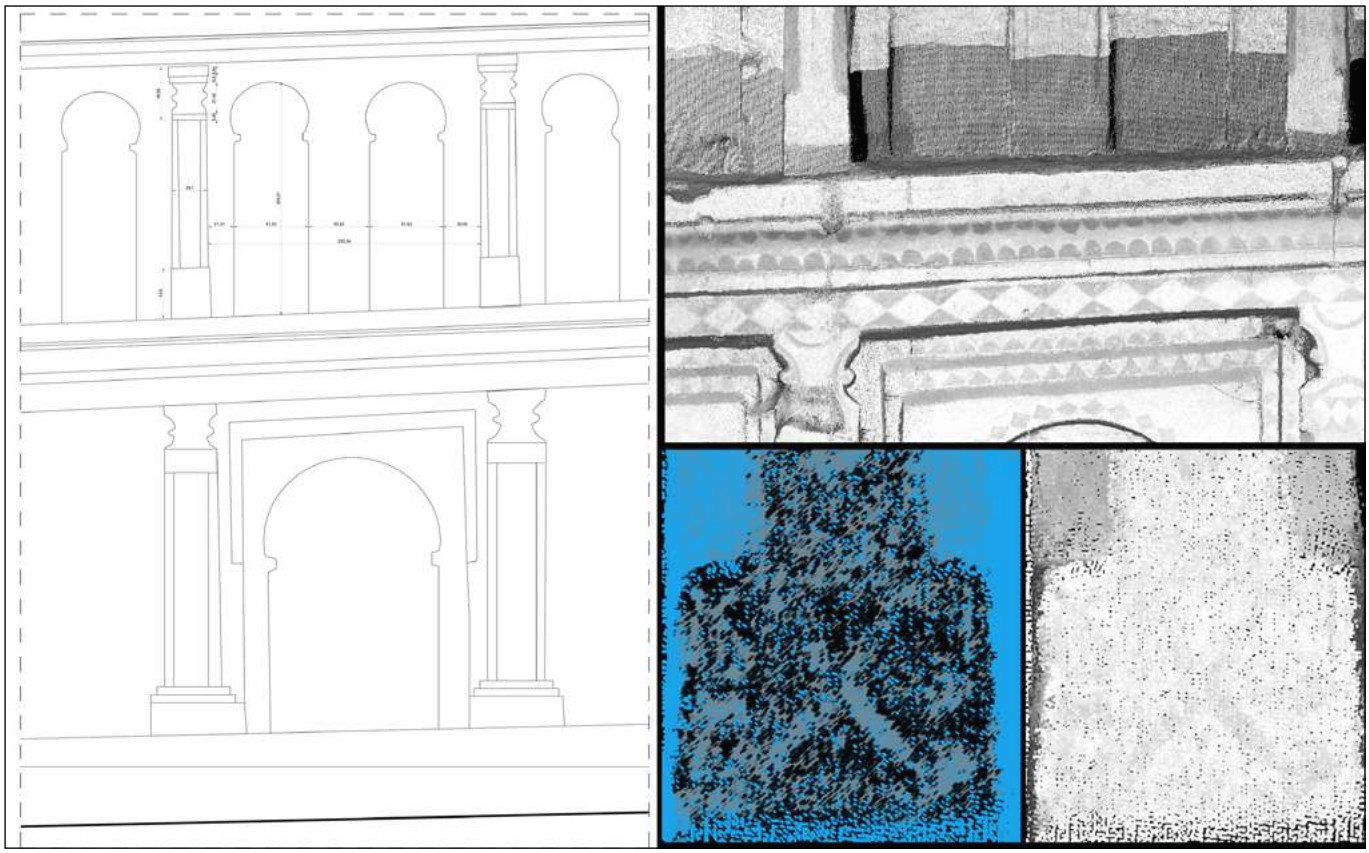

Fig. 12: reconstruction of a module of the side walls; details of the decoration of the trabeation and a St. Andrea cross on the dado of the superior order.
Fig. 12: ricostruzione del modulo della parete longitudinale; dettagli della decorazione della trabeazione e croce di S. Andrea sul dado delle paraste dell'ordine superiore.

Fig. 13: perspective from the ESE.
Fig. 13: prospettiva E-SE.

angles and capital. On a dado you can read a clipeus whit a S. Andrea cross; all the architectural elements where decorated (Figs. 12b, c).
The ESE wall, by the interior side, is architecturally relevant. On the superior order there are three wide opening, different in width, divided by pillars. On the right corner there is a walled opening; on the E the wall has been opened, and a small room with niche is visible. This level can be reached by the external stair, crossing built in masonry and rupestrian spaces. We can presume the presence of a *matroneum* (Fig. 13).
The frame between the two orders is similar to the one we described till the penultimate lower element. Immediately under the frame, the wall (width 5.1 m) is divided in four asymmetrical parts. Starting from E there are:
Enclosed in a panel closed by a frame (ext.1.19 x h 1.49 m) with a S. Andrea cross; in it' is triangular panels were represented some *clipei*, with the right *clipeus* (30 cm) with anagrammatic and enhanced cross still visible.
A panel (ext. 1.54 m, h 1.49 m) that surrounds a mullioned window. It has a jamb 70.3 cm high, a capital 8.7cm high, and a horseshoe arch 26.6 cm high; it is surrounded by jambs and frames decorated with hounds-tooth lines. Between the frames of the two windows there is a small pilaster with capital. The external frame is decorated by triangles with a central point; a panel 41.9 cm high divides the described box from a second panel with mullioned window too. This ends near the wall; presumably there was not a second panel with cross. Probably the church is dedicated to St. Andrew's because the only signs dedicatory are the crosses's St. Andrew. These are still visible on the pedestals of the pilasters and the upper panel before described (Fig. 14).
The surface under the described elements is seriously compromised. A masonry structure closes the original access, that was originally located at the centre of the wall. A NE of the wall there is a second walled opening with jamb and arch made of two pieces of cut stone. At the height threshold there is a step, probably part of the original subsellium (Fig. 13).
The WNW wall is almost destroyed; the eventual apse system is difficult to understand (Fig. 15). It is possible to hypothesize a central apse with side niches similar to the system found in Corisba (described in Fig. 16).

3D data treatment for settlement

The first phase of data treatment is the registration of the points clouds imported from the laser scanner. The result is a discontinuous 3D model whit millimeter accuracy.
The data elaboration was processed through the software Leica Cyclone v.6.0, that joins the single scans with specific algorithm of roto-translation based; in this particular case, this was carried out only on the identification of the homologous points of the surveyed

Fig. 14: ESE Front: the details mullioned window and panel with a S. Andrea cross.
Fig. 14: prospetto E-SE, dettaglio delle bifore e del pannello con la croce di S. Andrea.

object.
The result obtained with this standard process of elaboration of the points clouds is a geometrically correct 3D model, not useful for a comprehensive representation of the material and color data. The total darkness not allowed to take pictures.
The overlapping of the portions of the points cloud returned an accurate surface detail, which was not affected by noise and errors during the acquisition of the data, neither the luminous disturbance that usually occurs in dark environments. The obtained product can be processed again to highlight some specific details, depending on the need.
The final result presents a mapping and a geometry absolutely matching with the studied object. Chromatic details and shortcomings are easily noticed.
Furthermore, with the simple substitution of overimposed maps, the final design can be easily adapted to any aesthetic requirement, preserving unchanged the basic data.

Considerations on the Saklı and Ali Torun Kilise underground settlement

The amount of data has been collected within a few hours of work; the time available was very little, these results unreachable with traditional survey supported by technological tools. It has been appreciated the ease use of Faro Focus: its low weight and its small size made it possible to survey of difficult and cramped rooms.
These buildings are privately owned, are (closed) to the public and in complete darkness.
Therefore the survey with laser scanners, for its ability and quality to collect data, has been invaluable: the 3D models being produced allows to measure and investigate this small part of the architectural and urban system of Ortahisar.
The work carried with the scanner has been highly appreciated.
The 3D shows to a clear interpretation of the insediative complex. However, it still needs to be detected, since not all the locals were accessible.
The scans made possible to understand the architecture of the places and structures, and the first images extracted from the point cloud were invaluable to start studying this settlement.

Annotations

In Ortahisar, as in other towns of Cappadocia, the structural decay of the sites has accelerated with the change of the population during the first half of the XX century. Lost the wisdom and the culture of rock, the need to build at the surface led to the depletion of the rock structures used as quarries and the exploitation of their roof areas as the basis for new buildings. These are the factors that have contributed to the loss of cultural life in the cave, the physical destruction of an urban system and undermined the new settlement project.
Therefore, in the last century, and exponentially in the last 30 years, lack of management of surface water and waste water, the demand for and production of new comfortable urban settlements, away from city centers, fuelled by a cultural tourism have contributed to the collapse and abandonment of the historic village.
Negligence in time and ignorance of the value of cultural and environmental rupestrian heritage have contributed to the loss of the cultural heritage of living in a cave.
In various international countries restoration and environmental rehabilitation are ongoing for cultural needs or, more often, for economic interests related to touristic activity.
Discovered the economic value of tourism, residential structures of historic Ortahisar, inhabited until a few years ago, are on sale and are being restructured to respond to the hypothetical hotel requirements.
However, in the intervention works the historical, environmental and bio architectural value of the rock are not yet clear. New facade structures and patios are built ex-novo on rupestrian structures already

Fig. 15: cross-sectional view of the W-NW front. Apse wall.
Fig. 15: sezione trasversale del prospetto O-NO. Parete absidale.

compromised by intervening with reinforced concrete and stone. They are not correct restoration, but an operation of make-up made with richly decorated prefabricated elements that appear as a set of Hollywood.
The exposed rock is aesthetically appreciated by tourists, but the need of methods for urban and architectural requalification necessary to safeguard historical environmental landscape is completely ignored. In addition, fearing that the architectural heritage could potentially preclude actions for sale and restructuring, many private buildings are difficult to access.

Conclusions

The study and promotion of cultural heritage of the village of Ortahisar is necessary to promote an ethical and social conscience, to understand the economic value of culture, and to prepare a common project that meets the economical needs of the Community in accordance with the natural and anthropogenic landscape.
The study also contributes, in line with the co-operation between peoples, the promotion of a shared cultural area, the development of cooperation between researchers, practitioners and cultural institutions.
The research activity involved and interested local scholars, cultural and institutional traders for a common project. In particular, the study was made possible by the rapidity of the survey carried out with the 3D scanner, irreplaceable in harsh environments such as those in the context in which we operated.
The acquired data and its analysis, two-dimensional and three-dimensional digital models, such as the double orthogonal projection of the buildings carved into the rock, allow to: 1) analyze and define the relationships of the spaces; 2) supply an efficacious support to the documentation originated from the eventual analysis of the underground morphologies and excavation techniques, from the archaeometric data, and from the identification of manifold phases of utilization; 3) study the state of preservation of the rock-cut structures and prepare a plan for their consolidation, restoration and renovation.

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Fig. 16 a, b: a) Corisba Kilise. The apse has been reworked, the altar has been destroyed. On the back wall, beside the arch there are two vaulted niches, with diaconicon and prothesis; b) nartex with crosses in relief.
Fig. 16 a, b: a) Corisba Kilise. L'abside è stata rimaneggiata e l'altare distrutto. Sulla parete di fondo, ai lati dell'arco trionfale, vi sono due nicchie voltate, il diaconicon e la prothesis; b) nartece con croci in rilievo.

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