



EDICULA MULTIPLIER EVENTS

O3: Hands-on Framework The EDICULA Project | Multiplier Event 1 [E1]: The Historic City of Jerusalem, The Holy Sepulchre: A Hands-on Experience Learning from the Holy Sepulchre and Holy Aedicule

Jerusalem, 3 - 6 April 2022

Characterization and archaeometry of building materials of the Holy Aedicule – Compatibility
of conservation interventions

*Dr. E. T. Delegou*¹, *Emer. Prof. A. Moropoulou*²

¹ Interdisciplinary Research Group for the Monuments Protection, NTUA

² Chief Scientific Supervisor of the Holy Aedicule Restoration Project, NTUA

EDICULA: Educational Digital Innovative Cultural heritage related Learning Activities

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Characterization & archaeometry of building materials of the Holy Aedicule

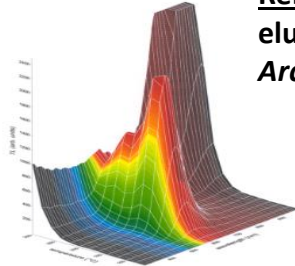
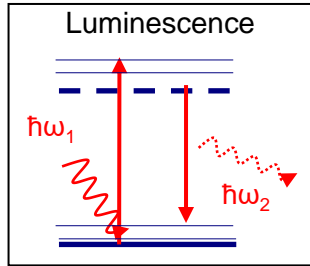
- How can we interrelate archaeometry with building materials science?
- How can we validate historical sources and testimonies by archaeometry / building materials data, and vice versa?
- Can the nexus Archaeometry - Building Materials – Historical Sources, provide solid and rigorous scenarios about the past?
- Is this the step from Interdisciplinarity to Transdisciplinarity?
- Can we start building a solid methodological approach towards this direction?



Archaeometry dating results - TL/OSL DATING OF MORTAR SAMPLES



Reference: Moropoulou, A., Zacharias, N., Delegou, E. T., Apostolopoulou, M., Palamara, E., & Kolaiti, A. (2018). OSL mortar dating to elucidate the construction history of the Tomb Chamber of the Holy Aedicule of the Holy Sepulchre in Jerusalem. *Journal of Archaeological Science: Reports*, 19, 80-91.



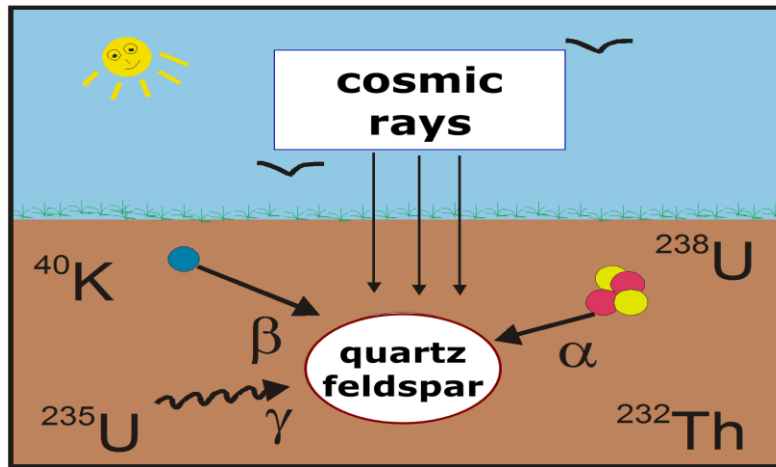
$$\frac{\text{Absorbed radiation dose (Gy)}}{\text{Dose rate (Gy/ka)}}$$

$$\text{AGE} = \text{ED/DR}$$

10 parameters are required, such as:

- Luminescence signal
- Signal correction
- Signal attenuation form
- Sample moisture content
- Calculation of cosmic rays
- Calculation of uranium, thorium and potassium

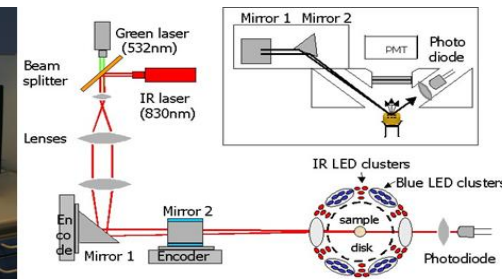
Use of the phenomena of Thermoluminescence (TL; stimulated by heat) and Optically Stimulated Luminescence (OSL; stimulated by light) to result in an ABSOLUTE AGE



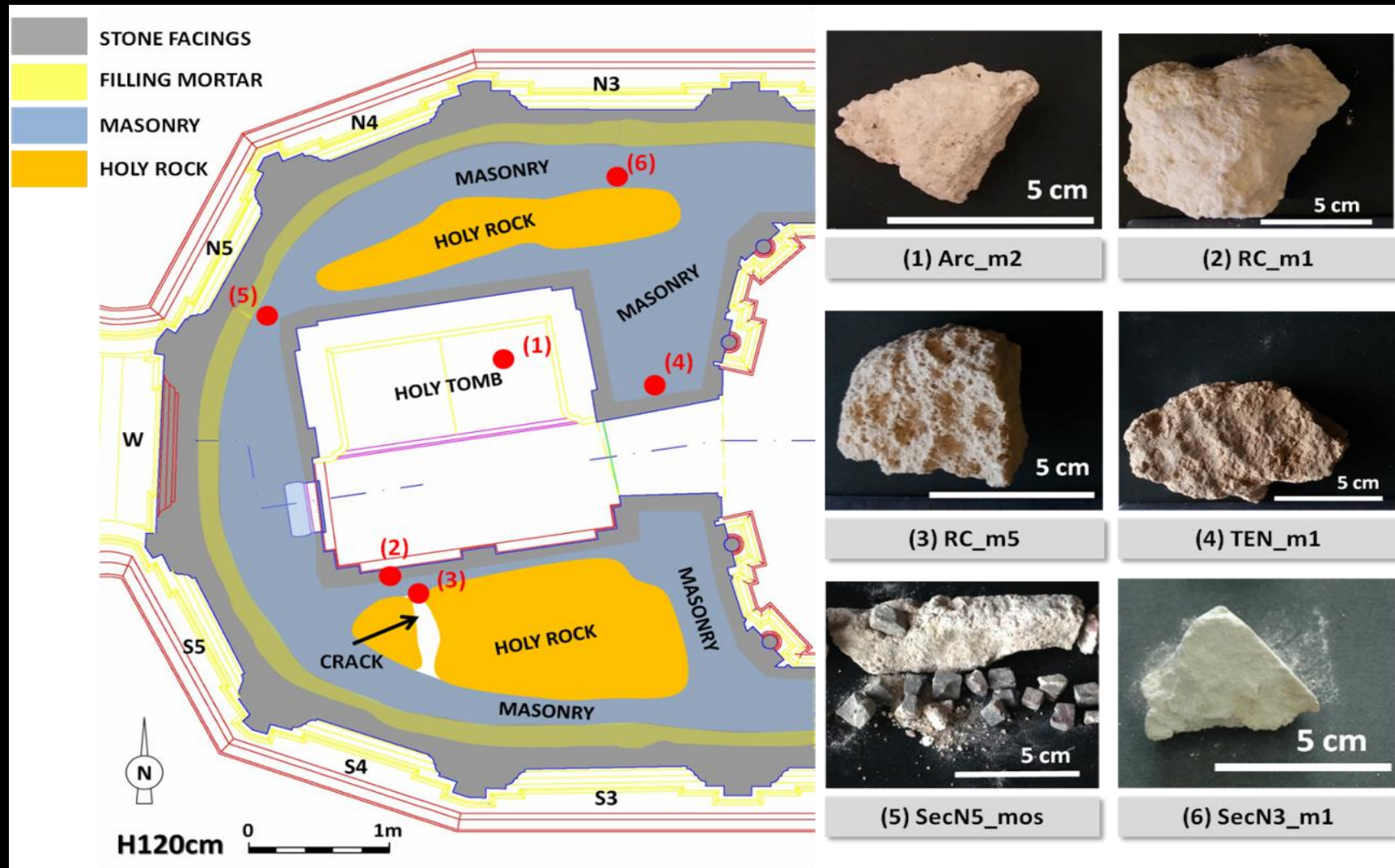
TL/OSL instrumentation



Holy Aedicule samples

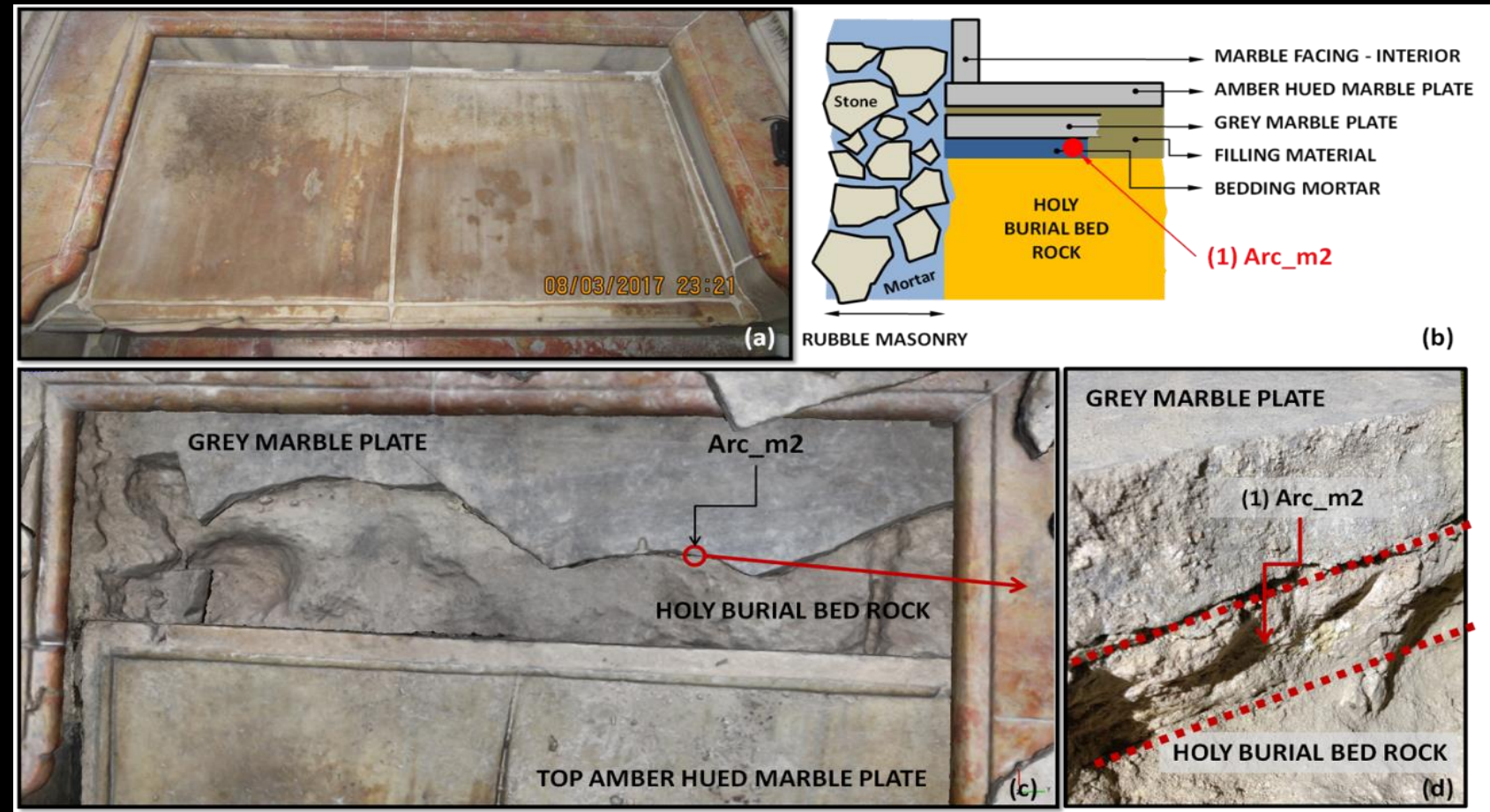


Location of the collected mortar samples



The location of the collected samples demonstrated on the ground plan drawing –section at 120 cm height– of the Tomb Chamber (left) (Lampropoulos et al, 2017); Photos of each collected sample (right).

Mortar Arc_m2



(a) Closed Tomb with the amber hued marble plate in place; (b) Schematic representation of sample location and surrounding materials in section, before the Tomb was opened; (c) The Tomb, when the top amber hued marble plate was shifted out of position, with the grey marble plate and the burial bed rock visible; (d) Exact sampling point of sample Arc_m2 under the grey marble plate

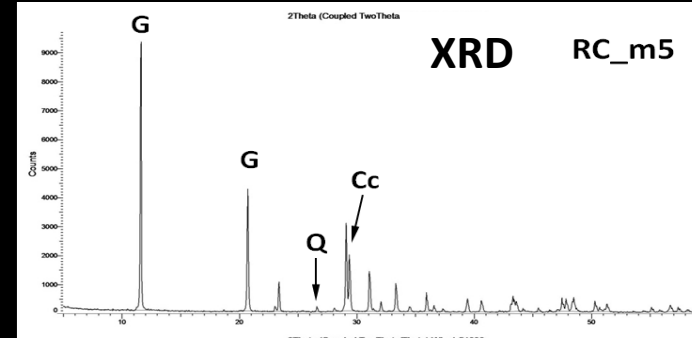
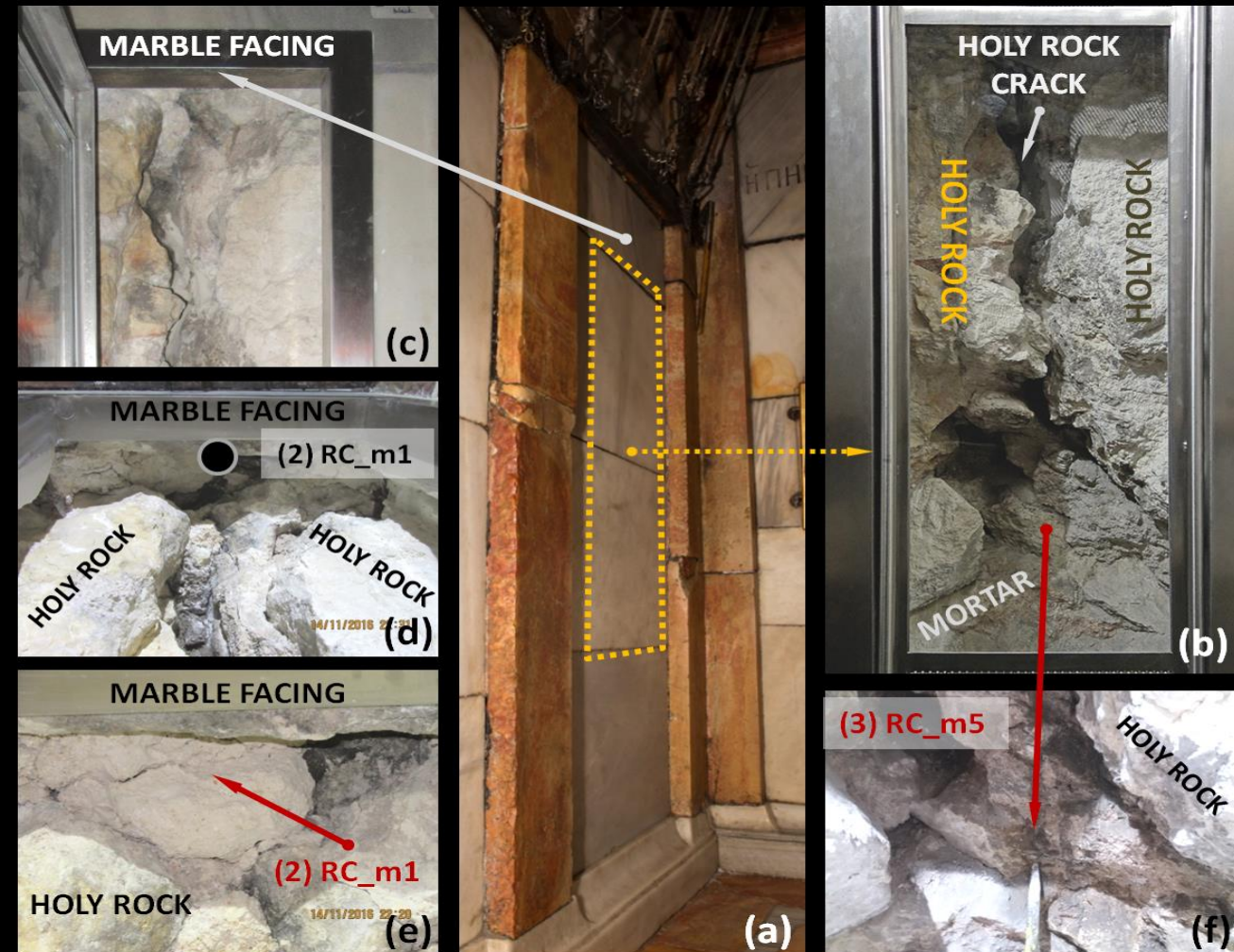
The presence of the fragmented grey marble slab within the Holy Tomb is an important discovery, since until recently, was only a hypothesis (letter of Boniface of Ragusa in 1570, and description of Maximos Simaios in 1809).

Mineralogical Composition: Gypsum, Calcite, Quartz, Anhydrite

Calendar centered Age: middle 4th c. CE (345 CE), Constantinean era

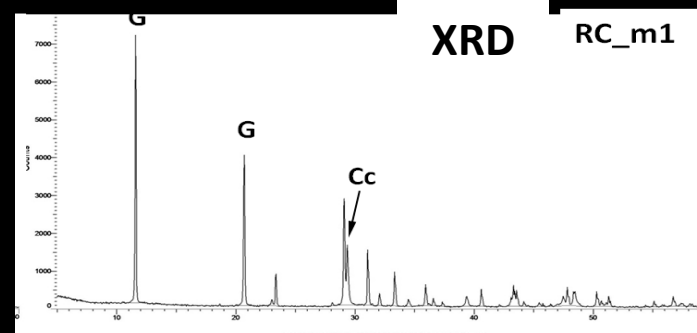
Thus, the Tomb of Christ, the initial burial bed rock surface of the carved cave on which his body was laid, was covered by a marble slab early on from the Constantinean era, at least from the top.

Mortars RC_m1 & RC_m5



RC_m5, mineralogical composition:
Gypsum, Calcite, Quartz

RC_m5, Calendar centered Age: late 16th c. CE, 1570 CE, reconstruction of 1555 by Boniface of Ragusa

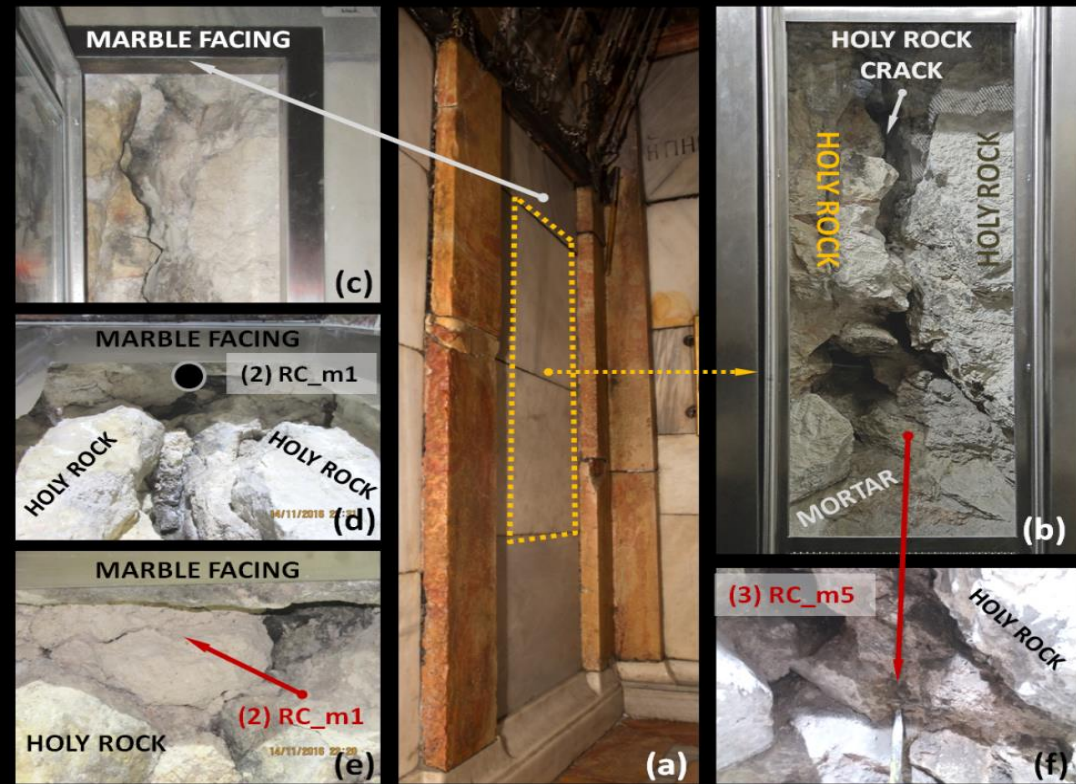


RC_m1, mineralogical composition:
Gypsum, Calcite

RC_m1, Calendar centered Age: early 4th c. CE (335 CE), Constantinean era

- The interior marble facings (opposite the Holy Tomb) where a window was placed;
- (b) The window installed to provide visibility of the Holy Rock;
- (c, d, e) The location where sample RC_m1 was collected behind the marble facing, above the window;
- (f) The location where sample RC_m5 was collected, at the lower part of the Holy Rock crack.

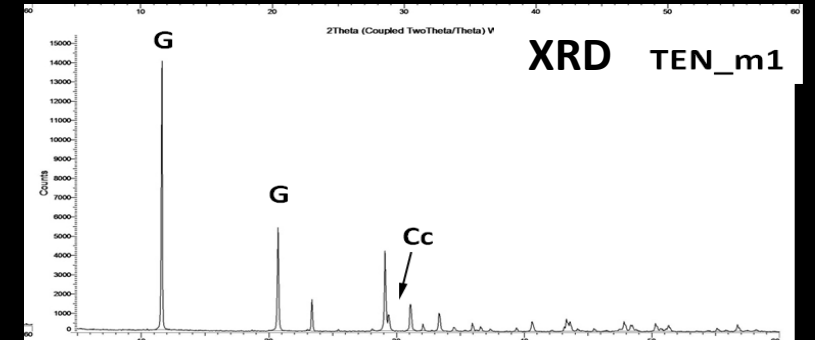
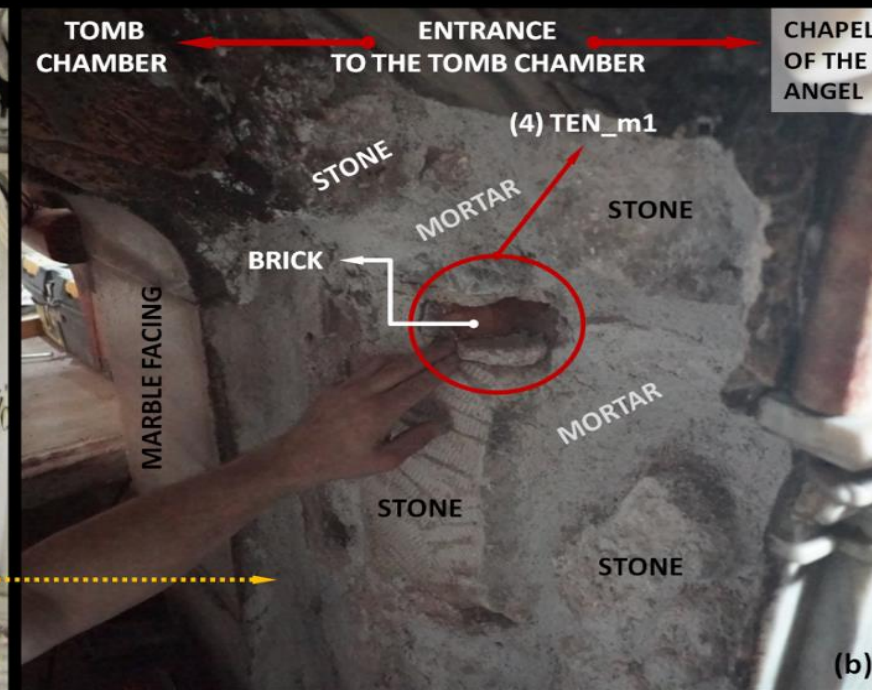
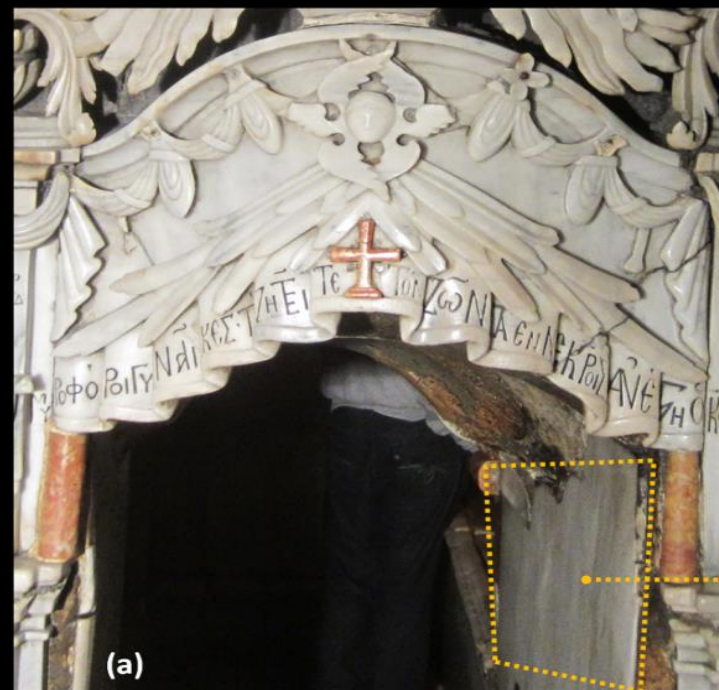
Mortars RC_m1 & RC_m5: possible scenarios



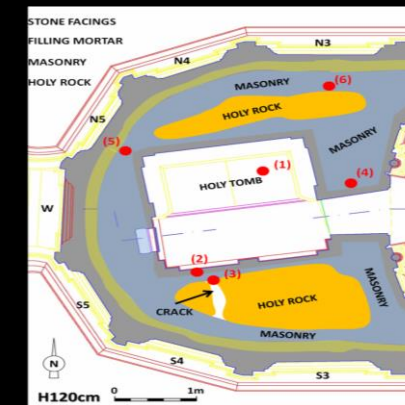
How can we have two mortars located so close to each other, but as it concerns dating they are centuries apart? (335 AD – 1555 CE)

- The fact that the RC_m1 mortar sample was in contact with both the Holy Rock and the marble facing, is an indication that the specific panel could have been in place since the Constantinean Aedicule.
- In the case that the marble panel is a later addition, then we can assume that the Holy Rock was at least plastered in the interior and not bare during the Constantinean era.
- Regarding RC_m5, the mortar sample taken within the Holy Rock crack, indicate that some panels were placed or replaced or even reattached during the Boniface restoration, without excluding previous or even subsequent restoration phases of the Holy Rock crack area.

Mortar TEN_m1



**TEN_m1, mineralogical composition:
Gypsum, Calcite**



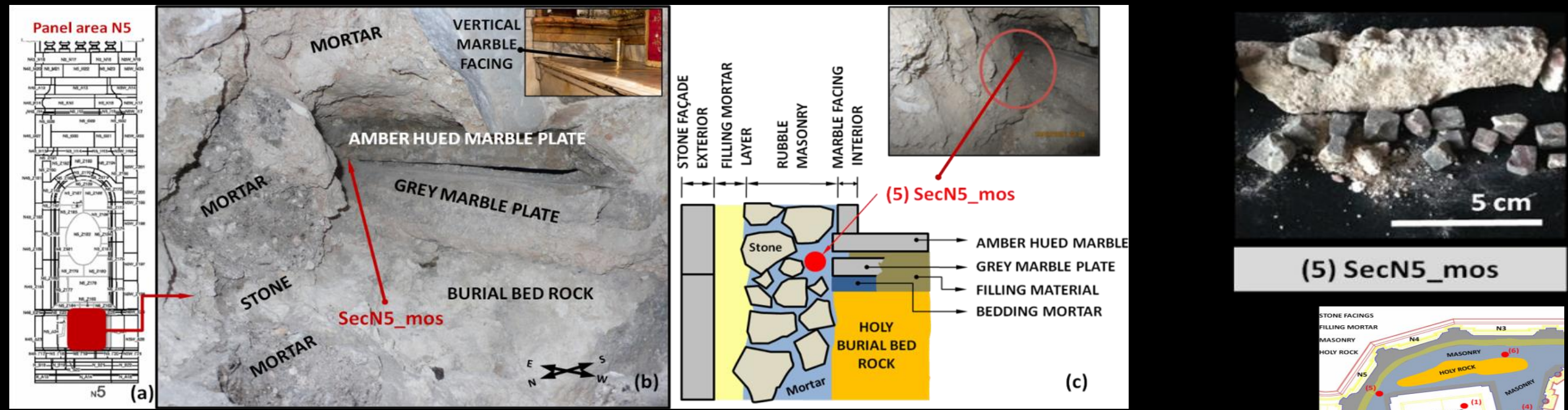
(a) The low entrance of the Tomb Chamber from the Chapel of the Angel, showing the marble slab that was temporarily removed; (b) The exact sampling point of TEN_m1.

TEN_m1, Calendar centered Age: middle 11th c. CE, 1040 CE,

It can be dated to the Byzantine reconstruction of the Aedicule, after the destruction of Al Hakim (1034-41CE), (Constantine Monomachos, Michael the Paphlagonian)

However, there is a possibility that this area could have been reconstructed during the Crusaders period (1099 CE).

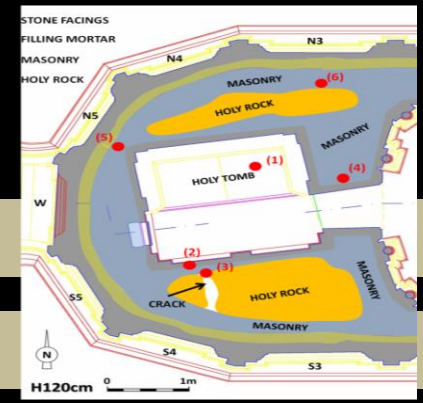
Mortar SecN5_mos: Could this be the remnant of the alleged mosaic decorations of the Holy Aedicula?



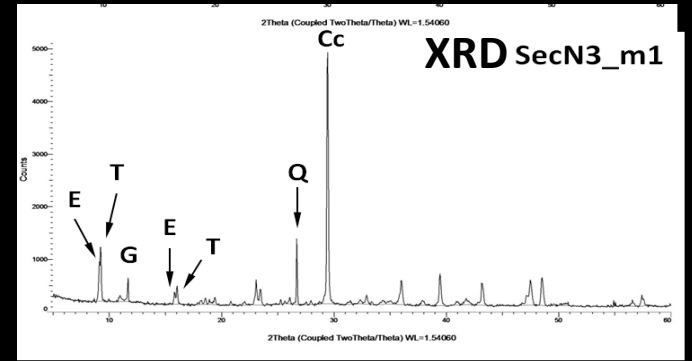
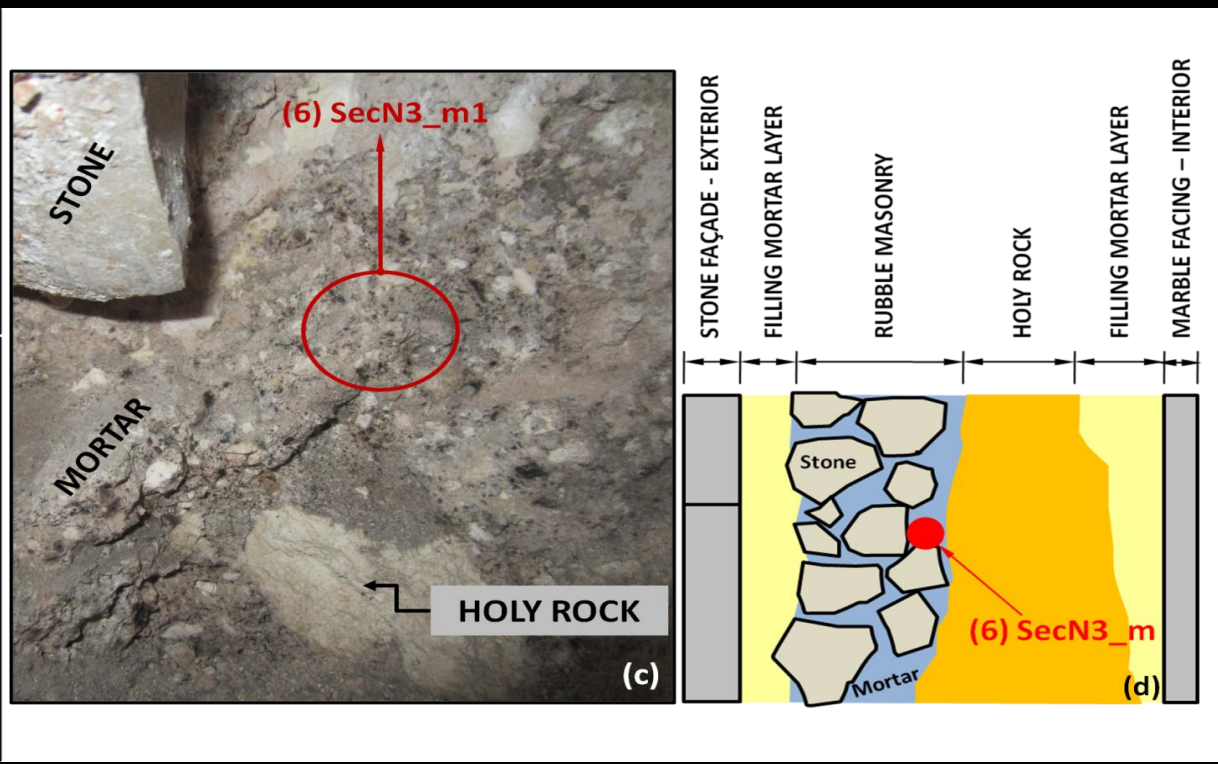
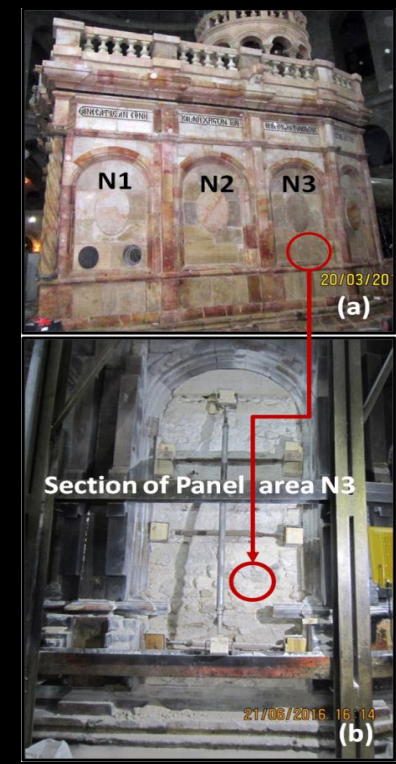
SecN5_mos, mineralogical composition: Gypsum, Calcite, Quartz

SecN5_mos, Calendar centered Age: middle 16th c. CE, 1560 CE, Reconstruction by Boniface of Ragusa

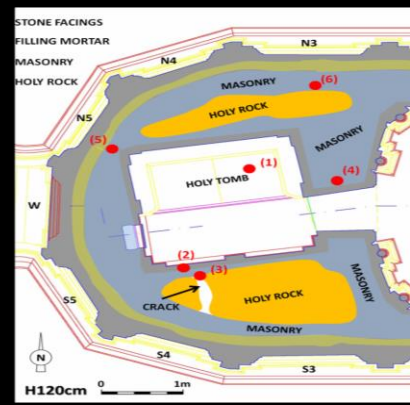
- SecN5_mos carried black crusted red tesserae, embedded in the mortar in a disordered manner.
- It could be the setting bed of a mosaic created during the Boniface of Ragusa restoration or the result of a conservation of an older mosaic during this era (possibly the latter due to the disordered positioning of the tesserae in the mortar and some historical testimonies corresponding to 1047 and 1149 CE that describe the presence of mosaics in the Holy Aedicula).
- In any case it seems it was placed in the masonry during subsequent restorations, where older parts of the Aedicula were preserved by embedding them in the newer phases.
- The production technology of the tesserae is under investigation



Mortar SecN3_m1



SecN3_m, mineralogical composition:
 Calcite, Quartz, Thaumassite, Ettringite,
 Gypsum



(a) North façade with exterior stone slabs in place; (b) The location of the masonry section at panel area N3, after removing stone slabs and filling mortar; (c) Exact sampling point of sample SecN3_m1 within the masonry; (d) Schematic representation of sample location and surrounding materials in section, before any intervention.

SecN3_m, Calendar centered Age, early 19th c. CE, 1815 CE, Reconstruction by Kalfas Komnenos

This sample was collected from a section of the inner masonry of the structure (in a depth of ~65 cm from the exterior surface of the stone facing, corresponding to the northeast corner of the Tomb), and it confirms the fact that the architect Komnenos in 1809-10 restored the inner masonry behind the exterior stone slabs.

Conclusively:

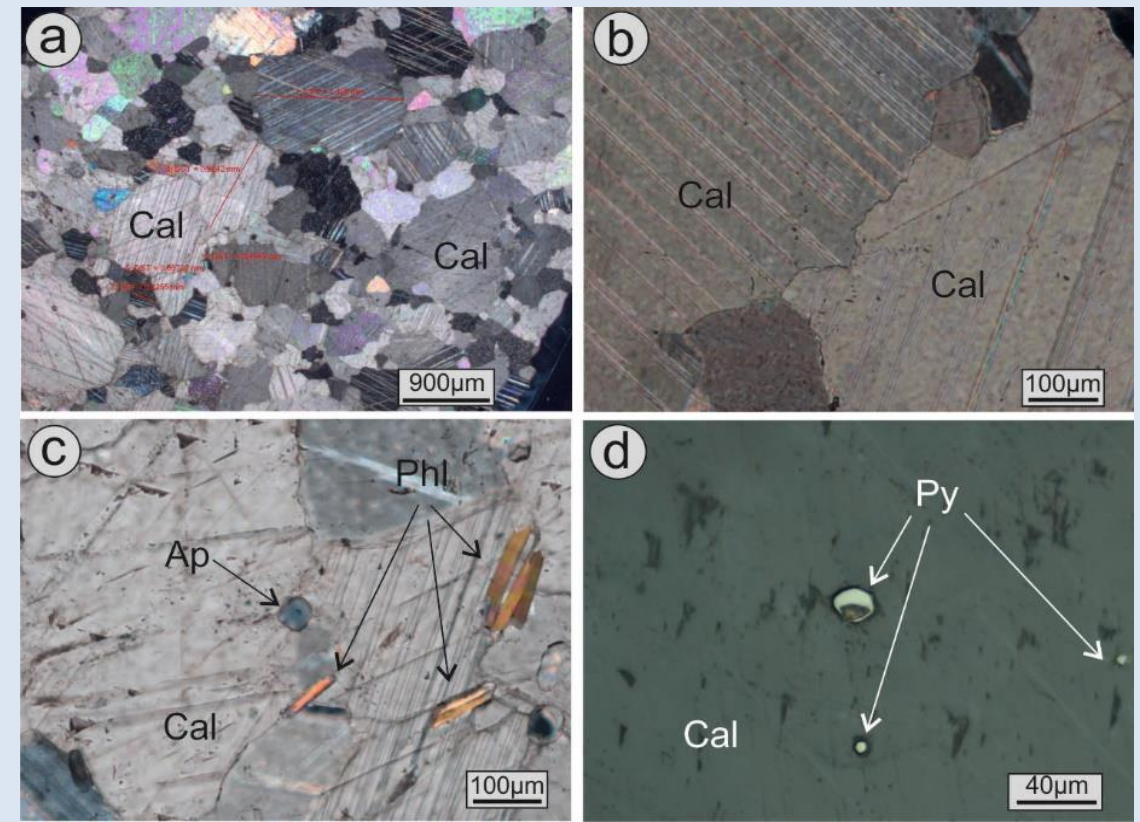
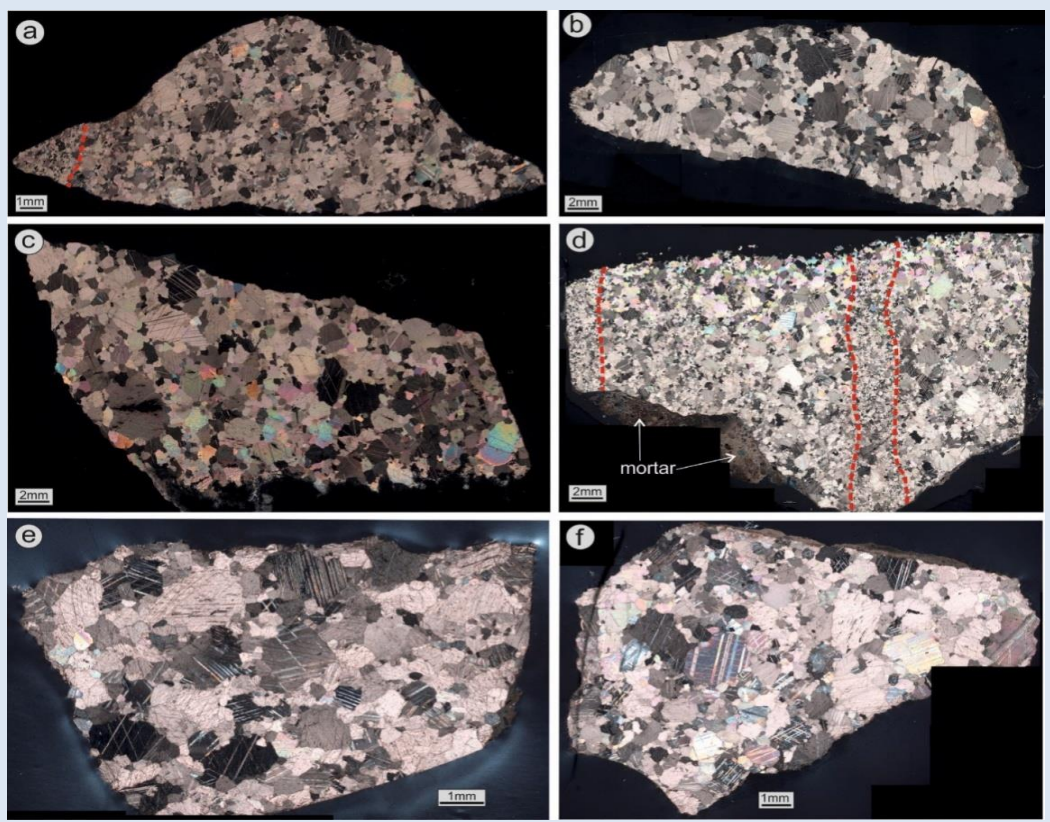
- Four distinct chronological periods, based on the OSL dating, were produced out of the six analyzed mortar samples.
- These chronological periods correspond to construction phases centered at the 4th, 11th, 16th and 19th centuries, being in alignment to major construction and restoration phases of the Holy Aedicule, shedding light to the construction history of the Tomb Chamber.
- The mortars dated to the Constantinean era, the Byzantine reconstruction and the renaissance restoration by Boniface of Ragusa were gypsum-based mortars; a fact that indicates continuity in the production technology of the mortars.
- The high amount of gypsum detected in these mortars indicates the partial use of gypsum aggregates within the mortar in addition to a gypsum or gypsum-lime binder.
- The choice of materials seems to be more or less the same, regardless of the role of the mortar in the structure and era of application.
- The presence of ettringite and thaumasite in the lime-based mortar dating to the Komnenos restoration is an indication of the use of aggregates deriving from the Hatrurim formation in Judean dessert.

The White Marbles of the Tomb of Christ in Jerusalem: Characterization and Provenance

REFERENCE: Moropoulou, A., Delegou, E. T., Apostolopoulou, M., Kolaiti, A., Papatrechas, C., Economou, G., & Mavrogonatos, C. (2019). The white marbles of the Tomb of Christ in Jerusalem: characterization and provenance. *Sustainability*, 11(9), 2495.

Petrographic and isotopic analysis was implemented to study the white marbles of the Holy Aedicule and the Tomb of Christ.

The examined marble samples display a characteristic heteroblastic fabric, which is characterized as “mortar-type”. They comprise mostly of calcite with minor presence of dolomite, micas (phlogopite, muscovite), apatite and pyrite.

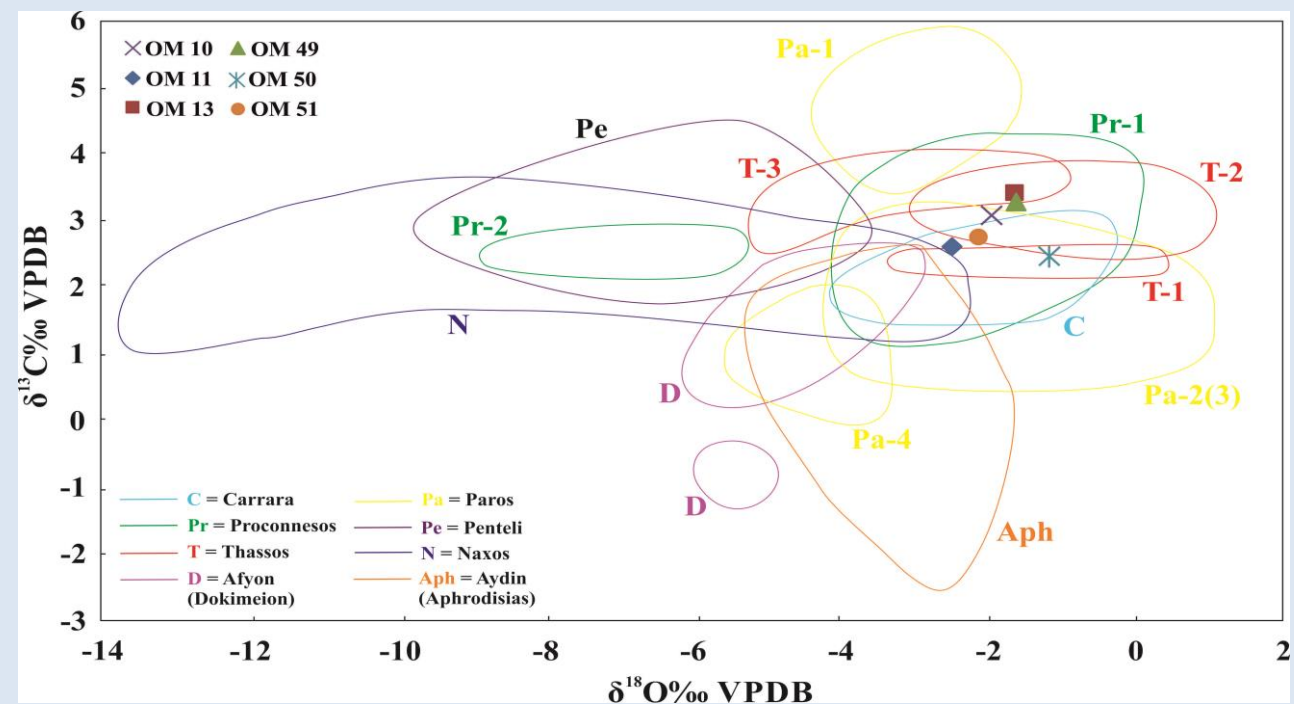


The White Marbles of the Tomb of Christ in Jerusalem: Characterization and Provenance

Their MGS values range from 1.6 to 2.3 mm, gathered mostly around 2 mm. Their isotopic signature is characterized by $\delta^{18}\text{O}$ values ranging from -2.49 to -1.13 (‰ V-PDB) and by $\delta^{13}\text{C}$ values ranging from 2.43 to 3.37 (‰ V-PDB).

Sample	Mineralogy	Fabric	MGS	GBS
OM-10	Cal (±Dol)±Phl±Ap ±Py	HE	2.0 0.4*	Sutured, embayed
OM-11	Cal (±Dol)±Phl±Ap ±Py	HE	1.7	Sutured, embayed
OM-13	Cal (±Dol)±Phl±Ap ±Py	HE	1.6	Sutured, embayed
OM-49	Cal (±Dol)±Phl±Ap ±Py	HE	1.9 0.6*	Sutured, embayed
OM-50	Cal (±Dol)±Phl±Ap ±Py	HE	1.7	Sutured, embayed
OM-51	Cal (±Dol)±Phl±Ap ±Py	HE	2.3	Sutured, embayed

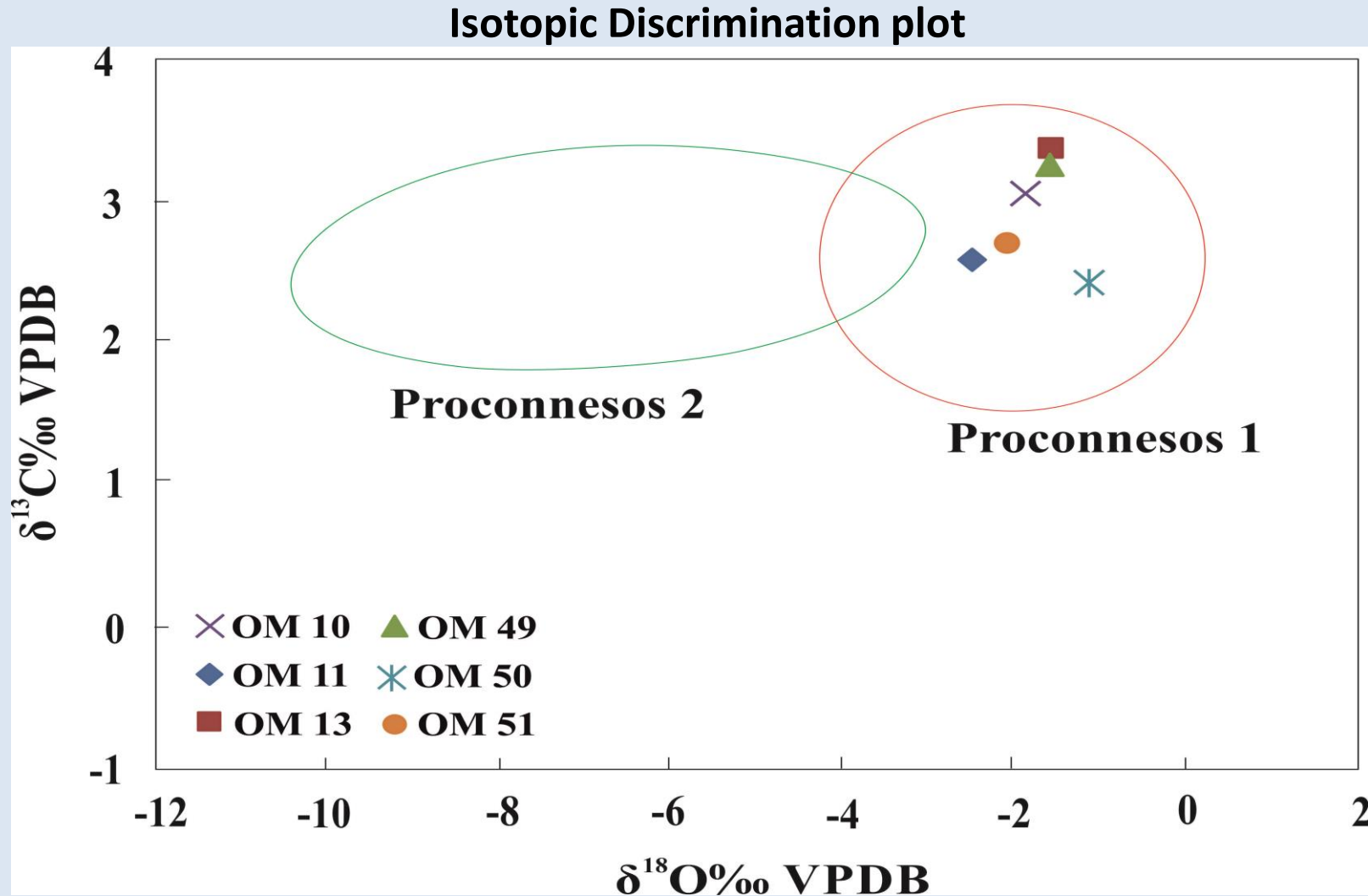
Sample	$\delta^{18}\text{O}$	$\delta^{13}\text{C}$
OM-10	-1.89	3.08
OM-11	-2.49	2.59
OM-13	-1.58	3.37
OM-49	-1.58	3.31
OM-50	-1.13	2.43
OM-51	-2.06	2.71



Isotopic Discrimination plot among Holy Aedicule samples and field of ancient marble quarries

The White Marbles of the Tomb of Christ in Jerusalem: Characterization and Provenance

The techniques employed proved to be adequate for the identification of their provenance and the aforementioned data suggest that the Holy Aedicule white marbles examined herein, originate from the island of Proconnesos and in particular they belong to the variety type Proconnesos-1.



The White Marbles of the Tomb of Christ in Jerusalem: Characterization and Provenance: Intra-site discrimination of Proconnesos quarrying locations

Quarry	Samples from the Holy Aedicule					
	OM10	OM 11	OM13	OM49	OM50	OM51
Altıntaş	√				√	√
Harmantaş					√	
Filiz						
OC13		√				
Mandira		√			√	√
Saraylar						
C1		√		√		
C2	√	√				
C3	√					
C4		√				
C5						
C5b	√		√	√		
C5t		√				
C6		√			√	
C6b						
C7						
C7i		√				
C8						
C9						
C10						
C11		√				
C12	√					
C12s						
C13		√				
C14	√	√				
C15		√				
C16						

Comparison of isotopic and MGS values between the Holy Aedicule samples and literature data for quarrying locations on Proconnesos island (Attanasio et al. 2008).

Highlighted boxes indicate pairing of the isotopic values of a Holy Aedicule sample (both $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) to the published range of values for a certain quarry; (√) stands for respective pairing regarding the MGS values.

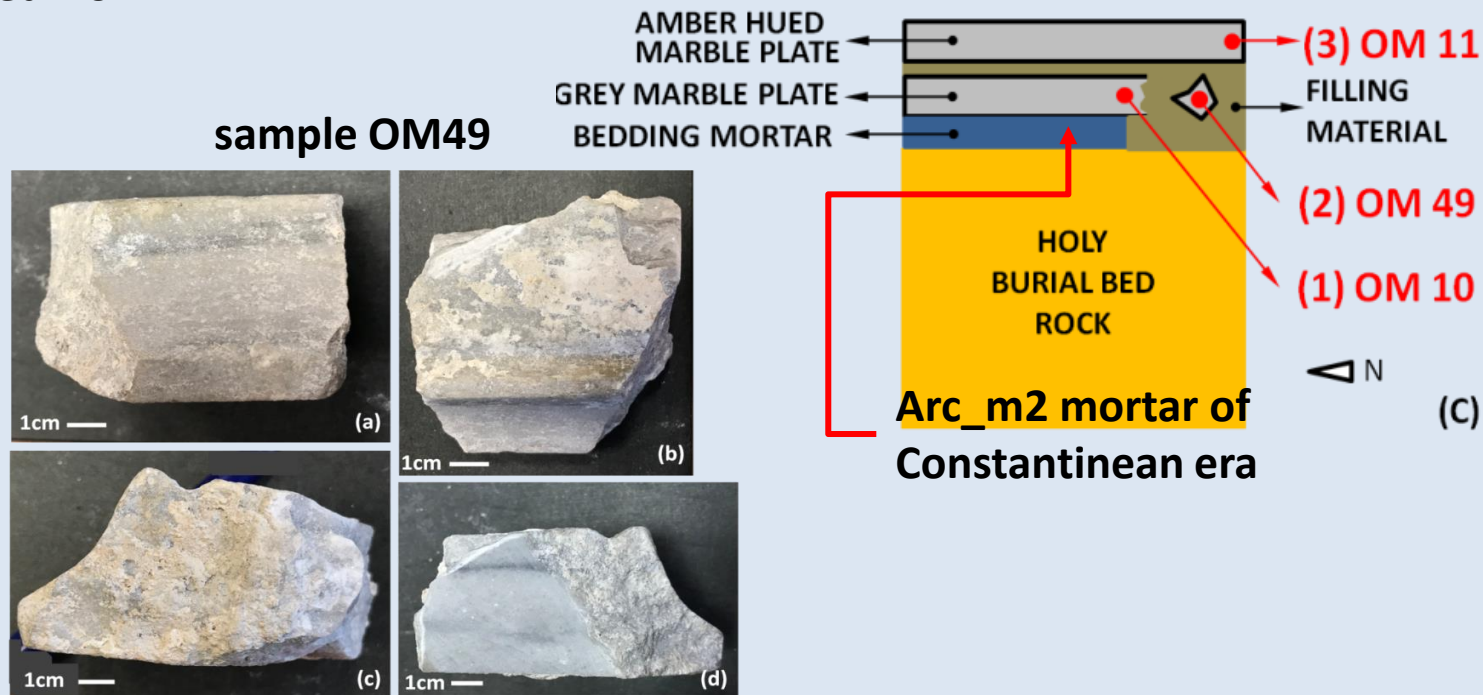
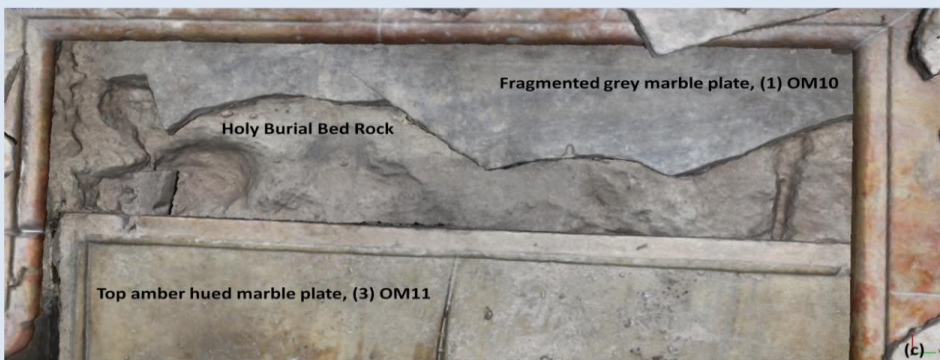
The White Marbles of the Tomb of Christ in Jerusalem: Characterization and Provenance

Could the marble fragment OM49 be the decorative edge of the Constantinean marble plate OM10?

The fragmented lower marble plate (corresponding to sample OM10), is in fact the initial cladding of the original burial rock surface attributed to the Constantinean era, because of the OSL dating of Arc_m2 mortar sample.

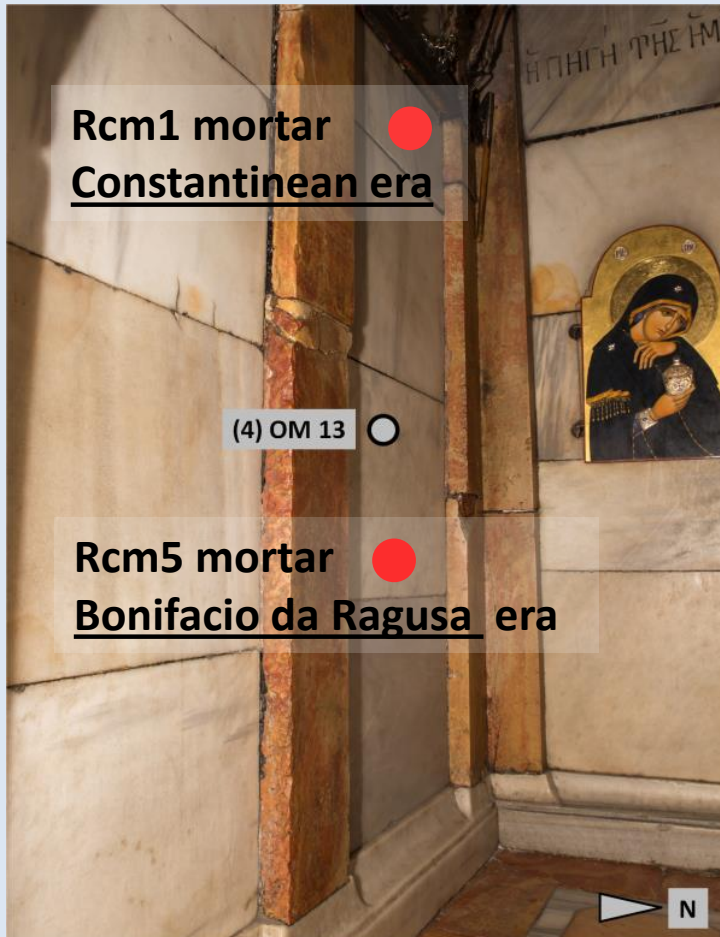
The marble fragment (sample OM49), found within the Tomb of Christ, which presented the same thickness as the lower Constantinean marble plate, is perhaps a fragment of the decorative edge from the missing part of the lower plate; if this is the case, the original marble member was extracted from the quarry C5b, which is the only common quarry between these two samples.

The upper plate of the Tomb (sample OM11), was added several centuries later, however, no definite conclusion regarding the era that it was placed can be drawn; furthermore, intra-site discrimination could not provide any safe conclusions regarding the exact Proconnesos quarry it originated from.



Could the Constantinian Tomb Chamber be adorned with Proconnesian marbles?

sample OM13



1st Scenario

The marble sample taken from the marble facings of the interior of the Tomb Chamber, opposite the Tomb of Christ (sample OM13), where the observation window is in place today, was most probably placed into its current position at the time of the Bonifacio da Ragusa restoration, since Rcm5 mortar is dated to his era.

However, we cannot exclude the possibility that this member was present from the Constantinian era, since marble members re-use was a common practice throughout the centuries, and Bonifacio da Ragusa reinstalled it.

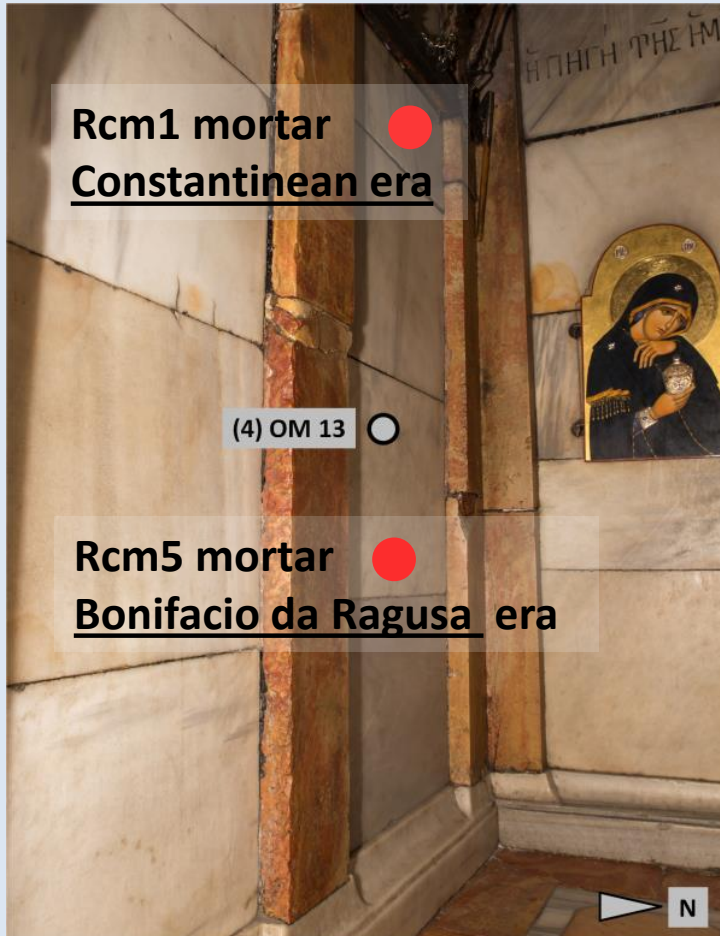
2nd Scenario

This second scenario is rather possible if we consider that the mortar Rcm1 (selected from behind a marble slab above the one examined in this study (OM13), was dated to 335AD (calendar centered age) that is the Constantinian Aedicule.

Thus, it is highly likely that the interior of the Tomb Chamber was adorned with Proconnesian marbles from the time of Constantine.

Could the Constantinian Tomb Chamber be adorned with Proconnesian marbles?

sample OM13



Overall Scenario for OM13-OM10-OM49

OM13 could have originated ONLY from the ancient quarry C5b.

So, if this marble member was first installed in the Constantinian era and Bonifacio da Ragusa reinstalled it, and taking into account that the lower tomb plate (OM10) was also installed in the Constantinian era, perhaps both members were quarried from C5b, which is the only common quarry of origin for both samples.

Furthermore, quarry C5b is also a common origin quarry with sample OM49, which is the marble fragment, perhaps the decorative edge of the lower marble plate, as already mentioned.

Thus, if OM13 & OM49 are of the Constantinian era such as the lower Tomb plate (OM10), then, all three of them could be originated from the ancient quarry C5b.

The White Marbles of the Tomb of Christ in Jerusalem: Characterization and Provenance

The two marble samples (OM50, OM51) from the west interior wall of the Chamber of the Angel, were collected from marble members, which were placed probably during the Crusaders construction phase, without, however, excluding the Bonifacio renovation or even the major reconstruction of Kalfa Komnenos in 1810.

Altintaş and Mandira are the only common origin quarries for these two samples and it is definite that they could not have originated from the same quarry as OM13 and OM49 (C5b).



Conclusively:

Proconnesian marble, and in particular the Proconnesos-1 variety, was the material of choice both for the cladding of the Holy Tomb, as well as for the interior facings of the Holy Aedicule.



Compatibility of conservation interventions

- How can we ensure compatibility assessment in an active construction site?
- How can compatibility assessment process affect the sustainability of a monument in a trans-disciplinary way?
- How can nondestructive monitoring of conservation/restoration works support decision making?
- How can nondestructive monitoring cause rescheduling, readjusting and/or modifications of the interventions applied?

Non-Destructive Techniques (NDT) are used in the Field of Protection of Cultural Heritage because:

- ✓ *Destructive sampling is prohibited in the conservation of historic monuments*
- ✓ *They offer certain unique capabilities in a variety of applications*

BUILT CH PROTECTION

DIAGNOSIS

PLANNING
OF INTERVENTIONS

IMPLEMENTATION
OF INTERVENTIONS

ASSESSMENT OF INTERVENTIONS

MONITORING

USE OF NDTs

STATE OF PRESERVATION

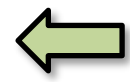
- ENVIRONMENTAL IMPACT ASSESSMENT
- STRUCTURAL & PHYSICO-CHEMICAL DATA
- MATERIALS & DECAY-DAMAGE MAPPING

MATERIALS QUALITY CONTROL

DECISSION MAKING

EFFECTIVENESS & COMPATIBILITY ASSESSMENT

MONITORING – MAINTENANCE



Validation by laboratory testing



**NATIONAL TECHNICAL UNIVERSITY OF ATHENS
LABORATORY OF MATERIALS SCIENCE AND ENGINEERING**

Portable Digital Microscopy

Digital Image Processing

Colorimetry

Ultrasonic Testing

Schmidt hammer

Endoscopy

Infrared Thermography

Ground Penetrating Radar



**Advanced Spatial Data Management
& Assessment Methods**

MONUMENT SCALE

Characterization of Materials

**Evaluation of Materials & Interventions
Compatibility**

Environmental Impact Assessment



INTEGRATED PROJECTS

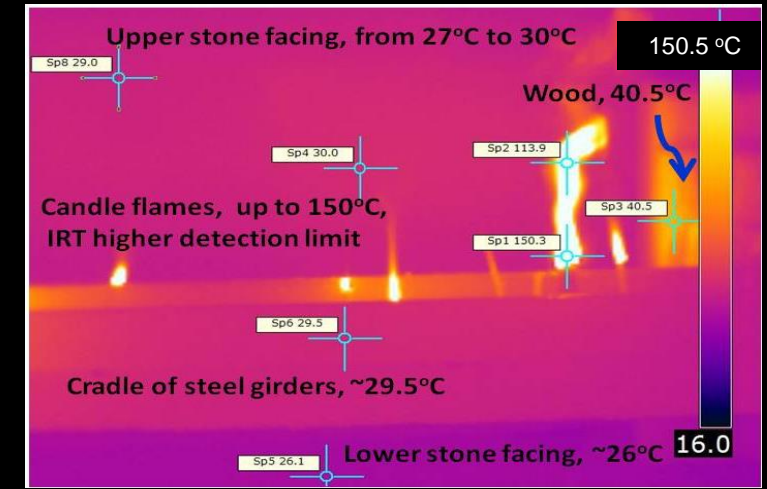
**Strategic Planning of Conservation Interventions
on Historic Buildings**

**Strategic Planning
of Environmental Management as a Tool for a
Sustainable Preservation of Historic Cities**

SUSTAINABILITY OF THE HOLY AEDICULE REHABILITATION:

A CHANGE ON PILGRIMS ATTITUDE

DURING THE CANDLES' BURNING



The problem:

Positioning of the burning candles on the metal frame → Candles' burning close to or even in contact with the architectural surfaces of the Holy Aedicule → Candles extinguishing on the facades

The result:

High temperature variations on the stone facings → Significant thermal stresses developed on the stone facings → Aesthetical and physicochemical degradation → Accumulation of black and oily depositions

SUSTAINABILITY OF THE HOLY AEDICULE REHABILITATION:

A CHANGE ON PILGRIMS ATTITUDE

JUST AFTER REMOVING THE BURNING CANDLES

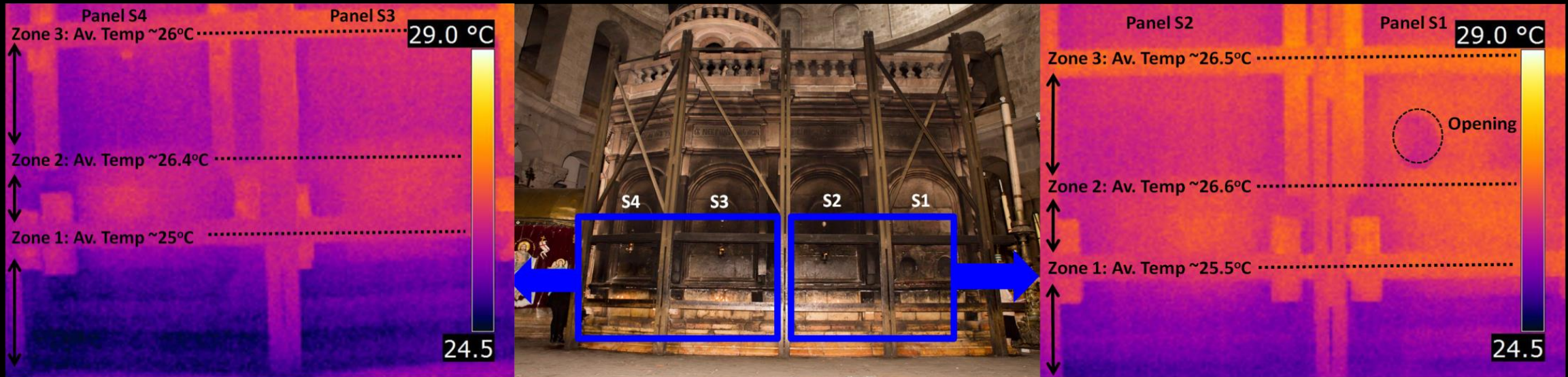


- Temperature heterogeneity at the investigated part of the façade
- Anisotropy of heat distribution over stone facings and subsequently in the deeper masonry layers via the mechanism of heat induction
- The thermo-hygric behavior of each building material (stone facings, filling and joint mortars and masonry building stones) is differently affected per height zone, as well as in depth, resulting in a corresponding thermo-hygric anisotropy

SUSTAINABILITY OF THE HOLY AEDICULE REHABILITATION:

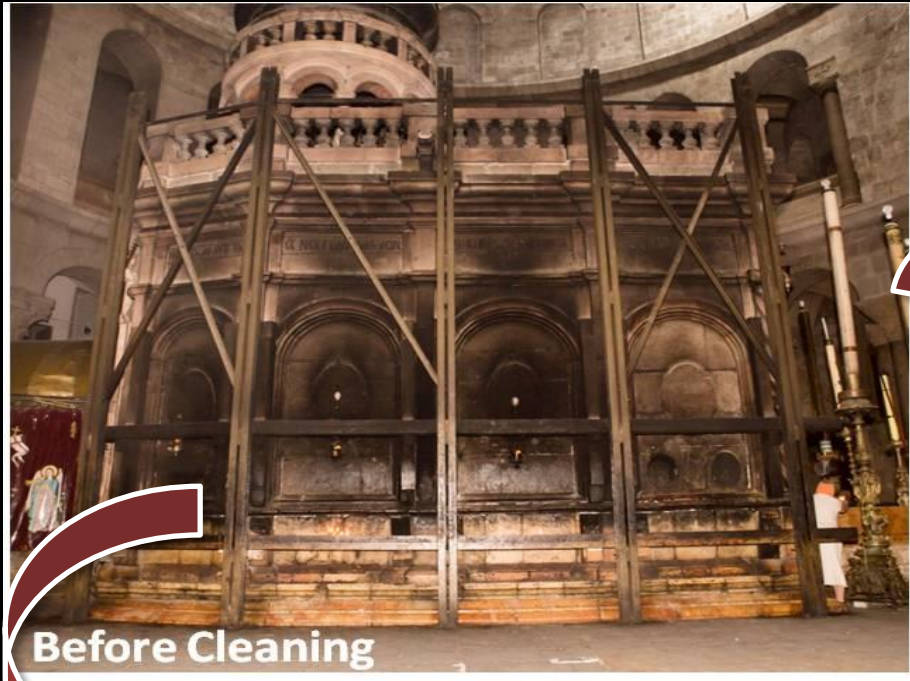
A CHANGE ON PILGRIMS ATTITUDE

THREE HOURS AFTER REMOVING THE BURNING CANDLES

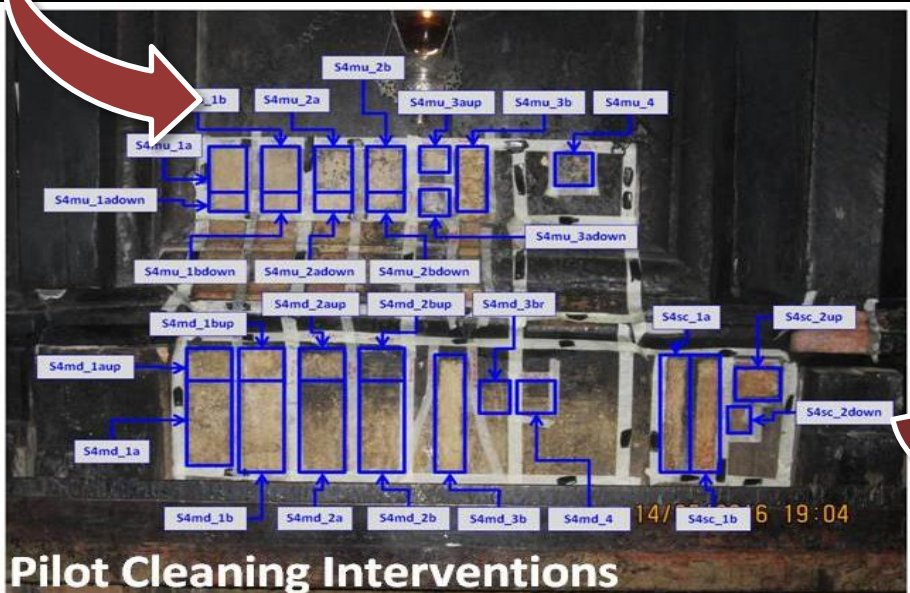


- Cooling down of this façade part takes place with a different rate per height zone and per panel demonstrating the anisotropy of heat transport phenomena among different building materials
- In overall, this thermal stresses cycle, to a large degree induced by the pilgrims on a daily basis during the visiting hours of the Holy Aedicule, deteriorates the preservation state of the building materials, accelerating their decay

CLEANING INTERVENTIONS



Before Cleaning

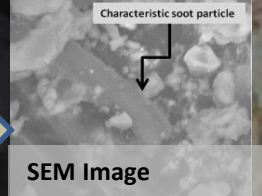


Pilot Cleaning Interventions

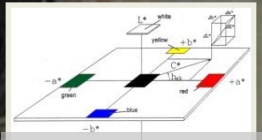
Assessment Techniques



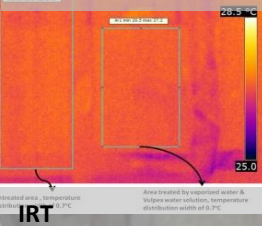
Digital Microscopy



SEM Image



Colorimetry



IRT



FROM PILOT TO FINAL APPLICATION

The Conservation lab at the Franciscan gallery: the heart of the conservation interventions



Portable Digital Microscope



Raman Spectroscopy



Portable Spectrophotometer



West panel, before grouts, 26/09/2016

Infra-red thermal camera

West panel, after grouts, 14/11/2016



Karsten tubes

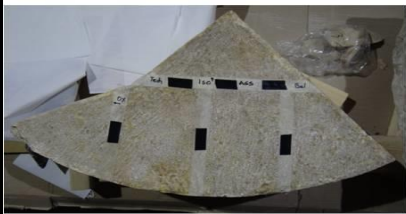


PROTECTION INTERVENTIONS

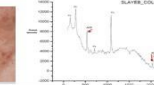
FROM PILOT APPLICATION

TO FINAL APPLICATION

Pilot Protection Interventions



Assessment



FOM Raman Karsten Tubes

Final Protection



A wax based material in water dispersion

Decision making



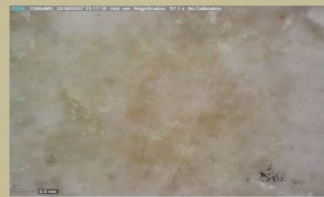
SUSTAINABILITY OF THE HOLY AEDICULE REHABILITATION:

A CHANGE ON PILGRIMS ATTITUDE

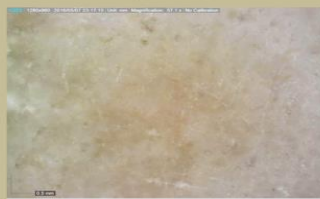
March 2017



South façade, after the rehabilitation works



North façade, after the rehabilitation works



AFTER 2 YEARS

January 2019



SUSTAINABILITY OF THE HOLY AEDICULE REHABILITATION:

A CHANGE ON PILGRIMS ATTITUDE

March 2017



JUST AFTER THE REHABILITATION PROJECT

January 2019



AFTER 2 YEARS



Thus, the **three Christian Communities** were motivated to **discontinue** the pilgrims' **practice of burning and extinguishing their candles** onto the Holy Aedicule's facades



Compatibility of conservation interventions

- How can we ensure compatibility assessment in an active construction site?
- How can compatibility assessment process affect the sustainability of a monument in a trans-disciplinary way?
- How can nondestructive monitoring of conservation/restoration works support decision making?
- How can nondestructive monitoring cause rescheduling, readjusting and/or modifications of the interventions applied?

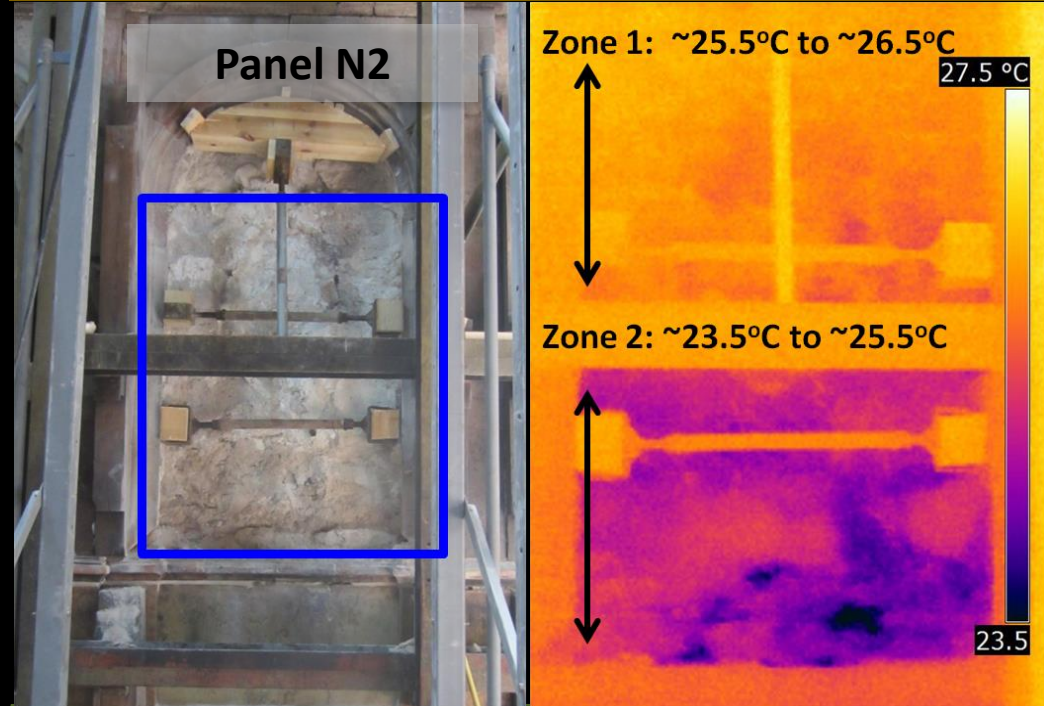
In situ NDT – Investigation of the preservation state of the historical building materials – Environmental impact assessment

Reference: Apostolopoulou, M., Delegou, E. T., Alexakis, E., Kalofonou, M., Lampropoulos, K. C., Aggelakopoulou, E., Bakolas, A., & Moropoulou, A. (2018). Study of the historical mortars of the Holy Aedicule as a basis for the design, application and assessment of repair mortars: A multispectral approach applied on the Holy Aedicule. *Construction and Building Materials*, 181, 618-637.

Digital Microscopy: Classification of historical mortars

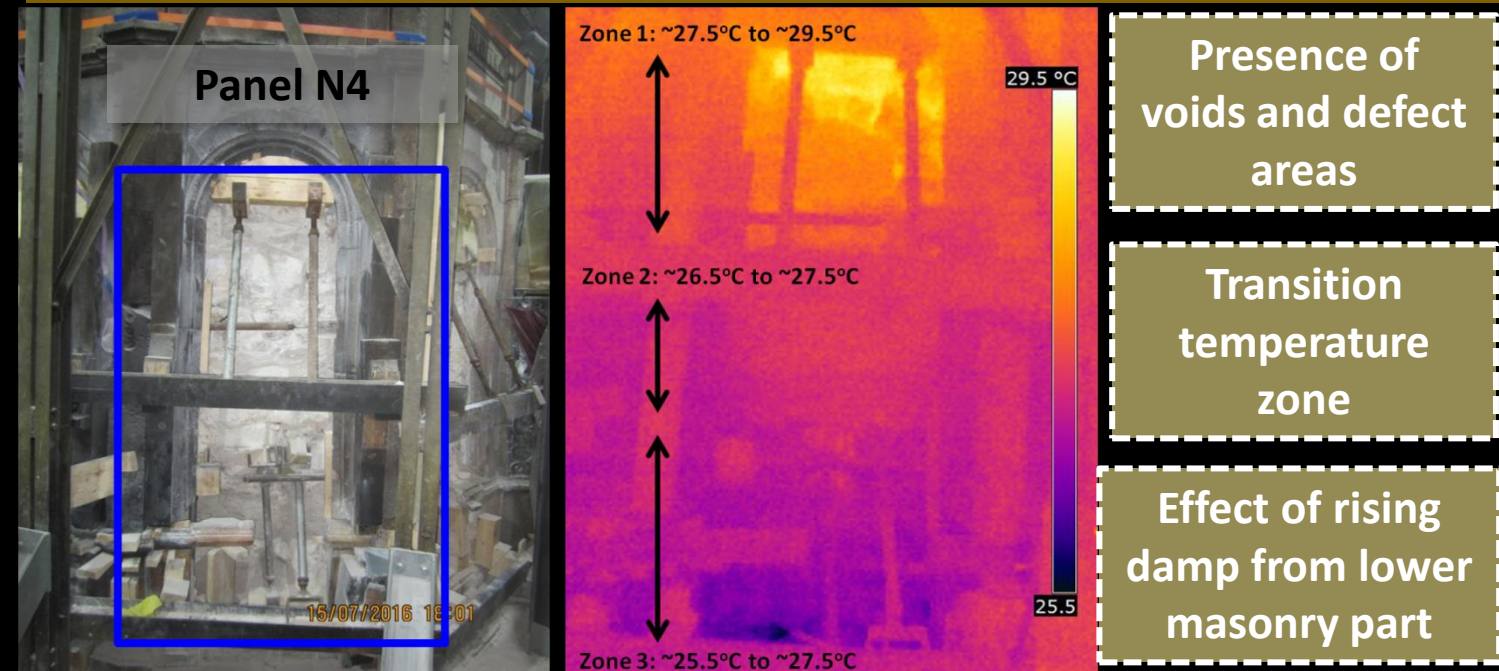


Intense rising damp from the underground



After façade stone slabs removal - filling mortar investigation

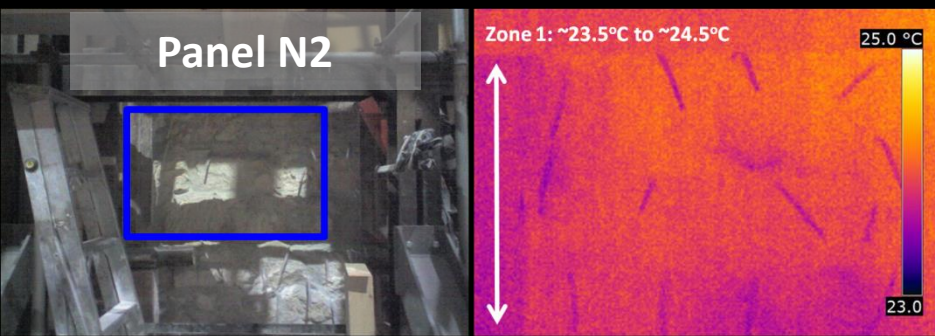
Defect areas at upper parts, rising damp at lower parts



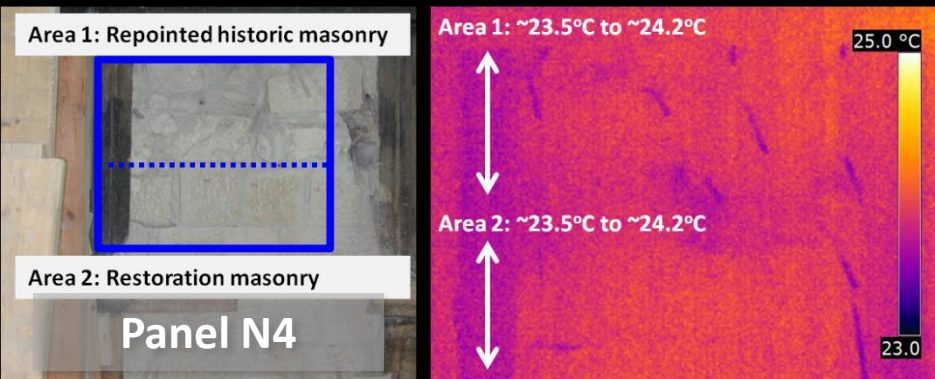
After filling mortar removal – Historical masonry

In situ NDT – Compatibility assessment of restoration and historical building materials

Compatibility of restoration mortars – historical mortars

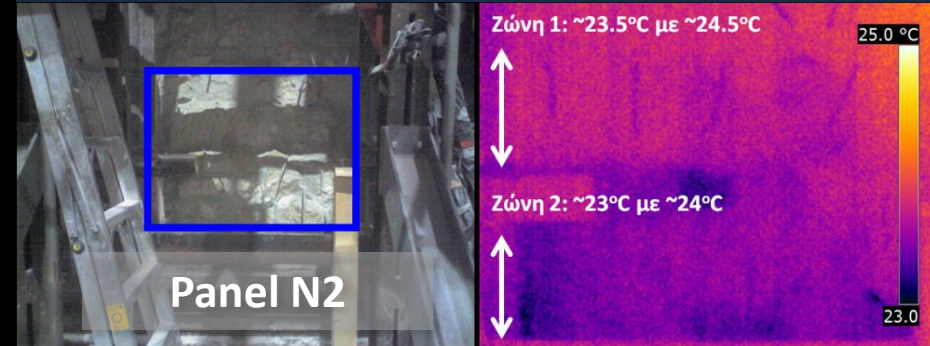


After repointing the temperature distribution width became tighter compared to the one that this masonry part displayed before the restoration mortars application, indicating compatibility among masonry elements



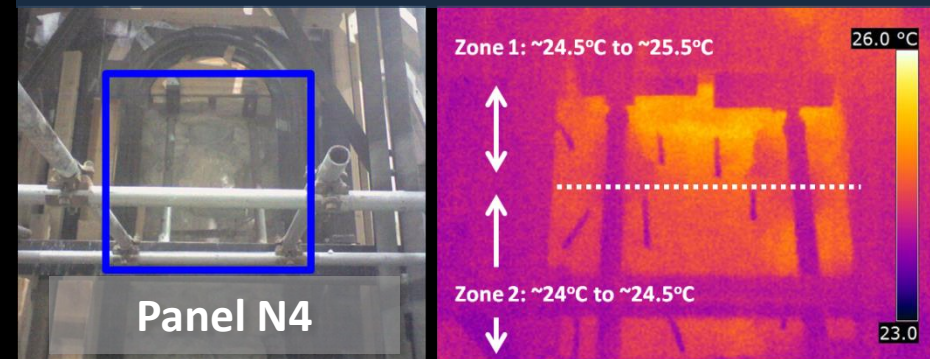
Homogenous temperature distribution at both masonry areas; indicating compatibility between the restoration mortar and the historic masonry & the historic and restoration masonry

Rising damp continues to effect the masonry the restored masonry



The lower masonry parts present lower temperatures.

After repointing – Necessity of grouting



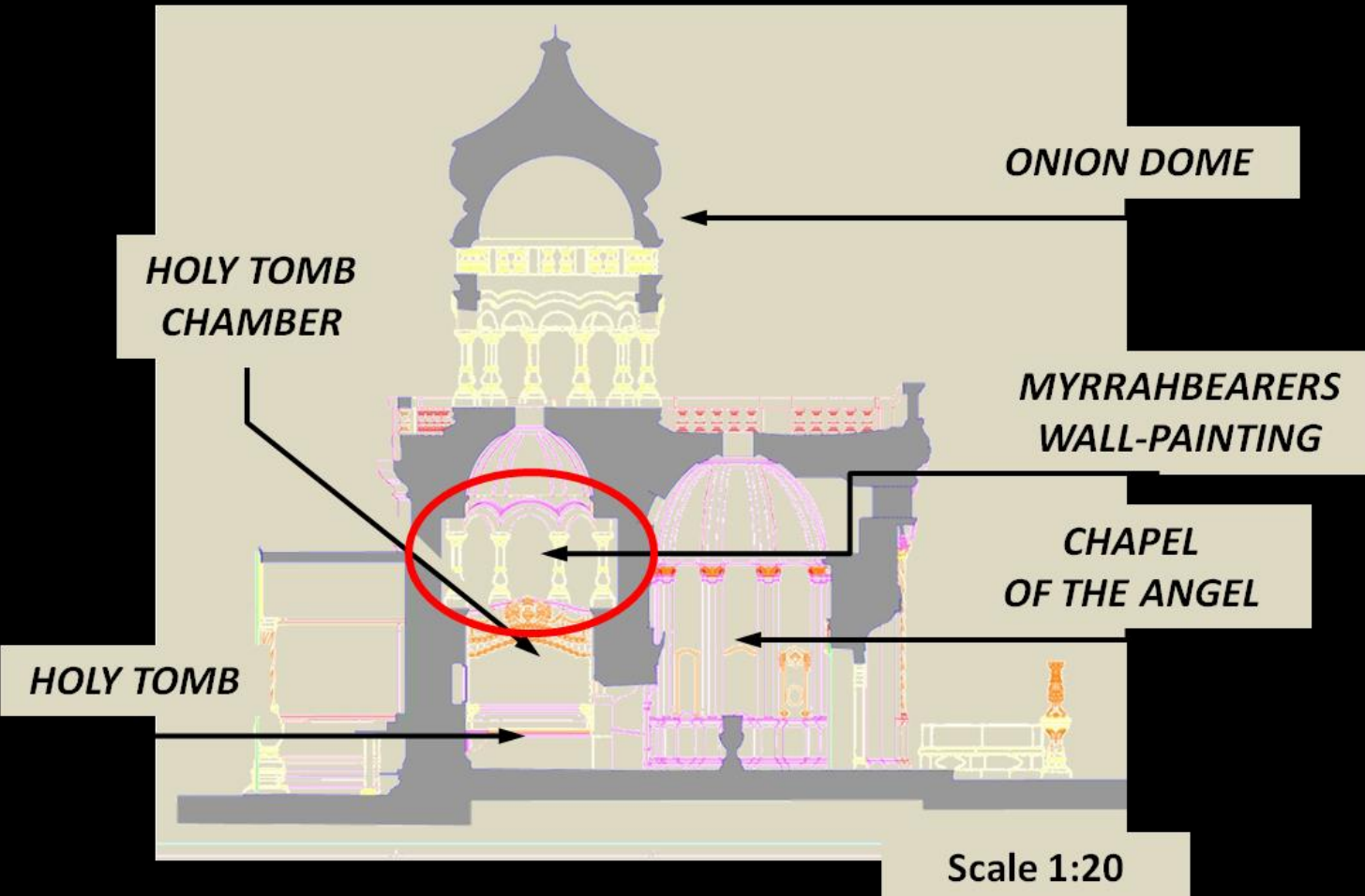
The higher temperatures of the upper parts were still evident, indicating the the necessity of grouting of the upper structure



Compatibility of conservation interventions

- How can we ensure compatibility assessment in an active construction site?
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- How can nondestructive monitoring cause rescheduling, readjusting and/or modifications of the interventions applied?

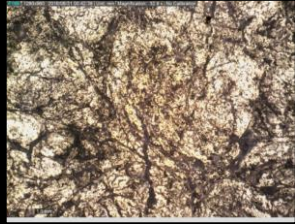
The wall painting of the Myrrh-bearers



➤ The upper part of the Holy Tomb is crowned by a dome that its base is decorated by a wall painting depicting the Myrrh-bearers, Angels Michael and Gabriel, and Virgin Mary.

REFERENCE: Alexakis, E., Delegou, E. T., Lampropoulos, K. C., Apostolopoulou, M., Ntoutsis, I., & Moropoulou, A. (2018). NDT as a monitoring tool of the works progress and the assessment of materials and rehabilitation interventions at the Holy Aedicule of the Holy Sepulchre. *Construction and Building Materials*, 189, 512-526.

In situ non destructive testing – NDT – Decay diagnosis Monitoring and assessment of conservation interventions – Myrrahbearers wall painting



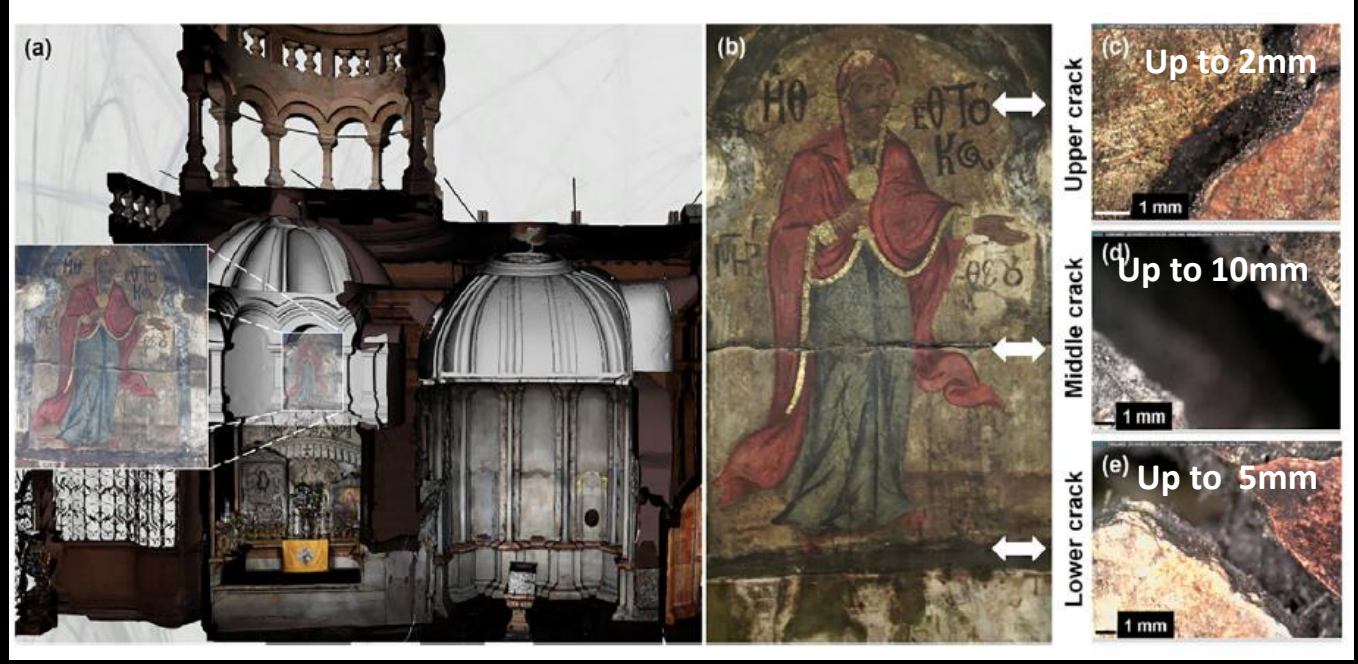
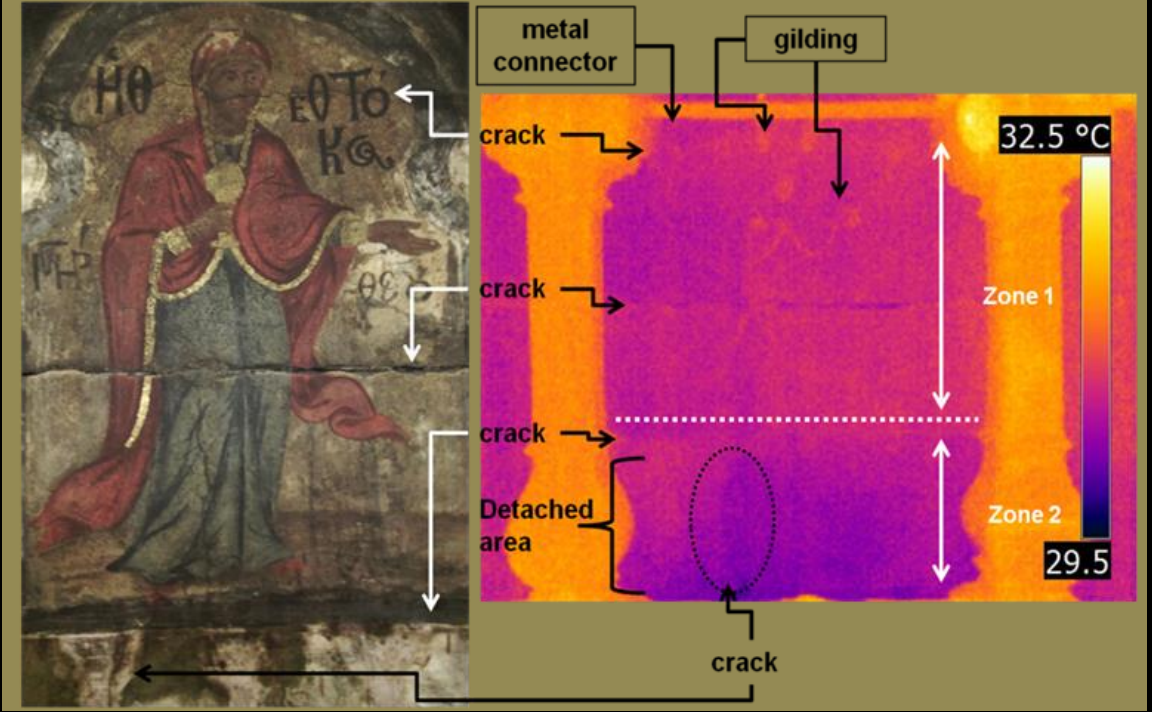
gilding



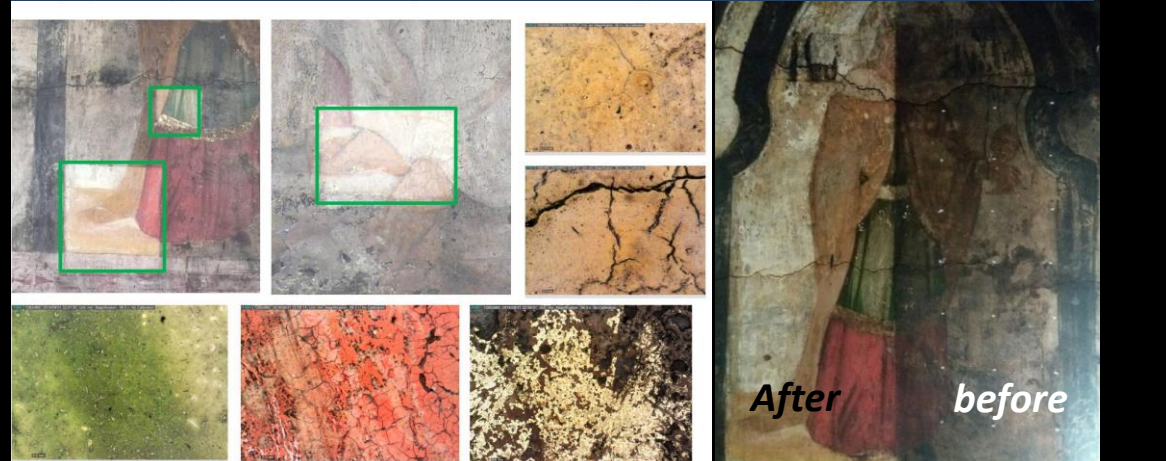
Surface cracks, accumulation of black deposition

A: Mapping of detached areas & gilding
 2 temperature zones separated from each other by the lower crack

A: Diagnosis, before any conservation works



Cleaning

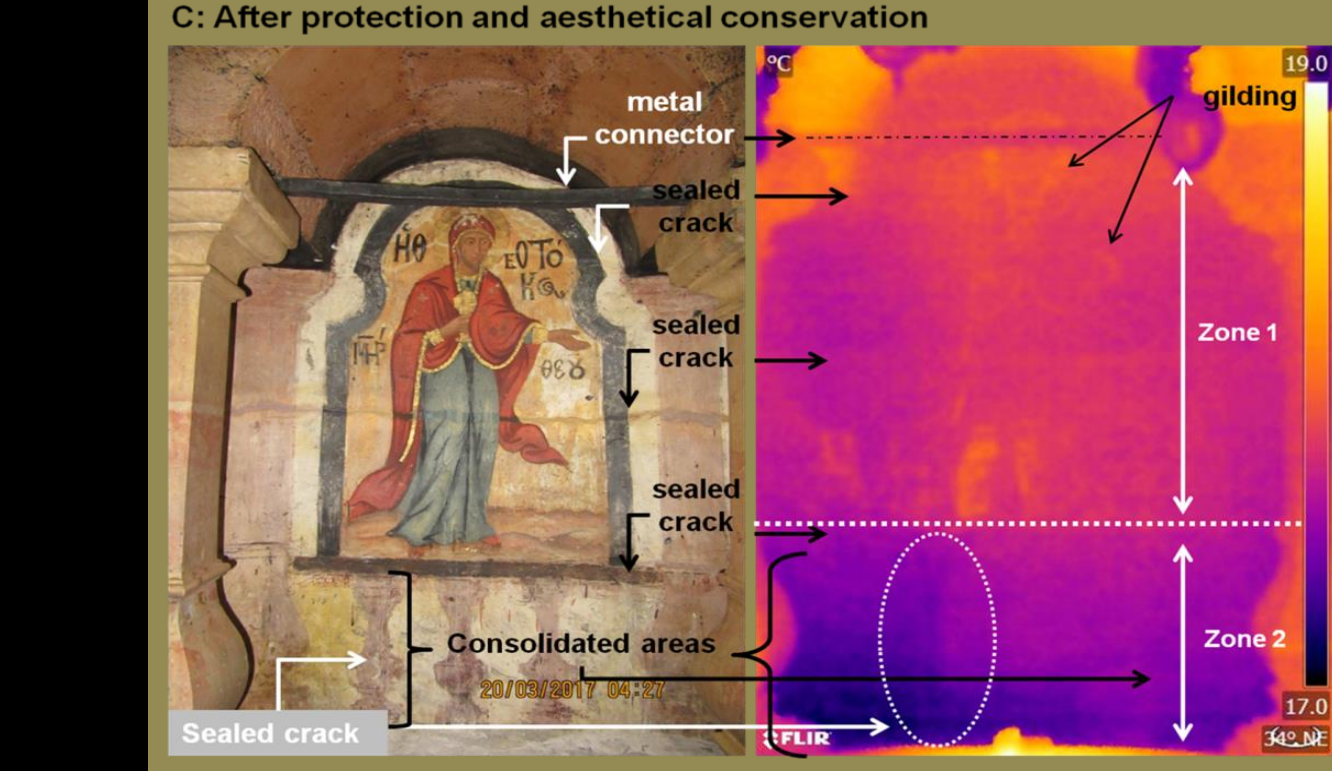
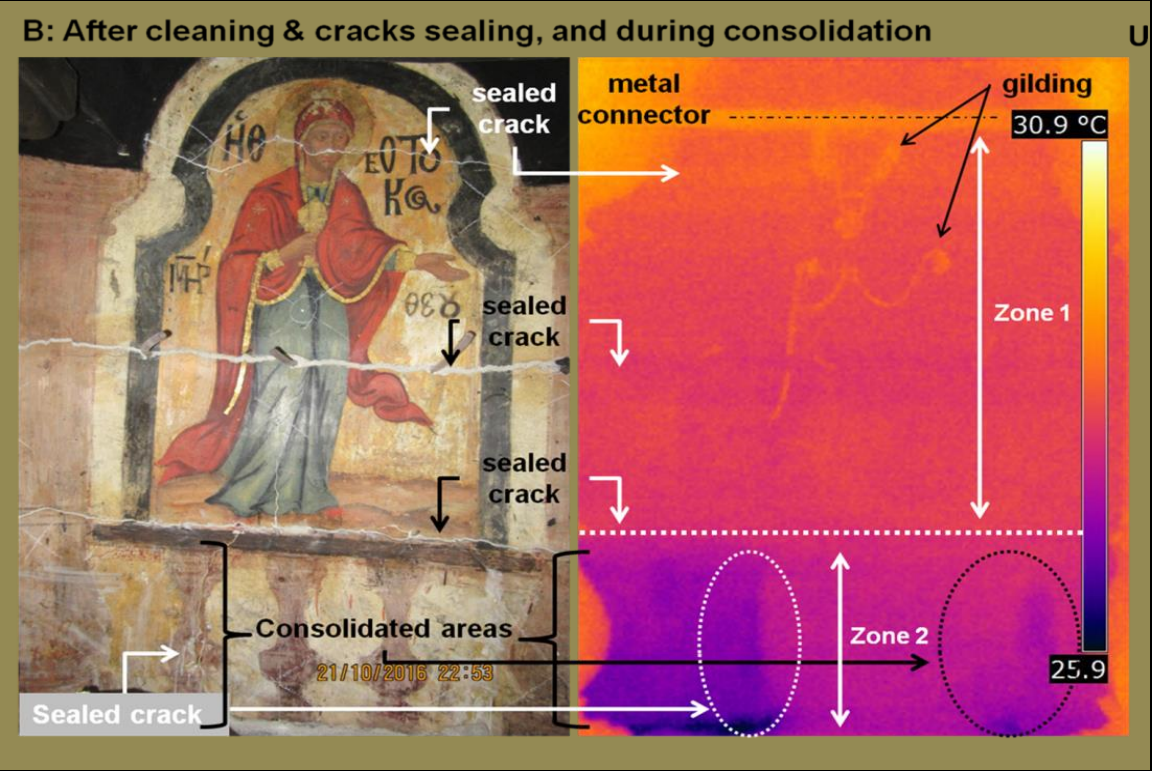


In situ non destructive testing – NDT – Decay diagnosis Monitoring and assessment of conservation interventions

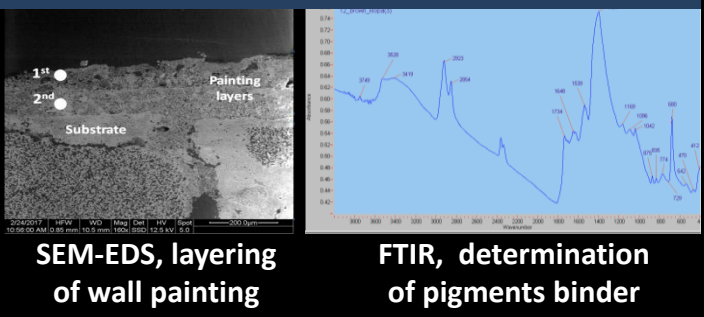
– Myrrahbearers wall painting

Mapping of the areas where the consolidation material has reached – displayed by lower temperatures

Temperature distribution homogeneity of the surface, indicates the compatibility of the applied conservation materials and interventions.



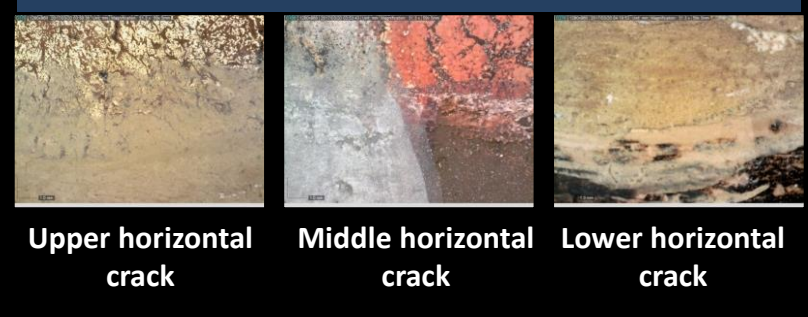
Analytical techniques after sampling



Digital Microscopy – cracks sealing



Digital microscopy – aesthetical conservation



USE OF NDTs IN SCIENTIFIC SUPPORT TO DECISION MAKING

- ❑ The **NDT monitoring of the conservation works made feasible compatibility assessment on real time, at real scale, playing a key role on planning and decision making.** In particular:
 - ❑ **Compatibility evaluation** among historical building materials and restoration materials was accomplished in cleaning, protection, repointing, and wall-painting preservation
 - ❑ The **IRT** results regarding rising damp phenomenon **led to a survey of the Holy Aedicule's underground area** to identify moisture sources and propose solutions
 - ❑ Furthermore, the **IRT** monitoring of the panels indicated the **necessity of grouting the upper zone** of the structure
 - ❑ **NDT** results motivated the three Christian Communities to **discontinue** the pilgrims' **practice of burning and extinguishing** their **candles** onto the Holy Aedicule's facades

- ❑ **NDT investigation in an active construction site**, during conservation works, presented many difficulties -presence of scaffoldings, metal frames, buttresses, personnel, heavy machinery, time restrictions, however **proved decisive regarding monitoring, assessment and scientific support in the decision making process**

The image shows the interior of a large, domed church. The dome is covered in intricate mosaics, including several figures in robes and a central figure with wings. The walls are also decorated with mosaics and Greek text. Light streams in from several arched windows, creating a bright, hazy atmosphere. A large, white, sans-serif text "THANK YOU" is overlaid in the center of the image. The overall scene is one of a grand, historic religious space.

THANK YOU