Non Destructive Assessment of the Mycenaean Tomb of Acharnon. Athens, Greece.

Authors: Sónia Santos Assunção, Klisthenis Dimitriadis, Yiannis Konstantakis, Vega Pérez Gracia
E-mail: sonia.assuncao@upc.edu

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1. THE DROMOS

2. THE TOMB WALL
   • Velocity of propagation in the stones
   • Circular scans (Scan)

3. THE SURFACE (OUTSIDE AREAS)
Location
History

Mycenean Period **Tomb of Acharnon**—Prehistoric age (1600 BC – 1200 BC)
- The structure of this Mycenaean Tomb (14th – 13th c. BC).
- Composed by a corridor that connects with a 5.4 by 2.7 m entrance.
- The interior part is 8.74 m high with 8.35 m diameter.
Methodology

**GPR:**
Objective: to define possible inner structure, layers and voids /finding archaeological targets

**Microresistivity:**
Objective: to define resistivity values and characterize materials

**Passive Seismic:**
Objective: to measure vibrations that could affect the integrity of the structure

**Chemical analysis:**
Objective: to determine salinity in material and soil

**Endoscopy:**
Objective: to obtain direct information about inner targets and structures
Methodology - Visual analysis
Methodology – Microcamera inspections
GPR

Dromos area
GPR Results

Dromos

Stairs

Entrance
GPR Results

Dromos

Entrance

Stairs
GPR Results

Entrance
GPR Results

Entrance - Odometer
GPR Results

Entrance - Time
GPR

Tomb interior Wall
GPR Results

Wall – 2D Radargrams

Distance (m)

Depth (m)

0
0.9
0.45

Stone - Layer 1

Interface between 2 layers

Stone - Layer 2

Interface

Stone - Natural soil

Voids
GPR Results

Wall – 2D circular Radargrams

Legend
- - - Layer 1
- - - Layer 2
Red: High attenuation
Yellow: High amplitude anomaly

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GPR Results

Height

191 cm

213 cm

Fissure
GPR Results - Surface
GPR Results - Surface

![Image of GPR results with annotations]

- Objective
- Location
- History
- Constructive characteristics
- Methodology
- Results
- Integration
- Conclusions
GPR Results - Surface
Integrated geophysical methods

✓ GPR:
Objective: to define possible interior structure, layers and voids / finding archaeological targets

✓ Microresistivity:
Objective: to define wall thickness, degree of stone deterioration, determine the resistivity values of the Tomb building materials

• Passive Seismic:
Objective: to measure ambient vibrations that could affect the integrity of the structure

• Geohemical analysis:
Objective: to determine the salt content in the Tomb building material and surrounding soils

✓ Endoscopy:
Objective: to obtain direct information about inner targets and structures
Integrated geophysical methods

Microresistivity
Yellow and red zones are human constructions "floating" in one very clayey geological environment.
Microresistivity surveys

Seismic: MASW (Multichannel Analysis of Surface Waves)

In an effort to **quantify the effect** of the vibrations due to the heavy road traffic, one additional geophysical study on earth dynamics was realized. The first step to this direction was to establish a microzonation study of the subsurface of Tomb is realized.

The digital seismograph DAQLINK III of GEOSERVICE was used.

As seismic source, the ambient road traffic was used.

**Passive seismics (MASW) have been applied with a circular 24 geophones spread**
Seismic: MASW (Multichannel Analysis of Surface Waves)

The phase velocity vs frequency diagram is plotted below, together with the shear wave velocity (Poisson's ratio) calculation.

The Tomb floor is located at the depth of 9 m from surface.
From the diagram is concluded that the average $V_s$ is 270 m/sec for a confidence depth of 44 m. An obvious result is that the Tomb will never suffer from earthquakes!
Conclusions

1. An anomaly was detected at the Dromos (entrance to the Tomb) at 20 cm depth.

2. Two interfaces were detected at 25 cm and 50 cm depth related to stone-stone interface and stone-natural soil interface, respectively. Data confirmed the analysis in situ of the local thickness obtained with GPR (always > 40 cm thickness).

3. Local fissures have been detected at different levels.

4. High signal attenuation may be associated to high salt content. An anomaly repeated in several radargrams indicates a probable presence of a wall.

5. The Apex of the Tomb was detected at 1 m depth as indicated by the model Biers, 1980.

6. The integration of the ERT allowed locating voids and to confirm high clay presence.
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