Geophysical Research Abstracts
Vol. 16, EGU2014-13961-1, 2014
EGU General Assembly 2014

Non-destructive assessment of the Ancient “Tholos Acharnon” Tomb building geometry

Sonia Santos-Assunçao (1), Klisthenis Dimitriadis (2), Yiannis Konstantakis (2), Vega Pérez-Gracia (1), Eirini Anagnostopoulou (3), Mercedes Solla (4), and Henrique Lorenzo (5)

(1) Department of Strength of Materials and Structural Engineering (RMEE), EUETIB/CEIB, Polytechnic University of Catalonia, C/Urgell 187, 08036 Barcelona (Spain), (2) Geoservice, 35, Lykaiou St, 114 76 Athens, Greece, (3) Second Ephorate of Prehistoric and Classical Antiquities, Greece, (4) Defense Center University (University of Vigo), Spanish Naval Academy, Plaza de España 2, 36920, Marín, Pontevedra, Spain., (5) EUET Forestal, University of Vigo. Campus A Xunqueira s/n. 36005-Pontevedra. Spain.

Ancient Greek Monuments are considered glorious buildings that still remain on the modern times. Tombs were specifically built according to the architecture of respective epoch. Hence, the main function was to royal families in Greece and other countries. The lack of systematic preservation could promote the damage of the structure. Therefore, a correct maintenance can diminish the impact of the main causes of pathologies. Schist, limestone and sandstone have been the main geological building materials of the Greek Ancient tombs.

In order to preserve several of these monumental tombs, in depth non-destructive evaluation by means of Ground-penetrating radar (GPR) is proposed in a scientific mission with partners from Greece and Spain surveying with the 1 GHz and 2.3 GHz antennas. High frequency antennas are able to identify small size cracks or voids. Grandjean et al. [1] used the 300 MHz and 900 MHz antennas, obtaining 2 cm and 5 cm of resolution. Later on, Faize et al. [2] employed a 2.3 GHz antenna to detect anomalies and create a pathological model.

The structure of this Mycenaean Tomb (14th – 13th c. BC) is composed by a corridor which is supported by irregular stones and the inner is 8.74 m high and 8.35 m diameter. The surface of the wall is composed by diverse geological materials of irregular shapes that enhance the GPR acquisition difficulty: 1) Passing the GPR antenna in a waved surface may randomly change the directivity of the emission. 2) The roof of the tomb is described by a pseudo-conical form with a decreasing radio for higher levels, with a particular beehive. If the roof of the Tomb is defined by a decreasing radius, innovative processes must be carried out with GPR to non constant radius structures. With GPR, the objective is to define the wall thickness, voids and/or cracks detection as well as other structural heterogeneities. Therefore, the aim is to create a three dimensional model based in the interpolation of the circular profiles.

Three dimensional interpolations of the circular profiles according to cylindrical coordinates and the decreasing ratio may be able to map with accuracy the wall structure and to create in a second step a structural dynamic model for the sustainable preservation of the Monument.

Acknowledgements

The authors acknowledge cost for funding action TU1208 “Civil Engineering application of Ground Penetrating radar” supporting part of this work, to the Second Ephorate of Prehistoric and Classical Antiquities, Greece.

References

[1] Grandjean, G. and Gourry, J.C., 1996. GPR data processing for 3D fracture mapping in a marble quarry (Thassos, Greece). Applied Geophysics., Vol. 36 (1), pp.19-30.
[2] Faize, A. and Driouach, A., 2012. “The Use of Ground Penetrating Radar for the Detection and Study of a Buried Marble and in Situ Location of Possible Cracks”. International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622. Vol. 2, (4), pp.1036-1039.