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PROCEEDINGS

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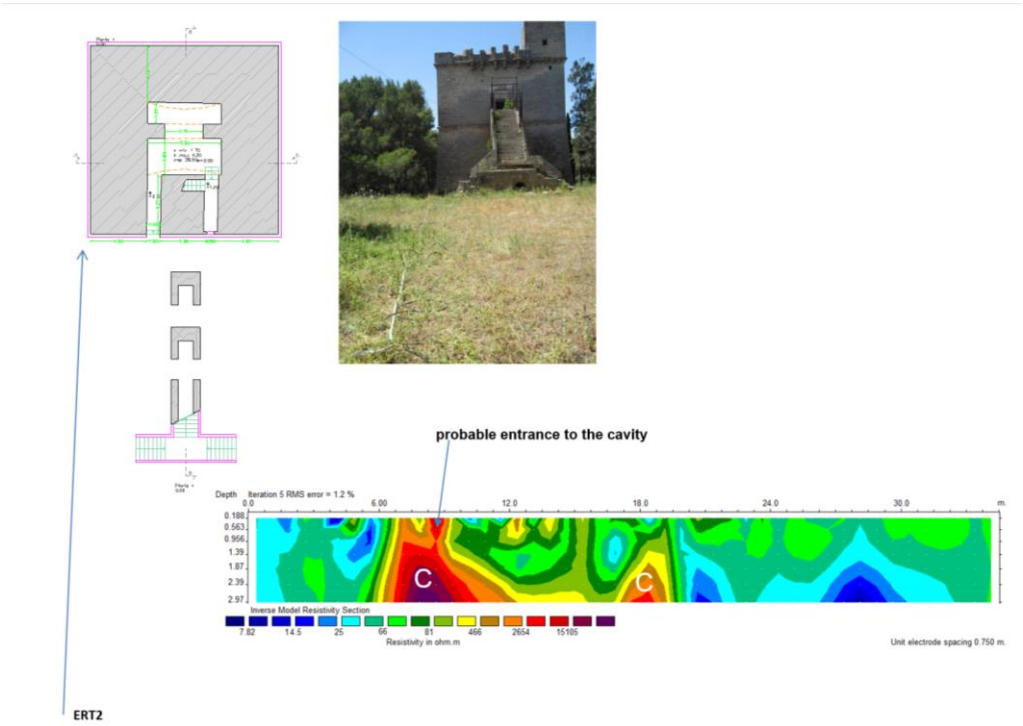

Fig. 2. The 2D resistivity distribution

The GPR survey was performed, with IDS Hi Mod georadar system. A dual band 200–600 MHz centre frequency antennae was used. A map of GPR profiles is shown in Figure 3. The following acquisition parameters were selected: samples per scan, 512; recording time window, 60 ns for 600MHz antenna and 120 ns for 200MHz antenna; gain function, manual. The most crucial step in GPR data interpretation is studying and understanding in a general way the components of 2D reflection profiles and then the reflection profiles themselves [5, 6]. Only when these components are understood can other displays such as amplitude maps and isosurfaces be interpreted. Take into account that the GPR profiles were normalised for amplitude, had background removed and were migrated using a Kirchoff 2D method. In order to perform a 2D Kirchoff migration the electromagnetic (EM) wave velocity was determined from the reflection profiles acquired in continuous mode, using the characteristic hyperbolic shape of reflection from a point source [5]. This is a very common method of velocity estimation and it is based on the phenomenon that a small object reflects EM-waves in almost every direction. The general stratigraphy in all profiles shows an unconsolidated surface soil with many pebbles that produced point-source reflections, (Figure 3) that enable the EM wave velocity analysis to be performed. The processing and imaging software (Reflex) allows the interactive velocity adaptation of a diffraction or reflection hyperbola by calculating a hyperbola of defined velocity and width. The velocities are combined into a 2D model using a special interpolation method. The interpolation is performed as follows: all actual velocities are summed for every point in the x–t range, proportional to the square of their distance from the (x, t) point. This method provides only the average EM-wave velocity to the depth of the source-point reflector. This type of 2D velocity distribution may be used in the 2D migration processing step. Application of this method gives both vertical (in time, hence in depth) and lateral velocity variations from 0.08 m/ns to 0.12 m/ns. An average velocity of 0.10 m/ns was obtained over the survey area.

Figure 3 show the processed R1 and R2 profiles related to 600MHz antenna. The R2 profile is near the ERT profile.

In the depth ranging between 1.0m and 1.5 m, it is possible to identify a reflection events (C) that denote a change in the polarity of the EM reflected way. This could be related to the presence of a cavity [5, 6]. In the R2 profile this correspond with the high resistivity anomaly (C).

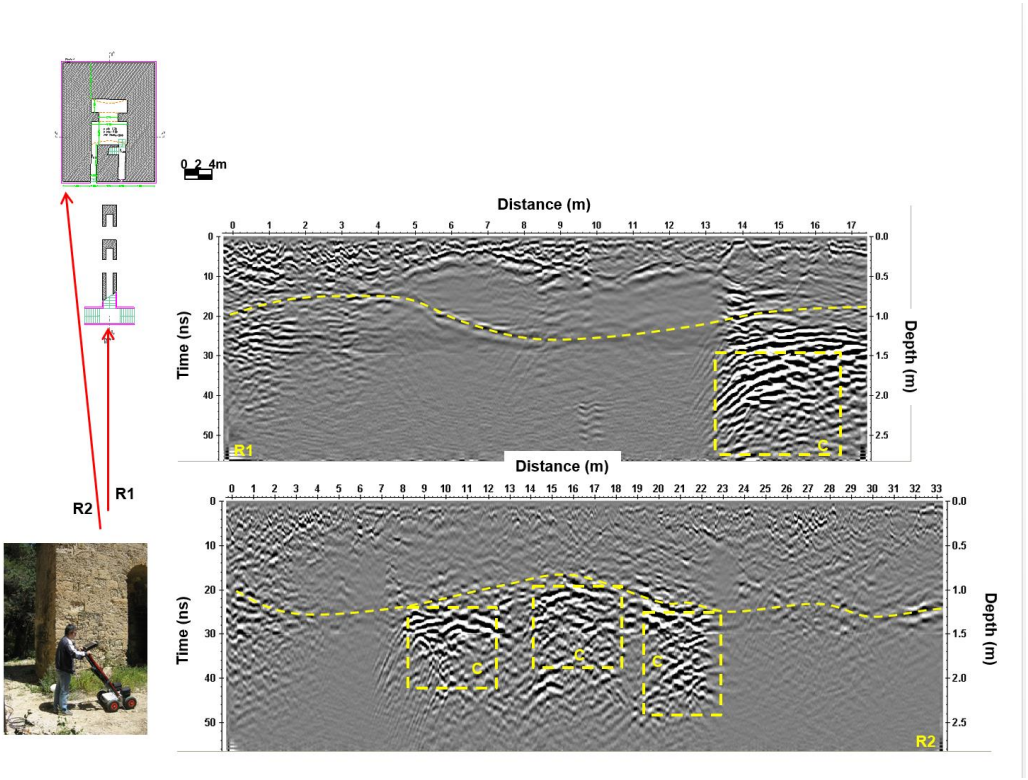

Fig. 3. The processed radar profiles

III. CONCLUSIONS

The first phase of this case study underline some interesting results.

The ERT profile highlighted the presence of a very fractured rocky substrate for the first 2m of depth.

The GPR profiles relating to the survey performed outside the tower show in the first meter from the surface the presence of significant disturbances to be related, probably, to the very fractured rocky substrate. The 2D ERT and GPR data acquired in the area outside the tower show the presence of an hypogean structure until now unknown.

REFERENCES

[1]Cosi G. 1989. Torri marittime di Terra d'Otranto. Indagine per il ricupero del territorio. Congedo: Galatina, Italy.

[2]Errico F. 2018. Le torri della "serie di Nardò": caratteri morfologici e analisi comparative", Proceedings of FORTMED 2018 - International Conference, October 18th-20th 2018, Torino, Italy, VIII, 587-593.

[3]Bruno F., Faglia V., Losso G., Manuele A. 1978. Censimento delle torri costiere nella Provincia di Terra d'Otranto. Ist. Italiano dei Castelli: Roma, Italy.

[4] Loke, M. H.: Electrical imaging surveys for environmental and engineering studies, A practical guide to 2-D and 3-D surveys: RES2DINV Manual, IRIS Instruments, www.iris-instruments.com, 2001.

[5]Leucci G., 2019, Nondestructive Testing for Archaeology and Cultural Heritage: A practical guide and new perspective. Springer editore pp 217, ISBN 978-3-030-01898-6

[6]Leucci G., 2020, Advances in Geophysical Methods Applied to Forensic Investigations: New Developments in Acquisition and Data Analysis Methodologies. Springer editore, pp 200, ISBN 978-3-030-46241-3

Loke, M. H. and Barker R. D.: Rapid least-squares inversion of apparent resistivity pseudosections using a quasi-Newton method, Geophysical prospecting, 44, 131-152.