

ARCHAEOLOGICAL WALLS IN PIAZZALE DONATELLO (FIRENZE, ITALY) DETECTED BY USING VLF-EM AND ERT SURVEY

G.M.S. Losito, L. Martelletti, V. Pazzi, A. Trova

DICEA, Università di Firenze

The area of Piazzale Donatello (Firenze), given its anomalous topographic shape, is a relevant archaeological problem. Since XIX sec this topographic high is employed as “Cimitero Protestante, detto degli Inglesi” (Fig. 1), but surface ceramic rests document its use in roman period. The archae-



Fig.1 – Aerial photograph of Piazzale Donatello (Firenze – Italy).

ologists L. Cappuccini and L. Donati (Florence University) hypothesize that this topographic high is the envelope of an Etruscan structure, like tomb. To investigate this area we have to deal with some surveying problems, mainly the tomb density and the urban traffic noise. We selected the VLF-EM qualitative method and the 2D-Electrical Tomography (ERT) to join the area accessibility of VLF-EM method with the quantitative electrical information of the ERT (Gualdani et al., 2003; Losito et al., 2007) without use expensive instruments (Finzi-Contini et al., 2003).

The VLF-EM survey covered all the area located inside the external walls (Fig. 2) and consisted in 4250 station points. The data have been processed by using the InFase and Quadratura components of the EM secondary field, both separately and jointed as Wave Amplitude %. Previously the InFase component has been processed to compensate the survey procedure (Losito et al., 2006). The hole presence requested a first data interpolation and the non-rectangular survey area (Fig. 2) requested numerical boundary conditions. The best result has been obtained from the amplitude data map. The ERT survey consisted only in 6 2D-ERT (Fig. 2) given the tomb density. The electrode interval was conditioned by the monu-

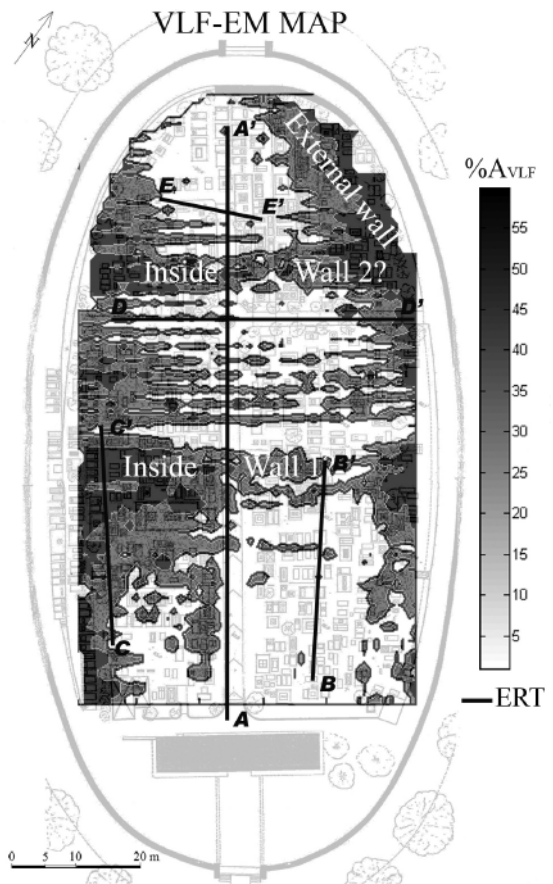


Fig. 2 – VLF-EM % Amplitude Map and 2D-ERT arrays.

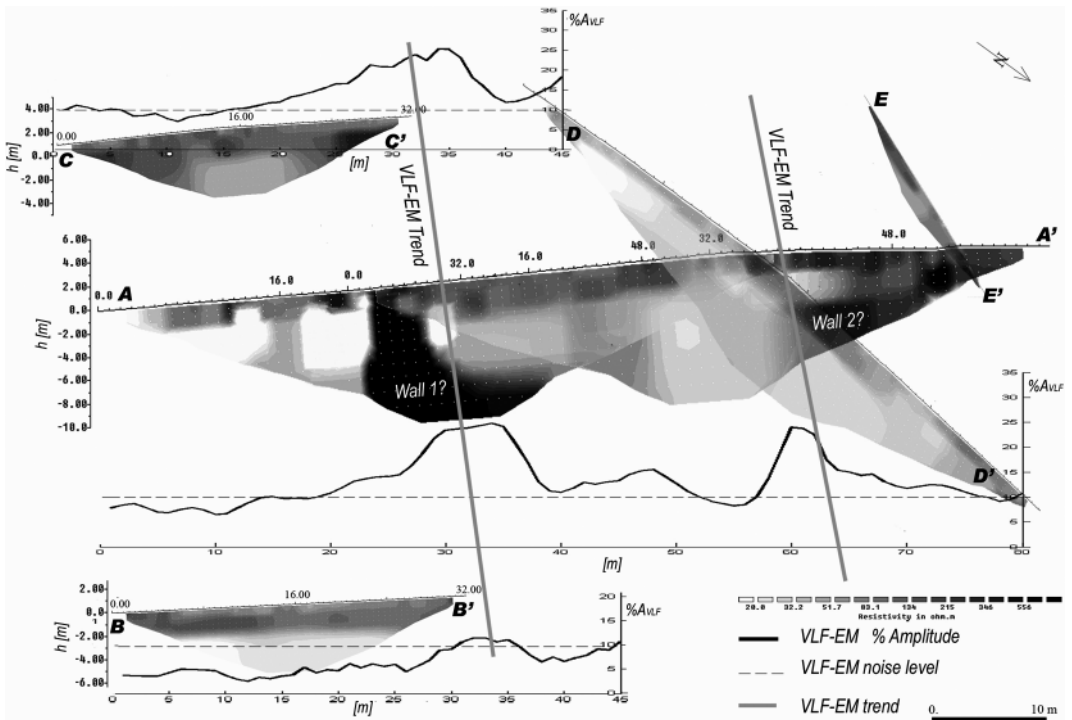


Fig. 3 – Resistivity models of 2D-ERT and correspondent VLF-EM profiles.

mental context. The main array AA' has been covered by using two 2D-ERT with 2 m electrode interval; for BB' and CC' arrays we used 1 m electrode interval; for DD' arrays we used 1.5 m electrode interval and for the last array, EE', we used 0.75 m electrode interval.

The survey results can be focused in the following points:

- i) the VLF-EM method shows two areas without EM anomalies (white areas - Fig. 2): this behaviour allows us to say that the high resistive objects located over the topographic surface don't produce EM field distortions at the working frequencies;
- ii) as expected the boundary external wall in general produce a big field distortion;
- iii) the two main transversal black areas can be interpreted as covered anthropic structures (walls – Fig.2) and are coherent with the Cappuccini's hypothesis;
- iv) the 2D-ERT (Fig. 3) clearly indicate a big resistivity high (wall1) in AA' array that is in a very good agreement with the correspondent VLF-EM anomaly profiles; a second anomaly (wall2) is less relevant probably because the top of the wall is more depth.

As conclusion, we can say that the VLF-EM method can successfully work in urban areas, if the terrains have low or intermediate resistivity values (up to 20 Ωm), and gives us 2D maps of the underground structures that can be z-defined by using 2D-ERT.

References

Finzi-Contini G., Mazzetti A., Losito G., Cicali P., Angelini R.; 2003: Prosperezioni geofisiche integrate nel sito archeologico della Basilica di San Piero a Grado (Pisa).
 Atti del 22° Convegno Nazionale Gruppo Nazionale di Geofisica della Terra Solida , 3 EAGE SEG. Roma, novembre 2003, pp. 371-373.
 Guldani R., Losito G., Angelini R.; 2003: Studio paleo-ambientale dell'area etrusca di Roselle (GR) mediante prospezioni elettromagnetiche integrate. Atti del 22° Convegno Nazionale Gruppo Nazionale di Geofisica della Terra Solida , 3 EAGE SEG. Roma, novembre 2003, pp. 375-377.

- Losito G., Pazzi V., Trova A.; 2007: 2D electrical prospecting to individuate a possible historical port of Roselle (Tuscany). *Epitome Geitalia* settembre 2007 Rimini, vol. 2, 480
- Losito G., et al.; 2006; VLF geo-electromagnetic surveys of geological and archaeological sites in the Egyptian Sahara. *Atti del 25° Convegno Nazionale Gruppo Nazionale di Geofisica della Terra Solida*. Roma, novembre 2006, pp. 433-436.