

### 3D ARCHAEOLOGICAL MAP: THE WEST-CENTRAL AREA OF SALENTO (ITALY)

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#### Abstract

The purpose of the topographical and archaeological research project is to provide a new contribution to the systematic survey of a Salento peninsula's sector, the territory of "Valle dell'Asso", updating the archaeological knowledge, through the systematic survey of the territory. The area analyzed (IGM, F. 214 III NE, Neviano), has a variously undulated surface, with elevations ranging from 45m to 140m above sea level, it is characterized by Serra Sant'Eleuterio to the West and Serra Montalto to the East. Among these elevations there is a valley, long and narrow, marked by the Asso's endorheic basin, probably formed in the Middle Pleistocene. The study of the area was integrated with the construction of a mosaic aerial photo and the construction of a Digital Terrain Model (DTM), prepared on base map in scale 1: 5.000 (Regional Technical Map).

#### Keywords

Archaeology, Topographic survey, Aerial Photography, DTM, *Salento*

#### 1. Territorial overview

The territory of "Valle dell'Asso" (LE-Italy), located in the central-western part of the Salento peninsula, has hydrogeological and pedological peculiarities that have strongly influenced settlement dynamics.

The distribution of settlements identified during the topographic and archaeological survey work, as well as the absence of data (settlements, roads, agricultural divisions) observed in certain areas of the same territory, are more easily understood if seen in this peculiar environment.

The territory analyzed (IGM ° F 214 III NE "Neviano"), is characterized by alternating between densely populated areas (in particular Galatone, Galatina Aradeo and Sogliano Cavour, with vast suburbs and uncontrolled urbanization of the countryside), and areas exclusively agricultural vocation, with dense fragmentation of ownership (*Serra of Neviano* and *Valle dell'Asso*).

From the morphological point of view, the area in question has a variously undulated surface, with elevations ranging from 45m to 140m above sea level, between *Serra Sant'Eleuterio* to the West and *Serra Montalto* to the East. Among these

elevations, named 'Serre', there is a valley, long and narrow, marked by the *Asso's* endorheic basin, probably formed in the Middle Pleistocene (Palmentola, 1989; Giaccari & Vitale, 2005; Sansò & Selleri, 2004).

Hydrographic network consists of three main sections, the highest of which, identified in the area south of *Aradeo*, is divided into several well-engraved erosion furrows and bordered by high river embankments up to 10 m, with direction N-S or NNW-SSE.

Hence, these incisions converge into two large grooves, oriented approximately NW-SE, converging at the height of the provincial road *Galatina-Galatone*, in a single channel.

However, despite leading themselves into karst sinkholes, the waterways, due to uncontrolled human interventions, are no longer able to drain the entire rainwater flowing down from the *Serre*; therefore, during periods of increased rainfall, also due to the impermeability of the clayey limestone in the area, veritable lakes and swampy areas are formed, the limits of which, represented in some maps made between 1600s and 1800s, can be analyzed through the comparative study of aerial photos<sup>1</sup>.

<sup>1</sup>Remarkable is the historical contribution that can be provided by the aerial photographs, which preserve the original look into the details of the landscapes and the

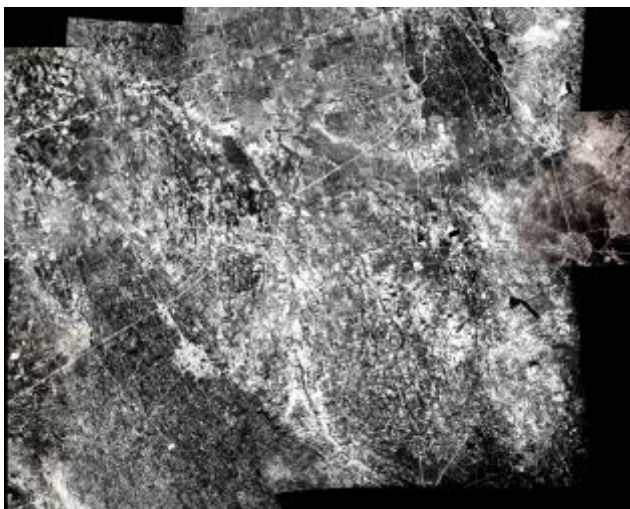
different moments of human intervention that come to change the geology, hydrology, vegetation, land use and above the anthropization mode.

## 2. Methodological premise

The first phase of the analysis work provides for an accurate bibliographic and archival research, the systematic collection of documentary material, the study of the local traditions, the retrieval of research tools (maps, historical and recent aerial photographs), aimed at a preliminary knowledge of the territory in all its aspects, from geology to all morphological and hydrographic characteristics and archaeological resources.

The focal point of the research is the direct and systematic analysis of the area, the basis for the historical reading diachronic and the reconstruction of the settlement dynamics of the ancient populations (analyzed by periods, from prehistory to the Middle Ages), susceptible to change and clarification, arising from the acquisition of new data, whether in other conditions of surface visibility or with other kind of investigations (Scardozi, 2004).

Various historical (IGM 1943 and IGM 1947) and recent aerial images<sup>2</sup> were analyzed for the reconstruction of the hydrographic system of the area.



**Fig. 1:** Mosaic of historical aerial photos related to the surveyed area - IGM 1943 (frame 159); IGM 1947 (frames 26-28); IGM 1955 (frames 8137-8146, 7849-7858)

Contextually, the shadow and damp marks, identified by stereoscopic analysis - especially in coincidence with fossilized, inactive channels - have been verified on the ground. Aerial images, georeferenced and merged into a mosaic, showed a dense network of paleo channels (Fig. 1-3).

<sup>2</sup> IGM 1943 (frame 159); IGM 1947 (frames 26-28); IGM 1955 (frames 8137-8146, 7849-7858).



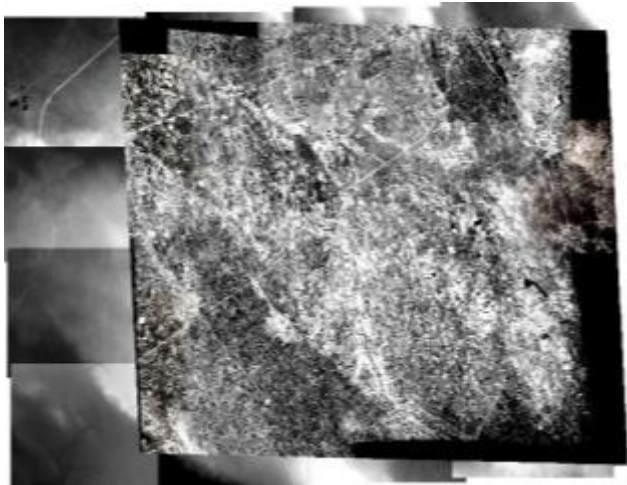
**Fig. 2-3:** Mosaic (part.). The shadow and damp marks relating to paleo channels of the 'Asso' river network.

### 2.2 Construction of a Digital Terrain Model (DTM)

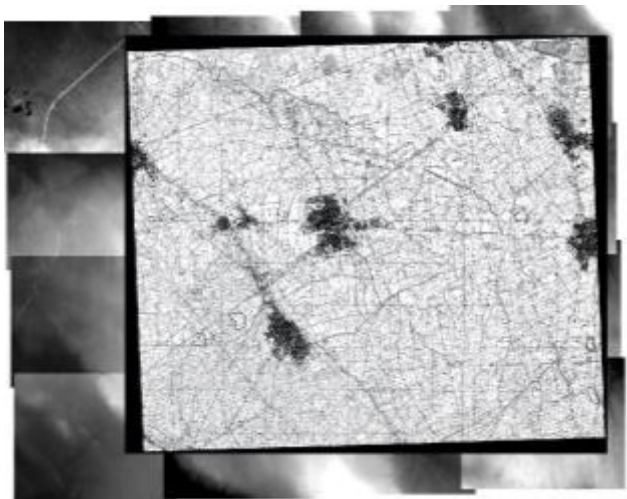
The study of the area was finally integrated with the construction of a Digital Terrain Model (DTM), prepared on base map in scale 1: 5.000 (Regional Technical Map) and overlaid by Provincial Technical Map (1:10000) and mosaic aerial photos<sup>3</sup>, properly georeferenced.

Among the softwares available (Global Mapper; Geomedia Professional Terrain; ArcGIS Desktop; Golden Surfer), useful for the restitution of the altitude data, it was decided, for convenience, to process the digital model using ArcMap and ArcScene applications of the ArcGIS DESKTOP 10.4.1 system, taking advantage of the

<sup>3</sup> IGM 1943 (frame 159); IGM 1947 (frames 26-28); IGM 1955 (frames 8137-8146, 7849-7858).



**Fig. 4:** Mosaic of historical aerial photos georeferenced on the ASCII Grid files (ARCMAP Application).



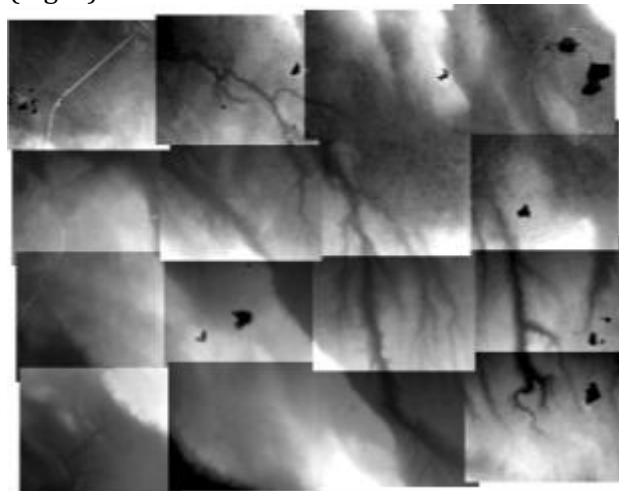
**Fig. 5:** The "Carta Tecnica Provinciale Numerica" (CTPN), in scale 1: 10000, georeferenced on the ASCII Grid files (ARCMAP Application).

characteristic of the GIS to create digital terrain models, also three-dimensional, which form the basis for analysis of visibility.

As first operation it is imported into ArcMap application the ASCII Gridfiles<sup>4</sup>, on which it is suitably georeferenced the mosaic of aerial photographs (Fig. 4) And the Provincial Technical Map (CTPN) in scale 1: 10000 (Fig. 5).

The density of altimetric variations allows to appreciate the ditches of the hydrographic

network channels of "Asso" and of the quarry areas (Fig. 6).



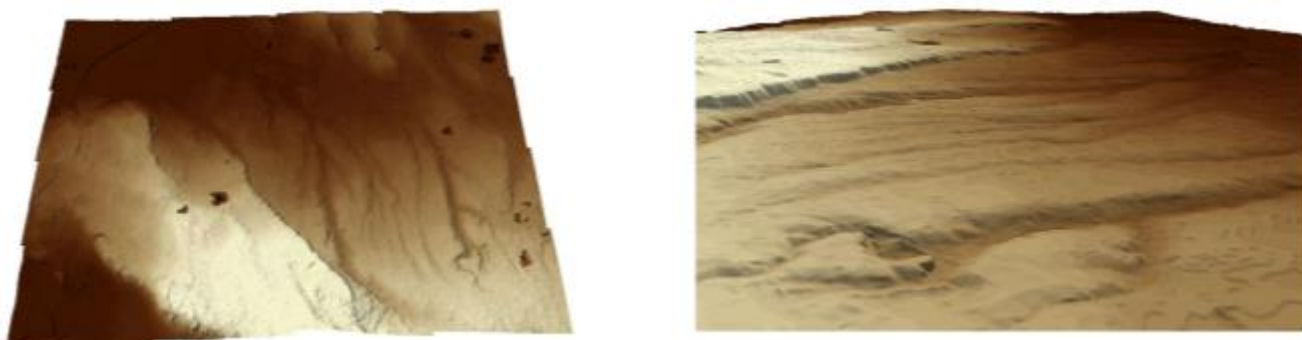
**Fig. 6:** ASCII Grid files: the density of altimetric variations allows to appreciate the ditches of the hydrographic network channels of "Asso" and of the quarry areas (ARCMAP Application).

The next step in the elaboration process was the import into the ArcSCENE application of the same files ASCII GRID and of the rasters georeferenced. Into ARCSCE, which allows you to display geographic information in three dimensions, it is made even more evident the altimetric datum since it is applied, at all points that make up the image, a value of accentuation of the quota compared to real datum (Fig. 7-11).

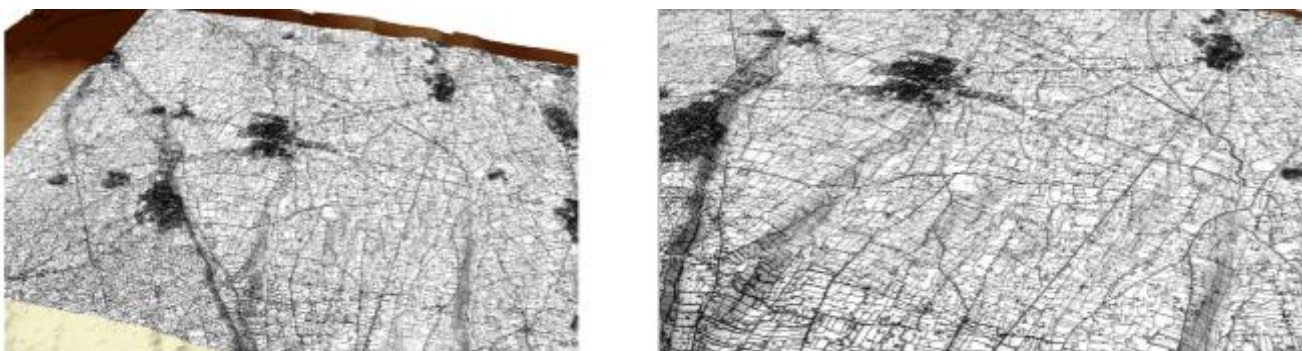
The Digital Elevation Model has enabled a more immediate display of the morphological and hydrographic characteristics of the area in relation to archaeological data, with the ability to better contextualize the information available; the latter aspect is not negligible in an area where the quota differences and the hydrographic datum have strongly influenced the distribution of settlements over the centuries.

It can, in fact, recognize a general tendency of occupy slightly raised areas, close to or in the immediate vicinity of the "Asso" water courses, which would seem to have affected considerably on the development of roadways.

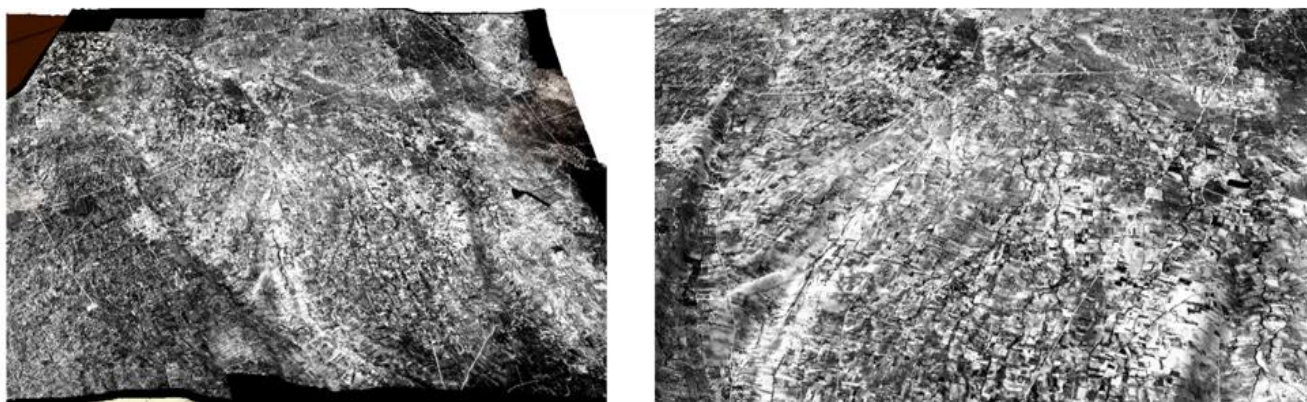
<sup>4</sup>For detailed documentation see: [http://www.sit.puglia.it/portal/portale\\_cartografie\\_tecniche\\_tematiche/Download](http://www.sit.puglia.it/portal/portale_cartografie_tecniche_tematiche/Download)



**Figg. 7-8:** Digital Elevation Model (DTM) of the area of interest, prepared on base map in scale 1: 5.000.



**Figg.9-10:** Digital Elevation Model (DTM) of area of interest, overlaid by Provincial Technical Map (1:10000).



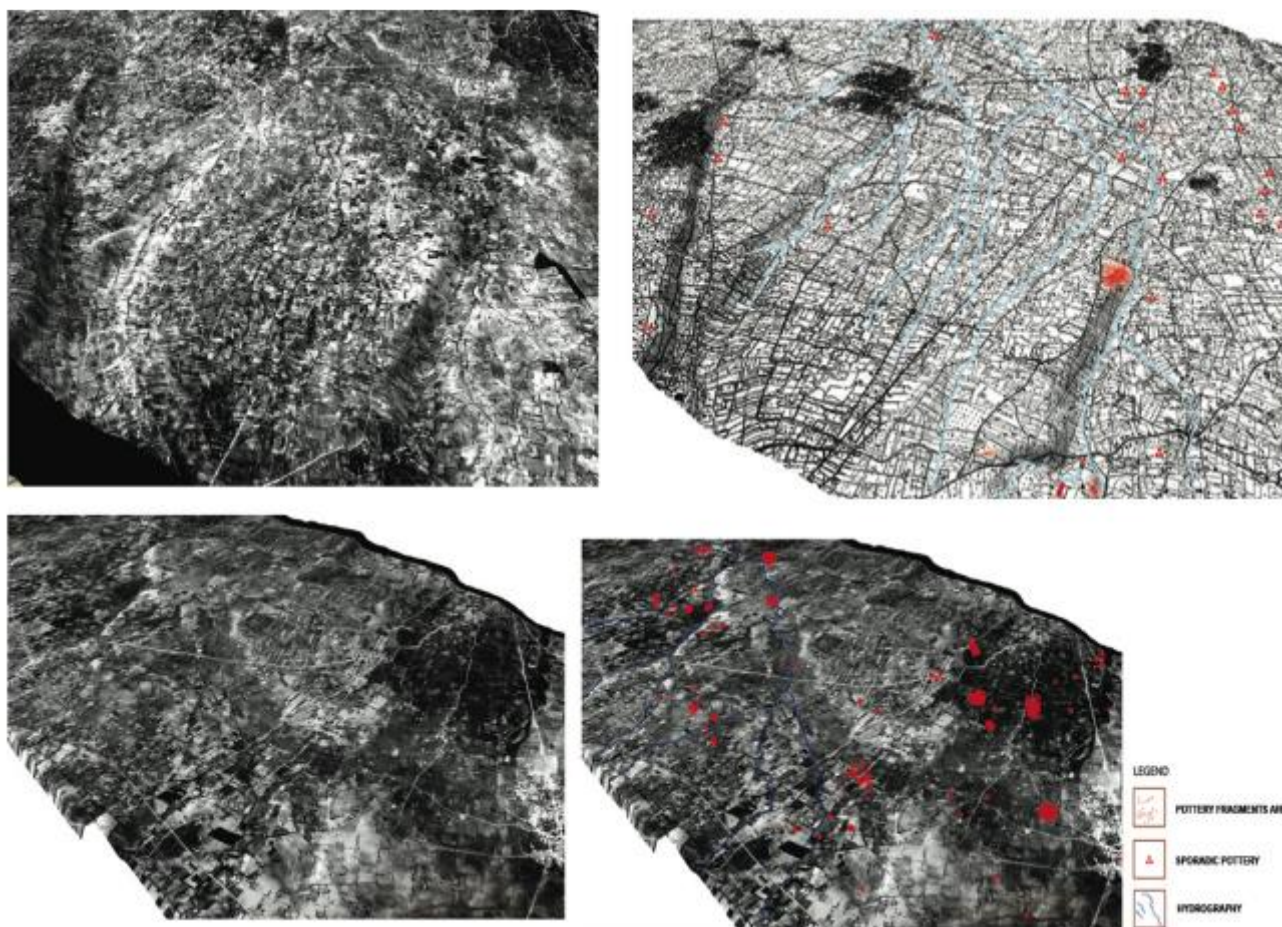
**Figg.11-12:** Digital Elevation Model (DTM) of area of interest, overlaid by mosaic aerial photos.

### 3. Case study: the proto-historic age and the Roman Age

From reading of the diachronic distribution of the finds in the territory examined, limited is the documentation relative to the Paleolithic and Neolithic ages. Evidently, particularly in the Paleolithic age, in a stage where the Salento peninsula represented a point of arrival for people who, pressed by the harsh climate during glacial periods, pushed by the North to the South (Radmilli, 1989), the environmental conditions of the Serra di Sant'Eleuterio and Valle dell'Asso

crossed by canals, have inhibited the formation of settlements. Certainly, it is not possible to speak of an absolute reading of the Palaeolithic presences in this area; the poor visibility conditions and the difficulties encountered in the survey of specific areas have influenced the discovery of any archaeological evidences.

Although limited, the evidence relating to the Neolithic would seem to illustrate a trend of employing raised areas, close to or in the immediate vicinity of rivers.



**Fig. 13 a-b:** 3D Archaeological Map (Part.): (Above) 'Asso' Valley, the southern part; (a)DTM overlaid by mosaic aerial photos; (a') Diachronic Map: DTM overlaid by Provincial Technical Map (1:10000) and proto-historic findings. (Below) 'Asso' Valley, the northern part; (b-b')DTM overlaid by mosaic aerial photos; (b') Diachronic Map: Roman Age findings.

Completely different is the situation relative to the Bronze Age, documented by a modest, but significant, increase of settlements, variously distributed.

Most areas of pottery fragments of proto-historic age, found in the area under investigation, refer mainly to settlements of medium and small size, probably without fortifications, the defense of which could be guaranteed by the natural topography of the area, confirming a situation already experienced in other areas of Salento (Guaitoli, 1997, 2003; Cazzella, 1996; Guastella, 2003a, 2003b; Martino, 2004).

From Observation of the distribution of settlements, in this strip of land crisscrossed by rivers and characterized by excellent agricultural potential, the population of proto-historic age comes distributed in the form rather extensive,

with a fair number of settlements, placed it whether in a dominant position or positions less isolated and easily accessible, not conditioned by the need to defend, but always in close relationship to rivers and springs (Guaitoli, 2001, 2003). Even where the settlements seem far from active channels, the observation of traces of moisture on aerial photo shows the presence in the past of water courses.

In the territory examined, it is observed, in the late Republican period, the formation of some rural settlements, which will be developed further in the Imperial roman age until late antiquity age.

The occupation of the fertile area east of Asso Channel, between Noha, and Cutrofiano, and Sogliano Cavour, still involved today with extensive cultivation of vegetables, endures, then, almost without interruption through the imperial

age, with an increase in the number of settlements in the third century. A.D., related to a new, more extensive and intensive agricultural employment<sup>5</sup>.

In particular, there is a general trend of occupation of sites on which they are found settlements dating back to the Bronze Age (Fig. 13a-b).

#### 4. Conclusions

Know the stages of evolution of the territory to document the history, through the analysis of situations now obliterated by development or rendered unreadable due to intensive processing, it becomes essential for the preservation and development of the historical heritage.

The lack of knowledge of the area leads to destruction or to damage to the archaeological

heritage, which can not be assessed, neither quantified, because of the fact that you do not know the object. The design of a spatial plan or, a fortiori, an intervention of environmental restoration, can not be separated from the reconstruction of the original conditions of the landscape to be restored; the themes of the settlement dynamics of the territorial organization forms, the man environment relationship in very specific historical and geographical contexts become, therefore, indispensable tool, expressed through the graphic and photographic documentation of the various phases of development, to be submitted to the authorities responsible for land management in the short time (Guitoli, 2003).

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<sup>5</sup>The conspicuous presence of African red slip ware, local production of ceramics by fire of the type 'S. Foca' (III cent. A.D.), the sporadic coins found, testify to the existence of small

and medium farms scattered, rise up mainly in inhabited contexts in earlier stages.

## REFERENCES

- Cazzella, A. (1996). Il versante adriatico della Puglia durante l'età del bronzo: appunti per una sintesi. In Cinquepalmi, A., & Radina, F. (1996), *Documenti dell'età del Bronzo. Ricerche lungo il versante adriatico pugliese* (pp. 17-22). Fasano, IT.
- Giaccari, E., & Vitale, A. (2005). Un GIS per la pianificazione degli interventi atti a mitigare il rischio idrogeologico del bacino endoreico del Torrente Asso, a sud di Lecce, 9a Conferenza Nazionale ASITA - Centro Congressuale "Le Ciminiere". In *Atti ASITA* (pp. 172-189). Catania, IT.
- Guaitoli, M. (1997). Attività dell'Unità Operativa di Topografia Antica. In Aa.Vv. (1997), *Metodologie di catalogazione dei Beni Archeologici, "BACT", 1.2* (pp. 9-18). Lecce-Bari, IT.
- Guaitoli, M. (2001). Il territorio e le sue dinamiche. In *Atti dei Convegni di Studio sulla Magna Grecia, Taranto XCI* (pp. 219-252). Taranto, IT.
- Guaitoli, M. (2003). Introduzione. In Guaitoli, M. (2003), *Lo sguardo di Icaro. Collezioni dell'aerofototeca nazionale per la conoscenza del territorio* (pp. 13-15). Roma, IT.
- Guastella, P. (2003). Saturo. In Guaitoli, M. (2003), *Lo sguardo di Icaro. Collezioni dell'aerofototeca nazionale per la conoscenza del territorio* (pp. 227-229). Roma, IT.
- Guastella, P. (2003). Torre Castelluccia. In Guaitoli, M. (2003), *Lo sguardo di Icaro. Collezioni dell'aerofototeca nazionale per la conoscenza del territorio* (pp. 229-233). Roma, IT.
- Martino, C. (2004). L'insediamento protostorico di San Donato di Lecce. In Aa.Vv. (2004), *Archeologia aerea. Studi di aerotopografia archeologica*, (pp. 183-192). Roma, IT.
- Palmentola, G. (1989) Lineamenti geologici e morfologici del Salento leccese. In *Atti del convegno sulle Conoscenze del territorio Salentino (Lecce, 12 dicembre 1987)* (p. 17). Lecce, IT.
- Radmilli, A. M. (1989) Il Salento nella Preistoria. In *Salento porta d'Italia. Atti del Convegno Internazionale (Lecce, 27-30 Novembre 1986)* (pp. 27-32). Galatina, IT.
- Sansò, P., & Selleri, G. (2004). *Caratterizzazione geomorfologica degli Inghiottoi carsici (Vore) della provincia di Lecce*. Lecce, IT.
- Scardozi, G. (2004). *Ager Ciminus (I.G.M. F. 137 Il NO Soriano nel Cimino, Il SO Vignanello)*. Viterbo, IT.

