



HAL
open science

Tritium Autrigonum (Monasterio de Rodilla, BURGOS): an urban approach to a Hispano-Roman agglomeration based on recent aerial surveys

Laurent Brassous, François Didierjean

► **To cite this version:**

Laurent Brassous, François Didierjean. Tritium Autrigonum (Monasterio de Rodilla, BURGOS): an urban approach to a Hispano-Roman agglomeration based on recent aerial surveys. *Zephyrus*, 2023, 91, pp.103-140. 10.14201/zephyrus202391103140 . halshs-04378679

HAL Id: halshs-04378679

<https://shs.hal.science/halshs-04378679>

Submitted on 5 Mar 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

TRITIUM AUTRIGONUM (MONASTERIO DE RODILLA, BURGOS): AN URBAN APPROACH TO A HISPANO-ROMAN AGGLOMERATION BASED ON RECENT AERIAL SURVEYS

Tritium Autrigonum (Monasterio de Rodilla, Burgos): aproximación urbanística a una aglomeración hispanorromana a partir de fotografías aéreas recientes

Laurent BRASSOUS* and François DIDIERJEAN**

* UMR LIENSs (La Rochelle Université/CNRS). 1 parvis Fernand Braudel. 17042 La Rochelle cedex 1 (France). E-mail: laurent.brassous@univ-lr.fr. ORCID ID: <https://orcid.org/0000-0003-3929-7406>

** Institut Ausonius. Maison de l'archéologie. Université de Bordeaux Montaigne. 8, esplanade des Antilles. 33607 Pessac (France). E-mail: francois.didierjean@numericable.fr. ORCID ID: <https://orcid.org/0000-0003-2871-178X>

Recepción: 19/09/2022; Revisión: 20/02/2023; Aceptación: 10/05/2023

ABSTRACT: The ancient town located at Alto de Rodilla (Monasterio de Rodilla, Burgos), identified as *Tritium Autrigonum*, has never been the subject of an archeological excavation, although the site has been known for a long time. However, the aerial survey campaigns conducted between 2001 and 2015 made it possible to take a large number of photographs that expose the urban form of the city. These images reveal, on an unprecedented scale, a significant portion of the buried structures throughout the urban agglomeration. After a brief presentation of the site and the extent of our current knowledge, this work details the exploitation of the rectified and georeferenced aerial views, making it possible to obtain an unedited planimetry of the remains. It also provides an exceptionally detailed description of the site. This expanding documentary base was used in 2016 to study and publish the remains identified as monuments. Since then, the analysis of the aerial photographs has made it possible to obtain a general plan of the city, to propose an analysis of the different facets of its urbanism in its various aspects and to situate the city within the urban spaces of the northern Hispanic area.

Key words: Antiquity; Aerial Survey; Geomatics; Town Planning; Architecture; Houses; Warehouses.

RESUMEN: La antigua ciudad situada en el Alto de Rodilla (Monasterio de Rodilla, Burgos), identificada como *Tritium Autrigonum*, nunca ha sido objeto de una excavación arqueológica, aunque el yacimiento se conoce desde hace mucho tiempo. Las campañas de prospección aérea desarrolladas entre 2001 y 2015 han permitido realizar un gran número de fotografías que han expuesto la forma urbana de la ciudad. Esas imágenes revelan, a una escala sin precedentes, una parte importante de las estructuras enterradas en toda la aglomeración urbana. Tras una breve presentación del yacimiento y del alcance de nuestros conocimientos actuales, este trabajo detalla la exploración de las fotografías aéreas rectificadas y georreferenciadas que han permitido obtener una planimetría inédita de los restos. También se proporciona una descripción excepcionalmente detallada del yacimiento. Esta base documental en expansión ya se utilizó en 2016 para estudiar y publicar los restos

identificados como monumentos. Desde entonces, el análisis de las fotografías aéreas ha permitido obtener una planimetría general de la ciudad, proponer un análisis de las distintas facetas de su urbanismo en sus diversos aspectos y situar la ciudad dentro de los espacios urbanos del área norte hispana.

Palabras clave: Antigüedad; prospección aérea; geomática; urbanismo; arquitectura; casas; almacenes.

1. Introduction¹

The Alto de Rodilla, in Monasterio de Rodilla, province of Burgos, is an important archaeological site that has long been identified with the city of *Tritium Autrigonum* mentioned by ancient authors². It controlled an important crossing point between the Ebro and Douro basins: the Brújula Pass (Figs. 1-2). The site has been the object of a few archaeological studies, which have defined an occupation from the First Iron Age to the end of Antiquity (Alonso, 1972-1973; Abásolo *et al.*, 2004). In the absence of extensive excavations and geophysical prospecting, it is still possible to use the aerial views collected during the numerous overflights, with exceptional results, of which the site was the object in 1986 (Passini, 1987) and especially from 2001 to 2015 (Didierjean *et al.*, 2016) to acquire a comprehensive knowledge of the agglomeration and its urbanism.

The presentation of the site, the history of its study, as well as the methodology adopted to achieve a planimetric diagram of the apparent remains from aerial survey, were discussed in a previous article published in 2016 devoted to the analysis of some monuments of this town (Didierjean *et al.*, 2016). On all these points, this contribution is therefore limited here to a brief review of the essential elements. Since this first contribution, the analysis of the aerial survey has made it possible to obtain a general plan of the city, which was previously unknown (Fig. 3). This work now makes it possible to present a complete description of the remains sector by sector, to analyze the extension of the

urban space –walls, cemeteries, dumping grounds–, to study the organization of the intra-urban space –road network, water supply, monuments, dwelling areas and economic spaces–, exploiting this exceptional opportunity to perceive the urbanism of an ancient town in its entirety.

2. Methodology

The site of *Tritium Autrigonum* is particularly suitable for aerial detection because it is completely devoid of later constructions, and entirely occupied by fields devoted to cereal cultivation. Its potential was confirmed in 1986 when J. Passini and A. Humbert flew over the sector and drew attention to the site, although the views published shortly after are difficult to exploit (Passini, 1987). The aerial survey conducted by F. Didierjean between 2001 and 2012 as part of research programs on the Douro basin and the *via de Hispania in Aquitaniam* have made it possible to multiply overflights and to constitute an important photographic file of several hundred images, both analog and digital³. However, these are oblique photographs, without overlap. We undertook the processing of this documentation in collaboration with researchers from UMR 7266 LIENSS, from La Rochelle University/CNRS.

In the interest of studying the urban form of *Tritium*, the first objective was to straighten and assemble these disparate photographs to obtain an image that was as complete and exact as possible of the recorded traces in order to draw up a planimetric diagram of the entire urban area. We chose to use the free QGIS software which is capable of straightening aerial photographs and assembling them in a georeferenced system.

¹ We would like to thank Fr. Healy, F. Pouget, P. Brunello, B. Guillot, C. Coutelier, J. A. Abásolo, I. Ruiz Vélez, M. Torrión as well as the Ausonius Institute, the LIENSS Laboratory and the Aquitaine Regional Council for their precious help in carrying out this work.

² Pliny, *HN*, 3.3.27; *It. Ant.* 450.1; *It. Ant.* 454.4.

³ The photographs published in this work were taken by F. Didierjean, with the exceptions mentioned.

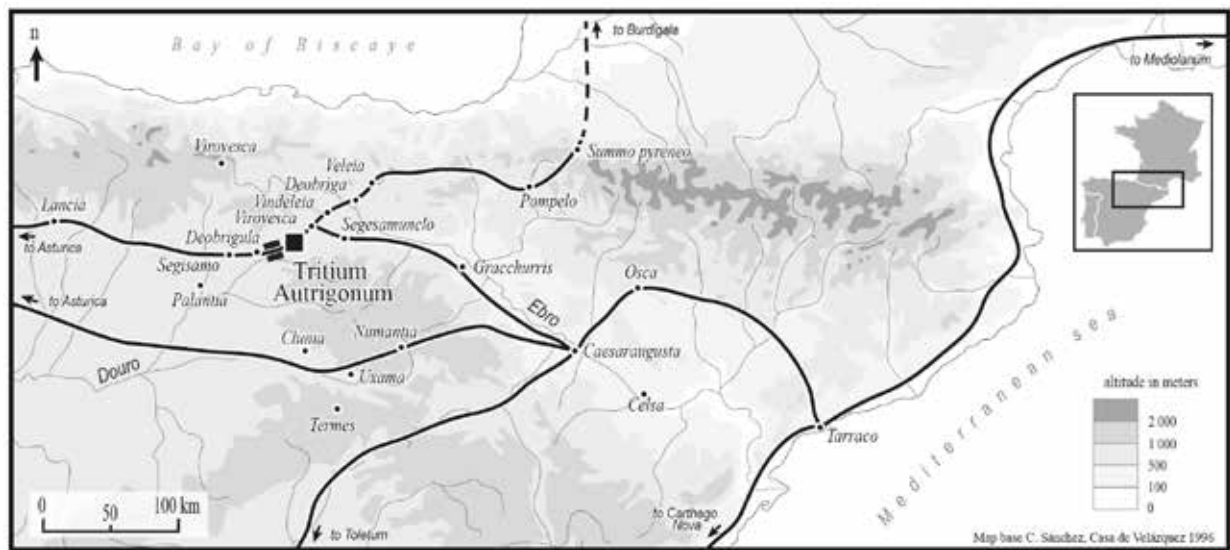


FIG. 1. Situation of Tritium Autrigonum on the Brújula pass, between the Ebro and Douro basins (DAO P. Brunello).



FIG. 2. General view of the site from the south.

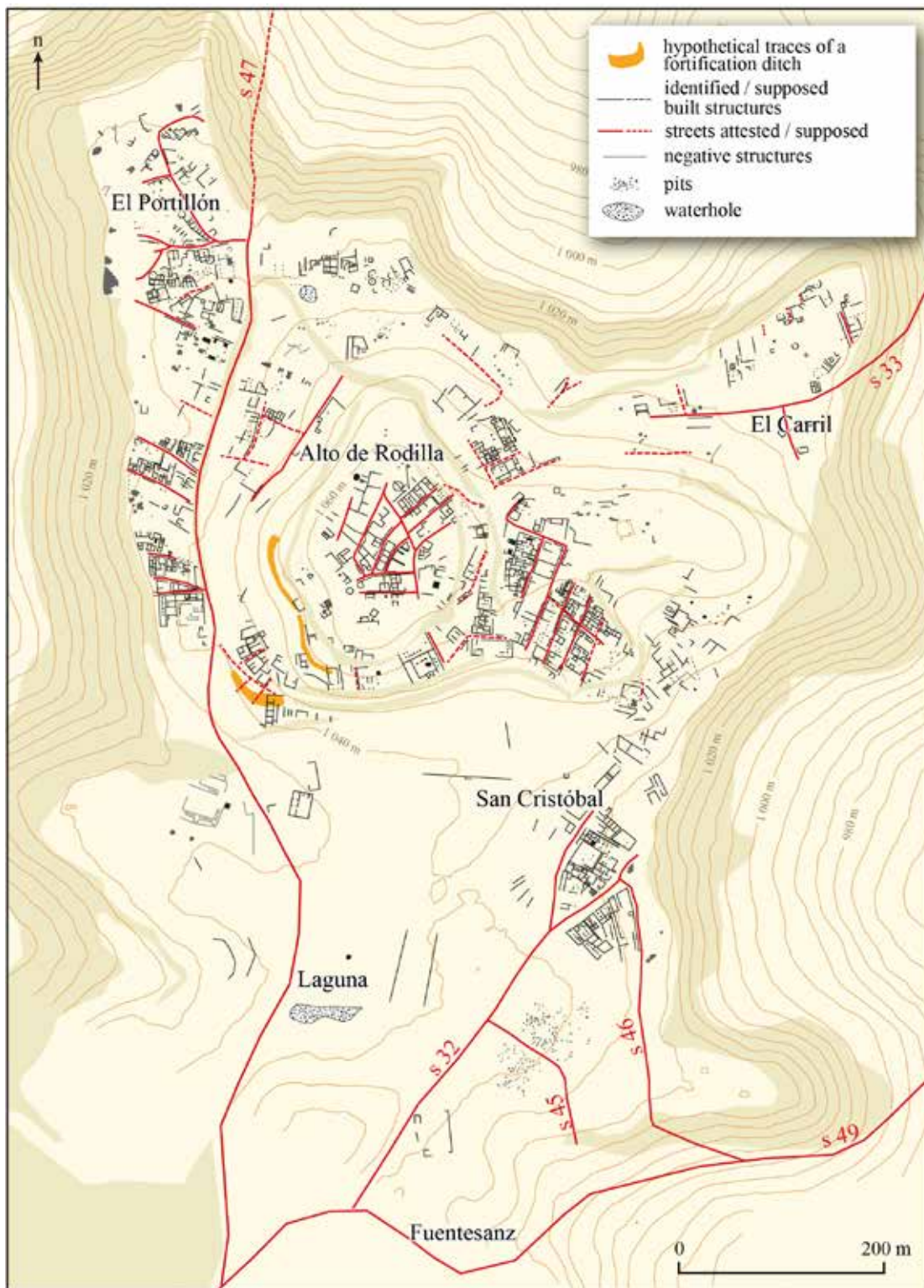


FIG. 3. Tritium Autrigonum: *Proposal map of the city from aerial survey* (DAO P. Brunello).

The production of this planimetric diagram was performed in several stages: it was first necessary to establish a selection of the aerial photographs to be georeferenced; then save an already georeferenced orthophotograph extracted from the ©Microsoft Bing search engine, covering the area of the site and providing a base canvas with an accuracy of 80 cm per pixel; finally, each of the selected aerial photographs was georeferenced by placing calibration points on them and automatically straighten with a polynomial transformation of type 2 (Didierjean *et al.*, 2016: 329-330).

One of the main problems with Tritium's planimetry was that most of the photographs were poorly-suited to the task: many were taken on analog photography during early missions –2004 and 2005–, using non-professional cameras with distorted optics⁴. In addition, the most favorable angle to take the images to reveal the structures is quite far from vertical. Finally, there was no question of producing a complete photographic survey of the site, for which we did not yet have the digital instruments that are widely available today. An example is the recent works on the urban evolution of ancient *Segisamo*, in Sasamón, Burgos (García Sánchez y Costa, 2020), which combines the use of a DTM obtained from a drone with older oblique views rectified by GIS. The height at which the images were taken at *Tritium* therefore varied between 250 and 500 m, and the angle between 60° and 80°; overlaps were limited, and often the overlapping shots corresponded to different missions and variable heights.

These conditions can generate errors, caused mainly by inaccuracies in location and optical distortions. Slight distance distortions appear on the margins of the straightened photographs, but they were partially compensated by the superposition of several images. However, being aware of this limited degree of exactitude is part of the method: according to Egels (2011: 43), it is necessary to provide an

⁴ Cameras used: Canon EOS 300 D, EF 24/70 mm lens, with Fuji 100 film –before 2006–; Nikon 70, AF-S-DX 18/70 mm zoom lens, without georeferencing –from 2006 to 2014–; Nikon D7200, AF-S Nikkor 18-140 mm zoom lens, without georeferencing –since 2015–.

assessment of the accuracy of the data, which can be improved by over-measuring. For the straightening and georeferencing of the Tritium photographs, we were able to place a large number of calibration points per image.

However, we have tried to improve this margin of error by adding a DTM, which would also provide the significant elevations and the division into terraces that the site presents. An intervention in the field was therefore programmed to complete the aerial photographs by carrying out an orthophotography of the site using an UAV, with the hope of seeing the remains, as with conventional aerial photographs, and to be able to thus calibrate these same aerial photographs with greater precision. The climatological conditions were indeed very favorable for detection at the end of spring of 2015, with little water, which followed a wet end of winter⁵. After establishing a network of reference points recorded with a differential GPS, a photographic coverage of the site was carried out with a camera on board an UAV⁶. This includes 1 558 images taken at regular intervals, covering an area of nearly 1.5 km². These shots were then assembled automatically using the *Agisoft Photoscan*[®] software and georeferenced using the network of GPS points established previously. This assembly provided a precise DTM with an accuracy of 50 cm per pixel, which is valuable for analyzing the location of the remains according to altitude⁷. Despite the good conditions, the buried structures did not show up on this photogrammetry.

The next step was to interpret the photographs and draw the visible remains directly in QGIS from the different images, each of which provides additional information. These were finally identified and classified in a georeferenced database. It was then possible to produce a first planimetric diagram

⁵ The mission took place on June 22-23, 2015.

⁶ This part of the work was carried out by B. Guillot, from UMR 5805 EPOC CNRS-Univ. of Bordeaux. Technical difficulties had to be overcome: the proximity of a wind turbine field caused electromagnetic disturbances aggravated by a storm, resulting in the loss of control of a drone, which we were fortunately able to replace.

⁷ Available in <http://sig.benoitg.free.fr/tritium/index.php>

of the town of *Tritium* (Fig. 3). Although this restitution still includes a margin of inaccuracy reaching 2 to 3 m in some places, it allows us to give a first relatively reliable evaluation of the plan of the town and even of the dimensions and surface of some remains over a limited area.

This planimetric diagram shows significant variations in the density of the remains, which poses the problem of the reliability of aerial photographs to reveal all the buried structures. A confirmation could have been provided by systematic pedestrian and geophysical surveys, but since these could not be carried out we performed a sampling that consisted in counting the apparent visible artifacts on a surface of one square meter –m²– at 25 determined points (Fig. 4). These were selected from areas where aerial views show a high density of structures, but also where voids are observed, as well as some areas of medium density. The elements taken into account were building stones, terracotta building materials –bricks and tiles–, and pottery. These tests show that the density of artifacts visible on the ground is also very variable. Comparison of the pattern of remains revealed by aerial photography with the results of the sampling of artifacts visible on the ground indicated an overall correspondence: of the 10 sectors with a high density of remains observed from the air, 9 also present a high density of artifacts on the ground; of the 11 sectors with low density of remains observed in aerial views the correspondence is not as good, because 3 of them present a high density of artifacts on the ground. This discrepancy between the information given by the aerial survey and the density of artifacts on the ground may be the result either of the addition of a backfill that masks the elements on the ground, or of the destruction of the remains that makes their aerial survey inoperative.

3. Description of the remains by sector

The observation and analysis of the processed images makes it possible to restore a plan of the urban structures of *Tritium*. Concerning the contribution

of the aerial survey, the exceptional character of the site of Rodilla appears more clearly by comparison with *Contributa Iulia Ugultunia*, another ancient city of the Iberian Peninsula. Located in Los Cercos, Medina de las Torres, province of Badajoz, the site offers conditions for detection as favorable as *Tritium*, with the difference that it was possible to deploy the full range of non-invasive methods on a large scale: oblique aerial photographs –with rectification– and vertical photographs, in the visible and infrared; electrical and electromagnetic surveys; measurement of soil resistance; and even the occasional use of geo-radar. Three findings emerged: first, oblique aerial photography is the method that allows the most accurate detection; secondly, the numerous traces found at *Contributa* rarely allow the identification of a building and even less so the characterization of the blocks and dwellings, as is the case at *Tritium*. Finally, excavations are essential to confirm previous observations (Mateos *et al.*, 2014: 109-131). In the case of *Tritium*, because of the current impossibility of carrying out geophysical surveys and excavations, the description of the urban structures is necessarily dependent on the information provided by aerial photographs. The photographs presented in this article are selections from a series of hundreds, they do not always show all the elements represented on the plan. On the latter, the buildings appear as light lines; hollow structures –or more rarely pullouts– appear as dark lines or spots. On the plan, the former had been rendered as solid black lines and the latter as gray lines or spots. The photographs also show rectangular structures forming dark spots, probably corresponding to hollow structures, but whose function remains undetermined: a cistern or semi-buried room? The uncertain traces were restored by discontinuous lines. It should be noted that aerial photography does not provide data concerning the chronology of the occupation. It is also not possible to perceive the possible compartmentalization of the buildings. Several sectors nevertheless present superimposed structures of different orientations or lines which do not match with a unitary structure. These elements

are all indications of various phases of construction. In order to facilitate the reading of the urban plan

of *Tritium*, we propose a sectoral breakdown based on the topography of the site (Fig. 4).

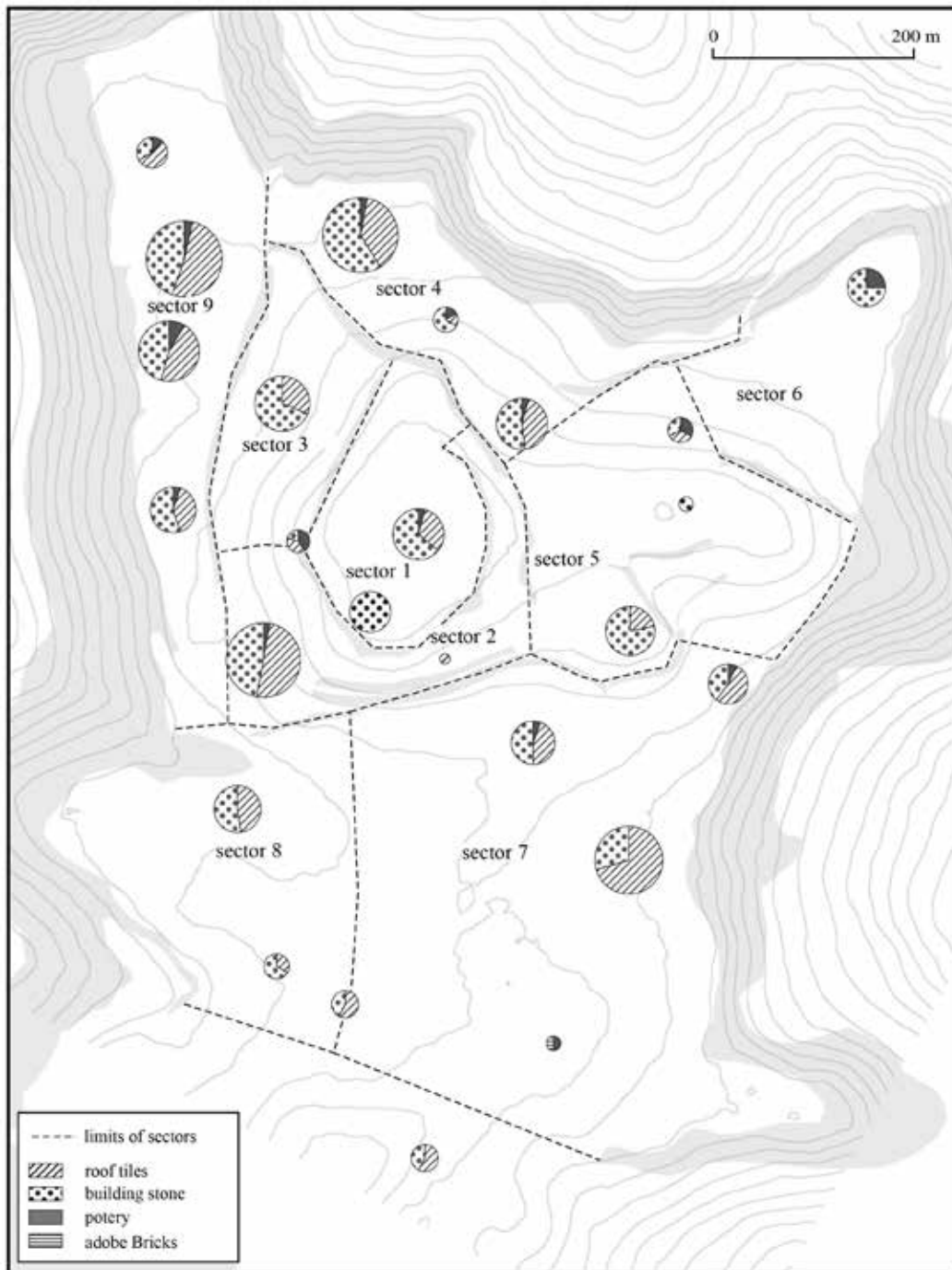


FIG. 4. Map of the city's sectors and results of the ground sampling (stones, tiles, pottery, mud brick); the size of the circles is a function of the number of artifacts observed per m^2 , with the colors indicating the proportion of different materials (DAO P. Brunello).

3.1. Sector 1: Summit (Figs. 5-6)

The building area is continuous, but the structures are less apparent on the edges –fillings and terrace–. The streets –s– form a non-orthogonal network, some have a roadway. We note the presence of a building whose important wall thickness and big column diameter suggest that it was a monumental structure –m1– in the south center (Didierjean *et al.*, 2016: 331-333), but most of the space seems devoted to housing, especially in the center and northeast. Houses –h– are also identifiable to the southwest. There are curvilinear structures including a circle with a central point, which we interpreted as circular houses –ch–. Some marks could correspond to wells –w– (Fig. 5).

3.2. Sector 2: Southern Slope (Figs. 7-9)

Below the terraces, there are two large traces that could belong to an ancient fortification system –di– which may have quickly disappeared (Figs. 6-7). On the one hand, in the extension of the embankments of the southern slope, a darker band which connects with the valley of the south-west could correspond to a filled ditch that blocks the promontory. On the other hand, at the foot of the embankment bordering the top platform to the west, a long dark band could also indicate the presence of a filled ditch. The southwestern part reveals a fairly loose urban form, made up of quadrangular buildings with a few rooms, resembling housing –h– close to indigenous traditions –see below p. 14–. Some of these buildings were built on these ditches which had previously



Fig 5. Sector 1 (Alto de Rodilla). Visible remains, seen from the southwest.

been filled in –h55–. To the south, we see some traces of what could be a monument (m2), given the imposing diameter of the columns –see below p. 132–. On the eastern side, the remains are dense (Fig. 8) with an example of superimposed structures indicating several development phases: on the first eastern terrace, below the top, a building with a square plan, the eastern limit of which cannot be determined but that seems to be about 15 × 15 m –h17–, appears to be embedded in an alignment of quadrangular buildings oriented differently by around 25° –h18– which must be probably later.

3.3. Sector 3: Western Terrace (Figs. 10 and 11)

The density of the remains is low, and some structures may correspond to houses –h–. We note one particularity: a large oval enclosure from 12 m long by 18 m wide, i.e. 216 m² –e1– evoking a corral or ancient housing. Apart from the north-south axis –s47– that runs along the slope from the west, few streets are visible in this sector. However, a clear line along the south north-northeast axis, rather irregular in its aspect and in its course, could be an indication of a kind of path (s38) joining the southwest –sector 2– and northeast –sector 4– blocks.

3.4. Sector 4: North and Northeast Sides (Figs. 12-14)

Here the remains are discontinuous. In the northern part, there are a few possible houses –h



FIG. 6. Sector 1 (Alto de Rodilla): Interpretation of the aerial photographs (DAO P. Brunello).

32-33–, curvilinear structures including a circle with a central point that we interpreted as circular houses –ch 76-78–, to which are added a few groups of pits –pi– and a probable fossil pond –po– (Fig. 12). To the south, there are a few scattered structures including a vast quadrangular enclosure from 27 m long by 28 m wide, i.e. 756 m² –e2– (Fig. 13).

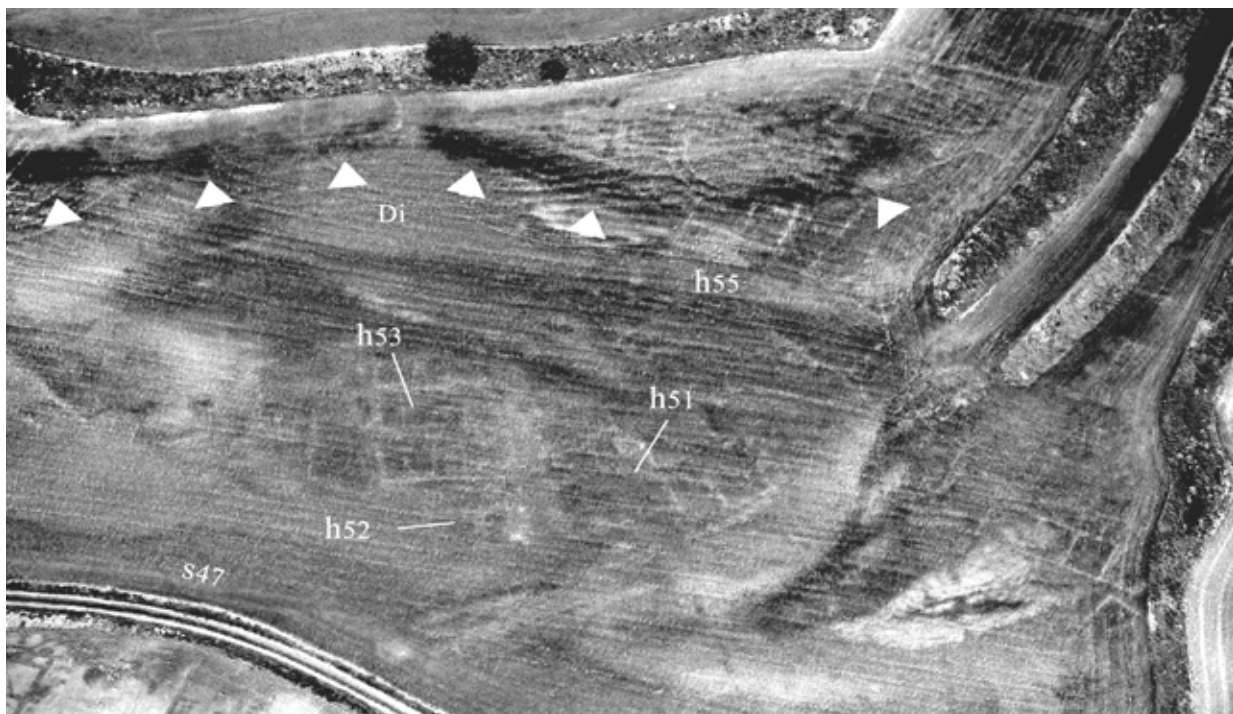


FIG. 7. *Western part of Sector 2: The visible remains seen from the west, with a ditch (di, arrows) covered by later buildings (h55).*

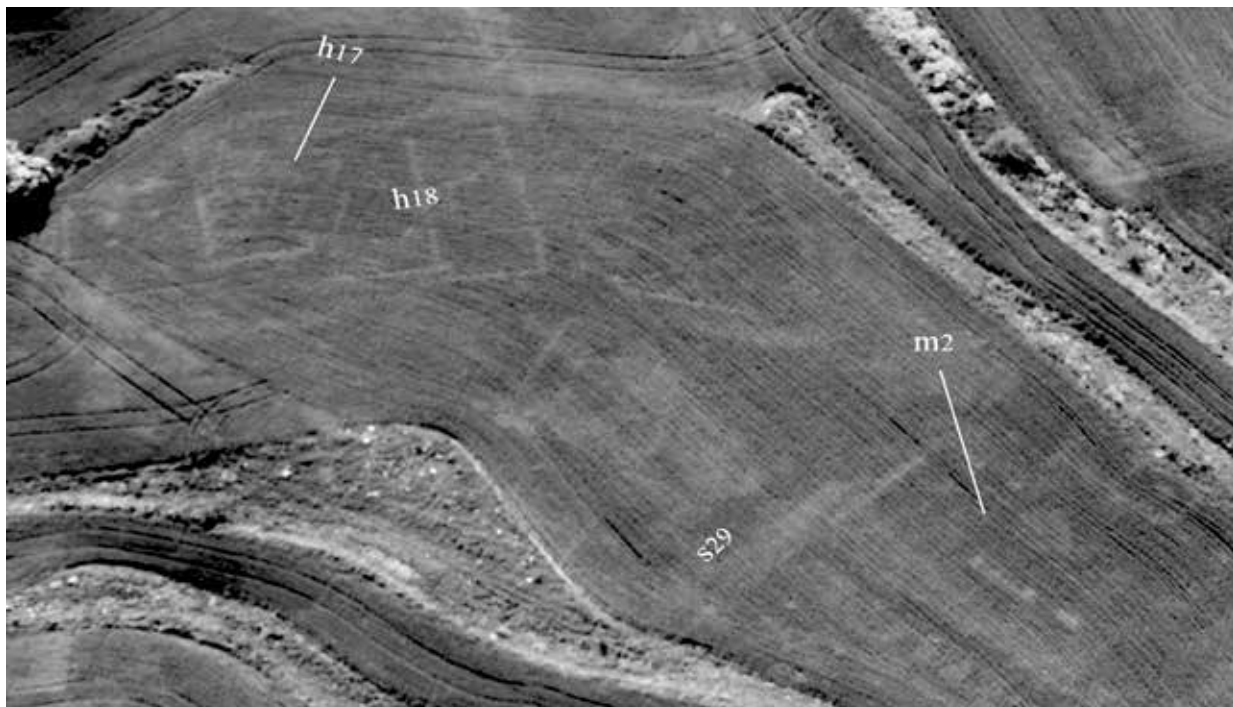


FIG. 8. *East part of Sector 2: The visible remains seen from the north-west: at the bottom right the possible forum (m2), and in the background a house (h17), covered by a probably later building oriented differently (h18).*

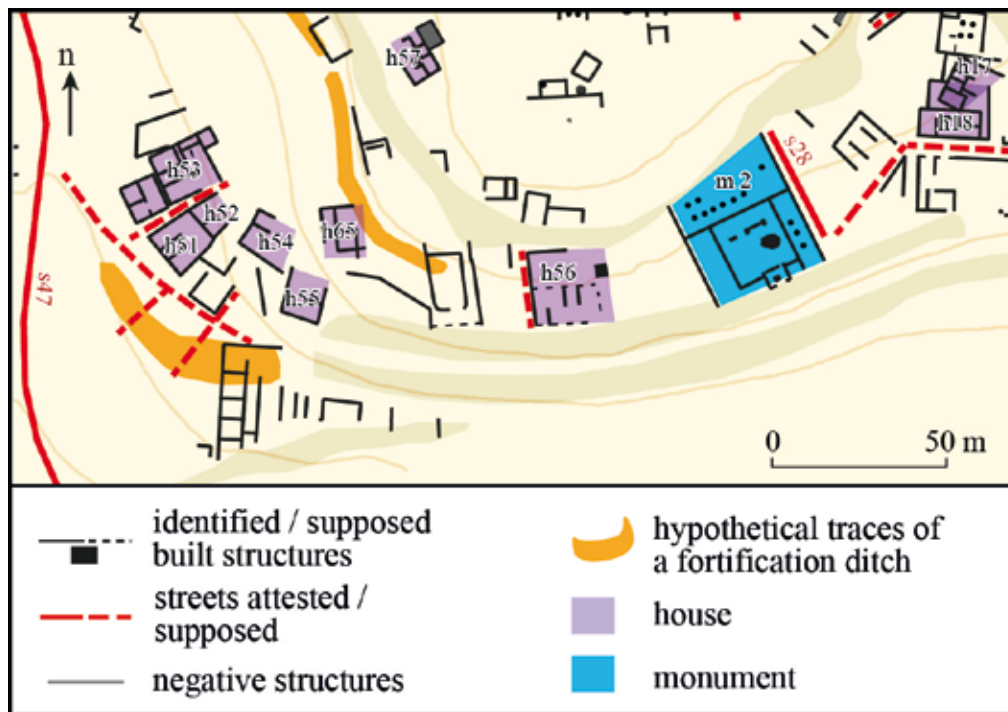


FIG. 9. Sector 2 (slope, south of the site): Interpretation of the aerial photographs (DAO P. Brunello).

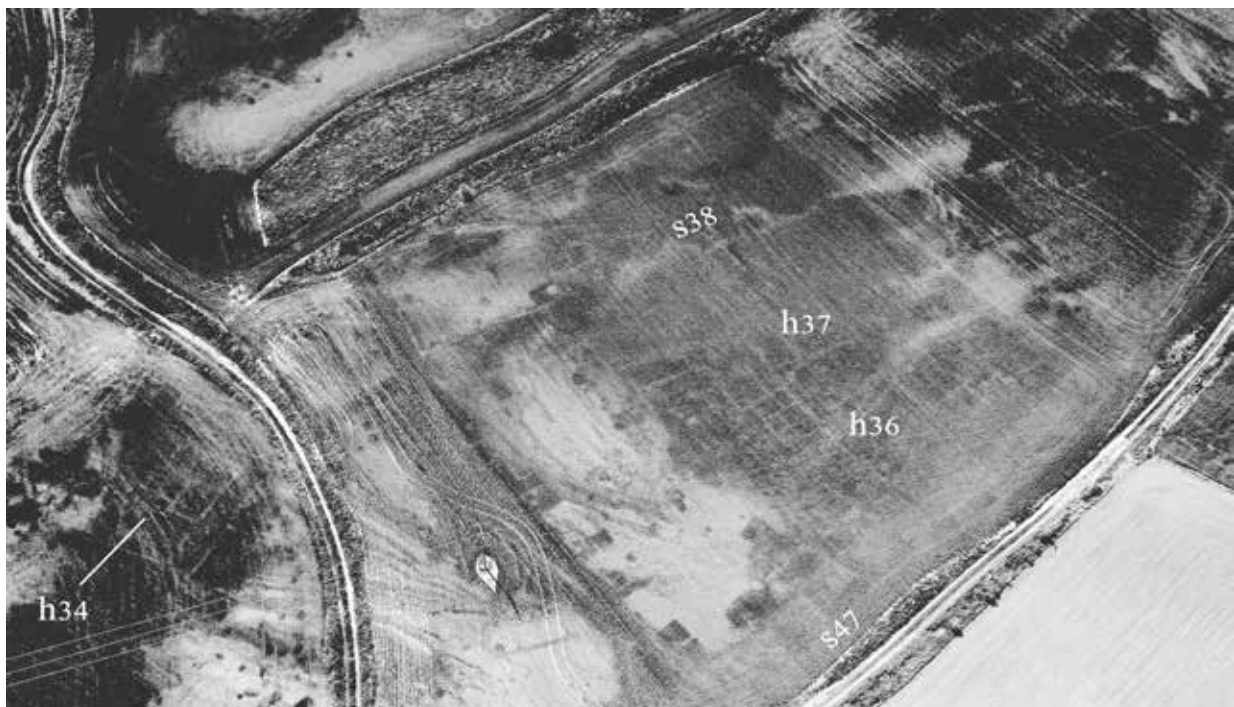


FIG. 10. Sector 3 (slope, western part of the site). Visible remains from the north, northern part: A discontinuous and little structured occupation.



FIG. 11. Sector 3 (slope, western part of the site). Interpretation of the aerial photographs. Note the low density of remains, especially in the south, and the large oval enclosure E1 (DAO P. Brunello).

The southern part forms an island in which three buildings with the same orientation can be clearly distinguished, two of which show signs of overlapping structures (Figs. 13-14). The largest –m3–, to the east, forms a rectangle 27 m long by 14 m wide, i.e. 375 m², and its eastern facade was reinforced, probably giving it a monumental character. It probably covers a longitudinal structure or at least seems to have been partly built on older elements. On the west side, there is a square unit of 185 m² with a centered plan evoking a domus –do24– which seems to cover an alignment of three or even four rooms oriented northeast/southeast forming a structure 22 m long by 3 m wide. To the south, we see a set of vast premises including a room under columns, which could be another domus –do31–.

3.5. Sector 5: Eastern Side (Figs. 15-16)

The well-exposed terrace sloping down to the south-east presents a particular organization of the remains (Fig. 15): here the density of the

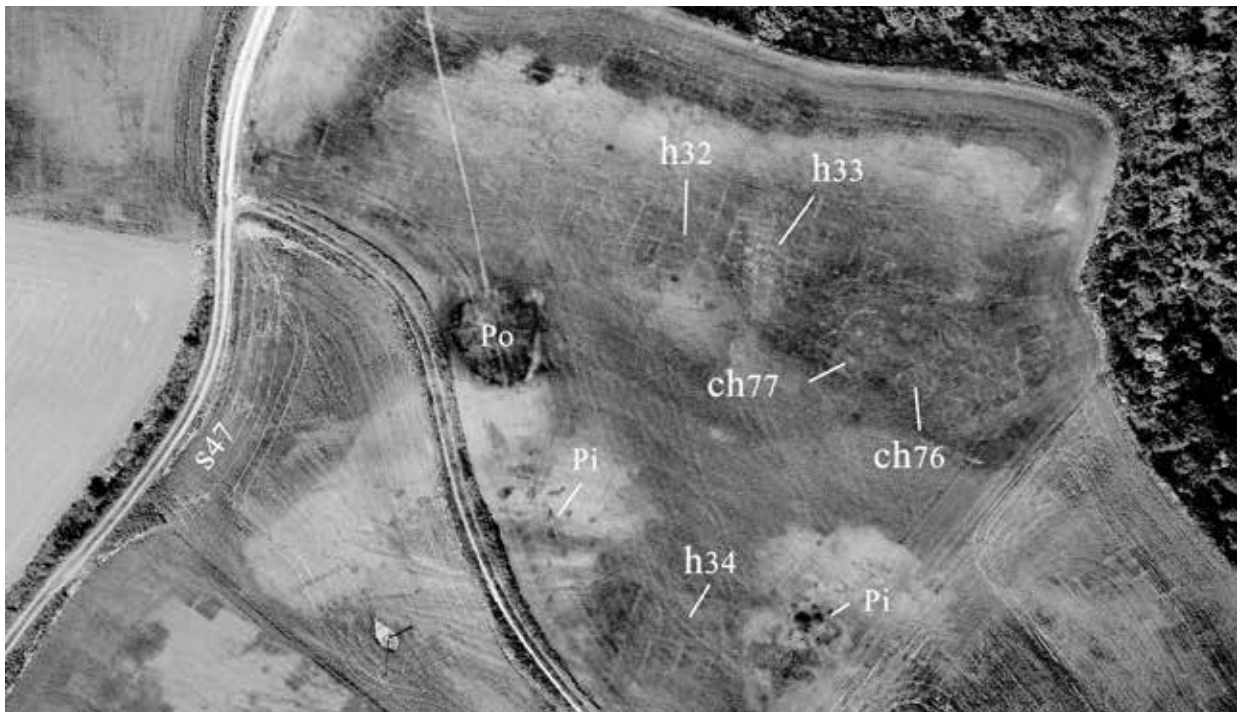


FIG. 12. Northern part of Sector 4: visible remains, seen from the northwest. Houses (h), circular houses (ch), unidentified buildings, a pond and groups of pits (pi).

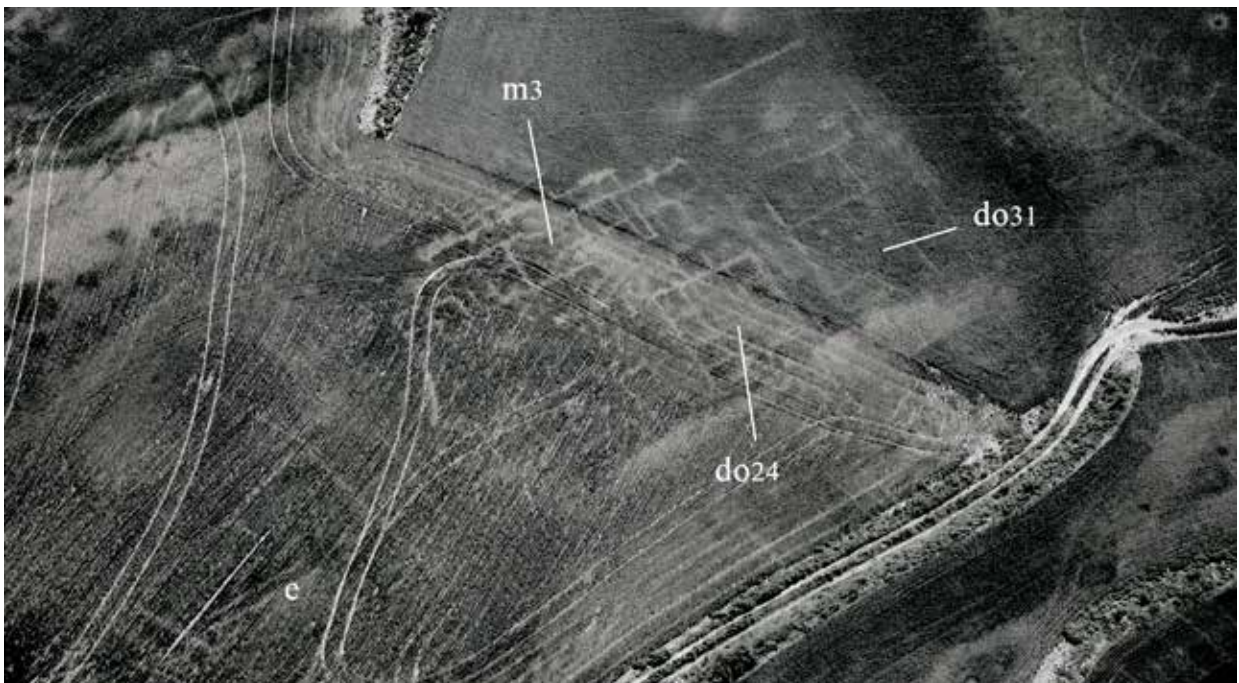


FIG. 13. Southern part of sector 4: visible remains, seen from the northwest. There is a large enclosure (e), two houses interpreted as a domus (do24 and do31) and a probable monument (m3).

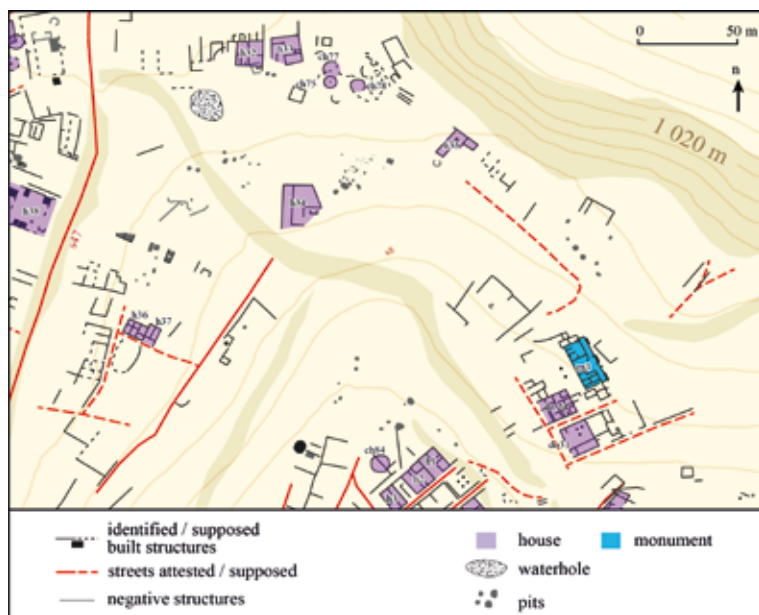


FIG. 14. Sector 4 (slope, north and northeast of the site). Interpretation of the aerial photographs. The remains are also discontinuous and of various natures. Two distinct areas can be distinguished, one to the north of the site (Fig. 12) and the other to the northeast of the site (Fig. 13) (DAO P. Brunello).

remains is high, the constructions are ordered along streets –s– which form an almost orthogonal network. This is probably housing –h–, with traditional constructions, to which are added in the northern part at least two buildings with an interior courtyard and columns which could be a *domus* –do14 and do15–. One of them had spaces that appear as clear shapes on aerial photographs, interpreted as masonry floors, which could be an indication of the existence of baths. It should be noted that the eastern part of the sector, which forms a hill, was apparently not occupied. Structures are unusually sparse between streets s26 and s27, as if an esplanade had been developed there later.

At the lower terrace to the south, quadrangular hollow structures appear to be cisterns or semi-buried rooms.

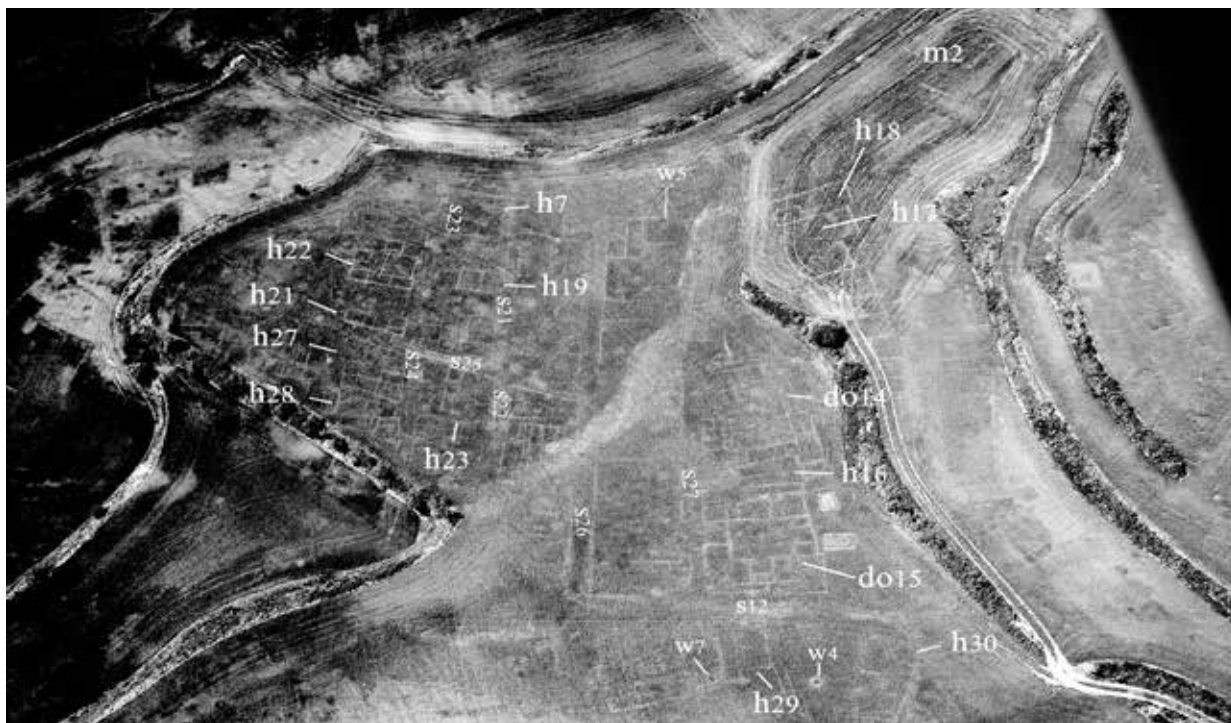


FIG. 15. Sector 5 (slope, east and southeast). Visible remains, seen from the north.



FIG. 16. Sector 5 (slope, east and southeast). Interpretation of the aerial photographs (DAO P. Brunello).

3.6. Sector 6: Northeast Outskirts, a place called El Carril (Figs. 17-19)

A roadway, sometimes visible from the air –s3– (Fig. 17 –s33–) and whose toponym El Carril keeps the memory, ran through the sector. It was an access to the city from the north. The plateau is occupied by sparse remains, where one can imagine a few traditional houses (h). There are some curvilinear structures interpreted as circular houses –ch– as in Sector 4 (Fig. 18). Some structures could be wells –w–.

3.7. Sector 7: Southern Ring Road, places called San Cristóbal and Fuentesanz (Figs. 20-22)

This vast sector to the south of the town presents contrasting aspects: in its northern part, in contact with the high point which forms the center of the settlement, vestiges can be observed on the ground

which are not visible from the air. The eastern border, however, is occupied by a suburb forming two islets (Fig. 20). The northern islet consists of some elongated southwest/northeast buildings, organized around a vast square courtyard –c1-c4–. The southern islet includes elongated buildings, with a slightly different orientation –south-southwest/north-northeast–, and large premises with internal colonnades, suitable for warehouses –wa1-wa4–. Unlike sector 5, the shape of the blocks and the buildings was dictated by the pre-existing layout of the paths –s4, s32 and s36–. There are two which converge from the ancient road that ran along the town, one arriving from the south and the other from the southwest. Curiously, they appear to have no pavement, as they form dark bands in the shots. The connection between them and the rest of the city is not apparent. Between these two paths, the survey has detected a large set of pits whose chronology and function remain to be determined (Fig. 21). The location of these pits along the access



FIG. 17. Sector 6: Access road from the valley seen from the south.

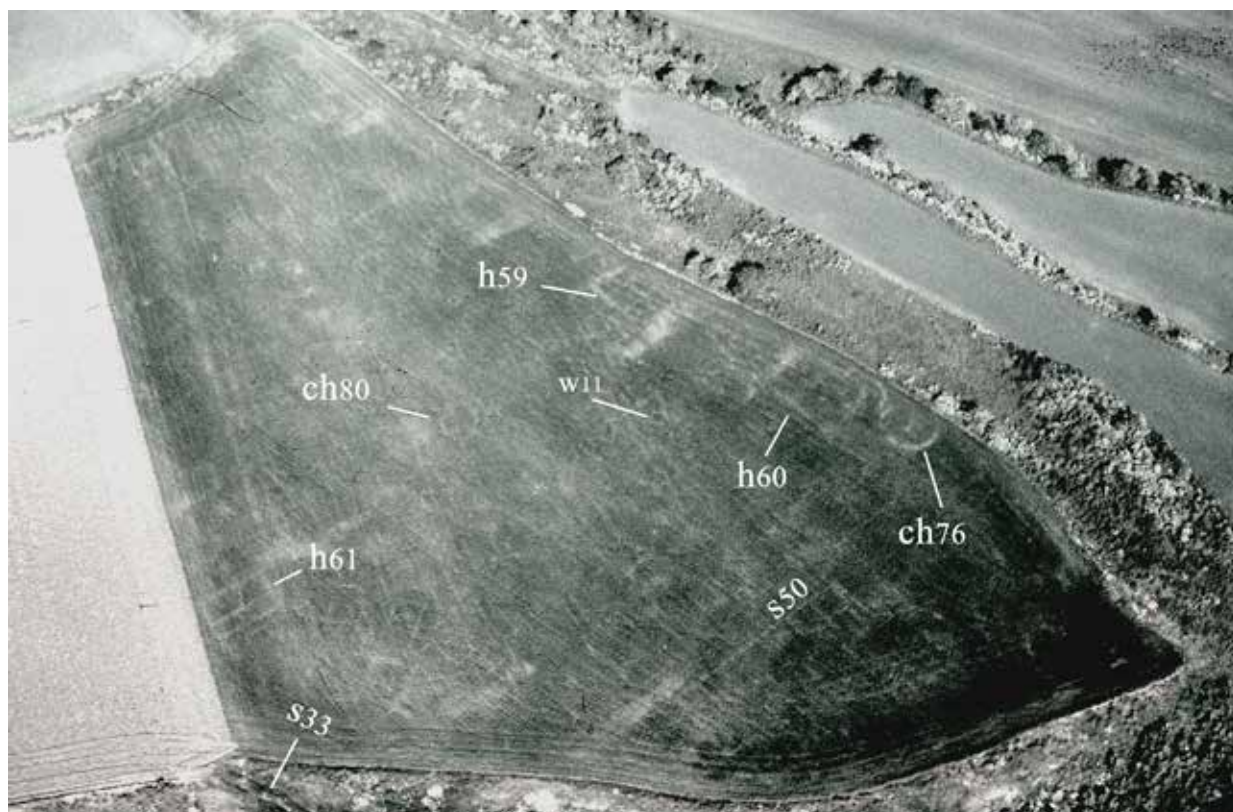


FIG. 18. Sector 6: Visible remains from the southeast, among which are circular houses (ch), quadrangular houses (h), a well (w).

roads to the city suggests a necropolis, but this is only a hypothesis that cannot be confirmed without excavations. The aerial survey indeed revealed, to the north of the road, a field of 238 pits –pi⁸ spread over approximately 7,000 m². The whole area seems to be crossed by a secondary path –s45–. The pits are distributed on both sides of this path without ever covering it. They appear as dark spots on the photographs. They are relatively homogeneous in their rather circular shape, but show great diversity in their dimensions –c. 0.60 m to 3 m in diameter–. Their distribution is quite uneven. There are concentrations of pits in some areas,

⁸ A similar field of pits was spotted on aerial photo in the valley below the town at c. 1,750 m. The location of these pits near the north access to the city also suggests a necropolis, but this is only a hypothesis that cannot be confirmed without excavations. Indeed, the ground survey did not provide any clues allowing a chronological or functional attribution.

while in others there are very few. There are some alignments, especially to the south of the path. The chronology of these pits has not been established, the ground control having collected some pottery from the protohistoric, Roman and medieval period. Finally, a large isolated building lies to the south of the sector, near Fuentesanz. Only a few elements organized around a large rectangular interior courtyard –c5– can be seen on aerial views (Fig. 21), but on the ground its imprint is strong. It is probably linked to the nearby road –s32–.

3.8. Sector 8: Southwestern Outskirts, a place called La Laguna (Figs. 21 and 23)

This small sector is almost devoid of remains, apart along the north/south road which crossed the town –s47–: there is a small building at the east interpreted as a house –h64– and a large quadrangular

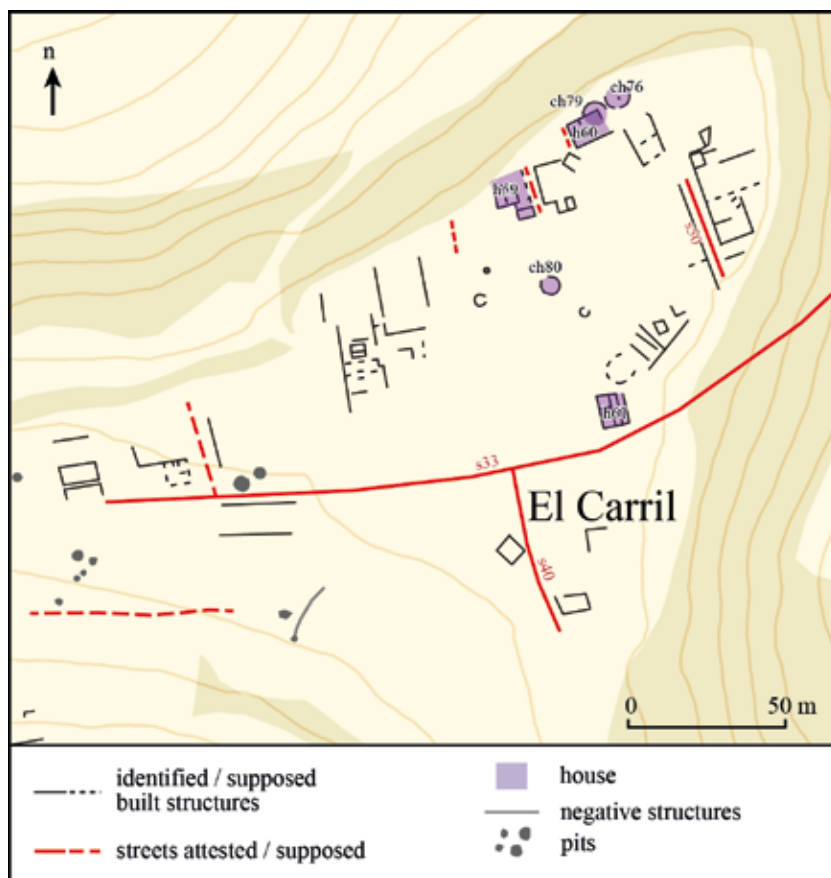


FIG. 19. Sector 6 (northeast outskirts, a place called El Carril): Interpretation of the aerial photographs (DAO P. Brunello).

building located to the west of the road –m5–, and whose function remains hypothetical –see below p. 132–. Another uncertainty concerns the depression forming a waterhole –pond– that gave the name of La Laguna to the southwestern part of the sector. On its northern bank, several pits –pi– can be seen, 6 of which form an alignment. They are surrounded by a curvilinear ditch –di–, whose function remains undetermined. Did the waterhole exist in Antiquity? Did it favor or discourage occupation? The documentation does not allow us to answer these questions yet.

3.9. Sector 9: western periphery (Figs. 24–28)

The western periphery of the town lies to the west of the road passing through the city –s47, still

in use today–. The sector corresponds to a flat area delimited by a steep slope on its west providing a view over the valley (Fig. 24 and 26). The western area in general has a rather dense distribution of features, although aerial photography alone does not show this. The area can be divided into two different regions: the southern part where streets perpendicular from S47 divide the area in blocks and the northern part, also known as El Portillón, with a more organic and spontaneous organization. We will treat these two areas subsequently in this section:

The southern part holds several islets divided by the perpendicular roads (Figs. 25 and 26). The most southern islet is occupied by a monumental building –m4– identified as a temple –see below p. 132– (Didierjean *et al.*, 2016: 333–336). The four other blocks that can be seen on this terrace seem to be devoted to housing –h–, in the

form of relatively spacious houses, with a building to the north provided with premises on the masonry floor (Fig. 25) which we propose to identify as a *domus* –do38–. In the vicinity, several negative quadrangular forms could be interpreted as cisterns or semi-buried rooms.

The northern part of the sector, called El Portillón, presents a very particular aspect (Figs. 27 and 28): here the constructions are scattered in a great apparent disorder of forms and organization, the paths –with pavements– form a dendritic network, as if they had been designed to serve some pre-existing dwellings –h–. There are several circular structures –ch 66, 68 and 70–, interpreted as circular houses. Three of these circular structures, measuring 8 m to 10 m in diameter, appear completely

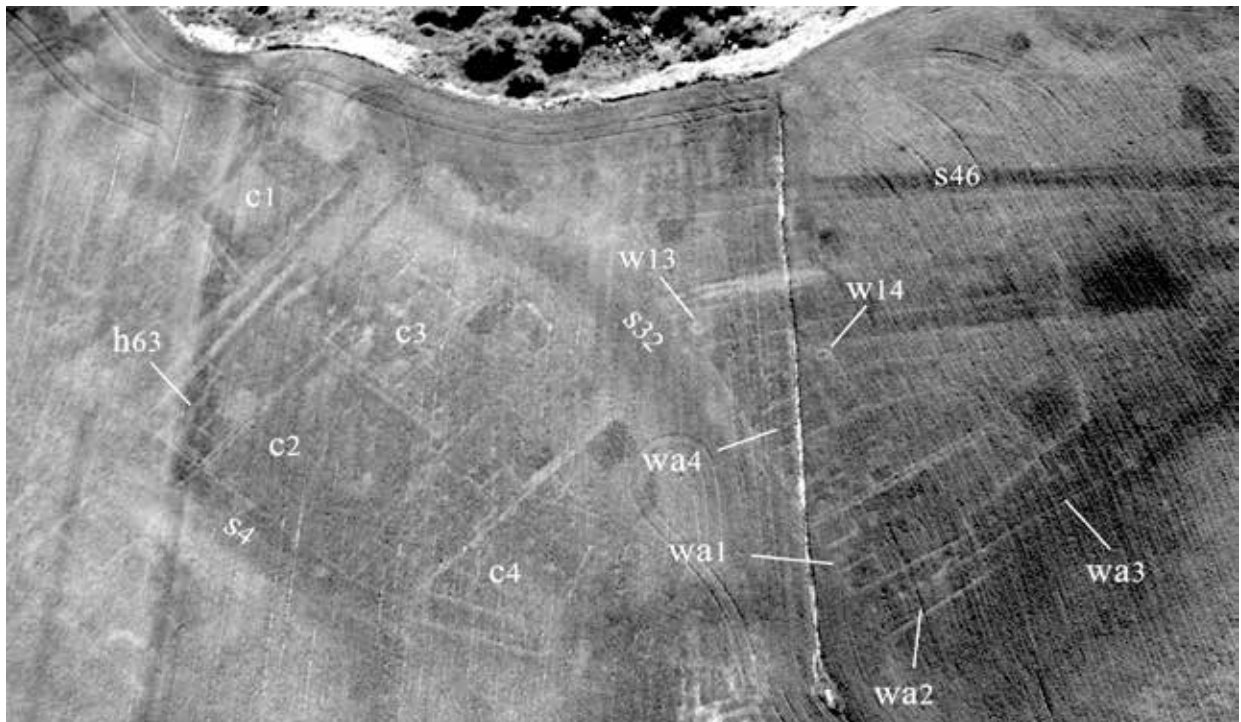


FIG. 20. Sector 7 (San Cristóbal). Visible remains, northern part. Two built blocks, seen from the west. The northern one (on the left) includes vast courtyards (c), the southern one (on the right), includes large elongated warehouses (wa) with two naves.



FIG. 21. Sector 7 (San Cristóbal and La Laguna). Visible remains, southern part, viewed from the south. In the center, a field of pits (pi) crossed by a road, and a large courtyard building (c5); on the left the pond (Laguna), with a ditch (di) and pits at its northern border. In the background the neighborhood of San Cristóbal with its accesses.

or partially superimposed with much larger quadrangular structures. Here again, this superimposition seems to mark two different states. Further to the northwest, on the same northern terrace, there are several circular structures which also appear intertwined. In the central part of the area, there are no built structures, but numerous pits –pi– on both sides of the main street.

4. Analysis of remains

4.1. Extension of the Urban Space

The traces of occupation revealed by aerial photographs cover an area of nearly 60 ha. They are distributed unevenly on a promontory which is almost a quadrilateral of about 1,000 m from north to south, 600 m from east to west. This promontory is bounded by steep slopes dominating two small steep-sided valleys to the east and west, to the north the valley leading to the Brujula Pass. To the south, it is attached by a narrow saddle to the Fresno de Rodilla plateau. This promontory does not have a flat area but is organized on several terraces. The observation of aerial photographs shows, as we have seen, a great discontinuity of structures which raises both the question of the limits of urban space and the discontinuity and diversity of occupation. Is it possible to limit the urban space? Is it

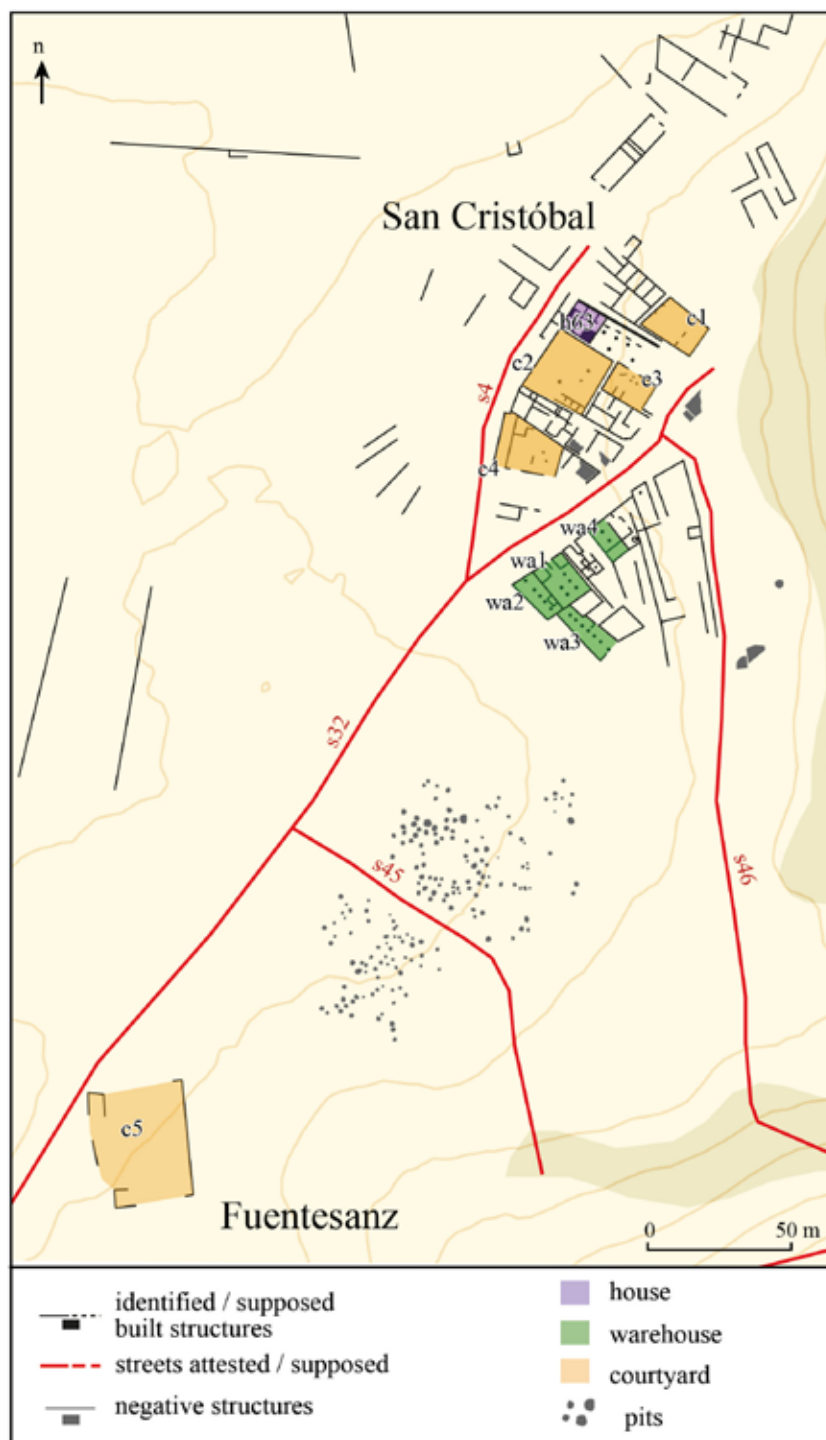


FIG. 22. Sector 7. Southern ring road, place called San Cristóbal. Interpretation of photographs. To the north, a district of large buildings apparently devoted to storage activities (c and wa). To the south, an important field of pits (p) (DAO P. Brunello).

possible to differentiate various categories of space within this urban plan? What are the differentiation criteria?

On the promontory, the density of the remains observed on the aerial photographs makes it possible to clearly distinguish three categories of space according to the density of their apparent remains (Fig. 3). We can initially distinguish continuously built-up spaces: the top platform of the Alto de Rodilla hill, the extension along terraces to the south

of this platform, the western edge of the promontory and the set of structures at the southeast of the promontory (San Cristóbal). There is then a second category of space where the building is discontinuous: the whole of the northern border of the promontory including its northwestern –El Portillón– and northeastern –El Carril– extremities, the eastern border of the promontory, and the southern part of the western rim –north of La Laguna–. Finally, some spaces are empty or almost empty: the

upper part of the western slope of the top, the hill to the east of the top platform, the majority of the southern part of the promontory with the exception of the sectors mentioned above.

This observation clearly opposes the northern part –sector 1-summit; sector 2-southern slope; sector 3-western terrace; sector 4-north and northeast side, sector 5-eastern side; sector 6-El Carril and sector 9-western periphery– and the southern part of the promontory –sector 7-San Cristóbal and sector 8-La Laguna–; it would seem to indicate that the heart of the urbanized space was located in the north, identified as intra-urban space, and that the south and its few residential blocks formed a peri-urban space. This difference suggests the idea of a physical demarcation between the two spaces, which raises the question of the existence of a town wall that would have separated them. In an ancient city, it is easy to distinguish the urban space itself from the peri-urban space by the presence of ditches and ramparts, by the location of the cemeteries and certain polluting activities

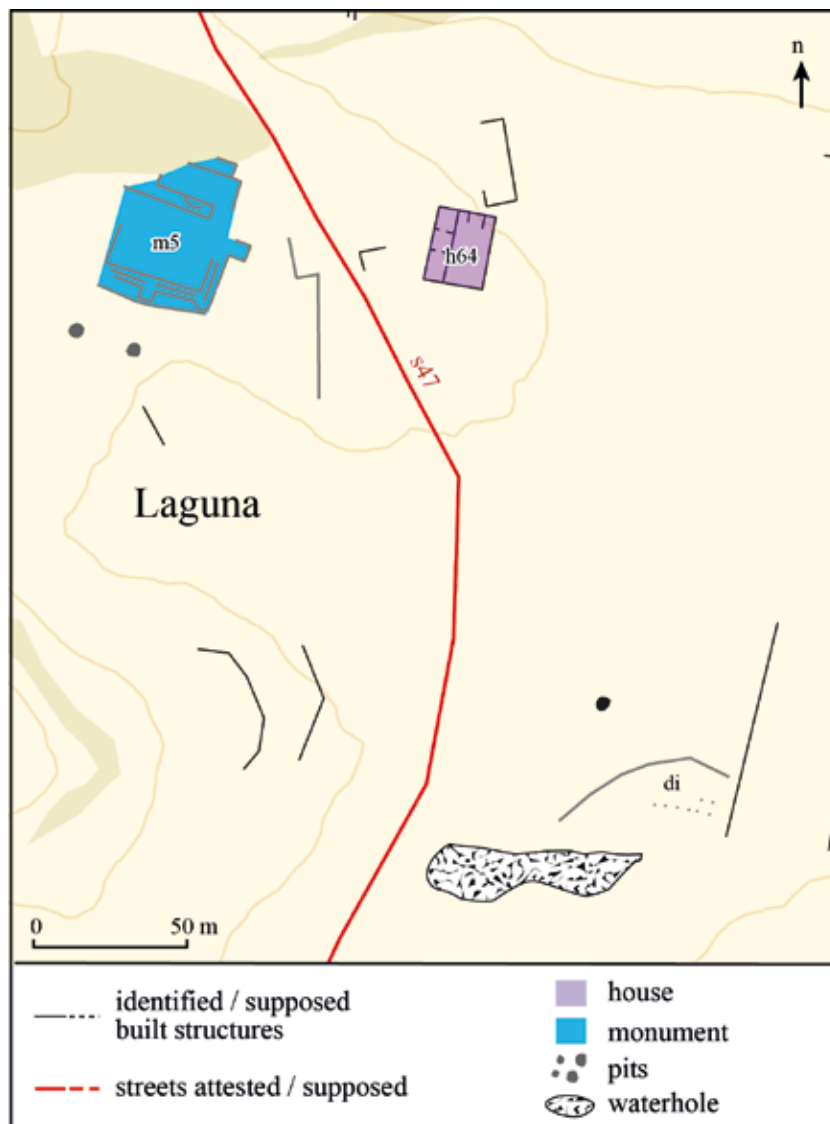


FIG. 23. Sector 8 (southern outskirts, a place called La Laguna). Interpretation of photographs (DAO P. Brunello).

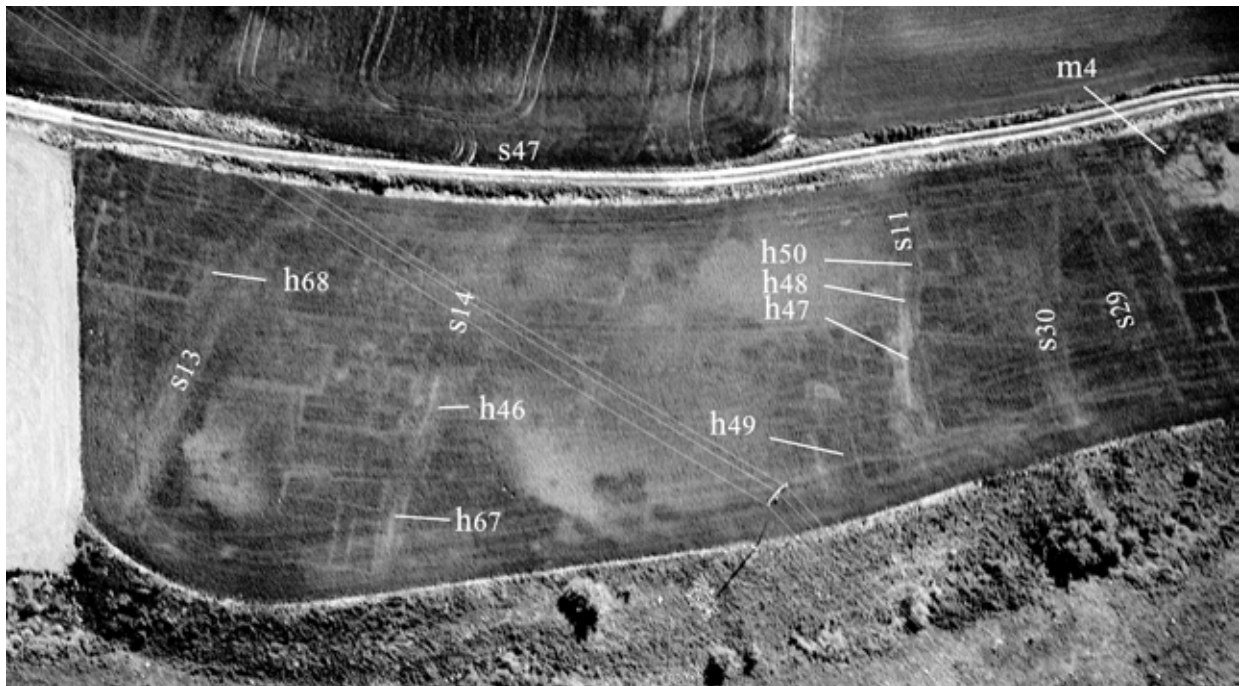


FIG. 24. Sector 9 (western outskirts). Visible remains from the west, southern part. With a temple (m4) on the south, and block of housing served by parallel streets connected to the north-south axis (s47).

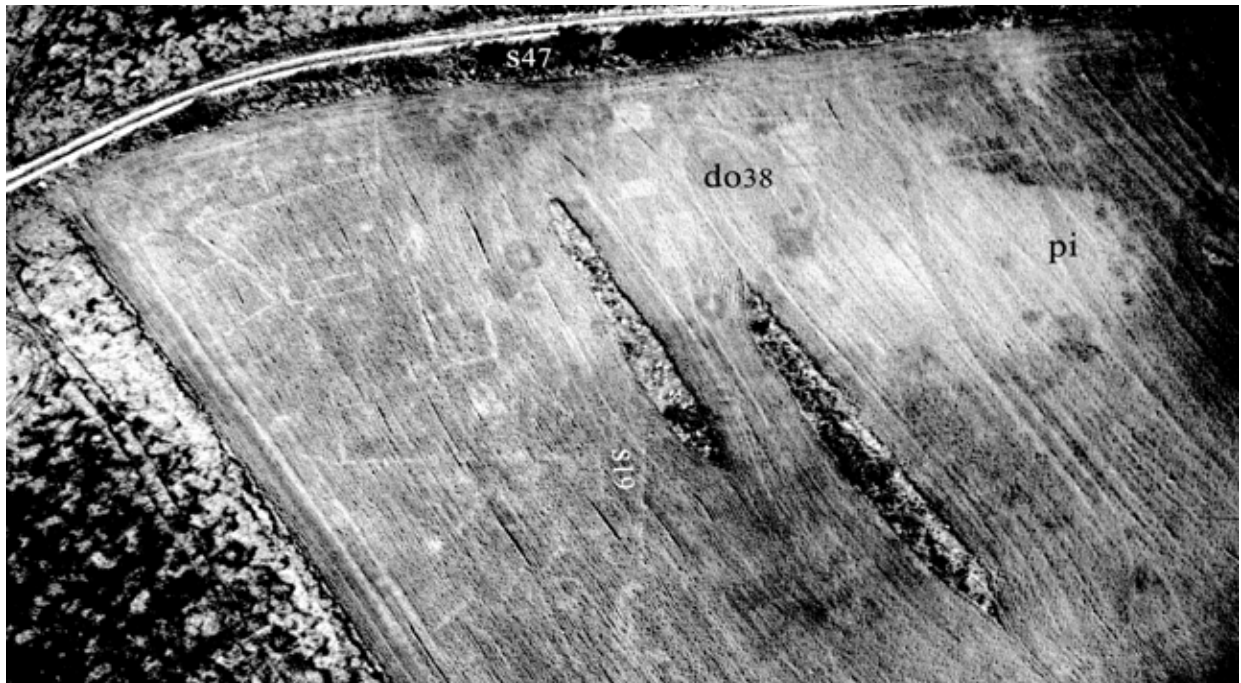


FIG. 25. Sector 9 (western outskirts). Visible remains from the west, center part. To the south of the promontory of El Portillón, we note a probable domus whose remains form large scree. Around it, we can see buildings with a disorganized structure as well as large hollow structures, possibly buried rooms or cisterns.

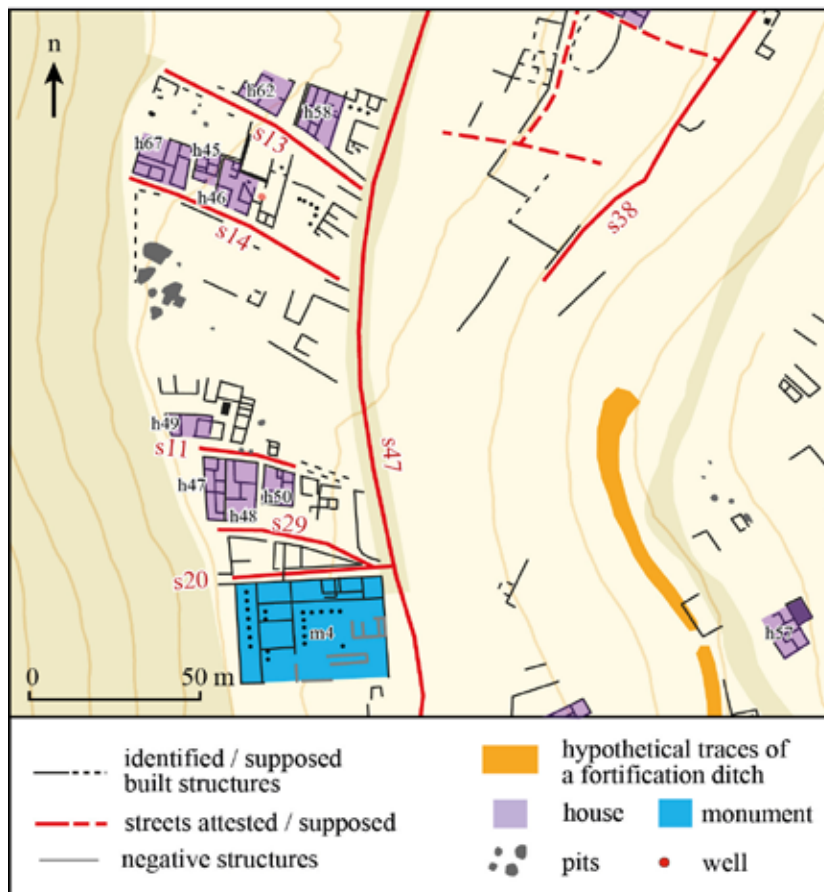


FIG. 26. Sector 9 (western outskirts: interpretation of photographs, southern part) (DAO P. Brunello).

including the refuse dumps. But in *Tritium*, there are no obvious traces of the existence of such places, neither on the ground nor on aerial photographs. This absence of information does not mean that they did not exist.

4.1.1. The Town Wall

Tritium being primarily a Celtiberian *oppidum*, like most of them it probably had a defensive system (Sacristán de Lama, 2011: 197). As mentioned above, the site is naturally defended by steep slopes on its north, west and east sides. The question of its defense arises essentially for the south side. At this location, the current observation does not reveal any obvious trace of a wall. This absence can

mean two things. Either the agglomeration did not have a built defensive system, or it existed but the traces of it have been erased⁹. The first hypothesis does not seem credible due to the importance of the *oppidum*. What could have been the chosen defense system then? Given what we know about the fortifications of the Celtiberian *oppida*, several solutions can be envisaged: either a wall, possibly doubled by a ditch, as for example at Valdeherrera, in Calatayud, Zaragoza (Sáenz and Martín Bueno, 2015), or a system combining a wall with overlapping terraces such as has been identified on the *oppidum* of Monte Bernorio, in Villarén, Pomar de Valdivia, prov. Palencia (Torres *et al.*, 2015: 57-82). The few clues examined previously in Sector 2 –see above, p. 5– could signal the presence of defensive ditches –di– that would have already been filled in Antiquity, as indicated by the presence of

buildings (Figs. 7 and 9) built in their footsteps¹⁰. This could be evidence of a fortified system specific to the top terrace, probably the primitive core of the agglomeration. It is indeed possible that the embankments that currently enclose it include elements of this initial defensive system; however, we observed on aerial photographs that the embankment sometimes covers ancient buildings, which

⁹ In the Vaccean area, most or all of the towns were equipped with a defensive system (Sacristán de Lama, 2011: 197).

¹⁰ Forget, C.: *De l'oppidum à la ville romaine. Étude du tissu urbain des villes du IIIe s. av. J.-C. au Ier s. ap. J.-C. en Gaule Celtique*. Mémoire de Master, presented in 2012 at the Univ. de Tours, p. 230. The rampart of *Numantia* was thus obliterated in places by the later extension of settlements (Jimeno, 2002: 52-54).

proves that it was reworked after Antiquity. Finally, let us add this observation: the probable presence of settlement structures prior to Roman domination on the northern and north-eastern promontories, which will be mentioned later –see below, p. 14–, would imply that from this period the agglomeration extended beyond the top platform, in poorly protected areas.

4.1.2. Cemetery

Two cemeteries (Figs. 21–22) have been discovered and partly excavated to the south of the promontory at a place called Fuentesanz (Abásolo *et al.*, 2004: 123–141). The first, dated to the Early Iron Age, occupies the spur pointing towards the south-east. The second, a little further north, is established on the crestline that follows the Roman road, and would seem to be from a later period according to the material collected –Second Iron Age?–. Both dominate the valley of Fuente Beza, the site where the only two funerary inscriptions from the Roman period were found and whose location is known, among the six published (Alonso, 1973: 214–217; Abásolo, 1982: 161–168; 2003–2004: 141–143). The presence of the pits field to the north of Fuentesanz in sector 7 should also be noted –see above, pp. 118–119–. In its current state, it cannot be said whether it is a protohistoric or ancient cemetery, or even a dump or storage pits of a medieval settlement. In view of these elements, the hypothesis of an ancient cemetery bordering the road that passes to the south of the city seems the most credible (Fig. 22).

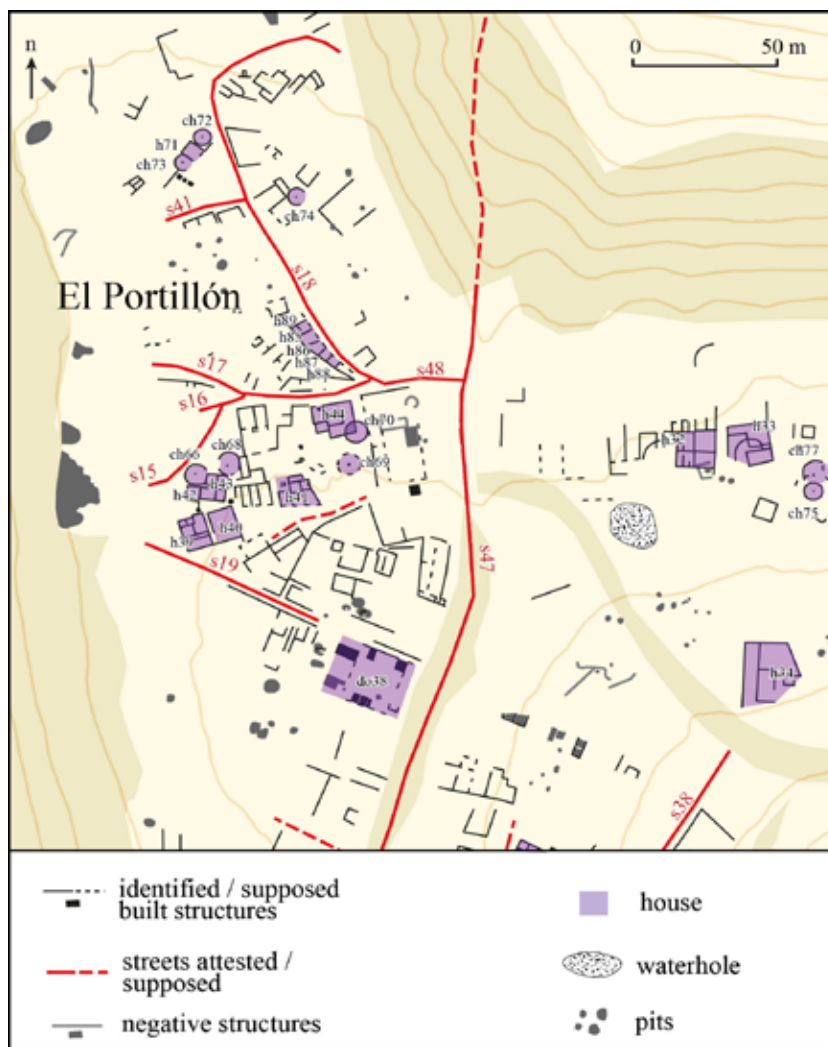


FIG. 27. Sector 9 (western outskirts, a place called El Portillón): visible remains from the north; the dispersion of the traditional houses served by a dendritic streets network, and the presence of several circular houses are noticeable (DAO P. Brunello).

4.1.3. The Dumping Ground

The location of the dumping ground is not known either. It is perhaps necessary to look for them at the foot of the steep slopes which surround the city where they have undoubtedly been covered by colluvium¹¹.

¹¹ Dumps are generally found outside cities, but smaller dumps can also exist in the intra-urban space (*cf.*

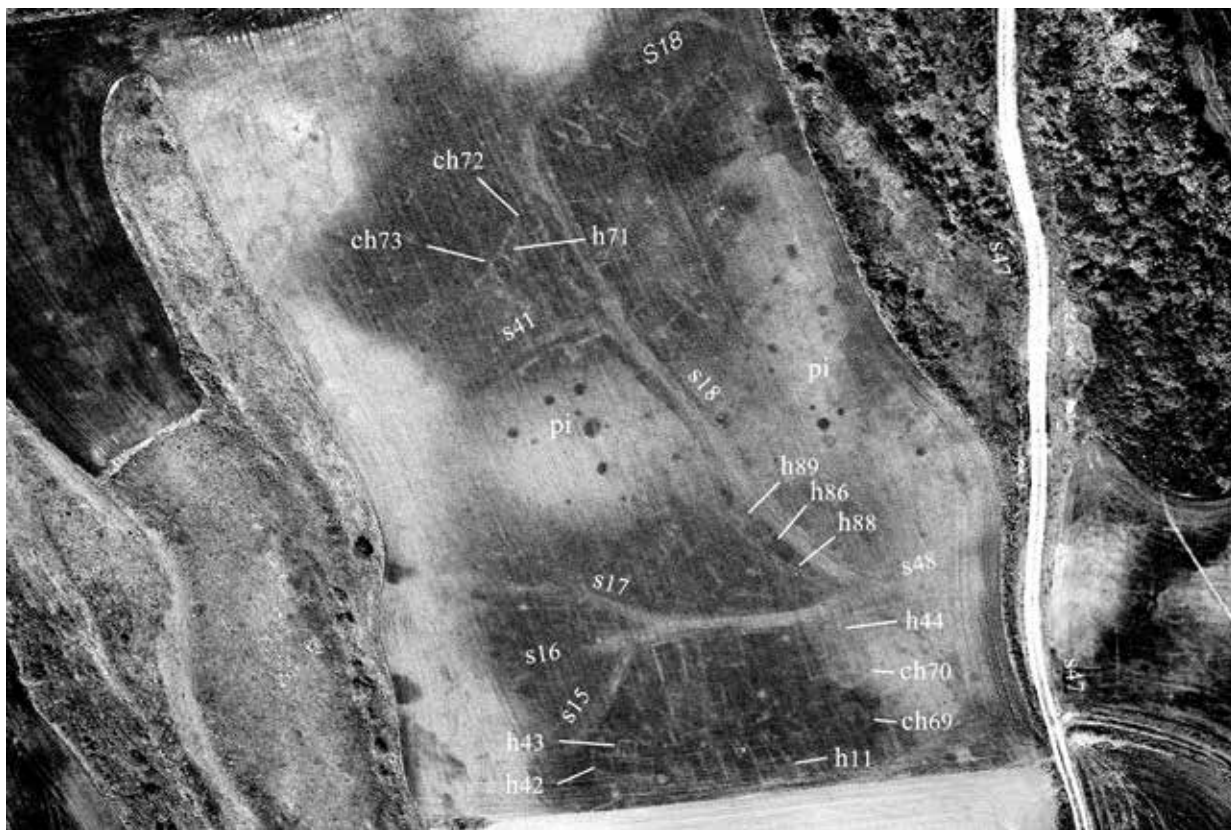


FIG. 28. Sector 9, western outskirts, a place called El Portillón; interpretation of photographs, central and northern part.

These elements make it possible to estimate the size of the city. Previous proposals for the area of the town ranged between 14 and 70 ha¹². The results of our analysis of the aerial photographs show that this city covered approximately 40 ha if we exclude the southern part of the promontory, and probably 45 ha if we take into account the southern suburbs of San Cristóbal and La Laguna. It was undoubtedly a great town for the Iberian Peninsula, although it did not have the size of large capitals as *Augusta Emerita* or *Tarraco*¹³.

Didierjean *et al.*, 1986; Duprè and Remolà, 2000; Arévalo *et al.*, 2016: 225-228).

¹² Houten (2021: 279) retains the visibly underestimated size of 14 ha; Carreras (2012: 76) generously advances 70 ha.

¹³ Carreras, 1996: 103-105; Montero, 1996: 74-75. Of the five categories of cities defined by Houten (2021:

4.2. The Organization of intra-urban Space

Inside the northern part which, based on our analysis, corresponds to the intra-urban space itself, the density of the visible vestiges, made possible by the observations on the ground, is very variable. Three categories of space have been distinguished depending on the density of their occupation (Figs. 3-4). This discontinuity of occupation at *Tritium* is not exceptional. Unbuilt intramural spaces are today a well-identified reality in several cities of the ancient world where they have been called para-urban spaces (Tréziny, 2012: 35). Probable factors explaining these variations could be first linked to natural conditions. At *Tritium*, the location of these spaces could be affected by slopes. The spatial

224-234), *Tritium* belongs to the second category, in decreasing order, between 40 to 80 ha; Mateos *et al.*, 2022.

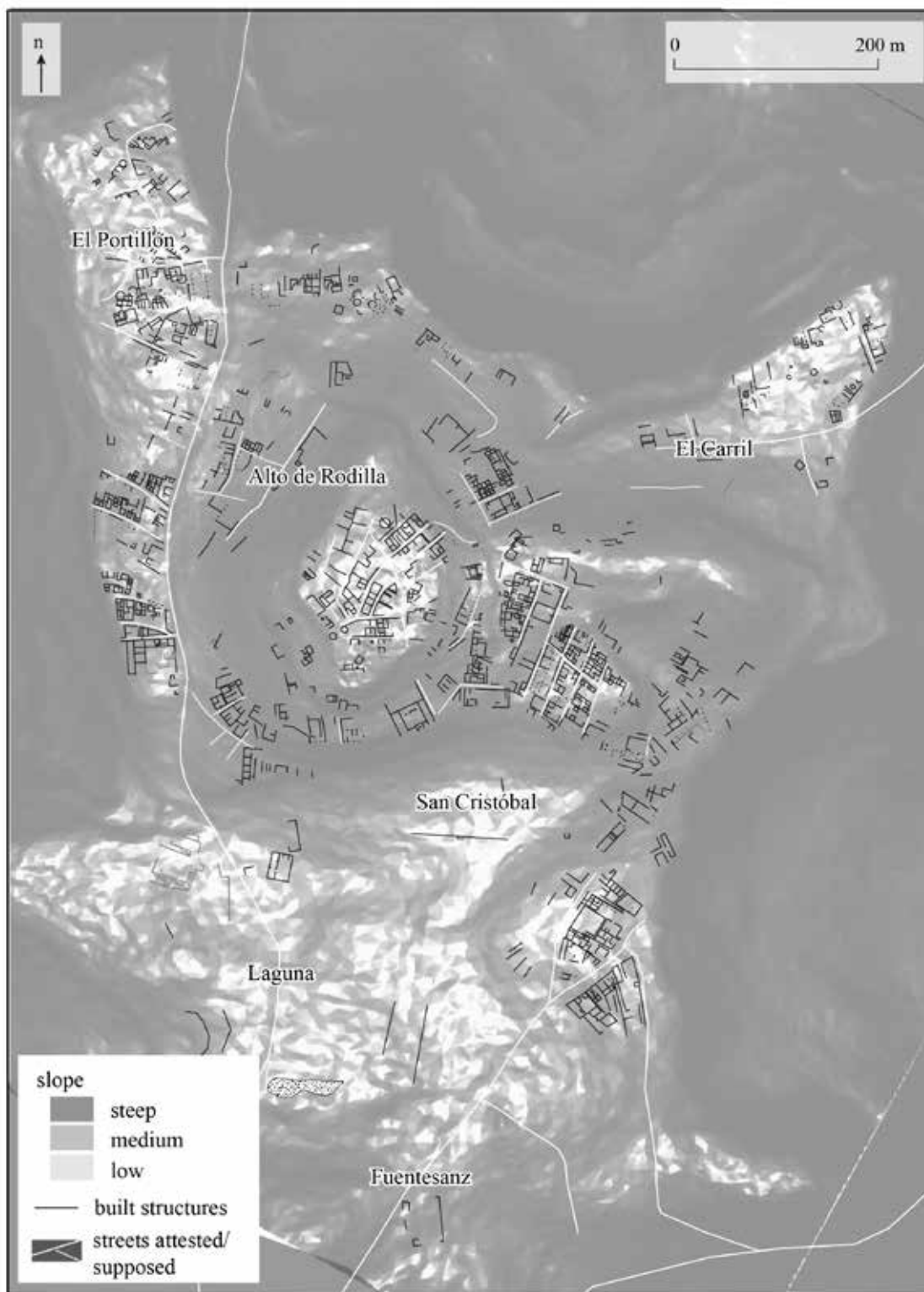


FIG. 29. Spatial analysis correlating the slopes and the distribution of the remains (DAO P. Brunello).

analysis carried out from the digital elevation model indeed shows that the remains visible from the air are concentrated on areas with low slopes such as in the top or on the west and south-east terraces (Fig. 29). Occupancy is not absent in sectors with a medium slope, for example on the better exposed south side, but disappears in sectors with a steeper slope. Low temperatures being a particularly acute problem on the site, exposure to the sun and wind could have been taken into account in the choice of occupation of certain sectors. We notice, in fact, that the southeast terrace, where the occupation seems particularly dense, is relatively sheltered from the prevailing cold winds from the northeast (Fig. 30) and exposed to the rising sun. This discontinuity of occupation was also observed in *Contributa Iulia*, although to a lesser degree: there are several gaps outside the walls. As in *Tritium*, the attractiveness of the roads leading out of the city could be observed. However, in *Contributa Iulia* the main locating factor is not the slope, but the proximity of a river (Mateos *et al.*, 2014: 124-126).

4.2.1. Road Network

Two aspects should be considered: first the connection of the city with the road network, and secondly the organization of intra-urban traffic. The town of *Tritium* was a stop on the main road linking *Tarraco* and *Asturica Augusta*¹⁴. It seems that the road did not cross the city but bypassed it to the south and probably also to the north (Figs. 3 and 31). In the first case, the road went up the Barberillo valley, followed the crest line of the Alto de Reinoso, and continued on the plateau to the Brújula pass. This bypass was connected to the city by two north-south accesses passing on either side of the place called Laguna. Of the first access to the east, only the archaeological traces visible on the aerial photographs remain (s32 and s46). To the west, the second is still a working rural road –s47–. For the northern bypass, it is necessary to assume a route passing at the foot of the slope dominating the valley leading

to the Brújula pass. This bypass was also connected to the town by two accesses. To the northeast of the settlement, the toponym El Carril preserves the memory of a first path –s33–, also clearly visible on aerial photographs (Figs. 17 and 19). To the north, at a place called El Portillón, the second possible access is still a working rural road s47. In the urban space itself, aerial photographs make it possible to identify as streets the regular linear spaces along which the constructions are arranged. Sometimes these streets appear as light bands which suggest the existence of a pavement. In other cases, it is a dark strip lined with buildings that signals the existence of a circulation space whose morphology remains to be determined. These streets form a network that presents a differentiated character whose topography often controls the organization, involving the absence of a central axis passing through the city center and a general regular organization at the scale of the site. It is, however, necessary to underline the existence of a north-south axis which joins both western accesses –La Laguna and El Portillón–. This axis passes at the foot of the western slope of the top, at the junction of this slope with the flat area which ends on the steep western slope. However, the roads have different organizations depending on the sector. On the top, the network of routes appears to be well adapted to the topography. Indeed, it does not have a regular grid but is organized around a triangular core taking up the general shape of the top. On this nucleus are grafted transverse paths parallel to each other. In addition, we note that the transverse paths are not in continuity with each other (Figs. 5-6) as observed in other places, which is explained by the search for a windbreak effect¹⁵. On the southeast terrace, on the contrary, we observe a relatively geometric network of five parallel streets of regular spacing –c. 21 m–, intersected obliquely by a transverse street (Figs. 15-16). Here, too, the streets seem to have a slight misalignment at the intersections. This regularity of the network seems to indicate that it predates the establishment of the buildings that line the

¹⁴ *It. Ant.* 450.1.

¹⁵ For example, in *Numantia*, in the southern part (Jimeno *et al.*, 2002: 51).

streets and could indicate a form of urban planning. On the west terrace, roughly parallel and slightly curved east-west, cross-roads are grafted onto the north-south axis connecting both north and south accesses to the city (Figs. 24 and 26). On this same terrace, but further north, on the promontory of the place called El Portillón, the organization is very different: the roads form a branching path serving each dwelling by a dedicated path with a roadway (Figs. 27-28). The road network here was built in relation to the existing dwellings. In the peripheral sector of San Cristóbal, the buildings are integrated into a network of access roads to the main road, with no visible connection with the nearby town. These paths are very wide here. One of them –s32– presents a dark linear outline bordered by two light bands that we interpret as sidewalks (Fig. 20). In the sector of El Carril, the aerial photographs make it possible to clearly observe the penetration into the city of the access road but do not show its insertion in the urban network (Figs. 17 and 19). This street network therefore presents two characteristics at the scale of the site: first, it is heterogeneous, with different forms depending on the sectors, and even within them; secondly, it is incomplete, in particular for the north and east sides of the city where it is not possible to connect the buildings observed to a possible network. The current state of the documentation does not make it possible to know whether it existed or not. The heterogeneity could be explained by the difference in urban design: to use the notions described by Bedon *et al.* (1988: 15), in some cases, e.g. at the top of the town or in El Portillón, it could be ‘spontaneous’ urban planning; for other spaces, such as on the southeast and west terraces, a ‘programmatic’ urbanism could be at work.

4.2.2. Water Supply

Rainfall, based on current data from the Burgos station, is low –currently 546 mm at Burgos airport–, with an autumn maximum and a summer

minimum (Fig. 30)¹⁶. The site does not currently have any superficial supply apart from two small depression ponds, one of which is located to the south of the site at a place called La Laguna (Fig. 21) and on the other in the north of the town (Figs. 12 and 14). This probably corresponds to the outcrop of a water table. Around 1970 the site had four springs –which no longer exist– providing a water supply that was probably not very abundant but relatively regular. According to J. M.^a Alonso Pascual, this was probably not enough for the needs of the town, which had adopted a conduct that he has observed in various places. Unfortunately, he did not precisely locate these remains and no trace of them can currently be found (Alonso, 1973: 219). The site’s water supply also had to be provided, either by wells or cisterns. Certain structures observed on the aerial photographs support this: in some cases, they are small dark circular spots surrounded by a light ring (Figs. 5 and 15), whose dimensions vary between 1 and 2 m in diameter and which have been interpreted as the trace of a well –w–. In other cases, aerial photographs show dark quadrangular spots (Figs. 7, 10 and 15) which could correspond to cisterns as observed in other places –*Uxama* and *Clunia*–. However, they could also be pits or basements¹⁷. Every Roman town was equipped with baths, but none of the structures observed in *Tritium* seem to indicate the presence of baths in the town.

Within this general organization, the aerial photographs make it possible to differentiate spaces according to their possible function: some were provided with monumental equipment, suggesting civic and religious activities, others were housing

¹⁶ We have based ourselves on the current climatic data: <http://www.aemet.es/es/serviciosclimaticos/datosclimatologicos/valoresclimatologicos?l=2331&k=cle> (average data for the period 1981-2010; accessed 2019/12/10). However, the climate may have changed since Antiquity: we have no data for this region.

¹⁷ In *Numantia*, many houses had a well or a cistern in the courtyard in Roman Age, and a basement was the rule in houses of the Celtiberian tradition (Jimeno *et al.*, 2002: 57, 95 and 111).

Current precipitation, temperature and wind direction near *Tritium Autrignonum*

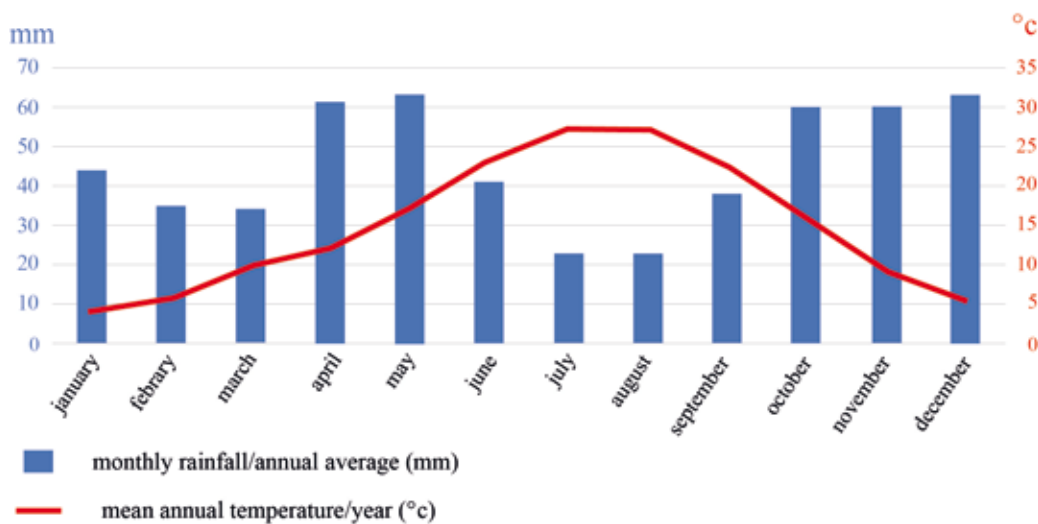
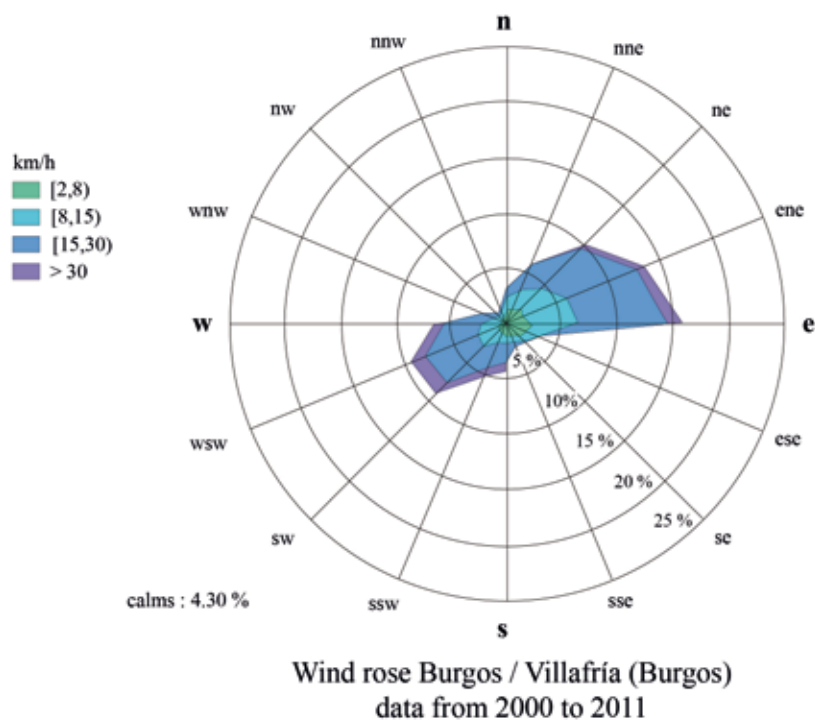


FIG. 30. Current precipitation, temperatures and wind near Tritium Autrignonum (AEMet station Burgos-Villafría, 1981-2010).

areas, and finally some were probably dedicated to economic activities.

4.3. The Monuments

Based on our observations, five monumental buildings stand out: on the top, on the western terrace, on one of the southern terraces, and on the southwestern periphery. Four of these monuments have already been the subject of a publication, the substance of which is reproduced here (Didierjean *et al.*, 2016: 327-343). They seem to occupy a rather small place in relation to the size of the city. There are probably other structures that correspond to monumental architecture, but the documentation does not allow us to identify them as such at the present time:

- On the highest point of the site, a monument –m1– with two large pillars is partially visible (Figs. 5 and 6). It could be a temple. If this is the case, comparisons should probably be sought in the local preroman tradition of Celtiberian culture, but the current state of our knowledge has not allowed us to find convincing parallels (Didierjean *et al.*, 2016: 331-333, fig. 8).
- On the southern terrace, a quadrangular complex of about 1600 m² –m2– formed by several buildings with internal colonnades, and a central area where various small built structures can be distinguished that could correspond to the bases of statues or inscriptions (Figs. 6, 8 and 9). The suggested identification is that of a small forum with an adjacent basilica¹⁸.

¹⁸ Didierjean *et al.*, 2016: 336-339, figs. 16-17. The *aedicula* of the possible *forum* would be positioned in the same way as the temples of the *forum* of *Segobriga* (Cebrián,

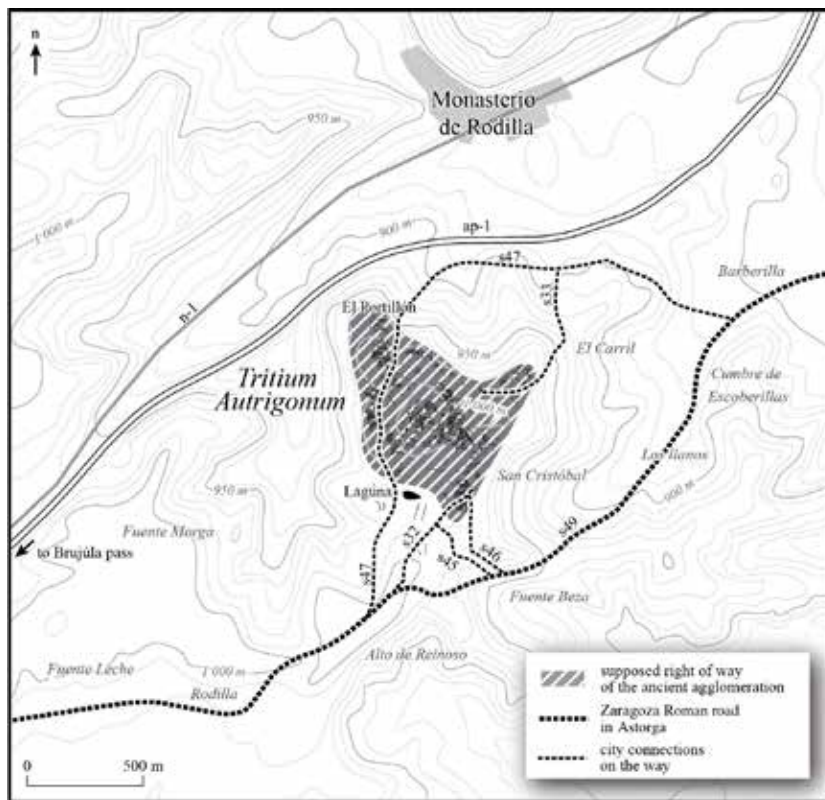


FIG. 31. Map of access roads to the city (DAO P. Brunello).

- A monumental building –m3–, is visible in the sector 4 (Figs. 13 and 14). It is a large quadrangular building of 27 × 13 m, covering about 340 m², with many rooms and three big massifs on its eastern façade. Its monumental character is not in doubt, but we are not in a position to propose a function for it.
- On the western terrace, in a dominant position, the aerial photographs revealed a vast quadrangular building of 1500 m² –m4– decorated with a colonnade on the façade and an internal colonnade surrounding a rectangular building (Figs. 24 and 26). The building is provided with several annexes. This plan is characteristic of a temple (Didierjean *et al.*, 2016: 333-336, figs. 11-12).

2021: 381-382) and Torreparedones (Morena *et al.*, 2011: 151-154).

- On the southwestern outskirts of the city, along the north-south road that crosses it, a group of negative structures form a vast quadrilateral measuring 45×140 m –m5–. The large central courtyard of this building is bordered by various annexes. The entrance is clearly visible to the south (Fig. 23). It may have been a *mansio* or a simple private inn (Didierjean *et al.*, 2016: 340-341, figs. 19-20).

4.4. The Dwelling Areas

For want of excavations, the identification of dwelling areas in the city of *Tritium* from aerial photographs alone remains uncertain. The analysis is all the more complex since the superimposition of different states clearly visible on several photographs

complicates the interpretation (Fig. 8, sector 2 h18 and h17; and Fig. 13). It is nevertheless possible to distinguish numerous relatively coherent complexes, whose plans vary between a circle, a square and a rectangle, over very heterogeneous areas, comprising a very variable number of rooms, which seem to correspond well to housing. Observation allows us to group these structures into seven categories, from the simplest to the most complex (Figs. 32 and 33). With a few exceptions, which will be considered separately, they are not Greco-Roman type habitats.

4.4.1. Pre-roman Traditional Habitat

In the northern part of the site, from El Portillón to El Carril and even on the top, there is a scattering of numerous circular structures with diameters

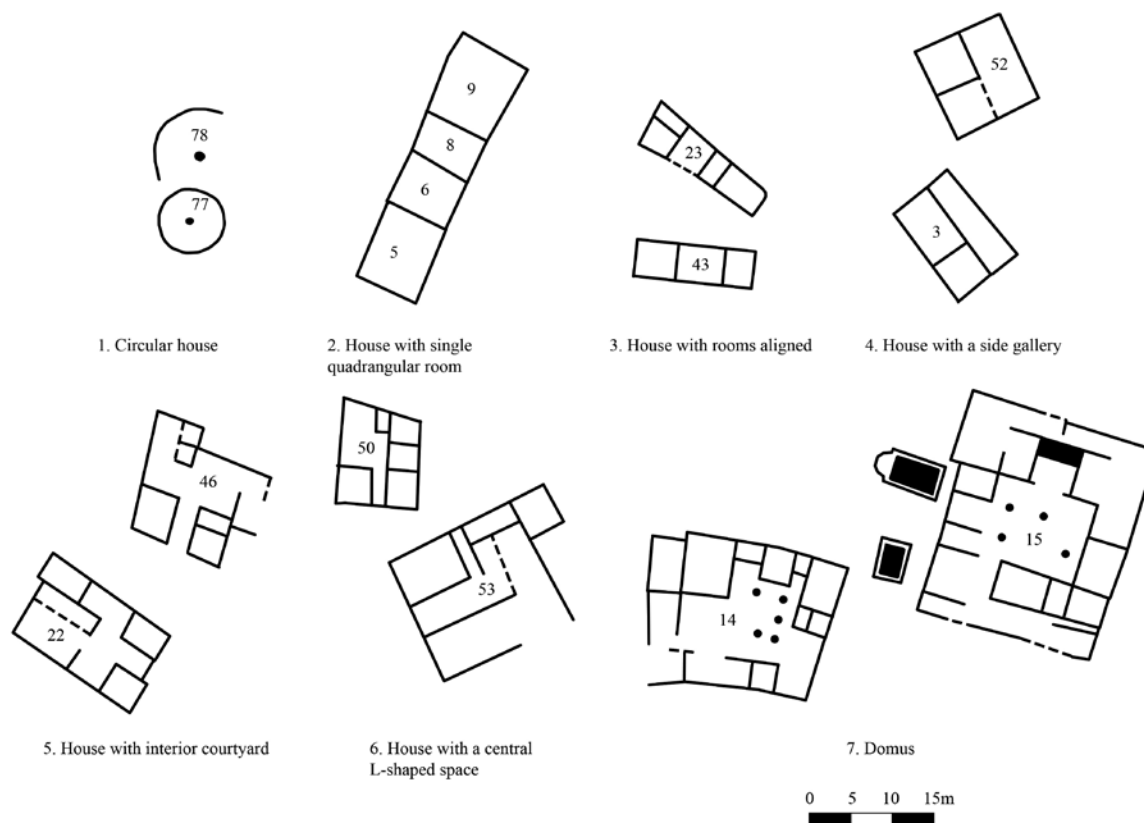


FIG. 32. *Typology of houses.*

ranging from 6 to 8 m, often with a central point, with the clues appearing clearly on the ripening grain. They constitute Type 1 habitats. They are probably circular houses with a central post, characteristic of the Early Iron Age in the region, as described at the Vaccean site of Las Cuestas, ancient *Dessobriga*¹⁹. In *Tritium*, the identification is reinforced by the presence of the chronologically corresponding cemetery mentioned above. Were these houses still functional in Roman Age? Their traces are tenuous, and there are several cases of superimposition with quadrangular structures, which were probably built later. This would indeed indicate their anteriority. However, it has been observed on several sites in the Vaccean area, a little further south of *Tritium*, that circular and rectangular houses coexisted during the Second Iron Age. On other sites, aerial surveys have revealed both types, although it is not possible to deduce a relative chronology²⁰. At *Tritium*, their distribution mainly on the northern periphery of the city could indicate a survival of ancient forms of habitat for populations of humble condition. If this is not the case, the Early Iron Age settlement must have been of considerable importance. The following types of dwellings seem to be related to the Celtiberian tradition: Type 2 is a single quadrangular room (Fig. 32, n.º 6); elsewhere, several rooms are associated and aligned, forming Type 3 habitats (e.g., n.ºs 23 and 43); these aligned rooms are sometimes flanked by a space resembling a side gallery –Type 4, e.g., n.º 3–. For some buildings, the architectural organization seems to indicate the existence of an entrance and an interior courtyard around which the rooms are distributed –Type 5–. Several of these ensembles have a vestibule flanked by two symmetrical rooms, which does not necessarily open onto a roadway, and which commands

a space with one or more rooms (e.g., n.º 46)²¹. Some of them have a central L-shaped space which could be a courtyard –Type 6, e.g., n.ºs 50 or 53–. Although we have no chronological data, the vast majority of these houses are similar to examples of pre-Roman domestic architecture²². Either these settlements predate the conquest or –more likely– they were built later and reflect the permanence of the pre-Roman domestic architectural tradition. An indication of this permanence could be the rarity on the site of the remains of *tegulae* and *imbrices*, which would indicate the permanence of thatched roofs. However, this rarity remains to be quantified precisely by intensive field survey. Although there is a lack of comparative data from the too few sites excavated in their entirety, certain comparisons can be made, notably with *Numantia*, where the houses of the Roman period retain the traditional organization, but with larger and more complex spaces. Certain types of houses observed at *Tritium* can be found in *Numantia*, notably Types 3, 5 and 6 at *Tritium*. The maintenance of vegetal coverings has also been observed in *Numantia*. In the same way, certain houses excavated at *Iuliobriga* are similar to Types 3 and 4 at *Tritium* (Iglesias, 2001: 113).

4.4.2. Traditional Roman Dwellings

Three constructions clearly stand out because of their characteristics, which bring them closer to the Roman domus –Type 7–. They are essentially relatively large buildings, organized around a central courtyard, two of them with a colonnade, and equipped with rooms with floors, probably masonry,

²¹ A similar –but not identical– arrangement has been observed at Azaila: a vestibule is sometimes found flanked on one side by two or four twin rooms (Beltrán Lloris, 1976: 136-137, Casa 6G).

²² On the house among the Vacceans, see Blanco, 2016: 43-84. Gros, 2001, and Uribe, 2015, consider only the classical forms of Roman housing. To our knowledge, there is no comprehensive study of ‘local tradition’ housing in the Roman period in the Hispanic area. But we can rely on the few examples of sites excavated in their entirety, mainly *Numantia* (Jimeno, 2002) and Azaila (Beltrán Lloris, 1976: 136-137).

¹⁹ Misiego *et al.*, 2003: 31-91; Delibes *et al.*, 2011: 49-94; Torrión, 2018: 39-41. The occupation here also extended beyond the fortified site, forming a real village below with streets with pavements serving the houses.

²⁰ E.g., sites of Soto de Medinilla, *Pintia*, Melgar de Abajo (Heredero, 1993: 300). For aerial survey: sites of Mota del Marqués, Torrelobatón, Valoria La Buena (Olmo and San Miguel, 1993: 528).

which could testify to the presence of mosaic floors or masonry hypocausts. The first two examples are located on the south-east terrace, which offers the most favorable exposure. The first set (Fig. 33, do15) measures nearly 32 m from east to west and 25 m from north to south and covers an area of about 850 m². The central courtyard measures 120 m². There are traces of four column bases. Around this courtyard at least twelve rooms can be distinguished, but their number was certainly higher. Three of these rooms have masonry floors. The first of these floors occupies the bottom of the large central room in the north wing of the courtyard. The second floor covers the whole of a room of 30 m² with an exedra and located to the west of this complex. A third masonry room appears to the south of the first. The second example (Fig. 33, do14), located to the south of the previous one, is of more modest size. It is a complex measuring 24 m from east to west and 18 m from north to south and covering an area of approximately 375 m². The space is organized around a central courtyard in which the traces of at least five column bases are visible. At least twelve rooms of varying sizes can be distinguished. The third example is located on the northern part of the western terrace (Fig. Figs. 25 and 28, do38). It consists of a group of six rectangular rooms of varying sizes (6 to 30 m²) probably with masonry floors, and with the same orientation. Three of them are adjoining. In addition, there is a rectangular hollow structure with an access –cellar?–. They seem to belong to the same rectangular complex of about 672 m², well aligned with the street, whose walls have disappeared, victims of the stonework. Two probable domus have been identified on the eastern slope but the evidence for this is more open to interpretation (Figs. 13 and 14, do24 and do31) The dwellings seem to occupy a large part of the area.

The lack of excavations makes it difficult to draw definitive conclusions. If our proposals are correct, on the whole the dwellings present a fairly wide diversity of forms. There seems to be a mix to varying degrees of pre-Roman traditions and influences from classical Mediterranean architecture, more

present in the periphery than in the central part of the town²³. This arrangement was also observed in *Numantia*, where the ‘Roman’ houses are concentrated in a new district, in the south-east of the city, where the conditions are the most pleasant (Jimeno, 2002: 112-113). This is not the case in Azaila, which is older, where the houses with an atrium are all located on the acropolis (Beltrán, 1975: 135-146). This diversity is undoubtedly also an indication of social hierarchy.

4.5. Economic Spaces

Most often, aerial photographs do not allow us to identify with certainty the function of the buildings observed. Nevertheless, some structures present forms that could be suitable for production or distribution activities. Regarding production, there was certainly cereal cultivation, as evidenced by the presence of numerous hand mills discovered in the fields (Alonso, 1973: 220). Some circular enclosures observed in the northern part of the city may have been used as storage spaces, as has been proposed, for example, in Montealegre (Sacristán, 2011: 284-285). Concerning distribution, the suburb of San Cristóbal, located in the southeast of the city and clearly separated from the rest of the town, could correspond to a warehouse district. There are two distinct blocks separated by a road (Figs. 20 and 22). The northern block, apart from the space h63 identified as an L-shaped courtyard house, presents four large spaces (Figs. 20 and 22, c1-c4) that appear to be closed but not covered and do not seem to be dwelling structures. They are of variable shape, quadrangular or trapezoidal. Their respective areas are 168 m², 576 m², 192 m² and 375 m². They could be courtyards used to store goods or to gather livestock. In the western part of the southern block, there are four large quadrangular spaces of elongated shape, with an internal colonnade, which are

²³ On these imitations of Roman houses, see Uribe, 2009: 71-81.

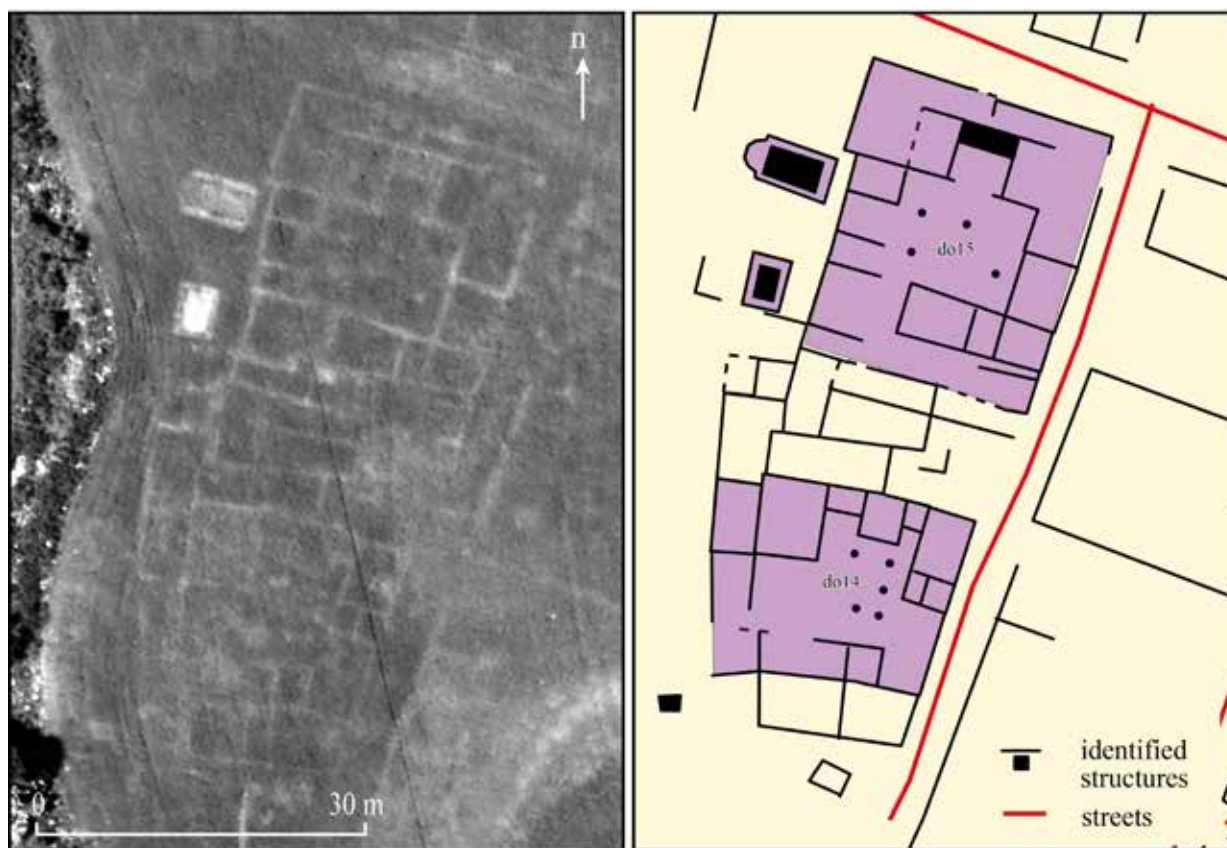


FIG. 33. Eastern terrace domus; rectified photograph and interpretation of the visible remains (do 14 and 15).

probably warehouses²⁴. One of them has a façade open to the street through a vestibule flanked by two square rooms (Figs. 20 and 22, wa1). This vestibule gives access to a covered space with a double colonnade dividing it into three naves. Its dimensions are 13 × 18 m –234 m²–. To the southwest, two contiguous buildings have a more elongated plan (Figs. 20 and 22, wa2-wa3). The first is 18 m long and 8 m wide. The second is 23 m long and 6 m wide. These two buildings had a central colonnade separating them into two naves. The last building is more compact –7 × 10 m– and has two internal columns (Figs. 20 and 22, wa4). In its eastern part, the southern islet shows very large structures reminiscent of the courtyards of the northern islet. In the absence of a reference study on warehouses

²⁴ Bouet, 2020: 695. The author points out that these types of building can have several functions, e.g., stables.

in ancient Spain²⁵, one must look for parallels in Gaul. According to a recent study by Bouet, these buildings belong to Type 2 warehouses²⁶.

The identification of these structures as storage spaces is supported by their location between the urban area and the main road that runs south of the city. The quality of the connections between this suburb and the road was highlighted above in the study of the road network. It should be taken into account that this road was of strategic importance and that the troops who were on the move needed the supplies that these warehouses could provide

²⁵ Despite its title, Salido's book (2017): *Graneros y almacenes en el Occidente del Imperio* deals mainly with granaries; however, the structures at *Tritium* cannot be granaries due to the apparent absence of ground elevation elements.

²⁶ Bouet, 2020: 688, with its variants 2a –single row of pillars– or 2b –two rows–.

(Brassous and Didierjean, 2010). These warehouses could have been part of a vast network of supplies to the cities and military garrisons, as has been demonstrated for northern Italy (Carre, 2011: 35).

5. Conclusion

The aerial photography campaigns carried out between 2001 and 2015 have revealed a large part of the hidden structures of the ancient town of *Tritium Autrigonum*. Carried out in what were sometimes very favorable technical and meteorological conditions, they complete considerably and clarify the data collected during the first overflight of 1986 made by J. Passini and A. Humbert. By integrating the oblique aerial photographs into a Geographic Information System, we have been able to access a higher level of information processing that enabled us to produce an exhaustive and exceptionally detailed planimetric diagram of the agglomeration. Certainly, some essential data have escaped observation, due in particular to the cutting of the relief into terraces, which has masked or suppressed some of the remains, probably including the town walls. Certain discontinuities observed in the occupation could also be due to colluvium masking the remains on steep slopes. However, the elements at our disposal allow an analytical approach to the urban space of *Tritium*.

One of the original features of this study of aerial photographs is that it gives an overall picture of the agglomeration. First of all, we note that it covered a large area, nearly 40 ha, which classifies it as one of the large cities (Montejo, 1996: 74-75; Houten, 2021: 224-234). However, the ratio of area to population proposed by Sacristán (280 inhabitants per ha), which would give *Tritium* a very large population –11 200 inhabitants–, can hardly be applied here. In fact, this only applies to cities *intra muros*, with concentrated dwellings, while in *Tritium*, as we have seen, we are dealing with a much more diffuse urbanism (Sacristán, 2011: 198).

The typically Roman urban planning scheme centered around a forum and its characteristic

monuments (temples, basilica, theater, amphitheaters, etc.) with a regular orthogonal road network such as could be observed elsewhere, entirely or partially, was not found at *Tritium*. The upper part of the city, which constitutes the geographical center and measures only 3 ha, seems to have been essentially occupied by settlements connected by an irregular network of non-rectilinear streets, with at least one monument that does not belong to any classical typology. This space thus appears much less standardized and specialized than in the Roman tradition. The forum, if the location and interpretation that we propose are correct, occupies a peripheral position on the southern side of the city. This fact, added to the apparent absence of equipment characterizing the Roman way of life –baths, public buildings– could raise some questions. This is not unique, and it would be adventurous to interpret it in terms of acculturation²⁷. The temple of the western terrace, which is to this day the only large monument characteristic of a clearly identified Roman architecture, is also located on the periphery. The district of the city with the most regular road organization is located on the southeast terrace. Here, too, are the large houses that most closely resemble the domus model. On the western terrace, a regular network of parallel streets can also be observed, into which the temple mentioned above is integrated. It is possible that these districts are extensions of the original core of the city, which occupies the top, even if the northern part of the promontory may have been occupied in a very loose manner since the Early Iron Age.

The study of the apparent structures suggests the presence of a certain number of housing units, the great majority of which seem to be linked to the pre-Roman tradition: circular huts, small houses with one to three rooms, probably with light roofs. Some of these structures, located on the lateral terraces, resemble the type of domus of Roman tradition. The cases of superposition observed, especially between circular houses and quadrangular buildings, make *Tritium* the ideal terrain for observing

²⁷ See Pizzo, 2020: 343 sq.

the evolution of the habitat in this cultural area, from the First Iron Age to the Roman Empire.

Such observations suggest that the pre-Roman structures on the top were preserved during the establishment of Roman domination. After the Roman conquest, buildings inspired by the classical Roman tradition would have been built not on the top but in its close periphery. This arrangement is not exceptional in the Romanized cities of the Iberian Peninsula: it has already been reported in many urban sites of the eastern coast of the peninsula and recently in the Ebro Valley²⁸. However, the validation of this hypothesis can only be obtained through archeological excavations that provide the necessary chronological data to date the occupation of the different spaces.

The urbanism of *Tritium* presents other remarkable characteristics, such as the importance of the peripheral spaces and the apparent discontinuity between the built spaces. The morphology of the latter is also highly variable. In addition to well urbanized areas such as the southeast terrace, other neighborhoods like El Portillón show signs of a certain rurality in their organization: less dense constructions, possible survival of circular houses, a network of service roads, and more numerous pits. The analysis also highlights the particular identity of the San Cristóbal sector, clearly distinct from the urbanized center, which seems to have been used for warehouses or for storage activities, probably linked to the proximity of the road that passes to the south of the town. It should be remembered that this road linked *Tarraco* to *Asturica Augusta* and the gold mines in the northwest, and was a strategic axis used by troops whose supplies had to be ensured²⁹. The city was undoubtedly an important stop on this route.

Given the importance of this town, one wonders why and when it was abandoned. Its occupation does not seem to go beyond late antiquity, but the

²⁸ Taradell, 1976: 294; e.g., Los Bañales (Andreu *et al.*, 2008).

²⁹ Brassous and Didierjean, 2010. However, no evidence of a military camp has been identified around the town, as is the case for *Segisamo* or *Libia* (Didierjean, 2014).

elements we have at present do not allow us to know more. These questions can only be answered with additional surveys and archaeological excavations on the site. This work is indispensable to complete and confirm the aerial observations. Moreover, a program of geophysical imagery has been elaborated by the Univ. de Cantabria in collaboration with Ausonius, from the Univ. Bordeaux-Montaigne, LIENSS from La Rochelle Univ. and the UNED. Unfortunately, its implementation is still facing the refusal, hopefully temporary, of some landowners.

Bibliography

- ABÁSULO, J. A.; ALONSO, J. M. and SÁINZ, F. (1982): “Nuevas inscripciones romanas procedentes de Briongos y Monasterio de Rodilla”, *Boletín del Instituto Fernán González*, 198, pp. 161-168.
- ABÁSULO, J. A.; RUIZ VÉLEZ, I. and RODRÍGUEZ RODRÍGUEZ, A. (2003-2004): “El conjunto arqueológico de Alto de Rodilla (Monasterio de Rodilla, Burgos)”, *Boletín del Seminario de Estudios de Arte y Arqueología*, 69-70, pp. 115-146.
- ALONSO, J. M. (1972-1973) : “Nuevos elementos romanos en la antigua *Tritium*”, *Zephyrus*, 23-24, pp. 209-220.
- ANDREU, J.; SOUTELO, S. G; GARCÍA-ENTERO, V; LORENZO, Á. and ALEGRE, M. L. (2008): “Cuestiones urbanísticas en torno a la *civitas* de Los Bañales (Uncastillo, Zaragoza)”, *Spal*, 17, pp. 233-266.
- ARCE, J. and GOFFAUX, B. (eds.) (2011): ‘*Horrea*’ *d’Hispanie et de la Méditerranée romaine*. Madrid: Casa de Velázquez.
- BEDON, R.; CHEVALLIER, R. and PINON, P. (1988): *Architecture et urbanisme en Gaule romaine vol. 1. L’architecture et les villes en Gaule romaine*. Paris: Errance.
- BELTRÁN LLORIS, M. (1976): *Arqueología e historia de las ciudades del Cabezo de Alcalá de Azaila (Teruel)*. Zaragoza: Univ. de Zaragoza.
- BLANCO, J. F. (2016): “La vivienda vaccea”, *Oppidum*, 12, pp. 43-84.
- BORLENGHI, A. (2011): *Il campus. Organizzazione e funzione di un spazio pubblico in età romana. Le testimonianze in Italia e nelle provincie occidentali*. Roma: Quasar.
- BOUET, A. (ed.) (2016): *Monumental! La monumentalisation des villes de l’Aquitaine et de l’Hispanie*

- septentrionale durant le Haut-Empire. Actes 6^e Colloque International Aquitania (Villeneuve-sur-Lot, 2015). Aquitania suppl., 37. Bordeaux: Ausonius.
- BOUET, A. (dir.) (2020): *Barzan IV. L'entrepôt de La Palisse à Barzan (Charente-Maritime), port des Santons, et les entrepôts urbains et périurbains dans les provinces gauloises*. Aquitania suppl., 41. Bordeaux: Ausonius.
- CABRÉ, J. (1929): "Azaila". In *IV Congreso Internacional de Arqueología*. Barcelona.
- CADIOU, F. and NAVARRO, M. (eds.) (2014): *La guerre et ses traces. Conflits et sociétés en Hispanie à l'époque de la conquête romaine (IIIe-1er s. a. C.)*. Mémoires, 37. Bordeaux: Ausonius.
- CARRE, M. B. (2011): "Les réseaux d'entrepôts dans le monde romain, études de cas". In ARCE, J. and GOFFAUX, B. (eds.): *'Horrea' d'Hispanie et de la Méditerranée romaine*. Madrid: Casa de Velázquez, pp. 23-39.
- CARRERAS, C. (1996): "Una nueva perspectiva para el estudio demográfico de la Hispania Romana", *Boletín del Seminario de Estudios de Arte y Arqueología*, 62, pp. 95-122.
- CARRERAS, C. (2014): "Nuevas tendencias y datos sobre la demografía romana en la Península Ibérica", *Boletín del Seminario de Estudios de Arte y Arqueología*, 80, pp. 53-82.
- CEBRIÁN, R. (2021): "Segobriga". En NOGALES, T. (ed.): *Ciudades Romanas de Hispania, 1*. Serie Arqueológica, 13. Roma: L'Erma di Bretschneider, pp. 377-388.
- COLLÉONI, F. (ed.) (2016): "Stations routières en Gaule romaine: architecture, équipement, fonctions", *Gallia*, 73(1). Paris: CNRS.
- DARDAINE, S.; FINCKER, M.; LANCHI, J. and SILLIÈRES, P. (2008): *Belo VIII. Le sanctuaire d'Isis*. Collection de la Casa de Velázquez, 107. Madrid: Casa de Velázquez.
- DELIBES, G. and ROMERO, F. (2011): "La plena colonización agraria del Valle Medio del Duero", *Complutum*, 22(2), pp. 49-94.
- DIDIERJEAN, F.; BRASSOUS, L.; GUILLOT, B. and RUIZ VELEZ, I. (2016): "Monuments vus du ciel. Les apports de la photographie aérienne à l'urbanisme de Tritium Autrigonum (Monasterio de Rodilla, Burgos)". In BOUET, A. (ed.): *Monumental! La monumentalisation des villes de l'Aquitaine et de l'Hispanie septentrionale durant le Haut-Empire. Actes 6^e Colloque International Aquitania (Villeneuve-sur-Lot, 2015)*. Aquitania suppl., 37. Bordeaux: Ausonius, pp. 327-343.
- DIDIERJEAN, F.; MORILLO, A. and PETIT-AUPERT, C. (2014): "Traces de guerre, traces de paix armée : l'apport de quatre années de prospection aérienne dans le nord de l'Espagne". In CADIOU, F. and NAVARRO, M. (eds.): *La guerre et ses traces. Conflits et sociétés en Hispanie à l'époque de la conquête romaine (IIIe-1er s. a. C.)*. Mémoires, 37. Bordeaux: Ausonius, pp. 149-179.
- EGELS, Y. (2011): "Photogrammetry: general principles and terminology", *EDYTEM. Cahiers de Géographie*, 12, pp. 41-50.
- FATÁS, G.; CABALLERO, I.; GARCÍA MERINO, C. and CEPAS, A. (1993): *Tabula Imperii Romani: hoja K-30 Madrid, Caesaraugusta, Clunia*. Madrid: CNIG.
- FRANCE, J. and NÉLIS-CLÉMENT, J. (eds.) (2014): *La 'statio': archéologie d'un lieu de pouvoir dans l'empire romain*. Bordeaux-Paris: Ausonius-De Boccard.
- GARCÍA SÁNCHEZ, J. and COSTA-GARCÍA, J. M. (2020): "Del oppidum indígena a la ciudad romana. Evolución del paisaje de Segisamo (Sasamón, Burgos, España) a través de la fotografía aérea. Datos de la prospección aérea de 2019", *Lucentum*, 39, pp. 131-148.
- GARCÍA Y BELLIDO, A. (1985 [2nd ed.]): *Urbanística de las grandes ciudades del mundo antiguo*. Bibliotheca Archeologica, V. Madrid: CSIC.
- HEREDERO, R. (1993): "Casas circulares y rectangulares de época vaccea en el yacimiento del Cerro del Castillo (Montealegre)". In ROMERO, F.; SANZ, C. and ESCUDERO, Z.: *Arqueología vaccea: estudios sobre el mundo prerromano en la cuenca media del Duero*. Valladolid: JCYL, pp. 281-302.
- HOUTEN, P. H. A. (2021): *Urbanisation in Roman Spain and Portugal, Civitates Hispaniae of the Early Empire*. London-New York: Univ. of Leiden.
- IGLESIAS, J. M. (ed.) (2002): *Arqueología en Iuliobriga (Retortillo, Campoo de Enmedio, Santander)*. Santander: Univ. de Cantabria.
- JIMENO, A.; REVILLA, M. L.; IGNACIO DE LA TORRE, J.; BERZOSA, R. and MARTÍNEZ, J. P. (2002): *Numancia, Guía del yacimiento*. Soria: Asoc. Amigos del Museo Numantino-JCYL.
- LEVEAU, P. (2014): "Stations routières et *stationes viarum*. Une contribution à l'archéologie de la station en Gaule Narbonnaise et dans les provinces alpines voisines". In FRANCE, J. and NÉLIS-CLÉMENT, J. (eds.): *La 'statio': archéologie d'un lieu de pouvoir dans l'empire romain*. Bordeaux-Paris: Ausonius édit.-Diffusion De Boccard, pp. 17-55.
- LORRIO, A. J. (2005): *Los celtiberos*. Madrid: RAH-UCM.

- MAR, R. and RUIZ DE ARBULO, J. (1993): *Ampurias romana, Historia, arquitectura y arqueología*. Sabadell: Edit. AUSA.
- MATEOS, P.; OLCINA, M.; PIZZO, A. and SCHATTNER, T. G. (dirs.): *Small Towns, una realidad urbana en la Hispania romana*. Mytra, 10. Mérida: IAM-CSIC.
- MATEOS, P.; PIZZO, A. and MAYORAL, V. (2014): "Integrating survey data for studying the townscape of *Contributa Iulia Ugultunia* (Medina de las Torres)", *Journal of Roman Archaeology*, 27, pp. 109-131.
- MISIEGO, J. C. and ETXEBERRIA, C. (eds.) (2003): *Actuaciones arqueológicas en la autovía del Camino de Santiago (A-231, León-Burgos), Provincia de Burgos (2000-2003)*. León: JCYL-Gical.
- MISIEGO, J. C.; MARTÍN CARBAJO, M. A.; MARCOS, G. J.; SANZ GARCÍA, F. J.; NEZ, R.; DOVAL, M.; GARCÍA RIVERO, P. F. and GARCÍA MARTÍNEZ, M. I. (2003): "Excavación arqueológica en el poblado protohistórico de Dessobriga (Osorno, Palencia, Melgar de Fernamental, Burgos)". In MISIEGO, J. C. and ETXEBERRIA, C. (eds.): *Actuaciones arqueológicas en la autovía del Camino de Santiago (A-231, León-Burgos), Provincia de Burgos (2000-2003)*. León: JCYL-Gical, pp. 31-91.
- MONTEJO, M. (1996): *Historia del urbanismo en España. Vol. 1. Del Eneolítico a la Baja Edad Media*. Madrid: Cátedra.
- MORENA, J. A.; VENTURA, Á.; MÁRQUEZ, C. and MORENO, A. (2011): "El foro de la ciudad romana de Torreparedones (Baena, Córdoba): primeros resultados de la investigación arqueológica (campana 2009-2010)", *Itálica*, 1, pp. 145-169.
- OLMO, J. and SAN MIGUEL, L. C. (1993): "Arqueología aérea en asentamientos vacceos". In ROMERO, F.; SANZ, C. and ESCUDERO, Z. (éds.): *Arqueología vaccea: estudios sobre el mundo prerromano en la cuenca media del Duero*. Valladolid: JCYL, pp. 506-528.
- PASSINI, J. (1987): "El conjunto urbano de *Tritium Autrigonum*", *Gerión*, 5, pp. 281-288.
- PIZZO, A. (2020): "Parva oppida. Ideología, gestión territorial y urbanismo en los centros 'menores' de época romana. Reflexiones sobre algunos casos de Hispania". En ANDREU, J. (ed.): *Parva Oppida: imagen, patrones e ideología del despegue monumental de las ciudades en la Tarraconense hispana (siglos I a. C.-I d. C.)*. Uncastillo: Fund. Uncastillo Los Bañales, pp. 337-398.
- ROMERO, F.; SANZ, C. and ESCUDERO, Z. (eds.) (1993): *Arqueología vaccea: estudios sobre el mundo prerromano en la cuenca media del Duero*. Valladolid: JCYL.
- SACRISTÁN DE LAMA, J. D. (2011): "El urbanismo vacceo", *Complutum*, 22(2), pp. 185-222.
- SÁENZ PRECIADO, J. C. and MARTÍN BUENO, M. A. (2015): *La ciudad celtíbero-romana de Valdeherrera (Calatayud, Zaragoza)*. Zaragoza: Prensa Universitaria de Zaragoza.
- SALIDO, J. (2017): *Arquitectura rural romana: graneros y almacenes en el Occidente del Imperio*. Autun: Mergoil.
- TARRADELL, M. (1976): "Las ciudades romanas en el Este de Hispania". In *Ciudades augusteas de Hispania*. Zaragoza: Univ. de Zaragoza, pp. 289-317.
- TORRES-MARTÍNEZ, J. F.; FERNÁNDEZ-GÖTZ, M.; MARTÍNEZ, A.; CABANILLAS, G.; VACAS, D. and MARTÍN HERNÁNDEZ, E. (2015): "Las fortificaciones protohistóricas del área cantábrica: aspectos defensivos, sociales y simbólicos. The protohistoric fortifications of the Cantabrian region: defensive, social and symbolic aspects", *Gallaecia*, 34, pp. 57-82.
- TORRIONE, M. (2018): "Dessobriga, oppidum vacceo, mansio altoimperial..., una búsqueda en curso". In SANZ, C. and BLANCO, J. F. (eds.): *Novedades arqueológicas en cuatro ciudades vacceas: Dessobriga, Intercatia, Pintia y Cauca*. Vaccea Monografías, 6. Valladolid, pp. 31-48.
- TOVAR, A. (1989): *Iberische Landeskunde. Las tribus y las ciudades de la antigua Hispania. Band, 3. Tarraconensis*. Baden-Baden: Bonner Jahrbücher des Rheinischen Landesmuseum.
- TRÉZINY, H. (2012): "Les espaces périurbains dans les villes grecques d'Occident". In BELARTE, M. C. and PLANA, R.: *Le paysage périurbain en Méditerranée Occidentale pendant la Protohistoire et l'Antiquité*. Documenta, 26. Tarragona: ICAC, pp. 33-46.
- URIBE, P. (2009): "Los fenómenos de imitación en las viviendas urbanas romanas en el Nordeste de la Península Ibérica", *Espacio, Tiempo y Forma. Historia Antigua*, 22, pp. 71-81.
- URIBE, P. (2015): *La arquitectura doméstica urbana romana en el valle medio del Ebro (siglos II a. C.-III d. C.)*. Aquitania suppl., 35. Bordeaux.
- VV. AA. (1976): *Ciudades augusteas de Hispania-I*. Zaragoza: Univ. de Zaragoza.