

PREHISTORIC CARPENTRY THROUGH THE STUDY OF IMPRINTS ON CLAY BUILDING FRAGMENTS FROM THE NORTHERN SPANISH PLATEAU*

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Abstract: *Mud fragments, dedicated to construction tasks, are commonly found in Recent Prehistory sites of the Duero Valley. However, only recently in-depth studies have been carried out on this subject. Such works are providing interesting results on the building activity developed by the prehistoric societies of these territories concerning their knowledge of carpentry techniques, which can be observed from the imprints that remain in those «prehistoric clays». The following data is provided by a group of building clays recovered from various sites between the III and II millennium BC, located in the Duero Valley. Those materials have been examined under general macroscopic conditions in order to detect a series of imprints with right angles typical of planks, beams and other solutions for optimising the raw wood material. A selection of these has been documented volumetrically using digital photogrammetry providing a series of digital moulds from which to obtain the positive in a non-invasive way.*

Keywords: *Chalcolithic; Bronze Age; Architecture; Carpentry; Photogrammetry.*

Resumo: *Fragmentos de barro de construção ocorrem frequentemente nos sítios arqueológicos da Pré-História Recente do Vale do Douro. Porém, só há pouco tempo se realizaram trabalhos aprofundados que estão a fornecer resultados inovadores, nomeadamente, no que se refere ao domínio das técnicas de carpintaria, observável a partir dos negativos identificados. Apresentaremos os dados fornecidos por um conjunto de fragmentos de barro de construção recuperados em vários arqueossítios do III e II milénios a. C. do Vale do Douro. Realizou-se uma observação macroscópica geral das peças, em busca de vestígios decorrentes da utilização de madeira na construção. Uma vez detetadas uma série de impressões que apresentam ângulos retos típicos das tábuas, vigas e outras soluções de otimização da matéria-prima vegetal, documentou-se volumetricamente uma seleção de fragmentos utilizando a fotogrametria digital, para se obter uma série de moldes digitais, a partir da qual se obteve o positivo de uma forma não invasiva.*

Palavras-chave: *Calcolítico; Idade do Bronze; Arquitectura; Carpintaria; Fotogrametria.*

1. INTRODUCTION

Clay construction fragments are a kind of archaeological evidence that has not started to receive proper attention in the Iberian Peninsula until relatively recent times¹. It is common for these remains to be referred indistinctly as «adobe» or «rammed earth», despite the fact these are construction techniques with different degrees of complexity, as well as different historical developments. These studies have not only allowed for

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¹ BELARTE FRANCO, 1993; SÁNCHEZ GARCÍA, 1997; GÓMEZ PUCHE, 2006; MATEU, 2011; PASTOR QUILES, 2014; FONSECA DE LA TORRE, 2015.

a more specific use of these terms but have also revealed the use of other techniques such as «wattle and daub» or, more recently, the use of kneaded mud «balls»².

In the case of the Spanish Northern Plateau, the lack of studies has been aggravated by a recurrent absence of architectural evidence during the III and II millennium BC. That eventuality has fomented an interpretation of the settlements as itinerant, formed by fragile dwellings made of perishable materials³. Therefore, despite the existence of housing floors formed by postholes or stone socles, the main archaeological evidence of the existence of housing structures, is the presence of accumulations of mud construction fragments inside pits, generally considered as silos reused as rubbish dumps⁴. These remains have not been analysed in this area until less than a decade ago⁵. They have confirmed the exclusive use of the wattle and daub technique for the dwellings built on the Chalcolithic site of El Casetón de la Era (Villalba de los Alcores, Valladolid)⁶. The use of this technique is not discordant with the erection of resistant structures capable of withstanding the passage of decades and whose destruction by fire requires a significant effort, as has been demonstrated by various experimental archaeology projects carried out in the Balkans⁷.

Wattle and daub requires large amounts of wood to form a framework that will later be covered in mud. The hardening of this because of the fire of these structures has allowed the preservation of the negative of this latticework that constituted the nucleus of the wall. The study of this material from various sites from the III and II millennium BC is a central part of the PhD research project of the author of this article. During the macroscopic analysis of these, several unique imprints were identified that could suggest the development of woodworking techniques among these populations. Although the use of these techniques has been known in the Peninsula since the Neolithic period thanks to the exceptionally preserved finds of posts and other wooden elements from La Draga (Banyoles, Girona, Spain)⁸, it is usual that no trace of this type of evidence remains. For this reason, the intention of this text is to publicise this type of evidence, which provides a new tool for detecting this type of artisan process and, based on its study, try to specify the geographical and chronological extension of these in the Spanish Northern Plateau, as well as trying to elucidate different manufacturing techniques.

2. METHODOLOGY

For the present work, the sites with possible imprints of planks or beams belonging to the main cultural horizons of the Recent Prehistory of the Northern Spanish Plateau have

² PASTOR QUILES, KNOLL, JOVER MAESTRE, 2019.

³ BLASCO BOSQUED, LUCAS PELLICER, 1980; PÉREZ RODRÍGUEZ *et al.*, 1993: 64; FABIÁN GARCÍA, 1995.

⁴ BELLIDO BLANCO, 1996.

⁵ FONSECA DE LA TORRE *et al.*, 2017.

⁶ DELIBES DE CASTRO *et al.*, 2018; RODRÍGUEZ MARCOS, CRESPO DÍEZ, 2020.

⁷ BANKOFF, WINTER, 1979; GHEORGHIU, 2008.

⁸ LÓPEZ BULTÓ, 2018.

been selected (Fig. 1 and Table 1). Unfortunately, we do not have any remains of constructive material in the otherwise scarce excavated bell beaker settlements. For example, we only have four documented huts for the entire Duero Valley, as opposed to 41 belonging to the previous period.

Table 1. Selected sites and total fragments analysed

Cronology	Settlements	Total framents	Total weight (Kg)
Pre-Bell Beaker Chalcolithic	Casetón de la Era	1902	141,60
	Los Cercados	458	10,45
	Los Bajos	205	10,01
Early Bronze Age	Los Torojones	74	39,89
	El Parpantique	137	62,27
	Pico Romero	92	6,37
Middle/Late Bronze Age	Carricastro	335	17,06
	Los Tolmos	79	20,44

These fragments belong not only to the walls of the houses, but also to other elements such as floors or hearths. Those belonging to the walls are catalogued by the technique used: wattle and daub, kneading or adobe, although there are always unidentifiable pieces. This cataloguing is based on criteria such as the morphology of the piece, its porosity, the inclusions present (both lithic and vegetal), the presence of smoothed faces and lastly, the presence of vegetal imprints and the nature of these.

The framework consists of a series of wooden pillars between where flexible rods are intertwined to form the core of the wall. The mud, once burned, preserves the imprint of this framework. Both thick posts and smaller rods can be distinguished, sometimes grouped in parallel. There are also marks with smooth faces and/or angles that will be analysed in greater depth.

These imprints usually form approximately the arc of a circumference, which makes it possible to obtain the approximate diameter of the original trunk or branch by using a simple mathematical operation. Nevertheless, a series of different impressions have been located, which have motivated this study. These are generally flat section impressions or at a 90° angle, that shows the negatives of the veins in the wood. The imprints that have been interpreted as belonging to beams or planks, which implies a certain degree of carpentry work that gives the raw material its shape. Similar imprints were detected in

the Italian Neolithic settlement of Trasano (Matera, Italy) who were interpreted too as marks of beams/planks⁹.

To help the study, photogrammetric models of these impressions have been made with the aim of obtaining the «positive» of the imprint in a non-invasive way such as making virtual moulds. Even though digital photogrammetry has numerous applications in the field of archaeology¹⁰, it seems that obtaining these positives is not usually a common practice, although it is a simple procedure. The photogrammetric model is imported into the free software program Blender, where a cube is added to intersect with the piece, covering the imprints. Once placed, the «Boolean» modifier is applied, using the «difference» operation. The result, once the original model has been hidden or eliminated, is to obtain the positive of the impressions inside the previously created cube (Fig. 2).

At this point, the lighting tools in the program can be used to enhance the relief of the face imprints to improve their visualization. This is a process that requires taking of many images and a considerable amount of time to process the three-dimensional model. Because of that, this technique has only been applied to a selection of pieces. The elements with possible evidence of carpentry have been documented photographically from various angles, paying special attention to the distribution of the imprints.

3. CHARACTERISTICS OF THE SITES STUDIED

Most of these sites have a similar context for this type of fragments: in secondary position inside negative silo type structures¹¹. Only the settlements of Viña de Esteban García¹², Los Torojones, El Parpantique¹³, Pico Romero¹⁴ and Los Tolmos¹⁵ have evidence of rubble associated with the foundations of the habitation structures. Another common aspect, which is key to understanding the preservation of this material, is fire. All the fragments studied have been exposed to high temperatures, which have hardened them and «fossilised» the wood traces.

On the contrary, the volume of material recovered, and its state of preservation differs substantially depending on the cultural horizon. Fragments from Pre-Bell Beaker Chalcolithic and Early Bronze Age sites are more numerous and generally have a significantly less eroded external appearance than those from Middle/Late Bronze Age sites. Both the scarcity of material and their rolled appearance may be the result of the location

⁹ TASCA, 1998.

¹⁰ CHARQUERO BALLESTER, 2016.

¹¹ HERRÁN MARTÍNEZ, 1986; PÉREZ RODRÍGUEZ, 1993; PALOMINO LÁZARO, NEGREDO GARCÍA, BALADO PACHÓN, 2019; RODRÍGUEZ MARCOS, CRESPO DÍEZ, 2020.

¹² DELIBES DE CASTRO *et al.*, 1997.

¹³ FERNÁNDEZ MORENO, 2013.

¹⁴ RODRÍGUEZ MARCOS, PALOMINO LÁZARO, 1997.

¹⁵ JIMENO MARTÍNEZ, FERNÁNDEZ MORENO, 1991.

of these settlements. These are generally located on the ridges of the calcareous moorlands, whose erosion over the centuries has made the levels of habitation disappear¹⁶.

Despite the existing divergences, it seems that the wattle and daub technique remains predominant during this period of two millennia until the generalization of the adobe technique in the Early Iron Age¹⁷. It is true that some fragments of Middle/Late Bronze deposits have been interpreted as adobes (Fig. 3) but they should be treated with caution due to the factors already mentioned, in addition to their small size.

4. THE IMPRINTS

From the material interpreted as daub, almost half of the pieces present at least one imprint of the framework, apart from Los Cercados, Los Bajos and Carricastro sites (Table 2). Both the first and third have a very fragmented sample that makes it difficult to identify the traces of the timber. In the case of Los Bajos, it is known that the material was selected prior to its delivery to the Museum of Zamora, so the sample may be biased.

Table 2. Total amount of daub fragments per settlement

Site	Total daub fragments	Fragments with post/branches imprints	Fragments with beam/plank imprints
Casetón de la Era	1163	265	29
Los Cercados	179	14	3
Los Bajos	102	25	4
Viña de Esteban García	350	171	27
Los Torojones	33	15	9
El Parpantique	32	16	13
Pico Romero	52	33	8
Carricastro	187	31	2
Los Tolmos	42	24	12

The most outstanding impressions are those that have flat surfaces or those that form a 90° angle. Sometimes they can be confused with smooth surfaces belonging to flat finishings or corners, especially when the imprint is eroded. When there is a good conservation, the veins of the wood could be seen, which clears up any possible doubts about its attribution. On other occasions, their distribution provides the definitive track

¹⁶ FONSECA DE LA TORRE, RODRÍGUEZ MARCOS, 2017.

¹⁷ CHAZELLES, 2011.

when, for example, two of these impressions appear in parallel or in relation to other branch impressions (Fig. 4).

Unlike the impressions of trunks and branches, the approximate dimensions cannot be calculated from the impressions of these planks or beams. Only in very rare cases is the total width of at least one side of these planks or beams known. For this reason, the double attribution of beam/plank is used to give an approximate interpretation of the wood, whose imprint has been fossilised in the clay.

Based on the observation in section of these marks, we can see how those that belong to Chalcolithic enclaves show angles slightly more open than 90°, a fact that contrasts especially with later examples in which the elaboration of the beams or planks seems to reach a higher level of expertise and/or standardisation.

In addition, a particular variant is only detected in the Viña de Esteban García site. These are imprints that form tighter angles, at around 45° or less. Two straight sides that create a «v» section usually form them but, on some occasions, one of the sides has a certain curvature (Fig. 4). They could be radially sectioned rods aimed at optimising the resources used in the framework from a minimum effort. The division into sections can be carried out with the help of a wedge that makes a first incision, and the rest can be separated manually by pulling both halves in opposite directions. This possibility is among the techniques traditionally used in carpentry and some approaches have even been made since experimental archaeology¹⁸. Four of the 26 pieces from this site show this type of technical solution, generally in groups of two or more arranged in parallel to each other, which seems to confirm their use in the framework of the walls. This way of treating the wood is not at odds with the elaboration of beams/boards that are profusely represented in this settlement.

We are therefore faced with at least two clearly differentiated techniques. On one hand, a quick and simple way of working the wood that has only been located in one of the sites studied (Viña de Esteban García). On the other hand, we have enough arguments to confirm the practice of woodworking to produce beams or planks, although the fragmentary nature of the materials prevents us from distinguishing on most occasions which of the two elements we are dealing with.

Most of these plank/beam imprints appear in isolation, unrelated to other marks. When this happens, they are usually curved branch imprints, usually arranged in parallel. There are some examples of two parallel beam/plank marks, mainly in Early Bronze Age sites. The only evidence of a possible fit between pieces of carved wood is found in a piece from the Chalcolithic period of El Casetón de la Era (Fig. 4), where two impressions cross at a 90° angle. Unfortunately, the poor conservation of the fragment prevents greater precision in the joining of these two strips.

¹⁸ ENNOS, VENTURA, 2017.

5. GEOGRAPHICAL AND CHRONOLOGICAL DISTRIBUTION

Although the presence of carpentry knowledge in the Spanish Northern Plateau during the III and II millennium BC has been confirmed, it seems that the frequency of its use varies from one moment to another, there being even possible different local trajectories. First, we must consider the existence of three main geographical areas: the western area, dominated by the countryside with a slight hillock relief, the central area where the clayey countryside alternates with the limestone moorlands, and the eastern area of the High Duero Valley, characterized by a more rugged orography. This not only determines the emplacement of the settlements but also the access to the raw materials used in the construction. As it can be observed, not all the areas have archaeological sites mentioned in this article (Table 3); this is because the materials recovered and studied in those enclaves have not yielded any signs suggesting carpentry work. This fact is especially significant in the western area, where woodworking vanishes after the Chalcolithic period. In any case, despite the numerous testimonies presented by La Viña de Esteban García, they are only 13% of the total of trusses located in the site, in the same range as the rest of the contemporary settlements. Precisely, this settlement has provided one of the largest collections of Chalcolithic polished stone axes and hoes¹⁹ who could be used for those carpentry works.

Table 3. Selected sites and total fragments analysed

Cronology	Western area	Central area	Eastern area
Chalcolithic	Los Bajos Viña de Esteban García	Casetón de la Era Los Cercados	
Early Bronze Age		Pico Romero	Los Torojones El Parpantique
Middle/Late Bronze Age		Carricastro	Los Tolmos

This trend is totally opposite in the central and eastern zone of the Plateau, where the percentage of beams/planks over the total of imprints is close to 50% in Early Bronze Age sites. At this point, it should be remembered that the sets of material studied are notably smaller than those of the previous period. This may indicate that we are dealing with a sample selected by the archaeologists and not with the totality of the unearthed material, which would mean that we are dealing with involuntary altered percentages.

¹⁹ STRATO, 1993.

It is remarkable how the imprints of beams/boards documented in Early Bronze Age settlements systematically present 90° angles, as well as more uniform surfaces, which speak of a greater degree of expertise and standardization in the woodwork, perhaps showing the existence of specialized artisans (Fig. 5).

However, once we get into the Middle/Late Bronze Age, the evidence of carpentry declines again, although it seems to remain at higher percentages in the east of the valley. Despite the fact that the settlement of Los Tolmos (Caracena, Soria) is considered to be a stationary shelter, some of the imprints shown the presence of beam/planks and the exceptional testimony of chopping marks from an axe in a post end (Fig. 6). This could suggest some continuity of the craft practices developed in the Early Bronze Age. In any case, the simple fact that we only have two examples for this period is sufficient testimony to the apparent abandonment of these practices. This fact may be related to the climate change that occurred in the transition from the III to the II millennium BC, discovered thanks to palynological analyses²⁰. This change in climatic conditions would not only have caused a change in economic practices towards grazing but also changes in the tree species available for construction.

6. CONCLUSIONS

It seems to be demonstrated that since the beginning of the III millennium BC, human groups had skills in carpentry that they applied to their dwellings. This fact should make us reflect on the traditional interpretation of these structures as feeble or temporary. The scarcity of evidence in situ of the huts of these societies may be due to other factors of a cultural nature that imply the use of fire to dismantle these structures in order to later deposit their remains inside pits.

It is possible that during the Chalcolithic period, any member of the group, given the simplicity of the documented techniques, could practice woodworking. However, we must consider the possibility that since the Bronze Age we find ourselves in front of specialized artisans who are dedicated exclusively to the task of shaping wood, not only for architectural purposes, but also for the realization of other types of objects that have not left archaeological traces.

The lack of documented evidence in the Middle/Late Bronze Age may be due to both the scarcity of recovered building material, which also presents a high degree of erosion, and the change in economic and settlement practices of these groups.

Finally, it is worth noting the potential of the use of digital photogrammetry to support this type of study based on the imprints left on the clay, both in the construction material and in the ceramics. By obtaining digital moulds, it is possible to study in more

²⁰ LÓPEZ SÁEZ *et al.*, 2014.

detail other artisan activities such as basketry or rope making, as well as the study of leaves and seeds that have left their mark on the clay and that could complement the palynological and carpological analyses.

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BIBLIOGRAPHY

- BANKOFF, H. Arthur; WINTER, Frederick A. (1979). *A House Burning in Serbia. What do burned remains tell an archaeologist?*. «Archaeology». 32:5, 8-14.
- BELARTE FRANCO, M.^a Carme (1993). *Arquitectura domèstica al Bronze Final i Primera Edat del Ferro a Catalunya: habitacions construïdes amb materials duradors: estat de la qüestió*. «Pyrenae». 24, 115-140.
- BELLIDO BLANCO, Antonio (1996). *Los campos de hoyos. Inicio de la economía agrícola en la Submeseta Norte*. Valladolid: Universidad de Valladolid. (Studia Archaeologica; 85).
- BLASCO BOSQUED, Concha; LUCAS PELLICER, María Rosario (1980). *El hábitat campaniforme de «El Perchel» en Arcos del Jalón (Soria)*. «Noticiario Arqueológico Hispánico». 8, 9-70.
- CHARQUERO BALLESTER, Ana M.^a (2016). *Práctica y usos de la fotogrametría digital en arqueología*. «DAMA». 1, 139-157.
- CHAZELLES, Claire Anne de (2011). *La construction en brique crue moulée dans les pays de la Méditerranée, du Néolithique à l'époque romaine. Réflexions sur la question du moulage de la terre*. In CHAZELLES, Claire Anne de; KLEIN, Alain; POUSTHOMIS, Nelly, eds. *Troisièmes Échanges transdisciplinaires sur les constructions en terre crue. Placés sous la présidence du Professeur Olivier Aurenche. Actes du colloque international de Toulouse16 et 17 mai 2008*. Montpellier: Ed. l'Espérou, pp. 153-164.
- DELIBES DE CASTRO, Germán et al. (1997). *De la tumba dolménica como referente territorial, al poblado estable: notas sobre el hábitat y las formas de vida de las comunidades megalíticas de la Submeseta norte*. In RODRÍGUEZ CASAL, Antón A., ed. *O Neolítico atlántico e as orixes do megalitismo: actas do Coloquio Internacional. (Santiago de Compostela, 1-6 de abril de 1996)*. Santiago de Compostela: Universidad de Santiago de Compostela, pp. 779-808.
- DELIBES DE CASTRO, Germán et al. (2018). *A Ditched Enclosure in the Middle Douro Valley: El Casetón de la Era (Villalba de los Alcores, Valladolid)*. In SASTRE BLANCO, José Carlos; RODRÍGUEZ-MONTERRUBIO, Oscar; FUENTES MELGAR, Patricia, eds. *Archaeology in the River Duero Valley*. Cambridge: Cambridge Scholars Publishing, pp. 61-84.
- ENNOS, Anthony Roland; VENTURA, João (2017). *The Mechanics of Splitting Wood and the Design of Neolithic Woodworking Tools*. «EXARC Journal», 4. [Consult. 27 nov. 2021]. Available at <<https://exarc.net/issue-2017-4/ea/mechanics-splitting-wood-and-design-neolithic-woodworking-tools>>.
- FABIÁN GARCÍA, José Francisco (1995). *El aspecto funerario durante el Calcolítico y los inicios de la Edad del Bronce en la Meseta Norte. El enterramiento colectivo en fosa de «El Tomillar» (Bercial de Zapardiel, Ávila)*. Salamanca: Universidad de Salamanca.

- FERNÁNDEZ MORENO, José Javier (2013). *El Bronce Antiguo en el Alto Duero: Los poblados del Parpan-tique de Balluncar y los Torojones de Morcuera (Soria)*. Valladolid: Universidad de Valladolid. (Studia Archaeologica; 98).
- FONSECA DE LA TORRE, Héctor J. (2015). *Estructuras de habitación calcolíticas en el Valle Medio del Duero. Un caso de estudio: El Casetón de la Era (Villalba de los Alcores, Valladolid)*. Santander: Universidad de Cantabria. Master thesis.
- FONSECA DE LA TORRE, Héctor J. et al. (2017). *Aproximación a la arquitectura del barro en el yacimiento de El Casetón de la Era (Villalba de los Alcores, Valladolid)*. In ÁLVAREZ RODRÍGUEZ, Alicia; TEJEDOR RODRÍGUEZ, Cristina; GARCÍA VÁZQUEZ, Iván, coords. *Investigaciones Arqueológicas en el Valle del Duero: Del Paleolítico a la Edad Media*. Valladolid: Glyphos 5, pp. 107-124.
- FONSECA DE LA TORRE, Héctor J.; RODRÍGUEZ MARCOS, José Antonio (2017). *Las técnicas constructivas de la prehistoria reciente en el Valle del Duero*. In HUERTA FERNÁNDEZ, Santiago; FUENTES GONZÁLEZ, Paula; GIL CRESPO, Javier, eds. *Actas del Décimo Congreso Nacional y Segundo Congreso Internacional Hispanoamericano de Historia de la Construcción: Donostia-San Sebastián, 3-7 octubre 2017*. Madrid: Instituto Juan de Herrera, vol. 1, pp. 569-576.
- GHEORGHU, Dragos (2008). *Built to be burnt: The Building and combustion of Chalcolithic dwellings in the Lower Danube and East Carpathian areas*. In NIKOLOVA, Lolita; MERLINI, Marco; COMSA, Alexandra, eds. *Circumpontica in Prehistory. Western Pontic Studies. Global gratitude to Eugen Comsa for his 85th birth anniversary*. Oxford: Archaeopress, pp. 55-68.
- GÓMEZ PUCHE, Magdalena (2006). *Estudio de los fragmentos de barro cocido en el yacimiento de la Illeta dels Banyets, El Campello, Alicante*. In SOLER DÍAZ, Jorge, ed. *La ocupación prehistórica de la Illeta dels Banyets (El Campello, Alicante)*. Alicante: Museo Arqueológico de Alicante, pp. 271-280. (Serie mayor; 5).
- HERRÁN MARTÍNEZ, Jose Ignacio (1986). *El yacimiento calcolítico de Los Cercados en Mucientes. Sobre los comienzos de la metalurgia en el Valle Medio del Duero*. Valladolid: Universidad de Valladolid. Bachelor's thesis.
- JIMENO MARTÍNEZ, Alfredo; FERNÁNDEZ MORENO, José Javier (1991). *Los Tolmos de Caracena (Soria) (campanas 1981 y 1982): aportación al Bronce Medio de la Meseta*. Madrid: Instituto de Conservación y Restauración de Bienes Culturales.
- LÓPEZ BULTÓ, Oriol (2018). *Las actividades de carpintería*. In PALOMO PÉREZ, Antoni; PIQUÉ I HUERTA, Raquel; TERRADAS BATLLE, Xavier, eds. *La Revolución Neolítica: La Draga, el poblado de los prodigios*. Madrid: Museo Arqueológico Regional, pp. 103-106.
- LÓPEZ SÁEZ, José Antonio et al. (2014). *Vegetation history, climate and human impact in the Spanish Central System over the last 9000 years*. «Quaternary International». 353, 98-122.
- MATEU SAGUÉS, Marta (2011). *Proposta d'aplicació de la micromorfologia a l'estudi dels materials de construcció protohistòrics*. «Estrat Crític». 5:2, 76-85.
- PALOMINO LÁZARO, Ángel Luis; NEGREDO GARCÍA, M.; BALADO PACHÓN, Arturo (2019). *Intervención arqueológica (excavación, control y prospección) para el desarrollo del parque eólico de «Carre-castro», tt.mm de Tordesillas y Velilla (Valladolid)*. Valladolid: Delegación Territorial de Cultura. Unpublished technical report.
- PASTOR QUILES, María (2014). 18. *Cabezo Pardo. Contribución a las formas constructivas de un hábitat argárico a partir del estudio de los elementos de barro*. In LÓPEZ PADILLA, Juan Antonio, coord. *CABEZO PARDO (San Isidro/Granja de Rocamora, Alicante)*. Excavaciones arqueológicas en el yacimiento de la Edad del Bronce. Alicante: Museo Arqueológico de Alicante, pp. 315-329. (Memorias; 6).
- PASTOR QUILES, María; KNOLL, Franziska; JOVER MAESTRE, Francisco J. (2019) *¿Adobes, terrones o bolas de barro amasado? Aportaciones para el reconocimiento arqueológico de las distintas técnicas constructivas que emplean módulos de tierra*. «Arqueología». 25:2, 213-234.

- PÉREZ RODRÍGUEZ, Francisco Javier *et al.* (1993). *Algunos aspectos de la Edad del Cobre en el Valle Medio del río Tera. Intervenciones arqueológicas de urgencia en Vecilla y Colinas de Trasmonte (Zamora)*. «Anuario del Instituto de Estudios Zamoranos “Florián de Ocampo”». 1993, 49-78.
- RODRÍGUEZ MARCOS, José Antonio; CRESPO DÍEZ, Manuel (2020). *Una ventana a los «recintos de fosos» calcolíticos del Valle del Duero. El Casetón de la Era (Villalba de los Alcores, Valladolid)*. In CARRETERO PÉREZ, Andrés; PAPÍ RODES, Concha, *coords. Actualidad de la investigación arqueológica en España I (2018-2019). Conferencias impartidas en el Museo Arqueológico Nacional*. Madrid: Ministerio de Cultura y Deporte, pp. 101-118.
- RODRÍGUEZ MARCOS, José Antonio; PALOMINO LÁZARO, Ángel Luis (1997). *Un asentamiento castreño del Bronce Antiguo en la Cuenca del Duero: el Pico Romero en Santa Cruz de la Salceda (Burgos)*. In BUENO RAMÍREZ, Primitiva; BALBÍN BEHRMANN, Rodrigo de, *coords. II Congreso de Arqueología Peninsular (Zamora, 1996)*. Zamora: Fundación Rei Alfonso Henriques, vol. 2, pp. 579-590.
- SÁNCHEZ GARCÍA, Ángel (1997). *La arquitectura del barro en el Vinalopó durante la Prehistoria reciente y la Protohistoria: metodología y síntesis Arqueológica*. In RICO NAVARRO, María Carmen, *ed. Agua y territorio*. Petrer: Ajuntament de Petrer, vol. 1, pp. 139-162.
- STRATO (1993). *Trabajos de lavado, siglado e inventariado de los materiales procedentes de la excavación arqueológica realizada en 1992 en el yacimiento de La Viña de Esteban García, Salvatierra de Tormes, Salamanca*. Salamanca: Junta de Castilla y León. Unpublished technical report.
- TASCA, Giovanni (1998). *Intonaci e concotti nella Preistoria: tecniche di rilevamento e problemi interpretativi*. «Archeologia dell'Italia Settentrionale». 7, 77-87.

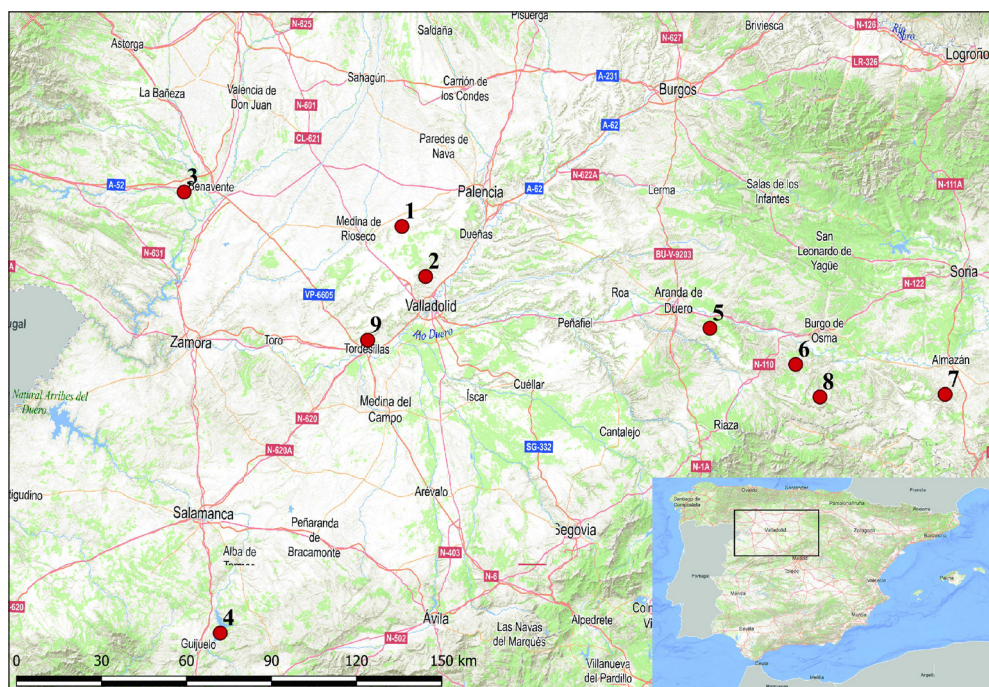


Fig. 1. Geographical localization of the settlements studied: 1. Casetón de la Era (Villalba de los Alcores, Valladolid); 2. Los Cercados (Mucientes, Valladolid); 3. Los Bajos; 4. Viña de Esteban García (Salvatierra de Tormes, Salamanca); 5. Pico Romero (Santa Cruz de la Salceda, Burgos); 6. Los Torojones (Morcuera, Soria); 7. El Parpantique (Ballúncar, Soria); 8. Los Tolmos (Caracena, Soria); 9. Carricastro (Tordesillas/Velilla, Valladolid)

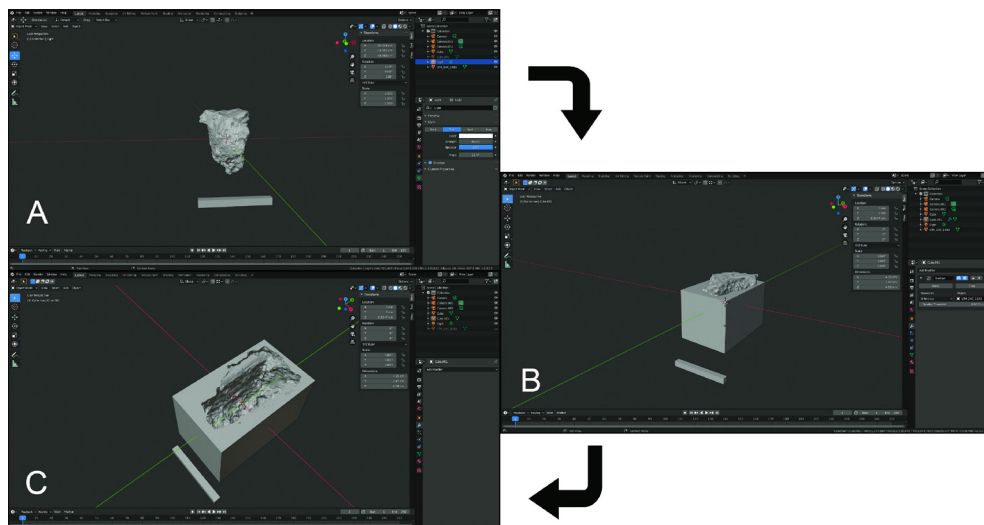


Fig. 2. Creation of a digital mould: A — Importation of the photogrammetric model; B — Creation of a cube and application of «Boolean modifier»; C — Final result

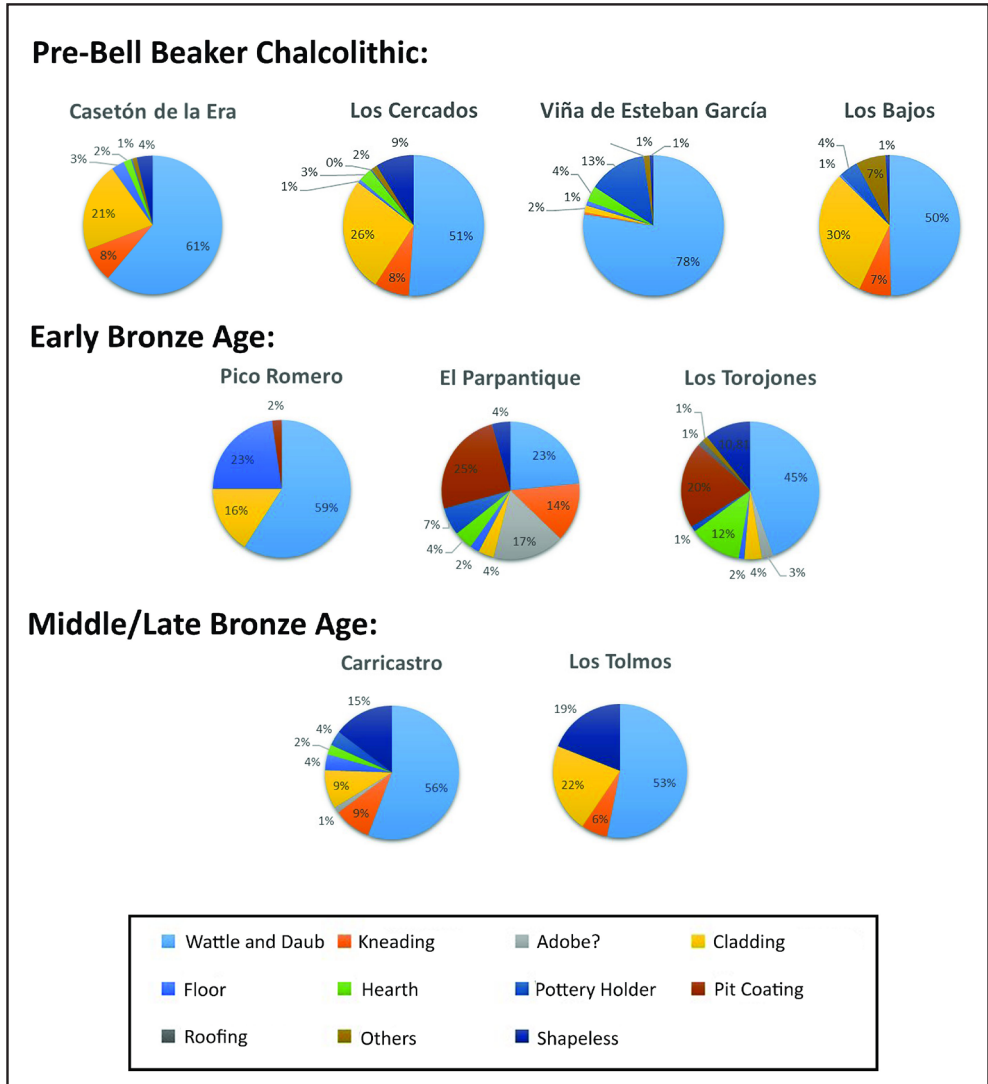


Fig. 3. Presence of each main typological classification in every settlement studied

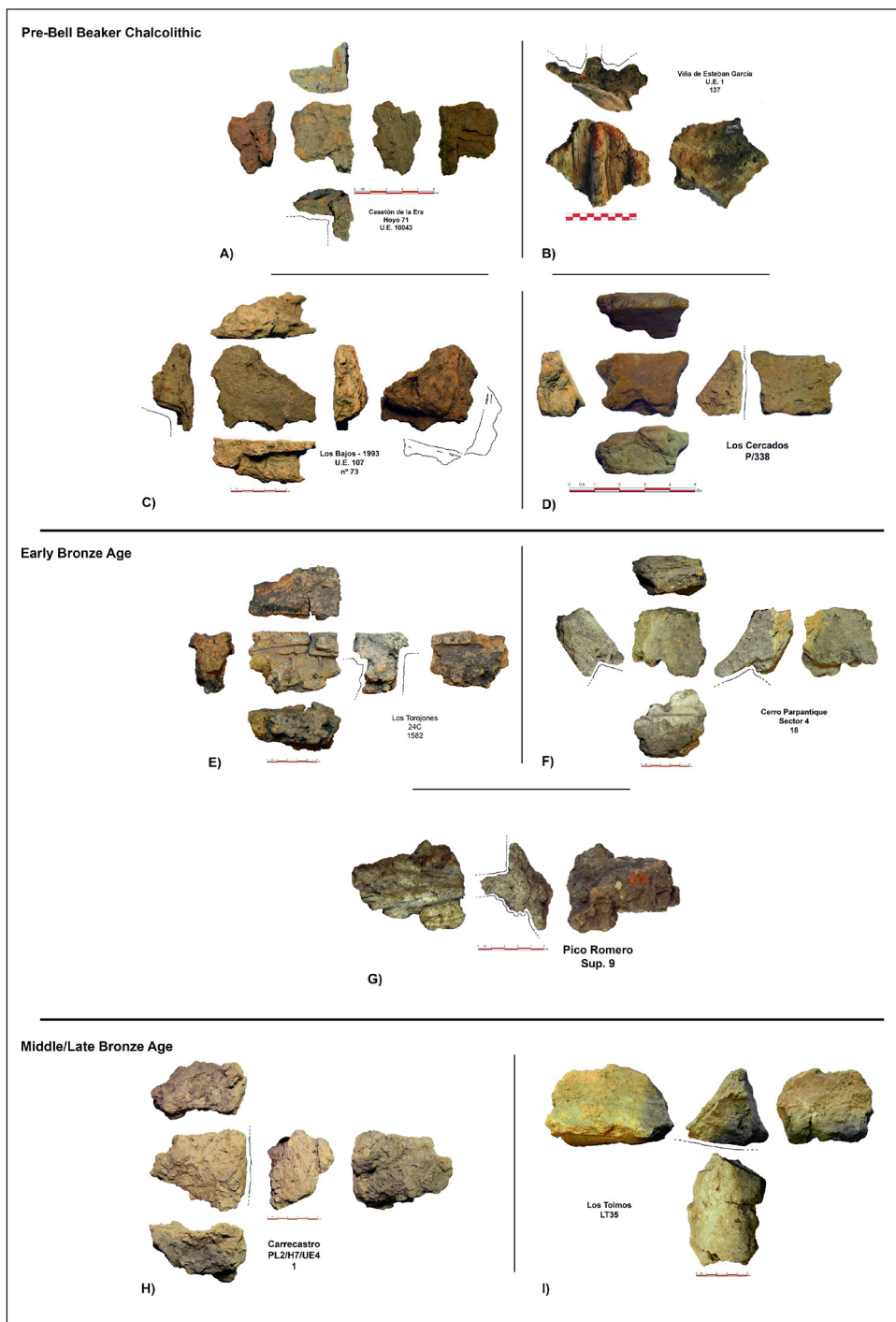


Fig. 4. Examples of fragments with plank/beam imprints from the settlements studied

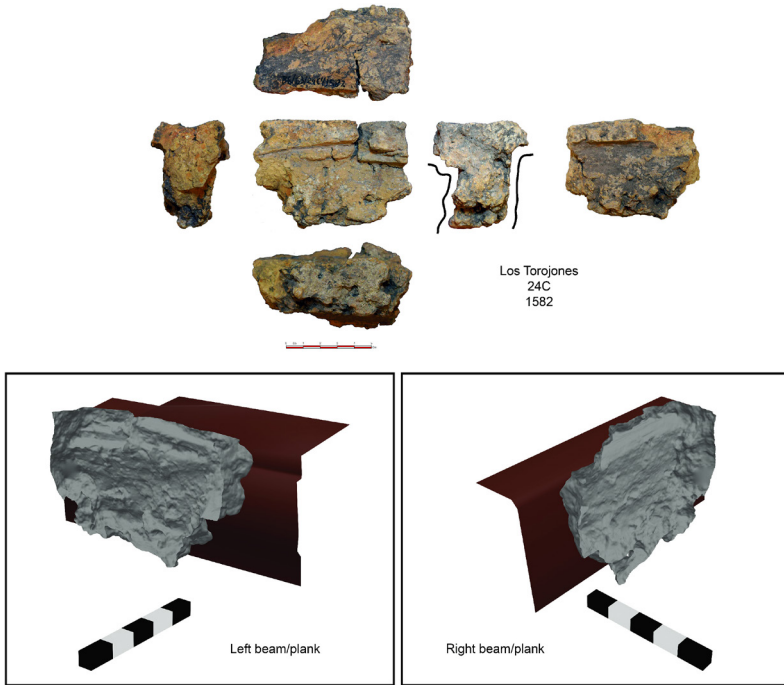


Fig. 5. 3D mould of the plank/beam imprints documented in the fragment 1582 from Los Torojones (Morcuera, Soria)

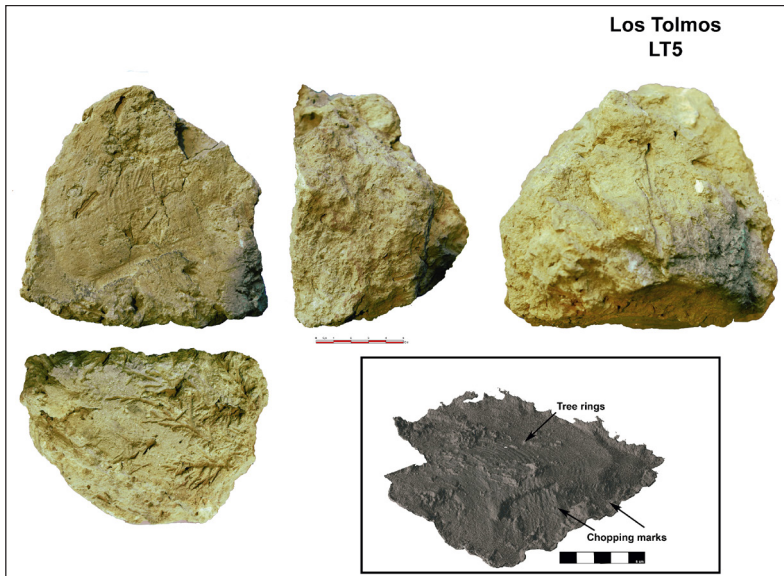


Fig. 6. Fragment LT5 from Los Tolmos (Caracena, Soria) where an end of a post could be identified, included the tree rings and a couple of chopping marks, clearly identified in the 3D positive of the imprint

