

Clay architecture in megalithic tombs along the Atlantic Façade: France and Iberia

Arquitectura de barro en el megalitismo de la fachada atlántica europea: Francia e Iberia

KEY WORDS: Clay Architecture, Megaliths, Neolithic, France, Iberia.
PALABRAS CLAVES: Arquitectura del barro, Megalitos, Neolítico, Francia, Iberia.
GAKO-HITZAK: Buztinaren arkitektura, megalitoak, Neolitoa, Frantzia, Iberia.

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ABSTRACT

Megalith's image along the Atlantic façade is linked to sizeable stone structures. Despite the importance of clay in creating wood and stone structures, this use remains invisible when analysing the skills of megalithic buildings. This paper gathers data from French and Iberian monuments to establish the central role of these construction materials throughout the Atlantic façade.

RESUMEN

El megalitismo de la fachada atlántica se asocia a las construcciones de grandes piedras que constituyen su imagen de referencia. Pese al papel del barro en arquitecturas de madera y de piedra, su uso resulta invisible en el estudio de las maestrías identificables en las construcciones megalíticas. Este texto recoge datos de monumentos franceses e ibéricos para establecer algunas reflexiones sobre su protagonismo en los grandes megalitos de la fachada atlántica.

LABURPENA

Fatxada atlantikoko megalitismoa lotuta dago harri handiekin egindako eraikuntzekin; erreferentziatzako irudia osatzen dute horiek. Eguurrezko eta harrizko arkitekturetan paper garrantzitsua izan zuen buztinak, baina eraikuntza megalitikoaren artean topa daitezkeen maisulanen azterketetan ikusezina da buztinaren erabilera. Monumentu frantziarren edo iberiarren datuak jasotzen ditu testu honek, fatxada atlantikoko megalito handietan duen protagonismoari buruzko hausnarketa batzuk ezartzeko.

1. INTRODUCTION

The most basic definition of megalithic architecture in western Europe describes them as sizeable stone structures, even though dry masonry is an essential element within some of the monumental settings. Their walls usually do not show the use of mortar, and it is systematically the case throughout the west of France (Laporte *et al.*, 2014: 477). In other areas of France and Iberia, we find a more complex scenario, including clay and lime mortars to reinforce and potentially waterproof the structure.

Megalithic studies in this European area have been focused on stone sizes, typologies of chambers and the descriptions of their entrances. Thus, the study of alternative construction techniques to the use of enor-

mous stones has not been appropriately developed. Some references in other areas of Europe are a reason to reflect on that fact. In the north of Europe, Polish researchers were able to reconstruct the lateral walls that accompanied classic trapezoidal monuments, showing an internal space with stone-less levels, comparable to megaliths from the north of Germany. In the UK, the case of Fussel Lodge is another interesting example. The existence of earthen buildings is historically known to have survived until recently around the British Isles. That is, in fact, where turf constructions were firstly recorded (Loveday, 2006).

The use of clay and adobe in wooden and stone structures is not entirely visible in the archaeological record. This is more notable the closer we get to the West. For that reason, these materials have been a second

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thought in France and Iberia, with a few exceptions (Fernández and García, 2016: 106; Bueno *et al.*, 2005, 2008, 2016a; Laporte, 2019; Laporte and Bocoum, 2019; Laporte and Bueno, 2022). In Iberia, the use of clay is recognised in Bronze Age sepulchres as part of the fitting of some burials. In the last few years, more data on Neolithic architectures (i.e., settlement walls, houses, tumuli, hypogea, dolmens, masonry tombs, etc.) has been collected. Known evidence consolidates the widespread use of clay as a for chambers and tumuli, cists and other delimited spaces inside and outside megalithic structures, as well as it is used, for wall supporting, for delimiting grave goods and corpses, and as raw material to manufacture stelae and figurines (Bueno *et al.*, 2016b; Martínez *et al.*, 2022).

Stone structures reveals the opportunity to source raw materials (neighbouring quarries), consistency (a certain know-how about stability and geometry) and visibility (volume and location). On the other hand, they describe a tradition and a specific way to build collective burial spaces. Funerary architectures cannot be separated from their ideological essence (electing reused supports, maintaining the same places with refurbishments). In that sense, engravings and paintings that characterise the Atlantic megalithic funerary narrative, use clay, sometimes coloured, as another element to be thoroughly studied.

This text aims to reflect on the use of different raw materials in Neolithic architectures from European Atlantic façade, taking as reference French and Iberian cases in which construction techniques in mud or clay are protagonists. Further developments could also concern Britain and Ireland, along with some other examples in the western mediterranean basin or in more continental parts of Europe, but these would need larger presentations than the ones detailed through this yet quite long article; it will be the aim of some forthcoming publications.

2. CLAY AS A CONSTRUCTIVE MATERIAL DURING LATE PREHISTORY IN THE ATLANTIC FAÇADE OF EUROPE

Clay is a common constructive element for building and manufacturing throughout human history, specially from the Neolithic period onwards. It is clearly attested for Neolithic architectures in Western Europe, although conservation is always complicated, which sometimes leads to difficult identification. As so, clay elements are frequently misinterpreted or not directly identified as part of the building system where stone seems like the main material. Such identification requires two complementary approaches at different observation scales: a morphological one that allows the detection of sizeable masses of clay shaped by human action defining plan and elevation of the monuments; and a chemical and micromorphological one through thin sections, which detects possible place of origin of the material, its ela-

boration, and application, as well as numerous information about the post-deposition processes (follow Knoll *et al.*, 2019) In Iberia, these applications have been tested in Bronze Age domestic contexts (Ferrer, 2010; Pastor *et al.*, 2022), and in France, for Neolithic structures, mostly in the last twenty years (Jallot *et al.*, 2000).

There are many techniques to build structures with earth and clay, among which constructive clay and finer mixtures are the main occurrences in most recorded Neolithic Western European buildings, with just a few references to adobe. Clay appears in three circumstances: as filling, to build walls, or as plaster for floors and walls also made of different materials, plant fibre or stone. From the simplest to the most complex:

- Simple accumulations of soil as the result of consecutive more or less efficiently structured fillings, which could include clay levels or walls, inside a funerary tumulus, for example.
- Mixed structures, armed with timber posts anchored in the ground with clay applied onto a frame of perishable material. Danubian neolithic houses are archetype. Clay is also used for flooring, including occasional colouring.
- Cob or adobe walls, as an alternative to wooden structures and stone walls. There are multiple combinations for domestic, monumental, or funerary applications, including a stone base and clay walls.

These three options are well represented in French as Iberian Neolithic and Chalcolithic, from domestic environments where the main use is not only for households, but also in the delimitations of sites where wood, clay, and stone are combined in a more complex relation between raw materials, their maintenance, and their transformation. Clay walls are recorded in the south of France from the early Neolithic onward (Sénépart *et al.*, 2018). In Iberia, we have references for stone-base and clay-walled huts from the oldest Neolithic (Gómez, 2008; Rojo *et al.*, 2005). However, it is not common to find composition, origin, transportation, or application studies about these structures. In the Garona valley, the adobe wall of a ramparts collapsed inside the ditch, have been dated in the mid-Neolithic (Gandelin *et al.*, 2011), which coincides with the chronologies for plan habitats with mud walls found along the riverbanks of La Manche (Laporte *et al.*, 2015; Bizien-Jaglin *et al.*, 2016). Later on, such structures are found on the plains of Hérault as an alternative to stone houses from the Fontbuisse culture (Jallot, 2003, Wattez, 2009). Furthermore, the role of clay has focused researchers' attention on relation to fortified and ditch enclosures from the south-eastern Iberian late Neolithic and the Chalcolithic. The height of these walls would have been developed with layers of mud, as it seems it happened at Los Millares (Cámara and Molina, 2013, figs.5-8), or with adobe, as observed in Marroquies Bajos, Jaen, Spain (Rodríguez *et al.*, 2006).

3. NEW DATA ON CLAY STRUCTURES IN FRENCH MEGALITHS

The antiquity of clay architectures in France presents technical solutions, such as the use of modular clay pieces, that are related to advanced mud brick construction. From the first half of the 5th millennium cal BC, the Paris basin presents some of the oldest funerary monuments, sometimes superposed onto houses of Danubian tradition. They are surrounded by ditches, and they are lengthened in shape with a ceremonial hallway towards the sepulchre (Duhamel, 1997). In occasion, this hallway has been interpreted as the only remain of a possible tumulus (Pillot & Lemerrier 2014), built at the image of a collapsed house (Migdley, 2008). Other monuments do not present evidence of any burials, even if they seem contemporary to the Passy type ones, as it occurs in Beurieu, Aisne (Colas *et al.*, 2018).

In Normandy, the monument 29 at Fleury-sur-Orne, Calvados, trapezoidal and 146m in length, was built using turf blocks (clay walls) around the 4750-4550 BC. The original quarry to build the only stone façade, on the East, stands on both sides of it (Ghesquière *et al.*, 2015, 2021). It does not have any identified burial. Close to the mouth of the Seine, at Porte-Joie Val-de-Rueil, Eure, a number of aligned stones are indirectly associated to a small group of graves of the Cerny culture. These seem to have been excavated into a previous construction delimited by mud walls (INRAP - C. Riche dir.). The elongated tumulus of Cuverville, 143m in length (Fromont *et al.*, 2021; Laporte *et al.*, 2018), shows in its easter end a mound of clay, which micromorphology suggests was originally a clay building (cob balls in Wattez *et al.*, forthcoming). Such constructional techniques could have been employed at least for some of the 35 Passy-type monuments from Fleury-sur-Orne (4550-4350 BC) which are associated with graves. (Fig.1)

The Crucheau tumulus (Saint-L'Heurine, Charente-Maritime), 110m in length and 35m wide, show inter-

nal turf structures (clay walls) comparable to dry stone tumuli (Burnez *et al.*, 2003). Fouillages (Jersey) was built in a similar fashion, with a plan delimited by spaced stones. This monument has a cist and at least two consecutive phases (Kinnes, 1986).

Hydromorphic clay fillings appear to be at least two thirds of Saint-Michel tumulus' mass, as found in other structures from the Morbihan gulf area (Boujot, Cassen, 2000; Le Roux 2006; Scarre, Laporte, 2021). The small "windows" arranged in the side walls of mine galleries from the 20th century dug in Saint-Michel tumulus do reveal the presence of clay modular pieces (Gouézin, 2017). Hand shape mudbricks appear within this mass that cover a dolmen and the stone tumulus containing a cist and another dolmen inside (Le Rouzic, 1932; Laporte, 2010). This is the same type of material used to build the houses at Lillemer (both puddled clay and mudbricks - handmade, not moulded), around the same time but more to the north of Brittany (Laporte *et al.*, 2014: 470-471).

Gasteenia dolmen, in the Atlantic Pyrenees (Marticorena *et al.*, 2018; Mens *et al.*, 2018), dated in the first half of the 4th millennium cal BC, was built on top of a clay formation 15m in diameter and 2m in height. (Fig.2) This mass has been characterised by micromorphology as an accumulation of aligned adobe structures (hand shape mudbricks structures), that lately sunk (Wattez *et al.*, forthcoming), and even though the excavation did not look at plans or elevations for it. Also, in the south of France, but closer to the Mediterranean, Céreirède, Lattes, Hérault, and Saint Pastour, Vergèze, Gard, monuments are attributed to a mid or late-Neolithic chronology. They have piriform plans and are surrounded by a ditch filled with stone slabs. At its centre, there is a semi-buried grave. A clear tumular mass has not been identified, even though the archaeological study demonstrated that the ditch was used to erect a cob wall that is no longer traceable (Wattez *et al.*, forthcoming).

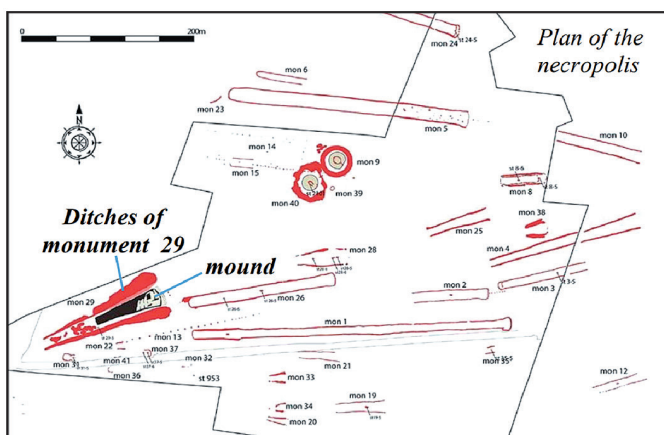


Fig.1. Stratification of a clay wall within the Monument n°29 of the «Hauts de l'Orne» STP necropolis (Fleury-sur-Orne, Calvados) - Middle of the Vth mill. BCE - dir. E. Ghesquière (Inrap, UMR 6566 CReAAH). Photo J. Wattez / Estratificación de una pared de barro del Monumento 29 - Hauts de l'Orne- STP necrópolis (Fleury-sur-Orne, Calvados. Mitad del V milenio cal BC. dir. E. Guesquière (Inrap UMR 6566 CReAAH). Photo Julia Wattez.



Fig.2. Mudbricks composing the mound on top of which the dolmen of Gaastenia is installed (Mendives, Pyrénées Atlantiques, France) - dir. P. Marticorena (UPPB / EHUH, UMR 5608 TRACES). General view. Photo courtesy of M. Onfray, cob lumps. Photo courtesy P. Marticorena / Adobes como parte del túmulo en cuya zona superior se incluye el dolmen de Gasteenia (Mendives, Pirineos atlánticos, Francia) dir. P. Marticorena (UPPB/EHUH, UMR 5608 TRACES). Vista general. Foto M. Onfray, adobes. Foto P. Marticorena.

The exceptional anthropologic record from the dolmen of Ubac, Provence, was included within a compacted clay tumular mass (Bizot & Sauzade, 2015). When excavated researchers were not aware of the possibility of clay architectures in such a context, especially here for the access structure (Laporte, 2016). There are a few examples in Iberia to support this idea.

Timber could also have had a role in these entrances, as we have recorded aligned wooden posts set up as corridors in the north of the Netherlands (Bakker, 1992). The collective burial from Mas Rouge at La Cavallade, Montpellier, Hérault, of late-Neolithic chronology, is a partially buried rectangular architecture carved into an older ditch of domestic use. Its space was divided with clay walls, sometimes with adobe (hand shaped mudbricks), and prepared earthen floors as well (Tchéremissov, 2018). Amongst the southern French late-Neolithic structures, the presence of chambers with clay walls, sometimes mixed with dry stone is noteworthy. That is the case of Peirouse at Marguerites, Gard (Jallot, 2009, fig. 16).

Along the French Atlantic façade, clay appear as a possible alternative solution to dry stone walls and façades, structuring or delimiting tumular masses with geometric plans, etc. There are at least turf walls, as the ones from Jersey and the British Isles. In the south of France, constructive techniques are more diverse but illustrated by scarce examples. Generally, clay within tumuli constructions has not been given special attention, despite this being widely present throughout the Iberian Peninsula.

4. CLAY STRUCTURES IN IBERIAN MEGALITHS

5th millennium cal BC architectures in Iberia are visibly polymorphic, which includes clay chambers (Bueno Ramírez et al., 2016a). The Iberian interior has a few examples of circular chambers with stone foundations

and clay walls (Velilla, Zumacales), with exclusively clay-made walls (Reinoso), or with walls made with a mix of clay and small pebbles (Castillejo) (Bueno *et al.*, 2005a, 2016a; Rojo *et al.*, 2020; Santa Cruz *et al.*, 2020; Zapatero, 2015). However, the distinction between different building techniques has not always been established (clay mound and/or walls, puddled clay and/or mudbricks, etc.).

It seems like a vast number of tumuli were made of clay and, occasionally, of clay mixed with medium and small pebbles to achieve greater compactness. It is even possible that evidence of burned limestone found at La Peña de la Abuela's chamber (Soria) was accompanied by a clay shell to control combustion of stone and timber. These processes of fire closing could explain the documented vitrification at the dolmen of Picoto de Vasco, in the north of Portugal (Abrunhosa *et al.*, 1995, 172; Alonso, 2015, 91; Alt *et al.*, 2016; Rojo *et al.*, 2002).

From the beginning of the 4th millennium cal BC, there are clay chambers in the north of Iberia as well. That is the case of one preceding a stone chamber within the same tumular mass (Bóveda & Vilaseco, 2015) from the dolmen of Chousa Nova 1 Galicia (Scarre & Laporte, 2021, fig. 5). The big tumuli at Monte Areo, Asturias (López *et al.*, 2010) include chambers where timber has a relevant role together with clay to erect the walls. The dolmen number 5 from La Cobertoria (Rodríguez & Busto, 2020) presents a dry-stone chamber that was dismantled at a later moment (Fig. 3). Graphic analysis revealed a clay ring with a vertical façade that is 1 metre high and closes the first phase of the monument. Clay structures are also seen in the hallway, which still has dry stone walls. This could be the second phase of the structure's development, but excavations did not fully delimit it. The final appearance of the mound partly reflects these mentioned contributions and has signs of incineration of some type.



Fig.3. Drone image. Dolmen of Cobertoria 5, Asturias, Spain. Photo courtesy F.Rodríguez del Cueto./ Imagen de dron. Dolmen 5 de La Cobertoria, Asturias, España. Foto F. Rodríguez del Cueto.

The supposed absence of cairns in Iberian Megaliths and the widespread idea that most structures had a stone shell, do not reflect the variety of documented structural solutions. Sometimes authentic cairns of quartz and quartzite (white being the most visible colour), compacted with yellow/red clay, do form the tumular structure. That is the case of Lagunita I, Cáceres (Bueno *et al.*, 2008a). Soil plus stone shell is a common option in the northwest, as well as in the south. The Soto dolmen is a good example of that (Bueno *et al.*, 2018) (Fig.4). This monument has an intra-tumular corridor made in clay, that has stone walls closer to the entrance resembling megalithic supports. Clay intra-tumular corridors are also habitual in architectures from the Portuguese area of La Beira from the end of the 5th/beginning of the 4th millennium cal BC. (Gomes *et al.*, 1998,86). They appear in big megaliths from Andalucía such as Viera, Romeral and many other southern structures.

Impressive stone tumuli, such as the one at Anta Grande de Zambujeiro (Evora, Portugal), highlight the complexity of these structures' construction. With a small stone mixed with clay limit (Soares & Tavares 2010, p. 99), the tumulus at AGZ could have been formed with adobe (hand shape mudbricks), as mentioned before for French monuments. Others were clearly erected solely with clay, such as the El Seminario (Huelva) necropolis (Linares, 2020). These can be dated as far as the second half of the 4th millennium cal BC.

Clay tumuli had to be more common than what has been preserved. Graves and cists ensembles of the 5th millennium cal BC chronology could have been located inside a clay tumulus that did not survive the pass of time. In that sense, the necropolis of Campo de Hockey (Cadiz) is worth mentioning. Stone delimited graves are disposed inside a circular shape, a clay tumulus that is only plausible due to the ditch that surrounds the structure. This could be supporting walls comparable to what was described for the monuments at Céreirède. More evidence was not recovered, although excavator noted the common appearance of red coloured clays (Vijande *et al.*, 2015, fig.5). (Fig.5)

There are not many examples of ditches around Iberian dolmens. The dolmen of Dombate (Galicia) could have had a closing clay structure, highly speculative, and a clay quarry to supply internal maintenance of the structure. For instance, the floor is made of clay and of white and red colours. The stone walls had a coloured clay plaster that was continued for the areas without stone (Carrera, 2011).

One of the differences between French and Iberian megaliths' façades is that the former has more of a vertical presence and the latter do not. Only at the necropolis of Alcalar (Algarve) with the Alcalar 9 structure we see comparable heights (Morán & Parreira, 2004). The ladder-like front of Lagunita III (Santiago de Alcantara, Cáceres) suggests architectonic solutions that are loo-



Fig.4. Clay Iberian mounds: Top, Infography of Los Millares showing the role of mud in the walls, huts and burial mounds from Cámara and Molina, 2013, fig.7. Middle, view of the stone base with clay, Pozuelo 3 and 4 mounds, Photo R. de Balbín. Down, clay mound of Dolmen de Soto, Huelva, Spain. Photo R. de Balbín./ Túmulos de barro en Iberia. Arriba: Infografía de los Millares en la que se observa el papel del barro en la construcción de paredes, cabañas y túmulos funerarios, según Cámara y Molina, 2013, fig.7 Centro: Túmulos de piedra y barro de Pozuelo 3 y Pozuelo 4. Foto R. de Balbín. Abajo: Túmulo de barro del dolmen de Soto, Huelva, España. Foto R. de Balbín.

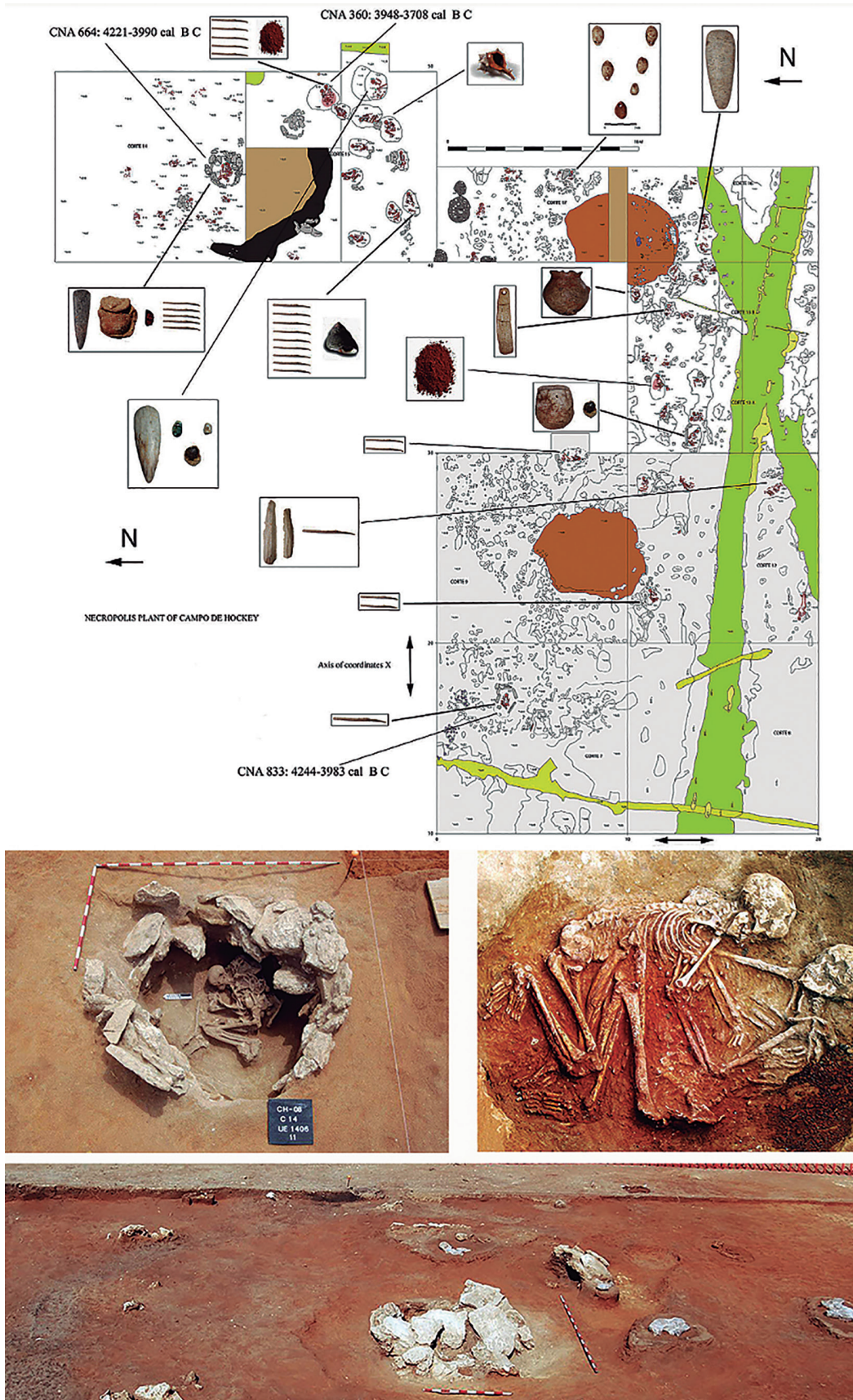


Fig.5. Campo de Hockey, Cádiz, Spain, spatial location of grave goods, from Vijande *et al.*2015. Above, detail of one of the architectures and of the burials with red dye. Below, view of the coloured earth of the tumulus. Photos courtesy of E. Vijande./ Campo de Hockey, Cádiz, España. Ubicación de los depósitos funerarios según Vijande *et al.*2016. Detalle de una de las arquitecturas y de sus enterramientos coloreados de rojo. Abajo, vista del túmulo de tierra coloreado. Fotos E. Vijande.

king to reach similar heights as well (Bueno *et al.*, 2008). In the Basque country, there are megaliths that appear included in a mass of dry stone (Fernández *et al.*, 2010), such as the ones seen on the north, but their façades are not clearly delimited or have disappeared.

Stone foundations are common, sometimes setup in a 'fish spine' fashion, showing notable skill, and clay walls that are occasionally coloured, such as in the case of Pozuelo, Huelva. Some megaliths' tumuli from the Iberian interior present an orderly construction of buttresses formed by two circles of vertical stones, whose height is close to the height of the chamber. Then, a third bigger circle of sizeable slabs is included and rest onto the previous circles. That last circle could be made of dry stone as well. Between circles, there was probably a fill of quartzite and slate bound with clay. On occasion, stone fillings between the vertical circles are not too compact or do not exist at all, which leads to the use of clay instead. That is the case at the dolmen of Teriñuelo, Salamanca (Tejedor *et al.*, 2017). Very similar, but of a later date, are the masonry burial mounds from Los Millares necropolis describes as concentric stone rings. These were probably held together with clay, which perhaps even aimed in raising the height of the structure (Cámara & Molina, 2013, fig.7). These clay and stone additions could represent successive extension phases for the monument.

Continuity in clay constructions during the 3rd millennium cal BC is suggested by the hypogea from the necropolis of Valle de las Higueras, where clay walls are abundant. Their inclination has been reconstructed by tracing the accumulation of grave goods and their position. Caves 5 and 8 from this site present clay limits inside, including a clay cist in cave number 5 that contained human remains (Bueno *et al.*, 2005a, 2008b). Clay vaulted roofs that were found at Valle de las Higueras, in addition to the one covering the *tholos* number 4's crypt at Perdigões, Portugal (Valera 2020, fig.15), and the *tholos* from Montelirio (Fernández Flores, García Sanjuán, 2016), suggest a structural solution that ought to be analysed in other monuments. The access to the hypogea was occasionally closed with masonry structures held with clay with a very high organic content. These black mud closings contrasted with the light colour of the closing stones, thus adding a visual component (Bueno *et al.*, 2015a, b). (Fig.6)

Improvements in the construction of Iberian megaliths are directly linked to the use of mortar. Clay or lime mortar are visible on the walls of the big monuments of the South. Old pictures from El Romeral, for example, reveal that the internal wall was completed using clay mixed with rocks. Conversely, the exterior wall was made with stones levelled and held with coloured clay. Some monuments from Valencina could have been built with this same technique. In these same structures, the tumulus was formed with lime mortar, which also appears at other sites such as Cabeço da Anta, Portugal (Caninas *et al.*, 2020, fig. 3.22).

5. CLAY STRUCTURES IN MEGALITHS ALONG THE ATLANTIC FAÇADE. DISCUSSION

The presence of clay structures in association with megalithic buildings along the Atlantic façade could be interpreted as an anecdotal occurrence, due to their image of stone almost atemporal solidity. In that sense, big stone monuments would represent a social effort that elevated quotidian constructions to something special and unique. On the other hand, the idea is that clay represents a simple element, easily accessible, and closer to daily life. The abovementioned examples are just a few references to highlight the diversity, complexity, and frequency of clay structures amongst stone megaliths along the Atlantic façade. The former has not been recognised sufficiently because their existence almost was not previously imagined.

The dialectic between earthen tumuli and stone cairns, a constant for the Britton megalithic chronologies (Boujot & Cassen 1992), requires a more nuanced perspective now. Some of the earthen mounds were delimited by dry stone walls (if not by unseen clay walls), whose height was partly conserved or whose collapse was identified around the adjacent ditches (Laporte *et al.*, 2011). They were as well geometric constructions, some delimited by a stone façade, but their more or less structured internal mass, consists of banks rather than rocks. This distinction is described as an east-west division in the UK (Scarre 2005, Field 2006). In Iberia, tumuli have not been seen as authentic cairns, but as soil fillings with stone shells, or as systems structured in deposits that delimit circular lines of buttresses like the case of Los Millares. All the mentioned examples confirm more complex options. Tholos-like structures in Los Millares and similar constructions have older dates in the Iberian hinterland.

For that reason, with a few exceptions (Moran & Parreira, 2004), most of the megaliths in Iberia seemed to differ from those of the Atlantic Europe by the absence of elevated façades. The image of French and Iberian tumuli is currently more comparable than ever, as dry-stone façades coexisted with clay structures or mixtures of stone foundation and clay elevation. Vertical and stepped façades (Bueno *et al.*, 2008), suggest an original interpretation about the use, visibility and access for these monuments. Furthermore, we may hypothesise that some ditches (Céreirède and Campo de Hockey) could be traces of clay walls that delimited tumuli but have disappeared.

Gasteenia, in the French Atlantic Pyrenees (Marticorena *et al.*, 2018, Mens *et al.*, 2018), and probably Anta de Cabeço da Anta (Portugal; Caninas *et al.*, 2020, fig. 3.22; Pereira *et al.*, forthcoming), were dolmens built on top of a clay mass, some structured with clay walls and potentially belonging to a previous monument. Clay chambers, and containment rings made of clay, equally appear in Iberia and France. In some cases, the timber and clay framework are well preserved (Andrés *et*

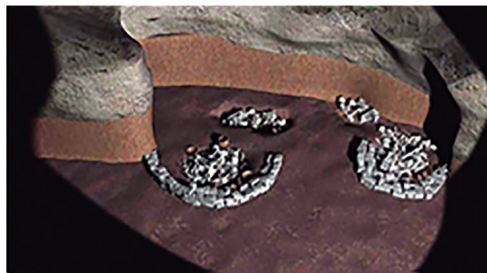


Fig.6. Above: Mud vault over the main chamber of Montelirio, Sevilla, Spain from Alvarez Flores and García Sanjuán, 2016,104. Centre: Mud vault at sepulchre 4 from Perdigoes, Evora, Portugal according to Valera, 2020, 27. Below: Infography of the chamber and antechamber of cave 3 with mud wall and vault, necropolis of Valle de las Higueras, Toledo, according to Bueno Ramírez *et al.* 2019. / Arriba: Resto de la cúpula de barro de la cámara principal del Montelirio, Sevilla, España según Alvarez Flores y García Sanjuán, 2016,104. Centro: cúpula de barro del sepulcro 4 de Perdigoes, Evora, Portugal según Valera, 2020,27. Abajo: rinfografía de la cámara y la antecámara de la cueva 3 de Valle de las Higueras, Toledo, con cubierta de barro y paredes de barro, según Bueno Ramírez *et al.* 2019.

al., 2001). Some singular structures, such as dry-stone or mud brick hypogea with a U plan, equally appear in Iberia and France (Armendariz & Irigaray, 1993; Jallot, 2009, fig.16). Interpretative models that proposed two opposed technical solutions (stone vs. clay and timber) as a cultural and chronological indicator, must be questioned considering the described variety of architectures. (Fig.7)

It is also a new contribution to record the use of simple clay or lime mortar to finely align rocks on walls or stone tumuli. Mentions to clay mortar in French megaliths are scarce. A clay filling was described for the stone walls at the dolmen of Grèves de Frécul (Aube, France), and for the tumular mass' base from a gallery grave at Reclus (Marne), dated in the beginning of the 4th millennium cal BC. (Desbrosse & Wattez, 2022). During the late-Neolithic, this filling solution to make stone constructions more compact has been recorded at the stone base of monuments built with timber posts in Pont-sur-Seine, Champagne, France. These have chronologies between the 3500-3000 cal BC. The use of lime mortar is implicit in the fire closings of some of the chambers built in limestone from the northern Meseta. In Iberia, lime mortars are documented at 4th and 3rd millennium cal BC monuments, especially in the south and less importantly in the west.

Determining the use of lime in archaeological sites before Roman times is a complex task. Recarbonatation produces calcite than is indistinguishable from the natural kind (Karkanas, 2007, 776). It is also very easily confused with fine natural calcareous sediments. There is no sense in discussing the origins and uses of lime in Neolithic constructions in this paper. However, there are two important elements: lime is part of the closing of monuments since the end of the 5th millennium cal BC in Iberia, and its use is also present during the second half of the 4th and the beginning of the 3rd millennium cal BC.

Tholos and hypogea reveal extensive knowledge in clay building, adding information about vaulted roofs in this material and suggesting bigger scale uses for it. Burials in Los Millares are an interesting case study. Their reconstruction with clay vaults, added to the height of their clay walls, would depict a very different scenario to what was previously assumed (Fig.8)

On top of that, coloured clays used in their construction enrich the potential visual value of these sites. Sometimes, the selection of clays for the tumulus shows a preference for more remarkable colours, which were visible at a point in their construction but not at the end. That is the case of Try, Guval, West Penwith (Jones & Quinell, 2012), where clay from the tumulus were deposited in circles. This is visible at the site of Montelirio,

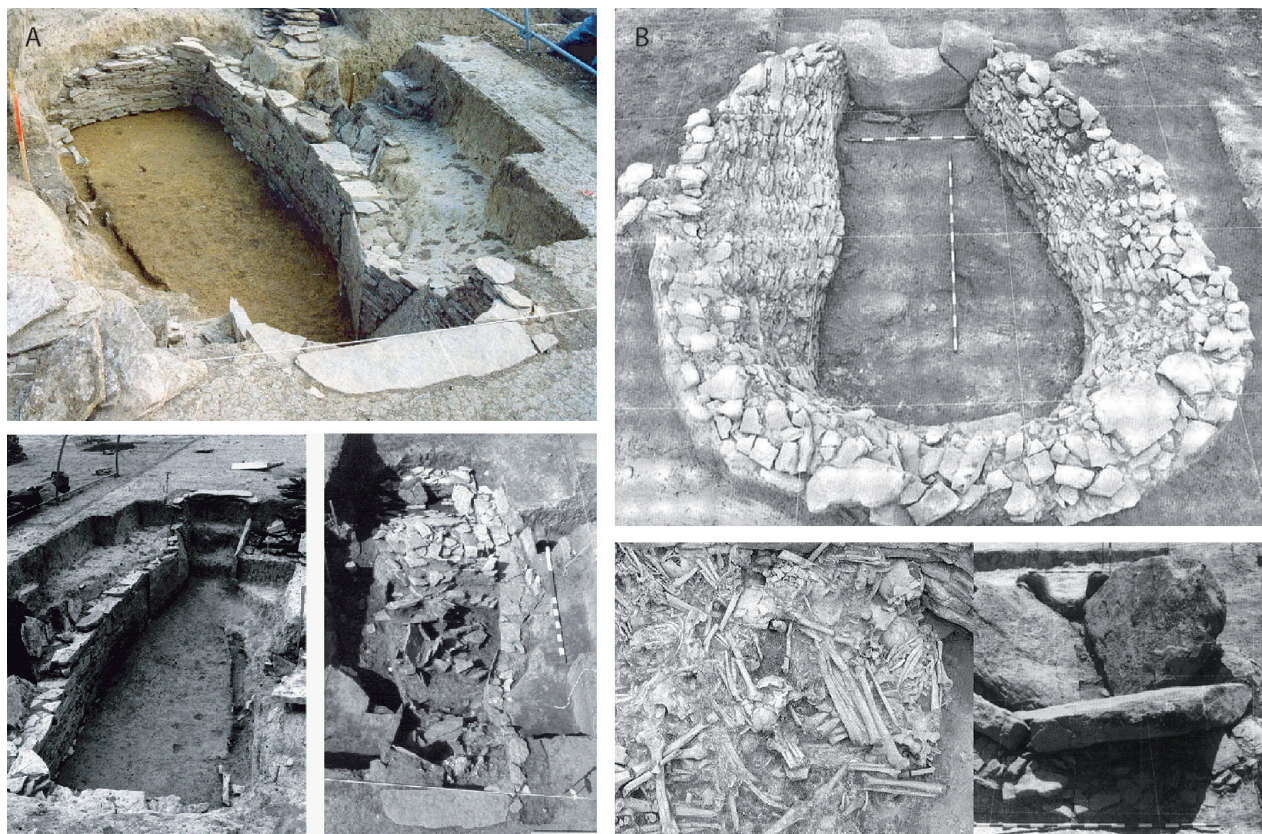


Fig.7. Cellars and hypogea. A/ Late Neolithic cellar at La Peirouse ovest, Marguettes, Gard from Jallot 2009; B/ Late Neolithic hypogea at Longar, Navarra, Spain from Armendariz Martija and Irigay, 1993. / Cámaras subterráneas e hipogeos A/ Cámara del Neolítico final de La Peirouse oeste, Marguette, Gard según Jallot,2009, B/ Hipogeo del Neolítico final de Longar, Navarra, España según Armendariz e Irigay,1993.



Fig. 8. Clay human images at Montelirio, Seville, Spain: Left, figurines painted in cinnabar, Right: Stele with embedded pieces from the ground level where it fell, and stele with white painting, red and black, after the cleaning process, from Bueno Ramírez *et al.* 2016b. / Imágenes humanas en barro, Montelirio, Sevilla, España. Izquierda, figuritas pintadas con cinabrio. Derecha estela con piezas incrustadas del nivel donde estaba tumbada, y estela con pintura blanca, negra y roja, tras el proceso de limpieza según Bueno *et al.* 2016b.

whose tumulus was made entirely from clay (Bueno *et al.*, 2016b). In Iberia, megalithic tumuli made of soil, and covered in stone or delimited by stone, were probably built by the consecutive deposition of treated clay sediments mixed with water and sundried. Some of them have naturally coloured sections intentionally placed, from specific provenances, or dyed with iron oxide.

Above all, clay tumuli are an enormous container of undoubted material consistency that shelters and compacts the interior and, sometimes, encloses the monuments. Thus, detailed studies allow us to approach their biographies from a different perspective.

6. CONCLUSION

The issues involved in presenting a general review of this evidence beyond the scattering of publications and the inclusion of data in very small contributions to much bigger works, are varied and diverse. Conservation is clearly the most relevant one, as clay turns into fine soil when it loses its hygrometry. If it was mixed with small and medium pebbles for consistency, archaeology would detect it as it actually appears in surprising quantities. On a few occasions, it has been possible to record intact walls, even with colour, packed and decorated floors, internal divisions, tumular delimitations, vertical façades, with or without stone foundations, etc.

Available data is based on on-site observations during the excavation process or the graphic documentation. Discussing the plan of clay structures, as well as trying to distinguish collapses and erections of their walls and façades, or more or less structured fillings, is an exercise that requires more field work and more information. Nevertheless, this present paper's catalogue suggests that this is a fruitful research line.

As a whole, we can confirm that clay architectonic structures were more common than previously assumed. Their presence is clear, but we still have not recorded fully delimited structures, or their full height development on the inside or the outside. Dolmens were built in stone, although timber and clay were relevant for their construction and maintenance, which would be better understood if we accounted for these less visible solutions. In this context, lime mortar was a fundamental piece in erecting tumuli, and in Iberia for the fillings of some dry-stone walls. It also contributed to the recorded technical array agreed to be in use during the life of megaliths in the Atlantic façade.

7. ACKNOWLEDGEMENTS

This text is part of the results of the project PGC2018-099405-B-I00. Some of the graphic material has been facilitated by M. Onfray, P. Marticorena, E. Vijande, F. Rodríguez del Cueto and R. de Balbín. We are grateful for their generosity as well as for the comments of M.J. Bóveda, X. Vilaseco, N. Fromont, P. Gouézin, R. Marsac, P. Séjalon and C. Riche. We are also grateful to the reviewers for improving this text. A. de Balbín and E. Navajo have contributed to translation of the paper.

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