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Funerary practices in megalithic tombs during the Argaric Bronze Age in South-Eastern Iberia: The cemetery of Los Eriales

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ABSTRACT

The transition between the Copper Age and the Argaric Bronze Age in south-eastern Iberia has traditionally been understood in an evolutionary framework that would have involved the replacement of some cultural forms by others. The chronology of megalithic societies has changed this assumption, revealing that the continuity of ancestral funerary practices is also a key feature of the Bronze Age. In this context, the new radiocarbon series from Los Eriales discussed in this paper can be considered a key contribution. Three main aspects stand out according to their statistical analysis: i) Los Eriales should be considered the most recent Iberian megalithic cemetery, as ritual activity began in the last centuries of the third millennium cal BC; ii) funerary activity took place during short events of intensive ritual depositions spanning a few decades, mainly in the 21st and 18th centuries; and iii) Los Eriales cemetery was mainly used during the Argaric period, which means the coexistence of two very different funerary practices: collective megalithic rituals and individual intramural inhumations. The continuity of megalithic rituals can be explained in terms of resilience to the social fragmentation that characterised Argaric societies.

1. Introduction

Iberian archaeology has been principally focused on a theoretical perspective that acknowledges social evolution as a linear pathway, involving the replacement of some cultural forms by others. The study of the transition between the Copper Age and the Argaric Bronze Age in south-eastern Iberia perfectly matched this notion of linear evolution and social progress. The cultural innovations that took place at the beginning of the Bronze Age, already described by Luis Siret and Enrique Siret (1890) at the end of the 19th century, have provided solid empirical foundations for this perspective.

Viewed in this way, the appearance of the Argaric culture marked a deep-seated change compared to the previous Chalcolithic cultural traditions. Settlements located in valleys or lowlands and characterised by circular huts were abandoned. The new Argaric sites were principally placed on hilltops and houses were trapezoidal or rectangular in shape. Argaric communities placed their tombs inside settlements, normally below dwellings, and individual inhumations became the most characteristic ritual practice. These innovations were also fuelled by changes in craft activities that involved the appearance of new pottery vessels and the intensification of metallurgical production (Aranda Jiménez et al., 2015, 2021a). According to recent studies based on radiocarbon dating, all these innovations occurred quickly. The coexistence between the Chalcolithic and Argaric societies, if it existed, would have spanned a short period of not more than a few decades (Lull et al. 2010, 2015). Chalcolithic cultural features would have ended with the emergence of the Argaric culture.

As a result, Argaric societies were envisaged as culturally monolithic and homogeneous. In this context, any social practices associated with the permanence of cultural traditions were considered typical of

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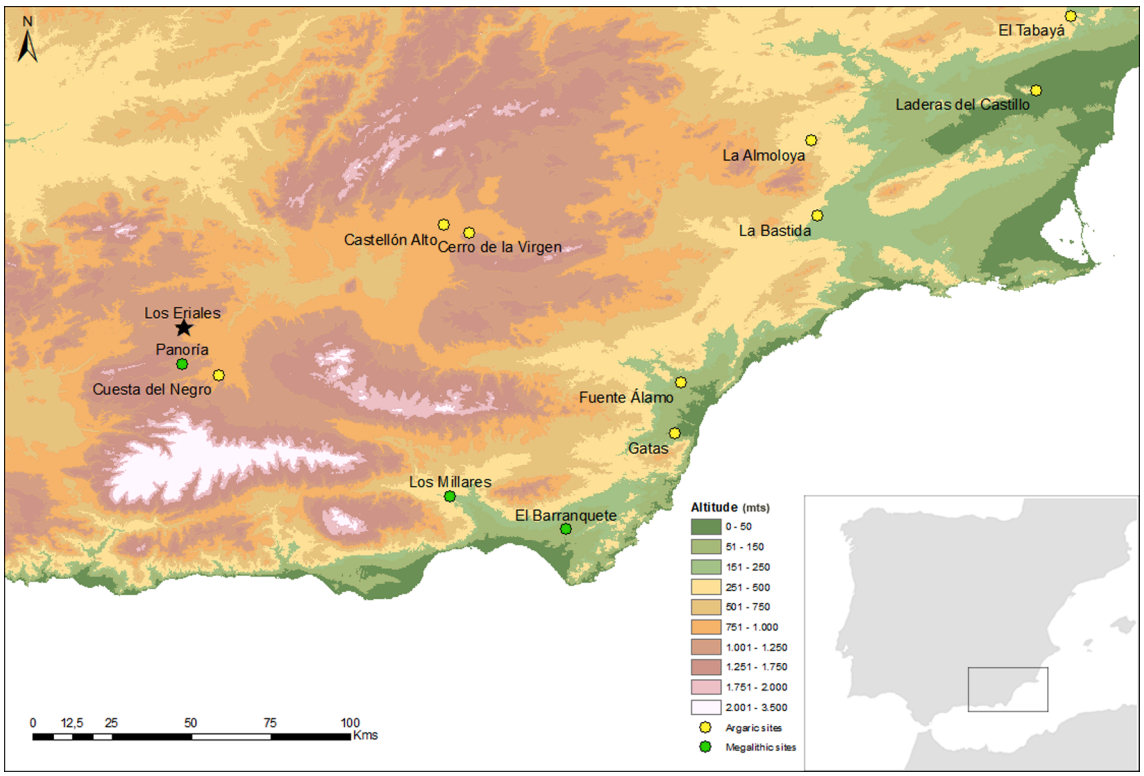

Fig. 1. Archaeological sites mentioned in the text. The Cerro de los Castellones site shares the location with Los Eriales.

marginal communities or, alternatively, of societies in the process of "acculturation" (Arribas y Molina, 1979; Aguayo, 1986).However, in recent years social practices based on cultural continuity, hybridisation, and resilience have begun to be explored from new theoretical perspectives, leaving aside the evolutionary framework (Aranda Jiménez et al., 2021a).

For this purpose, we developed a research project aimed at studying the temporality of the megalithic phenomenon in south-eastern Iberia during the last decade. One of the main goals was to explore the social practices of reuse of these ritual monuments. As result, a new radiocarbon series of 224 dates was produced (Aranda Jiménez et al., 2022, 2021b,2021c,2020b,2020c,2018b,2017; Aranda Jiménez and Lozano Medina, 2014), which imply a noteworthy improvement given that, before 2012, only ten dates were known. According to the new radiocarbon series, two main conclusions can be drawn: i) no interruption or hiatus in megalithic funerary practices occurred *ca.* 2200 cal BC when the Argaric societies appeared, and ii) megalithic ritual activity continued to be particularly intensive during the Bronze Age (Aranda Jiménez et al., 2018a, 2020a, 2021c). Especially remarkable is El Barranquete cemetery, in which 23 of the 46 available dates fell in this period (Aranda Jiménez and Lozano Medina, 2014; Lozano Medina and Aranda Jiménez, 2018; Aranda Jiménez et al., 2018a).

The progress of this project has led us to extend the radiocarbon dating programme to new megalithic sites, including Los Eriales. The aim of this paper is to discuss the new radiocarbon series obtained for this cemetery in a Bayesian framework. The resulting refined chronology will be discussed according with the cultural features of the Copper and Bronze Age societies of the region.

1.1. Los Eriales cemetery

Los Eriales was one of the first megalithic sites to be discovered on the Iberian Peninsula (Fig. 1). In his work "Antigüedades prehistóricas de Andalucía" (1868) Manuel de Góngora y Martínez includes the find of a vast necropolis on the so-called Los Eriales plain in the Guadix basin. He excavated four tombs and briefly described the main finds: "In four of the many dolmens that are there, I decided to excavate, recovering […] two copper arrow points, fragments of pottery vessels, a complete skull and a copper ring, bones, and two flint arrows, with another piece of bronze…" (Góngora y Martínez, 1868:97-98).

A few years later, in 1890, Luis Siret and Pedro Flores systematically excavated Los Eriales cemetery recording the main architectural features and grave goods in field notebooks. With the exception of the so-called Dolmen 1 (Siret, 1891 [2001], 1893), the results remained unknown until 1943 when Georg and Vera Leisner published them in the book titled "Die Megalithgräber der Iberischen Halbinsel: Der Süden". They described 32 tombs typologically belonging to dolmens with rectangular or trapezoidal funerary chambers and passages that were occasionally divided by perforated slabs into equal sections. The grave goods were mainly pottery vessels and metal objects belonging typologically to the Copper Age and the Argaric Bronze Age. Especially typical of the latter period were carinated bowls, chalice-shaped vessels, riveted daggers, and ornaments such as rings, bracelets, and earrings, some made of silver.

Next to Los Eriales cemetery, in the 1970 s the settlement of Cerro de los Castellones was discovered and excavated (Mendoza et al., 1975) (Fig. 1). Located on a plateau-like promontory, the settlement spans the period between the end of the Copper Age and the Agaric Bronze Age. Different habitational and defensive structures built with stone foundations and mud walls were found. Especially remarkable was the discovery of several intramural burials that followed the typical Argaric ritual of individual inhumations (Mendoza et al., 1975; García Carretero et al., 2017). Due to the close spatial, chronological and cultural relationship, we could associate Cerro de los Castellones with the Los Eriales cemetery.

2. Materials and Methods

The archaeological finds from Los Eriales are part of the collection Louis Siret bequeathed to the National Archaeological Museum (MAN)

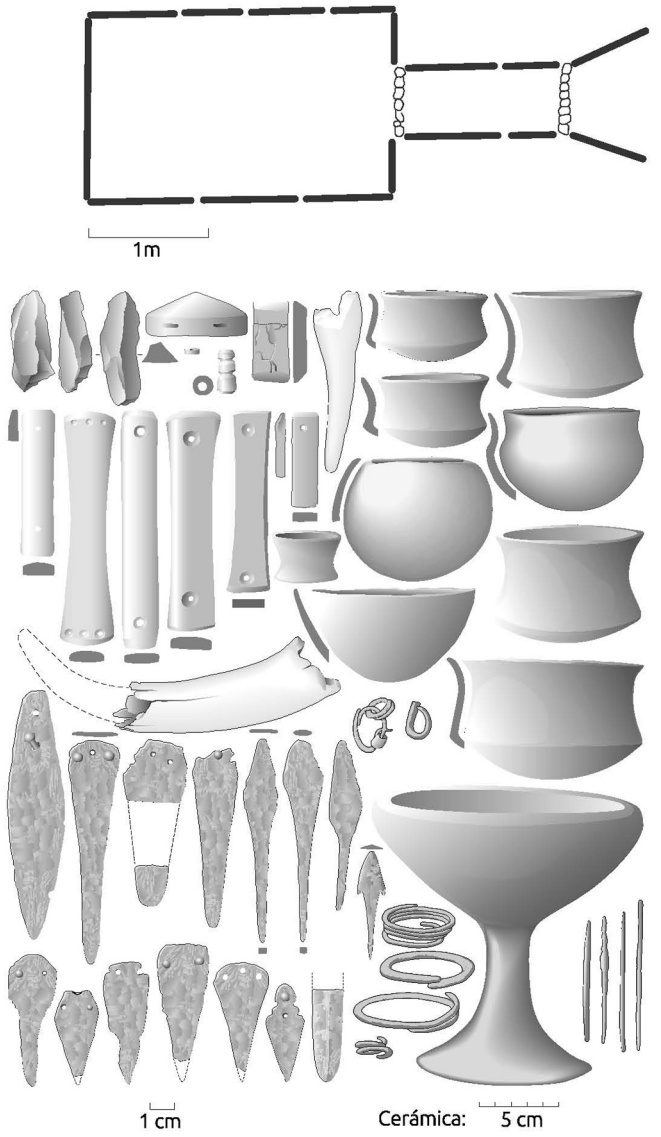

Fig. 2. Schematic plan and grave goods of Tomb 14 at Los Eriales cemetery (after Leisner and Leisner 1943).

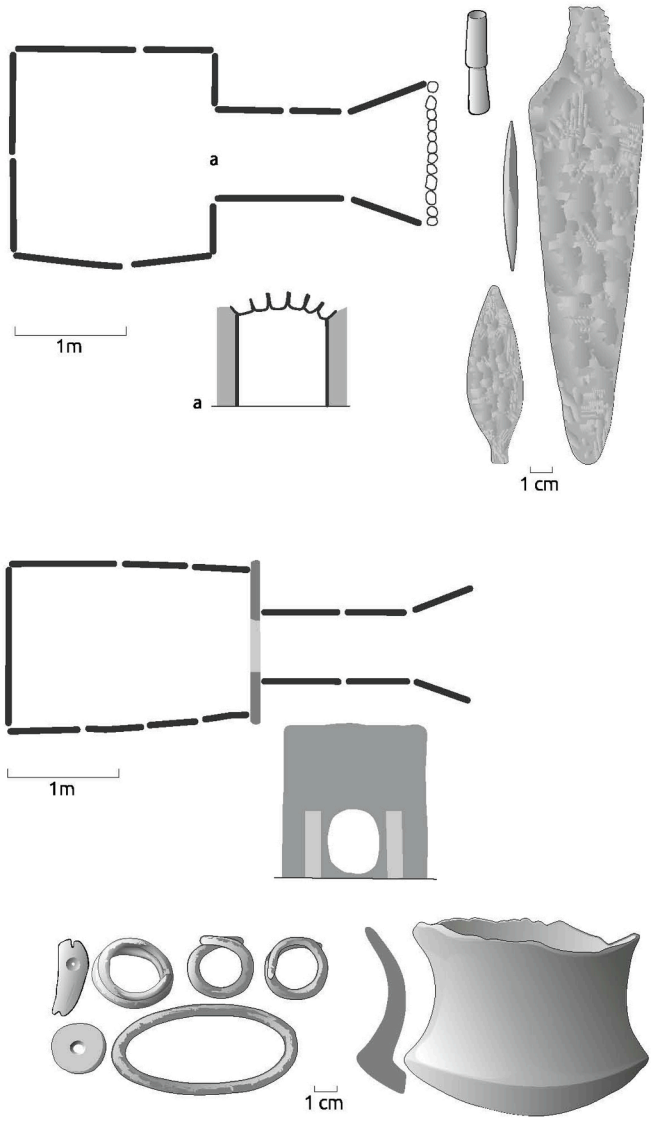

Fig. 3. Schematic plans and grave goods of Tombs 5 (up) and 7 (down) at Los Eriales cemetery (after Leisner and Leisner 1943).

in Madrid. Of the different burials excavated by Luis Siret and Pedro Flores, Tombs 5, 7, and 14 were selected for this study, as the typological features of their grave goods include the largest chronological variability known from the cemetery (Figs. 2 and 3). The three tombs are small dolmens with rectangular funerary chambers, slightly trapezoidal in the case of Tomb 7, and passages that were found enclosed by masonry walls in Tombs 5 and 14, and by a perforated slab placed between the passage and the funerary chamber in Tomb 7. In all three cases, there were trapezoidal forecourts in front of the passage entrances.

The bioarchaeological analysis of the human skeletal remains of these tombs was carried out as a first step. In total, 754 human bones and teeth belonging to an MNI of 34 were studied. The skeletal remains belong to individuals of both sexes and all ages although most of them belong to the adult age. Samples were selected according to the MNI. Given the multi-depositional nature of these megalithic tombs, this dating strategy is probably the best option of ensuring that no individual was dated twice.

Of the 34 samples selected, four failed due to poorly preserved collagen. The 30 remaining samples were dated at the Scottish Universities Environmental Research Centre (SUERC) (following Dunbar et al. 2016) by Accelerator Mass Spectrometry (AMS) (Table 1). The dates were calibrated through the OxCal v4.4.4 software (Bronk Ramsey, 2001, 2009, 2017) with the IntCal20 atmospheric curve (Reimer et al., 2020). Calibrated ranges endpoints are rounded out by 10 years when the error is $\geq$ 25 years, and by 5 years when the error is $<$ 25 years (Stuiver and Polach, 1977; Millard, 2014). Bayesian models and Kernel Density Estimation plots were obtained by using the OxCal program v4.4.4 (Bronk Ramsey, 2001, 2009).

In order to know the palaeodiet values and a possible 'reservoir effect' on the samples, that may produce earlier dates than expected (Stuiver and Braziunas, 1993; Lanting and Van Der Plicht, 1998; Cook et al., 2001), δ^{13}C and δ^{15}N stable isotope analysis were carried out by continuous-flow isotope ratio mass spectrometry (CF-IRMS) at the SUERC.

3. Results and Discussion

In terms of paleodiet, δ^{13}C and δ^{15}N values for adult individuals of

Table 1
Radiocarbon dates, quality markers of collagen, and stable isotopes values from Los Eriales cemetery.

Laboratory Code	Type of material (Age)	Radiocarbon age (BP)	%C	%N	C: N	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	Calibrated date (68 % probability) cal BC	Calibrated date (95 % probability) cal BC
TOMB 5									
SUERC-101380	Tooth 47 (juvenile)	3866 ± 25	39.7	14.2	3.3	−19.1	9.6	2460–2280	2460–2200
SUERC-101387	Tooth 47 (adult)	3843 ± 23	38.8	13.7	3.3	−19.4	9.5	2345–2205	2455–2200
SUERC-101377	Tooth 47 (adult)	3760 ± 25	38.7	14.2	3.2	−19	9.9	2280–2130	2290–2040
SUERC-101378	Tooth 47 (adult)	3755 ± 24	39.6	14.2	3.2	−19.6	10.8	2270–2135	2285–2040
SUERC-101376	Tooth 47 (adult)	3740 ± 25	39.3	14.1	3.3	−18.4	9.7	2200–2055	2275–2035
SUERC-101382	Tooth 47(adult)	3713 ± 23	38.6	14.0	3.2	−19	9.7	2195–2035	2200–2030
SUERC-101379	Tooth 47 (adult)	3711 ± 24	41.7	15.0	3.2	−19.2	10.7	2190–2035	2200–2025
SUERC-101386	Tooth 47 (adult)	3690 ± 23	38.1	13.9	3.2	−19.3	8.6	2135–2030	2195–1980
SUERC-101381	Tooth 47 (adult)	3682 ± 23	37.3	13.7	3.2	−19	10.7	2135–2025	2195–1975
SUERC-101390	Tooth 85 (Infant II)	3675 ± 23	38.1	13.1	3.4	−18.7	9.5	2135–1980	2145–1970
SUERC-101388	Tooth 47 (adult)	3642 ± 23	37.2	13.5	3.2	−18.9	10	2035–1955	2135–1935
SUERC-101372	Tooth 47 (adult)	3384 ± 24	41.3	14.0	3.4	−19.4	11.3	1735–1625	1745–1615
SUERC-101389	Tooth 47 (Infant II)	3378 ± 23	30.0	11.9	2.9	−19.5	8.8	1690–1620	1745–1565
TOMB 7									
SUERC-101398	Tooth 47 (adult)	3442 ± 23	39.8	14.1	3.3	−19.1	8.2	1870–1690	1880–1640
SUERC-101396	Tooth 47 (adult)	3441 ± 23	41.8	14.8	3.3	−18.6	10.1	1870–1690	1880–1640
SUERC-101391	Tooth 47 (adult)	3407 ± 23	39.5	13.9	3.3	−18.8	9.4	1745–1635	1865–1620
SUERC-101392	Tooth 47 (adult)	3378 ± 23	40.5	14.3	3.3	−19.4	10.7	1690–1620	1745–1565
SUERC-101397	Tooth 47 (adult)	3377 ± 23	41.9	14.2	3.4	−19.2	7.9	1690–1620	1745–1565
TOMB 14									
SUERC-101717	Tooth 46 (adult)	3759 ± 28	39.0	13.8	3.3	−19	9.2	2280–2060	2290–2040
SUERC-101714	Tooth 46 (adult)	3690 ± 28	40.8	14.2	3.3	−18.4	9	2140–2030	2200–1970
SUERC-101715	Tooth 46 (adult)	3678 ± 28	41.1	14.6	3.3	−19.3	9.4	2140–1980	2200–1950
SUERC-101716	Tooth 46 (adult)	3653 ± 28	41.5	14.0	3.4	−19.4	10.6	2130–1960	2140–1940
SUERC-101724	Tooth 46 (adult)	3649 ± 28	36.9	13.3	3.2	−19.1	9.8	2120–1950	2140–1930
SUERC-101401	Tooth 46 (adult)	3635 ± 23	41.4	14.3	3.4	−18.9	9.4	2030–1955	2130–1925
SUERC-101719	Tooth 46 (adult)	3626 ± 28	40.1	14.0	3.4	−19	9.4	2030–1940	2130–1890
SUERC-101718	Tooth 46 (adult)	3625 ± 28	40.5	14.0	3.4	−19.3	9.1	2030–1940	2130–1890
SUERC-101399	Tooth 46 (Infant II)	3612 ± 24	32.5	12.2	3.1	−19.2	8.6	2025–1935	2035–1890
SUERC-101725	Tooth 46 (adult)	3601 ± 28	39.0	13.7	3.3	−19.3	8	2020–1900	2040–1880
SUERC-101723	Tooth 46 (adult)	3538 ± 28	37.0	13.4	3.2	−19.7	8.7	1930–1770	1960–1750
SUERC-101726	Tooth 46 (adult)	3413 ± 28	38.9	14.1	3.2	−19.1	7.9	1750–1630	1870–1620

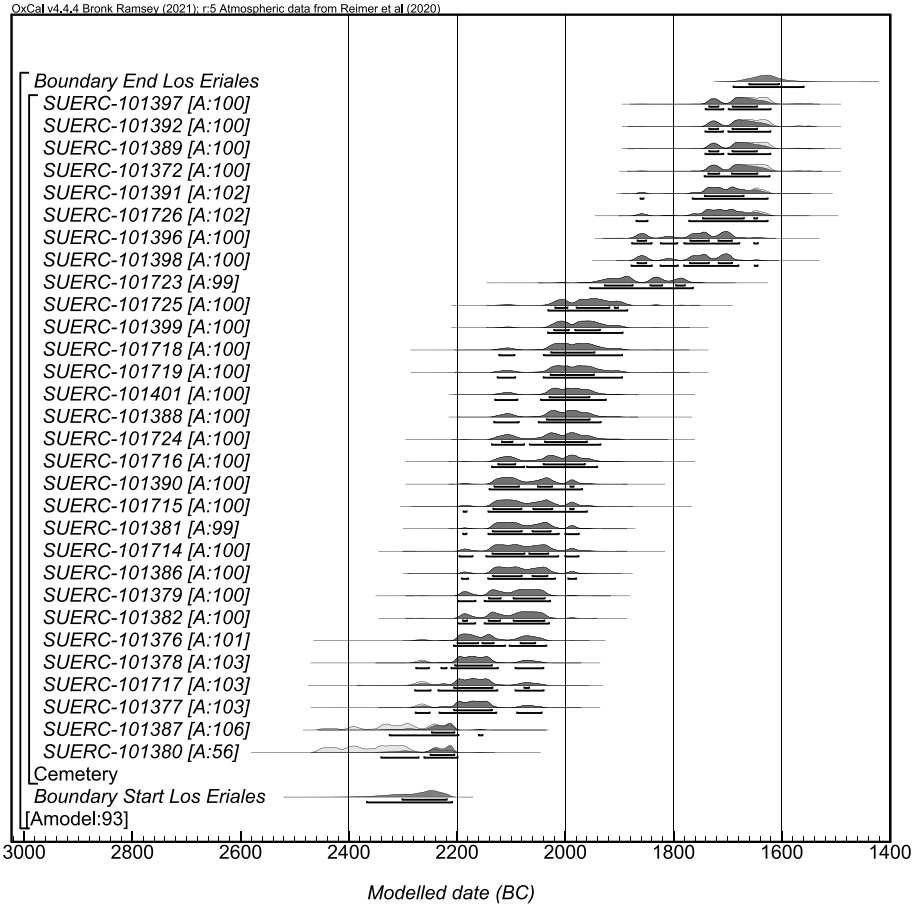

Fig. 4. Single-phase model of Los Eriales radiocarbon dates.

Table 2
Posterior density estimates of statistical models discussed in the text.

Cluster criteria	Parameter	Posterior density estimate (68 % of probability cal BC)	Posterior density estimate (95 % of probability cal BC)
Los Eriales			
Cemetery	*Boundary Start*	*2300–2210*	*2370–2210*
	Boundary End	*1660–1610*	*1690–1560*
	Span	*550 and 640 years*	*530 and 700 years*
Difference between Panoría and Los Eriales	*Difference Start Panoría & Start Los Eriales*	*−1240 and − 1040 years*	*−1330 and − 800 years*
	Difference End Panoría & Start Los Eriales	*200 and 440 years*	*100 and 710 years*
Tomb 5	*Boundary Start*	*2355–2240*	*2440–2215*
	Boundary End	*1715–1600*	*1730–1525*
	Span	*550–675 years*	*490–725 years*
Tomb 5 (testing model) Phase 1	*Boundary Start*	*2420–2240*	*2495–2210*
	Boundary End	*2320–2190*	*2390–2140*
	Span	*0–35 years*	*0–110 years*
Tomb 5 (testing model) Phase 2	*Boundary Start*	*2205–2090*	*2230–2060*
	Boundary End	*2080–2010*	*2130–1960*
	Span	*20–115 years*	*0–175 years*
Tomb 5 (testing model) Phase 3	*Boundary Start*	*1770–1650*	*1945–1630*
	Boundary End	*1720–1600*	*1730–1550*
	Span	*0–30 years*	*0–75 years*
Tomb 7	*Boundary Start*	*1770–1705*	*1865–1680*
	Boundary End	*1720–1630*	*1735–15850*
	Span	0–65 years	0–125 years
Tomb 14	*Boundary Start*	*2160–2060*	*2240–2040*
	Boundary End	*1870–1810*	*1880–1680*
	Span	*180–290* years	*170–420 years*
Difference between Tombs 5, 7 and 14	*Difference Start T5 & Start T7*	*−630 and − 495 years*	*−740 and − 425 years*
	Difference Start T5 & Start T14	*−265 and − 110 years*	*−355 and − 30 years*
Los Eriales + Argaric sites			
Cerro de la Virgen	*Boundary Start*	*2275–2170*	*2350–2150*
	Boundary End	*1490–1425*	*1505–1365*
Cuesta del Negro	*Boundary Start*	*1950–1890*	*1980–1835*
	Boundary End	*1495–1450*	*1500–1400*
Castellón Alto	*Boundary Start*	*1995–1905*	*2080–1885*
	Boundary End	*1810–1695*	*1865–1660*
Los Eriales	*Boundary Start*	*2305–2120*	*2365–2210*
	Boundary End	*1660–1605*	*1685–1560*
Differences between sites	*Difference Start Los Eriales & Start Cerro de la Virgen*	*−109 and 29 years*	*−185 and 99 years*
	Difference End Los Eriales & End Castellón Alto	*60 and 193 years*	*−5 and 254 years*
	Difference End Los Eriales & End Cerro de la Virgen	*−223 and − 135 years*	*−284 and − 89 years*
	Difference End Los Eriales & End Cerro de la Virgen	*−202 and − 125 years*	*−254 and − 84 years*
Los Eriales + Panoría			
Megalithic series in Guadix basin	*Boundary Start*	*3550–3490*	*3590–3450*
	Boundary End	*1665–1610*	*1690–1570*
	Span	*1830–1890*	*1770–1910*

Tombs 5, 7, and 14 (n = 27)[1] ranged from −18.4 to −19.7 ‰ (-19.2 ± 0.3 ‰ average) and from 7.9 to 11.4 ‰ (9.6 ± 0.9 ‰ averages) respectively. These results are consistent with other megalithic cemeteries previously studied in south-eastern Iberia, such as Los Millares (Waterman et al., 2017; Aranda Jiménez et al., 2020a), Mojácar (Aranda Jiménez et al., 2021a), El Barranquete (Díaz-Zorita Bonilla et al., 2019),

[1] The individuals classified as infants were not included to prevent estimates from breastfeeding values.

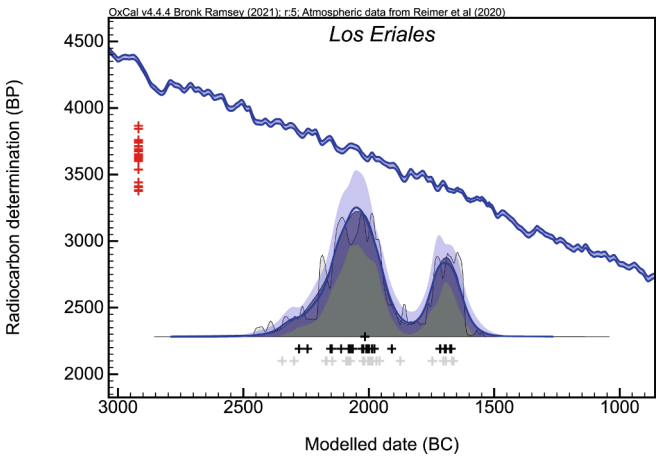

Fig. 5. Los Eriales KDE model.

and the very close Panoría cemetery (Díaz-Zorita Bonilla et al., 2019). According to these studies, the consumption of marine or freshwater resources was insignificant, which rules out the "reservoir effect" at Los Eriales population.

Unfortunately, the recording methods applied during Los Eriales excavations prevent the use of chronological information, such as the sequential order of funerary depositions, for modelling the new radiocarbon series. Consequently, the first Bayesian model arranges all dates in a simple bounded phase (Hamilton and Kenney 2015).

According to this model (index of agreement of A_{model} = 92.6) (Fig. 4, Table 2, and Appendix A), the first bodies were deposited between *2370 and 2210* cal BC (*95 % of probability; boundary Start*) or between *2300 and 2200* cal BC (*68 % of probability*), and the last between *1690 and 1560* cal BC (*95 % of probability, Boundary End*), or possibly in *1660–1610* cal BC (*68 % of probability*). The calculated span suggests a period of use of between *550* and *640* calendar years (*68 % probability Span)*.

If all radiocarbon dates are included in a KDE model (Kernel Density Estimation) (Fig. 5), ritual activity appear principally concentrated in the 21st century and between the last decades of the 18th century and the first decades of the 17th century cal BC.

Two main aspects can be highlighted from these chronological estimations. Firstly, Los Eriales can be considered the most recent megalithic cemetery found in south-eastern Iberia and would extend the construction of passage dolmens to, at least, the last centuries of the third millennium. In the nearby cemetery of Panoría (Fig. 1), characterised by similar megalithic monuments, burial activity occurred between *3595 and 3450* cal BC *(95 % probability; Start Cemetery)* and *2180–2010* cal BC *(95 % probability; End Cemetery)* (Aranda Jiménez et al., 2022), which means that mortuary depositions at Panoría began between *800* and *1300* years earlier than in Los Eriales (*95 % probability, difference start Panoría & Los Eriales)*. Secondly, Los Eriales provides the first radiocarbon dates for funerary rituals performed in passage dolmens during the Argaric Bronze Age (*ca.* 2200–1550 cal BC). Until now, radiocarbon evidence of megalithic reuse was mainly chronologically studied in *tholos*-type tombs (Aranda Jiménez and Lozano Medina, 2014; Aranda Jiménez et al., 2020a).

For a better understanding, the new radiocarbon series was modelled considering the three dated tombs (Fig. 6, Table 2, Appendix A). This Bayesian model (A_{model} = 75) acknowledges the date SUERC-101726 of Tomb 14 as an outlier. The date with a poor agreement (A: 39 %) falls below the 60 % recommended reliability threshold (Bronk Ramsey 1995). Nevertheless, it has been retained in the model as it identifies funerary reuses. These practices have been found in many megalithic cemeteries in the region (Aranda Jiménez et al., 2018a, 2022). Therefore, it should not be considered an outlier from an archaeological point

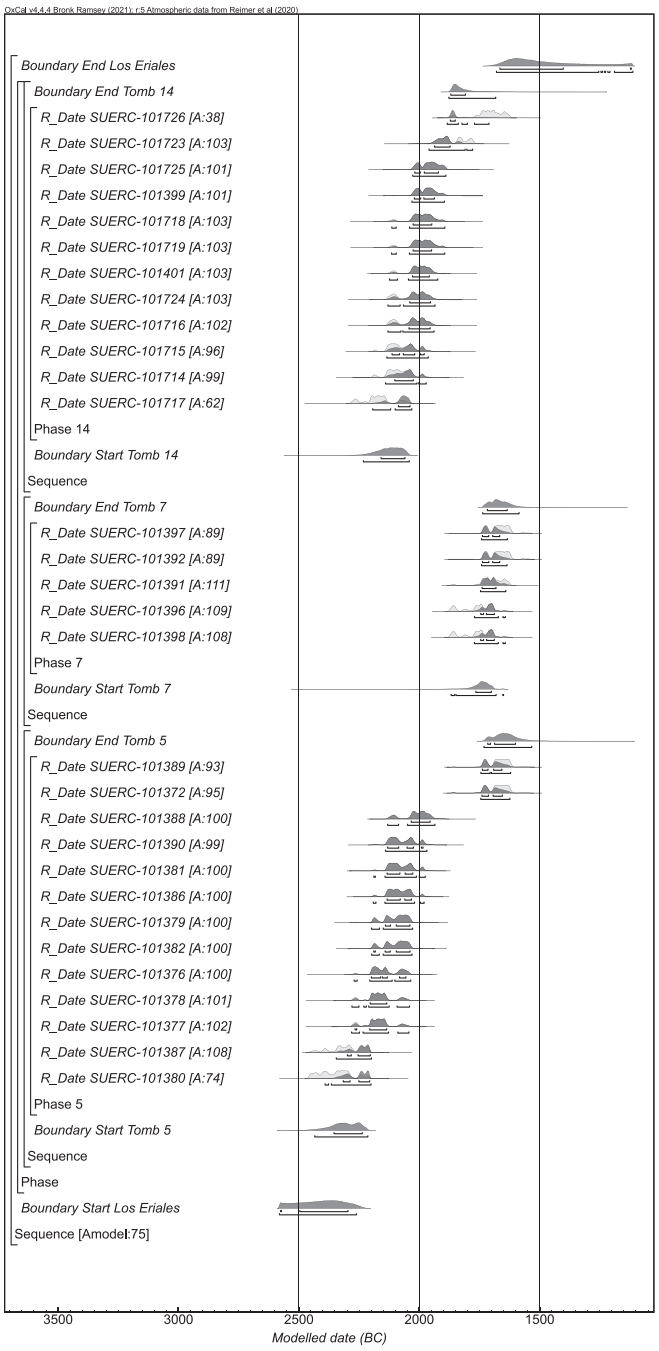

Fig. 6. Probability distribution of dates from Tombs 5, 7, and 14 at Los Eriales cemetery.

of view.

Based on this model, mortuary activity began in Tomb 5 between *2440 and 2215* cal BC (*95 % of probability; boundary Start*), probably in *2355–2240* cal BC (*68 % of probability*), which means between 110 and 265 years earlier than in Tomb 14 (*68 % probability; Difference Start Tomb 5 and Start Tomb 14*) and between *495* and *630* years earlier than in Tomb 7 (*68 % probability; Difference Start Tomb 5 and Start Tomb 7*). The end of funerary rituals at Tomb 5 is estimated to have occurred between *1730 and 1525* cal BC (*95 % of probability; boundary End*), probably in *1715–1600* cal BC (*68 % of probability*). The calculated time span suggests a period of use of between *550* and *675* calendar years (*68 % probability Span*).

However, according to the chronological funerary dynamics found in other megalithic cemeteries (Aranda Jiménez et al., 2017, 2022), the possibility of short periods of mortuary activity was also explored. For this purpose, a new Bayesian model was built considering the three groups in which the radiocarbon dates are principally concentrated as separated depositional events (A_{model} = 89) (Fig. 7, Table 2 Testing model, Appendix A). One main aspect stands out from this model: each group of interments would have been deposited during a brief period that spanned between *0* and *35 years (68 % probability; Span Phase 1),* between *20* and *115* years *(68 % probability; Span Phase 2),* and between *0* and *30 years (68 % probability; Span Phase 3)*. Assuming a period of 25 years for a generation (following Whittle et al. 2007), just a few generations –between one and four – were buried during each period of mortuary depositions. Additionally, these short periods are also emphasised by the test of contemporaneity. Phases 1 and 3 pass the test (T' = 0.5; df = 1; T′(5 %) = 3.8 and T' = 0.0; df = 1; T′(5 %) = 3.8 respectively) and also Phase 2 if the most recent date (SUERC-101388) is not considered (T' = 13.3; df = 7; T′(5 %) = 14.1) (Ward and Wilson, 1978).

Although previous uses cannot be ruled out, the available evidence places the beginning of funerary activity in Tomb 7 in *1865–1680* cal BC *(95 % probability; Boundary Start)*, probably between *1770 and 1705* cal BC *(68 % probability)* and ended in *1735–1585* cal BC *(95 % probability; Boundary End)*, possibly in *1720–1630* cal BC *(68 % probability)*. The short span, between *0 and 65* years *(68 % probability)*, suggests a period of use between one to three generations. Nevertheless, the possibility that all the individuals could have died at the same time can be considered, as all the radiocarbon dates pass the test of contemporaneity (T' = 7.8; df = 4; T′(5 %) = 9.5) (Ward and Wilson, 1978).

In the case of Tomb 14, the Bayesian model estimates that burial activity began in *2240–2040* cal BC *(95 % probability; Boundary Start)* and probably between *2160* and *2060* cal BC *(68 % probability)*. Funerary rituals ended between *1880 and 1680* cal BC (*95 % probability; Boundary End*) possibly around *1870–1810* cal BC (*68 % probability*), which implies a period of use between *180* and *290* years *(68 % probability; Span)*. Although the recording methods used during excavations prevent us from giving more accurate chronological estimations, it is remarkable that of the 12 dates that make up the radiocarbon series, nine pass the test of contemporaneity (T' = 9.2; df = 8; T′(5 %) = 15.5). This means that most of the interments would have been deposited during a very brief period. As in Tombs 5 and 7, this is consistent with a mortuary use of the tomb based on a few generations.

The comparison between chronological models makes it possible to underline three main aspects. Firstly, funerary activity began at very different times. The earliest mortuary depositions were in Tomb 5 around the 23rd century, in Tomb 14 in the 21st century, and in Tomb 7 in the 18th century. Secondly, the three tombs were reused during the Argaric Bronze Age. Especially remarkable is Tomb 7, in which all the dated individuals belong to this period. If we only consider the available evidence and assume that the earliest dated individuals were deposited just after the tomb was erected, the megalithic building activity spanned the Argaric Bronze Age. Thirdly, the mortuary use of these tombs was not maintained over long periods. Quite the opposite was true, as the periods of use were punctuated and brief, just for a few decades or even years, probably from one to four generations. These brief periods of use are also characteristic of an increasing number of Iberian and other European megalithic monuments. Especially noticeable are the cases of Panoría (Aranda Jiménez et al., 2022), Montelirio (García Sanjuán et al., 2018), and Alto Reinoso (Alt et al., 2016) in Iberia. Some examples in other European regions are the British cairns and long barrows of Ascott-under-Wychwood (Bayliss et al., 2007a), Hazleton North (Meadows et al., 2007), West Kennet (Bayliss et al., 2007b) and Wayland's Smithy I (Whittle et al., 2007), or the Irish Mound of the Hostages (Bayliss and O'Sullivan, 2013; Quinn and Kuijt, 2013). As in Los Eriales, in all these cases chronological models reveal that funerary activity was concentrated in short periods, including the possibility of simultaneous interments.

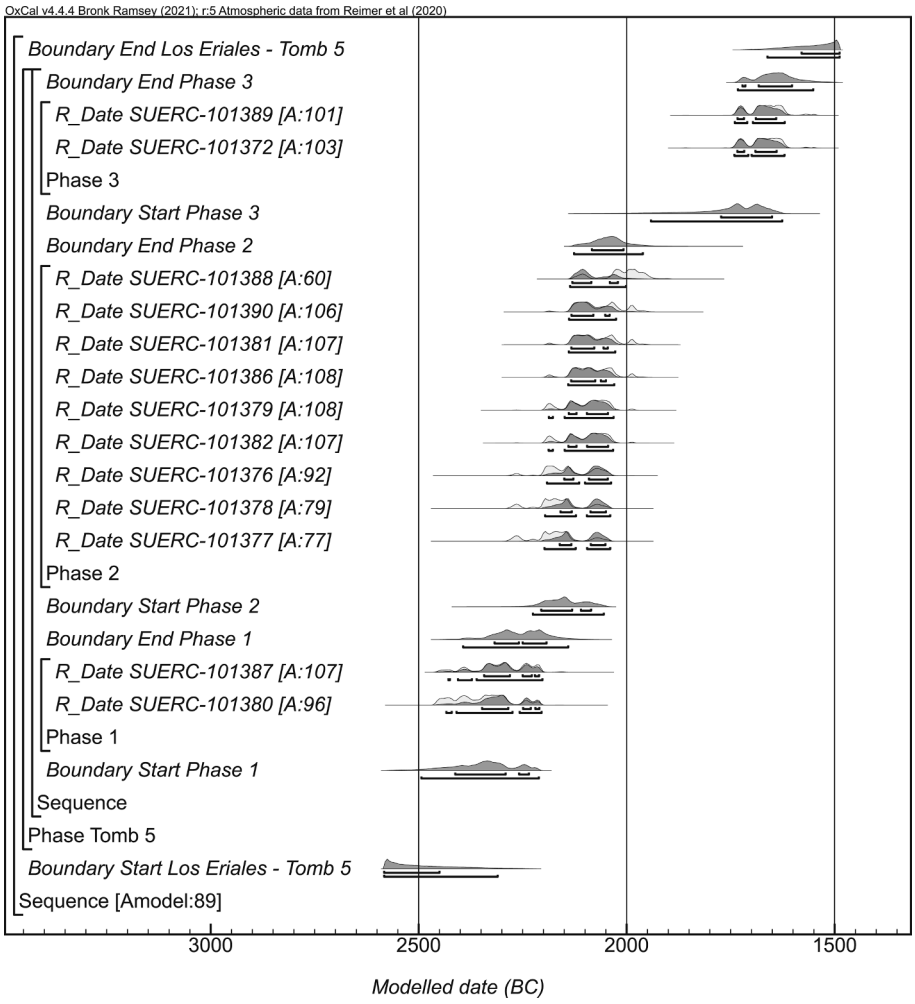

Fig. 7. Tomb 5 Bayesian model (testing model).

For comparative purposes, the new series from Los Eriales has also been compared with the radiocarbon chronology of the typical Argaric funerary ritual characterised by individual burials inside settlements. In total, 75 radiocarbon dates from three Argaric sites located in the same region as Los Eriales – Cerro de la Virgen, Cuesta del Negro, and Castellón Alto – were compiled (Cámara and Molina, 2009, 2011; Molina et al., 2014, 2016) (see Appendix A). As in Los Eriales, all the dates were obtained from human bone samples.

A specific KDE model for each of the three Argaric sites plus Los Eriales was built (Fig. 8, Appendix A). The comparison between them reveals that the beginning of ritual activity at Los Eriales specifically matches Cerro de la Virgen. The difference between the start of both sites suggests that mortuary depositions at Los Eriales would have preceded Argaric rituals by not more than a century *(−109 and 29 years,*

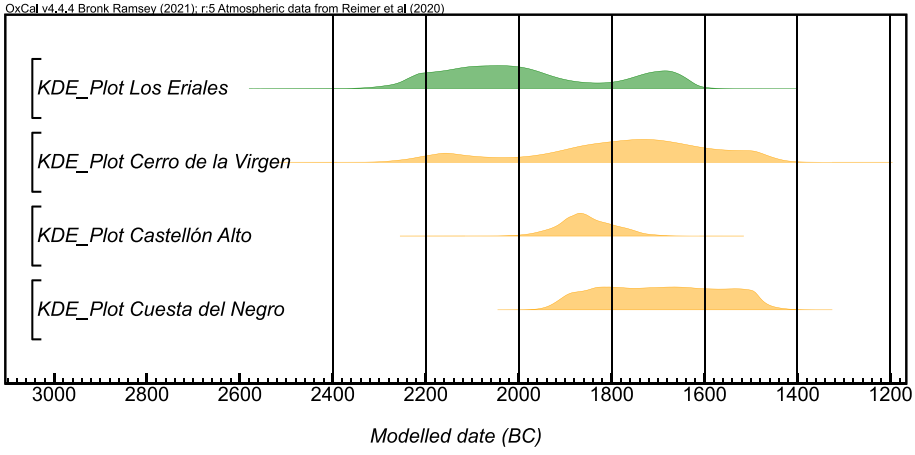

Fig. 8. Comparison between the KDE-modelling of Los Eriales and three Argaric sites.

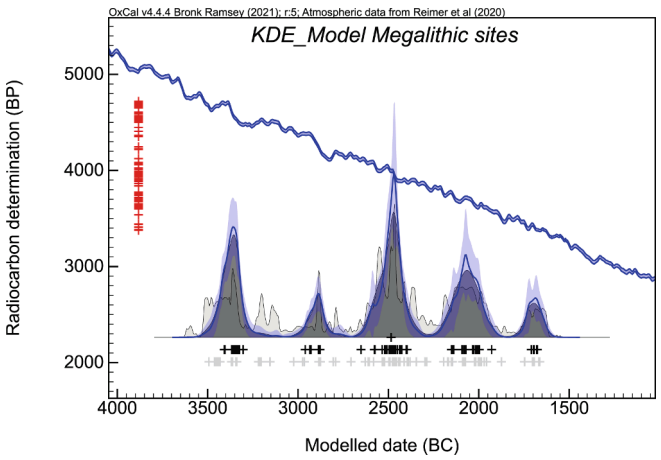

Fig. 9. KDE-modelled distribution of all radiocarbon dates from the megalithic cemeteries of the Guadix basin.

difference start Los Eriales & start Cerro de la Virgen; 68 % probability). This is because several tombs at Cerro de la Virgen have been dated to the beginning of the Argaric period (*ca.* 2200 cal BC).

Thanks to recent radiocarbon dating developments what was traditionally considered the core area of the Argaric culture in the Vera basin has been expanded to neighbouring regions. Radiocarbon dates as early as those of sites such as Gatas (Lull et al., 2009, 2011) and Fuente Álamo (Schubart, 2012) in the Vera basin can be found in La Bastida and La Almoloya in the Murcia region (Lull et al., 2015), Laderas del Castillo and Tabayá in Alicante (Hernández Pérez et al., 2021) and Cerro de la Virgen in the Guadix basin (Fig. 1). Funerary activity at Los Eriales began shortly before the appearance of the earliest Argaric society cultural features and continued throughout the first centuries of the second millennium. The end of funerary rituals at Los Eriales occurred between *60* and *190* years (*difference End Los Eriales & End Castellón Alto; 68 % probability)* after the end of Castellón Alto, between *135* and *223* before Cerro de la Virgen (*difference End Los Eriales & End Cerro de la Virgen; 68 % probability),* and between *125* and *202* years before Cuesta del Negro (*difference End Los Eriales & End Cuesta del Negro; 68 % probability)*. The comparison between different Argaric sites and Los Eriales shows that the coexistence of traditional megalithic rituals and the new individual intramural interments was a main feature of the Early Bronze Age.

Finally, we evaluated the radiocarbon chronology of the megalithic phenomenon in the Guadix basin, adding to the new Los Eriales radiocarbon series the already-known radiocarbon chronology of Panoría (Aranda Jiménez et al., 2022). Both cemeteries total 103 radiocarbon measurements. According to the Bayesian model, megalithic rituals began in *3590–3450* cal BC (*95 % of probability; boundary Start*), probably in *3555–3490* cal BC (*68 % of probability*), and ended in *1690–1570* cal BC (*95 % of probability, Boundary End*), possibly in *1670–1610* cal BC (*68 % of probability*). This implies a long period of use of megalithic monuments in the region, between *1830* and *1890* calendar years (*68 % probability Span*). Nevertheless, according to the KDE model of this radiocarbon series (Fig. 9) mortuary activity was concentrated mainly in five pulses of ritual intensity in the 34th, 29th, 25th, 21st and 18th centuries. Again the punctuated pattern of funerary use emerges as a main feature of the megalithic monuments.

4. Conclusions

Los Eriales cemetery belongs to a long megalithic tradition that in south-eastern Iberia began in the first half of the fourth millennium cal BC (Aranda Jiménez et al., 2017; Lozano Medina and Aranda Jiménez, 2018). In this context, Los Eriales should be considered the most recent cemetery, as funerary activity began there in the last centuries of the third millennium cal BC. The variability of the beginning of burials between the tombs would also suggest that some building activity could have occurred in the first centuries of the second millennium cal BC. Funerary rituals took place over a period of several centuries and ended in the last decades of the 17th century. Nevertheless, mortuary activity was concentrated mainly in the 21st and 18th centuries during brief events of intensive ritual depositions spanning a few decades, approximately-one to four generations. This punctuated pattern agrees with growing evidence of Iberian and European megalithic monuments characterised by short spans of use separated in many cases by hiatuses in the ritual activity.

A key contribution of the new Los Eriales radiocarbon series would be its relationship with the Argaric period. Around *ca.* 2200 cal BC, social dynamics changed dramatically in south-eastern Iberia with the emergence of the Argaric societies. As has been noted above, many cultural innovations occurred at this time, which has been explained in terms of cultural discontinuity with the previous Chalcolithic societies. Los Eriales adds new evidence that would support the intensity and relevance attained by the continuity of megalithic funerary rituals during Argaric times. Until now, three megalithic cemeteries –El Barranquete, Panoría and Los Millares– have provided radiocarbon dates that confirm their reuse during the Argaric Bronze Age. Now, Los Eriales emerges as the first megalithic cemetery principally used during this period. Only a few interments show an age-at-death that clearly falls before the appearance of the typical Argaric rituals.

Not only do megalithic mortuary rituals fail to disappear at the beginning of the Argaric period, but they continue with intensity throughout this period, which shatters the hypotheses referring to the supposed cultural uniformity of Argaric societies. In those times, two very different funerary practices coexisted: an old tradition that comprised the continuity of collective megalithic rituals and a new mortuary practice characterised by individual intramural inhumations with significant differences in grave goods. Argaric funerary rituals have been understood as evidence of new cultural identities based on the appearance of social stratification and elites. In contrast, collective megalithic ritual practices emphasised traditional and ancestral values away from the Argaric innovations.

These two funerary behaviours –one more individual and the other more relational– can be explained in different ways. The reuses of megalithic monuments could be the result of specific Argaric social groups excluded from the individual intramural inhumation. This option has a major drawback as none social biases have been found in the Argaric funerary ritual. Men and women, including all age ranges, appear equally. Furthermore, Argaric tombs range from burials without any grave goods at all, around the 40 % of total, to others with large amounts of ritual objects. The variability in the quantity and quality of grave goods has been understood as evidence of a hierarchical organization that would include different social groups from elites to foreigners, captives and/or slaves (Lull and Estevez, 1986; Lull et al. 2009, 2011). Then, it seems that very different social groups are represented in the intramural funerary ritual, which makes unclear if Argaric population reused the megalithic monuments.

Alternatively, the dolmen reuse can be explained in terms of resistance of non-Argaric communities (Aranda Jiménez et al. 2018a, 2020a). The mortuary activity in cemeteries such as Los Eriales could have been considered as part of social practices aimed at neutralising the Argaric social fragmentation process. Megalithic monuments would have become the perfect locus for affirming and fostering of a sense of collective identity, as opposed to the more individualised Argaric social identities. The new radiocarbon series of Los Eriales can be considered a major contribution that has clearly improved our understanding of the social interactions between megalithic and Argaric societies. In contrast to its believed cultural uniformity, south-eastern Iberia was a region shared by social groups with differentiated, heterogeneous, and changing cultural features. The societies we know as Argaric undoubtedly enjoyed a relevant position in this complex scenario, but they were not alone; they lived together with the 'others', social groups that should be

considered non-Argaric, as their ritual and ceremonial practices suggest.

CRediT authorship contribution statement

Lara Milesi García: Conceptualization, Formal analysis, Writing – original draft, Visualization, Investigation. **Gonzalo Aranda Jiménez:** Conceptualization, Writing – original draft, Project administration, Funding acquisition, Supervision. **Marta Díaz-Zorita Bonilla:** Methodology, Writing – review & editing, Investigation. **Sonia Robles Carrasco:** Investigation, Writing – review & editing. **Derek Hamilton:** Methodology, Formal analysis, Writing – review & editing. **Miriam Vílchez Suárez:** Writing – review & editing, Investigation. **Margarita Sánchez Romero:** Investigation, Funding acquisition, Writing – review & editing. **Paula Becerra Fuello:** Investigation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data has been included in the manuscript and attached as appendices

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jasrep.2023.103972.

References

Aguayo, P. 1986. La transición de la Edad del Cobre a la Edad del Bronce en la provincia de Granada, in: *Homenaje a Luis Siret (1934-1984)*. Consejería de Cultura. Junta de Andalucía, Sevilla: 262-270.

Alt, K.W., Zesch, S., Garrido-Pena, R., Knipper, C., Szécsényi-Nagy, A., Roth, C., Tejedor-Rodríguez, C., Held, P., García-Martínez-De-Lagrán, I., Navitainuck, D., Arcusa Magallón, H., Rojo-Guerra, M.A., 2016. A Community in Life and Death: the late neolithic megalithic tomb at alto de reinoso (Burgos, Spain). PLoS One 11 (1). https://doi.org/10.1371/journal.pone.0146176.

Aranda Jiménez, G., Lozano, M.A., 2014. The chronology of megalithic funerary practices: a bayesian approach to grave 11 at El Barranquete Necropolis (Almería, Spain). J. Archaeol. Sci. 50, 369–382. https://doi.org/10.1016/j.jas.2014.08.005.

Aranda Jiménez, G., Montón-Subías, S., Sánchez-Romero, M., 2015. The archaeology of Bronze Age Iberia: Argaric societies. Routledge, New York.

Aranda Jiménez, G., Lozano Medina, A., Camalich Massieu, M.D., Martín Socas, D., Rodríguez Santos, F.J., Trujillo Mederos, A., Santana Cabrera, J., Nonza-Micaelli, A., Clop García, X., 2017. La cronología radiocarbónica de las primeras manifestaciones megalíticas en el sureste de la Península Ibérica: las necrópolis de Las Churuletas, La Atalaya y Llano del Jautón (Purchena, Almería). Trab. de Prehist. 74, 257–277. https://doi.org/10.3989/tp.2017.12194.

Aranda Jiménez, G., Lozano Medina, A., Díaz-Zorita Bonilla, M., Sánchez Romero, M., Escudero Carrillo, J., 2018a. Cultural continuity and social resistance: the chronology of megalithic funerary practices in southern iberia. Eur. J. Archaeol. 21 (2), 192–216. https://doi.org/10.1017/eaa.2017.42.

Aranda Jiménez, G., Lozano Medina, A., Sánchez Romero, M., Díaz-Zorita Bonilla, M., Bocherens, H., 2018b. The chronology of the megalithic funerary practices in south-eastern iberia: the necropolis of panoría (Granada, Spain). Radiocarbon 60, 1–19. https://doi.org/10.1017/RDC.2017.96.

Aranda Jiménez, G., Sánchez Romero, M., Díaz-Zorita Bonilla, M., Lozano Medina, A., Escudero Carrillo, J., Milesi García, L., 2020a. Cultural resistance to social fragmentation: the continuity and reuse of megalithic monuments during the argaric bronze age in southeastern Iberia. In: Díaz Del Rio, P., Lillios, K., Sastre, I. (Eds.), the Power of Reason, the Matter of Prehistory. Papers in honor of Antonio Gilman Guillén, CSIC, Madrid, pp. 213–234.

Aranda Jiménez, G., Díaz-Zorita Bonilla, M., Hamilton, D., Milesi García, L., Sánchez Romero, M., 2020b. The radiocarbon chronology and temporality of the megalithic cemetery of Los Millares (Almería, Spain). Archaeol. Anthropol. Sci. 12 (5), 1–17. https://doi.org/10.1007/s12520-020-01057-7.

Aranda Jiménez, G., Díaz-Zorita Bonilla, M., Hamilton, D., Milesi García, L., Sánchez Romero, M., 2020c. A Radicocarbon dating approach to the deposition and removal of human bone remains in megalithic monuments. Radiocarbon 62 (5), 1147–1162. https://doi.org/10.1017/RDC.2020.67.

Aranda Jiménez, G., Cámalich Massieu, M.D., Martín Socas, D., Díaz-Zorita Bonilla, M., Hamilton, D., Milesi García, L., 2021b. New Insights into the Radiocarbon Chronology of Iberian Megalithic Societies: the tholos-type Tombs of Mojácar (Almería, Spain). Eur. J. Archaeol. 24 (1), 4–26. https://doi.org/10.1017/eaa.2020.41.

Aranda Jiménez, G., Montón-Subias, S., Sánchez Romero, M. 2021a. La Cultura de El Argar (c. 2200-1550 cal a.C.), Comares, Albolote (Granada).

Aranda Jiménez, G., Milesi García, L., Díaz-Zorita Bonilla, M., Sánchez Romero, M., 2021c. The radiocarbon chronology of the tholos-type megalithic tombs in Iberia: exploring diverse social trajectories. Trab. Prehist. 78 (2), 277–291. https://doi.org/10.3989/tp.2021.12276.

Aranda Jiménez, G., Milesi García, L., Hamilton, D., Díaz-Zorita Bonilla, M., Vílchez Suárez, M., Robles Carrasco, S., Sánchez Romero, M., Benavides López, J.A., 2022. The tempo of the Iberian megalithic rituals in the European context: the cemetery of Panoría. J. Archaeol. Sci. 140 https://doi.org/10.1016/j.jas.2022.105579.

Arribas, A., Molina, F. 1979. El poblado de "Los Castillejos" en las Peñas de los Gitanos (Montefrio, Granada). Campaña de excavaciones de 1971, Cuadernos de Prehistoria, Serie Monográfica 3, Universidad de Granada, Granada.

Bayliss, A., Benson, D., Galer, D., Humphrey, L., Mcfadyen, L., Whittle, A., 2007a. One thing after another: the date of the ascott-under-wychwood long barrow. Camb. Archaeol. J. 17 (1), 29–44.

Bayliss, A., Whittle, A., Wysocki, M., 2007b. Talking About My Generation: the Date of the West Kennet Long Barrow. Camb. Archaeol. J. 17(1) suppl. 85–101.

Bayliss, A., O'Sullivan, M., 2013. Interpreting chronologies for the Mound of the Hostages and its contemporary Irish contexts. In: O'Sullivan, M. (Ed.), Tara: From the Past to the Future. Wordwell and UCD School of Archaeology, Bray, pp. 26–104.

Bronk Ramsey, C., 1995. Radiocarbon calibration and analysis of stratigraphy: the OxCal program. Radiocarbon 37, 425–430. https://doi.org/10.1017/RDC.2017.39.

Bronk Ramsey, C., 2001. Development of the radiocarbon calibration program. Radiocarbon 43, 355–363. https://doi.org/10.1017/S0033822200038212.

Bronk Ramsey, C., 2009. Bayesian analysis of radiocarbon dates. Radiocarbon 51, 337–360. https://doi.org/10.1017/S0033822200033865.

Bronk Ramsey, C., 2017. Methods for summarizing radiocarbon datasets. Radiocarbon 59, 1809–1833. https://doi.org/10.1017/RDC.2017.108.

Cámara, J.A., Molina, F., 2009. El análisis de la ideología de emulación: el caso de El Argar. Cuadernos de Prehistoria y Arqueología de la Universidad de Granada. 19, 163–194.

Cámara Serrano, J.A., Molina González, F., 2011. Jerarquización social en el mundo argárico (2000–1300 aC). Quaderns de Prehistoria i Arqueología de Castellò 29, 77–100.

Cook, G.T., Bonsall, C., Hedges, R.E.M., Mcsweeney, K., Boroneant, V., Pettitt, P.T., 2001. A Freshwater Diet-Derived 14C reservoir effect at the stone age sites in the iron gates gorge. Radiocarbon 43, 453–460. https://doi.org/10.1017/S0033822200038327.

Díaz-Zorita Bonilla, M., Aranda Jiménez, G., Bocherens, H., Escudero Carrillo, J., Sánchez Romero, M., Lozano Medina, A., Alarcón García, E., Milesi García, L., 2019. Multi-isotopic diet analysis of south-eastern Iberian megalithic populations: the cemeteries of El Barranquete and Panoría. Archaeol. Anthropological Sci. 11, 3681–3698. https://doi.org/10.1007/s12520-018-0769-5.

Dunbar, E., Cook, G.T., Naysmith, P., Tripney, B.G., Xu, S., 2016. AMS 14C dating at the scottish universities environmental research centre (SUERC) radiocarbon dating laboratory. Radiocarbon 58 (1), 9–23.

García Carretero, J.R., Martín Ruiz, J.A., Palomo Laburu, A., 2017. Ajuar de una sepultura de la Edad del Bronce del Cerro de los Castellones (Laborcillas, Granada). Antiquitas. 29, 57–67.

García Sanjuán, L., Vargas Jiménez, J.M., Cáceres Puro, L.M., Costa Caramé, M.E., Díaz-Guardamino Uribe, M., Díaz-Zorita Bonilla, M., Fernández Flores, A., Hurtado Pérez, V., López Aldana, P.M., Méndez Izquierdo, E., Pajuelo Pando, A., Rodríguez Vidal, J., Wheatley, D., Bronk Ramsey, C., Delgado-Huertas, A., Dunbar, E., Mora González, A., Bayliss, A., Beavan, N., Hamilton, D., Whittle, A., 2018. Assembling the Dead, Gathering the Living: Radiocarbon Dating and Bayesian Modelling for Copper Age Valencina de la Concepción (Seville, Spain). J. World Prehist. https://doi.org/10.1007/s10963-018-9114-2.

Gongora y Martínez, M. (1991 [1868]). Antigüedades Prehistóricas de Andalucía (ed. Fascimil), Universidad de Granada, Granada.

Hamilton, W.D., Kenney, J., 2015. Multiple bayesian modelling approaches to a suite of radiocarbon dates from ovens excavated at Ysgol yr Hendre, Caernarfon, North Wales. Quat. Geochronol. 25, 75–82. https://doi.org/10.1016/j.quageo.2014.10.001.

Hernández Pérez, M., Jover Maestre, F.J., López Padilla, J.A., 2021. En los orígenes de El Argar: la cerámica decorada como indicador arqueológico de su espacio social inicial. Trab. Prehist. 78 (1), 86–103.
Lanting, J.N., Van Der Plicht, J., 1998. Reservoir Effects and Apparent 14C Ages. Journal of Irish Archaeology. 9, 151–165.
Leisner, G., Leisner, V., 1943. Die Megalithgräber der Iberischen Halbinsel: Der Süden. Walter de Gruyter, Berlin.
Lozano Medina, A., Aranda, J.G., 2018. Long-lasting sacred landscapes: the numerical chronology of the megalithic phenomenon in south-eastern iberia. J. Archaeol. Sci. Rep. 19, 224–238. https://doi.org/10.1016/j.jasrep.2018.02.038.
Lull, V., Estevez, J., 1986. Propuesta metodológica para el estudio de las necrópolis argçaricas. In: Homenaje a Luis Siret (1934–84). Junta de Andalucía, Sevilla, pp. 441–452.
Lull, V., Micó, R., Rihuete Herrada, C., Risch, R. 2010. Límites históricos y limitaciones del conocimiento arqueológico: la transición entre los grupos arqueológicos de Los Millares y El Argar, in: Bueno, P., Gilman, A., Martín Morales, C., Sánchez-Palencia, F. J. (Eds.), Arqueología, Sociedad, Territorio y Paisaje. Estudios sobre Prehistoria Reciente, Protohistoria y transición al mundo romano. Homenaje a Mª Dolores Fernández Posse. Consejo Superior de Investigaciones Científicas. Instituto de Historia,Madrid, pp.74-95.
Lull, V., Micó Pérez, R., Rihuete Herrada, C., Risch, R. 2015. Transition and conflict at the end of the 3rd millenium BC in south Iberia, in: Meller, H., Arz, H. W., Jung, R., Risch, R. (Eds.), 2200 BC - A climatic breakdown as a cause for the collapse of the old world?, Tagungen des Landesmuseums für Vorgeschichte Halle 12, Halle, pp.365-407.
Lull, V., Mico, R., Risch, R., Rihuete, C., 2009. El Argar: la formación de una sociedad de clases. In: Hernández Pérez, M.S., Soler Díaz, J.A., López Padilla, J.A. (Eds.), En Los Confines Del Argar. Una cultura de la Edad del Bronce en Alicante, MARQ Museo Arqueológico de Alicante, Alicante, pp. 224–245.
Lull, V., Mico, R., Rihuete, C., Risch, R., 2011. The Argar and the beginning of class society in the western Mediterranean. In: Hansen, S., Müller, J. (Eds.), Sozialarchäologische Perspektiven: Gesellschaftlicher Wandel 5000–1500 V.Chr. zwischen Atlantik und Kaukasus, Deutsche Archaeologisches Institut-Von Zabern, Berlin, pp. 381–414.
Meadows, J., Barclay, A., Bayliss, A., 2007. A short passage of time: the dating of the hazleton long cairn revisited. Camb. Archaeol. J. 17 (1), 45–64.
Mendoza, A., Molina, F., Aguayo, P., Carrasco, J., Nájera, T., 1975. El poblado del "Cerro de Los Castellones" (Laborcillas, Granada), XIII Congreso Nacional de Arqueología (Huelva, 1973). Zaragoza.
Millard, A., 2014. Conventions for reporting radiocarbon determinations. Radiocarbon 56 (2), 555–559. https://doi.org/10.2458/56.17455.
Molina González, F., Cámara Serrano, J.A., Afonso Marrero, J.A., Nájera, T., 2014. Las sepulturas del Cerro de la Virgen (Orce, Granada). Diferencias cronológicas y sociales. Revista Atlántico-mediterránea de Prehistoria y Arqueología social. 16, 121–142.
Molina González, F., Cámara Serrano, J. A., Delgado Huertas, A., Jiménez-Brobeil, S., Nájera Colino, T., Riquelme Cantal, J. A., Spanedda, L. 2016. Problemas cronológicos y análisis de dieta en la Edad del Bronce de los Altiplanos granadinos: el caso del Cerro de la Virgen (Orce, Granada, España), Del neolític a l'edat del bronze en el Mediterrani occidental. Estudis en homenatge a Bernat Martí Oliver, Tabajos Varios SIP 119, Valencia, pp.451-463.
Quinn, C.P., Kuijt, I., 2013. The tempo of life and death during the Early Bronze Age at the Mound of the Hostages, Tara. In: O'Sullivan, M. (Ed.), Tara: From the Past to the Future. Wordwell and UCD School of Archaeology, Bray, pp. 154–164.
Reimer, P., Austin, W., Bard, E., Bayliss, A., Blackwell, P., Bronk Ramsey, C., Butzin, M., Cheng, H., Edwards, R., Friedrich, M., Grootes, P., Guilderson, T., Hajdas, I., Heaton, T., Hogg, A., Hughen, K., Kromer, B., Manning, S., Muscheler, R., Palmer, J., Pearson, C., Van Der Plicht, J., Reimer, R., Richards, D., Scott, E., Southon, J., Turney, C., Wacker, L., Adolphi, F., Büntgen, U., Capano, M., Fahrni, S., Fogtmann-Schulz, A., Friedrich, R., Köhler, P., Kudsk, S., Miyake, F., Olsen, J., Reinig, F., Sakamoto, M., Sookdeo, A., Talamo, S., 2020. The IntCal20 Northern Hemisphere radiocarbon age calibration curve (0–55 cal kBP). Radiocarbon 62, 725–757. https://doi.org/10.1017/RDC.2020.41.
Schubart, H., 2012. Die graber von Fuente Álamo, Madrider Beiträge 42. Reichert Verlag Wiesbaden.
Siret, L., 1893. L'Espagne préhistorique. Revue des Questions Scientifiques XXXIV 537–560.
Siret, E., Siret, L. 1890. Las primeras edades del metal en el sudeste de España. Resultados obtenidos en las excavaciones hechas por los autores desde 1881 a 1887, Barcelona.
Siret, L. 2001 [1891]. L'Espagne préhistorique. Consejería de Cultura de la Junta de Andalucía, Sevilla.
Stuiver, M.A., Polach, H.A., 1977. Reporting of ^{14}C data. Radiocarbon 19 (3), 355–363.
Stuiver, M., Reimer, P.J., 1993. Extended 14C data base and revised CALIB 3.0 14C age calibration program. Radiocarbon 35 (1), 215–230.
Ward, G.K., Wilson, S.R., 1978. Procedures for comparing and combining radiocarbon age determinations: a critique. Archaeometry 20, 19–31.
Waterman, A.J., Beck, J., Thomas, J.T., Tykot, R.H., 2017. Stable isotope analysis of human remains from Los Millares cemetery (Almería, Spain, c. 3200–2200 cal BC): regional comparisons and dietary variability. Menga: Revista de Prehistoria de Andalucía. 8, 15–27.
Whittle, A., Barclay, A., Bayliss, A., Mcfadyen, L., Schulting, R., Wysocki, M., 2007. Building for the dead: events, processes and changing worldviews from the thirty-eighth to the thirty-fourth centuries cal. BC in southern Britain. Camb. Archaeol. J. 17 (1), 123–147. Suppl. l.