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## Abstract

A number of megalithic cromlechs have survived in Iberia, the most monumental cases being found in the present territory of Portugal. Some of these sites date back to the sixth or fifth millennium BCE and are among the oldest stone enclosures in Europe. The orientations in the landscape of 12 megalithic cromlechs in the Alentejo (south of Portugal) have been recently investigated, and the results of a survey conducted there show a pattern toward eastern rising orientations. A possible ritual interest in the Full Moon crossovers, particularly in the Autumn Full Moon crossover, was tested.

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## Introduction

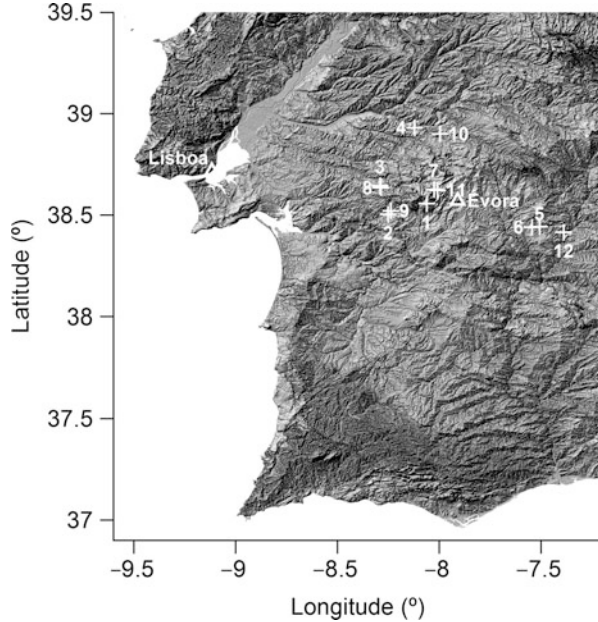
A large number of cromlechs have survived in Iberia, especially in the Pyrenean zone, where 1,104 enclosures were indentified (Peñalver 2004). Most of these cromlechs are located in the highlands, clustering around 1,000 m elevation, presenting a circular structure with diameters ranging from 1–20 m, with an average of 5 m. Twenty cromlechs in this area have been excavated and dated by C-14 from the Late Bronze Age (1,300–700 BCE) and Iron Age (800 BCE to 50 CE). A 12 m circular structure in the *Serra da Estrela*, built with white quartz stones at 1,000 m elevation, was also recently identified in Portugal. These enclosures have been associated with herding activities, forming a part of pastoral sociocultural practices. Unfortunately, with the exception of the cromlech situated in *Serra da Estrela*, the authors are not aware of other archaeoastronomical surveys of circular enclosures in the area.

More monumental and apparently much older are the megalithic cromlechs that survive in the Alentejo. This region extends, roughly, from south of the Tejo river to north of the Algarve, a province on the southern Portuguese coast. The majority of these megalithic monuments are scattered throughout the Évora district, in central Alentejo, between the Tejo and Sado hydrological basins (Fig. 97.1). This territory is very flat, with modest elevations. Today archaeologists believe that Neolithic economies may have been established in central Alentejo as early as 5,600 BCE (Zilhão 2003) and that the megalithic cromlechs in that area were structures built during the period centered on the Middle Neolithic, that is, in the sixth to fifth millennium BCE, predating the cultures that built the communal megalithic seven- and nine-stone tombs in the same area (Calado 2004). The culture that built the cromlechs could have resulted from the sedentarization process of the Mesolithic populations that occupied the basins of the rivers Tejo and Sado (Calado 2004), or through the colonization by groups that migrated into this area (Zilhão 2001). There is no direct radiocarbon dating available from these sites, and the established chronology arises mainly from materials found in excavations. The chronology has also been set by association with nearby settlements or surface remains.

According to the Portuguese archaeologist Manuel Calado (2004), the basic structure for these megalithic enclosures was a development of a horseshoe shape, opened to the east (Fig. 97.2a and b). The cromlechs are usually close to the top of a hill on a slight slope facing east. In most of the monuments, the largest menhir is located outside of the horseshoe line, at one “focus” of the cromlech. Several menhirs are decorated, the most common engraved motifs being crescents, circles, horseshoes, and crosiers. Some menhirs present what seems an anthropomorphized composition. Excluding cup marks, most of the engraved menhirs were found in the larger enclosures of Almendres, Portela de Mogos, and Vale Maria do Meio. The inner area of the enclosures could be used as a scenic ritual space, and in the largest enclosures like Almendres, an entire community could gather inside (Belmonte 1999).

The 12 surveyed sites range from the smallest, Vale d’el Rei, with 12 menhirs in a perfect horseshoe shape of  $8.3 \times 6.4$  m, to the monumental Almendres with 94

**Fig. 97.1** Location of the central Alentejo cromlechs: (1) Almendres, (2) Casas de Baixo, (3) Cuncos, (4) Fontainhas, (5) Monte da Ribeira, (6) Perdigões, (7) Portela de Mogos, (8) Sideral, (9) Tojal, (10) Vale d'El Rei, (11) Vale Maria do Meio, (12) Xarez



**Fig. 97.2** The Alentejo megalithic cromlechs. (a) With 94 standing stones the complex enclosure of Almendres is the biggest in Iberia. The picture shows a detail with one engraved menhir (photograph by Luís Tirapicos) (b) Vale d'el Rei is a perfect horseshoe and is the only one on relatively level ground (photograph by Fernando Pimenta)

standing stones and a much more complex structure of  $61 \times 31$  m. Also included in this group are the sites where the menhirs are completely dismantled, and no information remains concerning their original positions.

Since the establishment of these monuments was probably linked with the earliest stages of sedentary life in the region, their builders were likely

hunter-gatherer-farmers (Silva et al. 1993; Jorge 1999; Ammerman and Paolo 1998). It is possible that their settlements were occupied on a seasonal basis requiring a rough time reckoning in the form of a seasonal calendar.

It is interesting to note that the long-distance winter transhumance – the regular movement of men and flocks – driving sheep for the winter from the central mountain areas of Portugal to the pastures in the Alentejo plains, practiced since the Middle Ages up to the twentieth century, would put the shepherds and sheep in the Alentejo between October and March. It is generally accepted that these transhumance movements, referred by Pliny the Elder (23–79 AD) and already regulated in the Roman period (Pasquinucci 1979), followed the natural routes and seasonality of wild animal migrations in search of better pastures. It is possible that the hunter-gatherers may have followed the same routes and seasonality pattern. There is evidence that some of these routes could have been used for transhumance since the Neolithic period (Logemann et al. 1995), but it is, of course, arguable whether large-scale transhumance existed in the Neolithic period, due to the limited stock of sheep and goats, that raised through the Neolithic, and the lack of complex political structures needed to traverse long-distance transhumant routes and urban settlements providing a market for agricultural and specialized pastoral products (Robb 2007).

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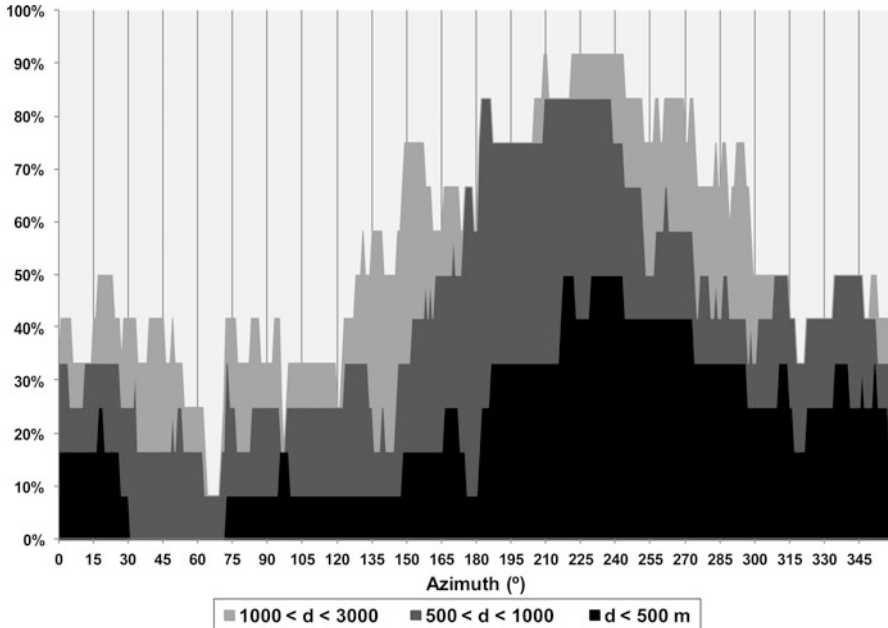
## Orientations of Iberian Cromlechs

Different approaches have been followed concerning the orientations of Iberian cromlechs. Some researchers have investigated directions of possible astronomical significance, either along alignments of selected menhirs (Alvim 2009) or by analyzing the symmetry axis and horizon features seen from some of the enclosures (da Silva and Calado 2003a).

Marciano da Silva (da Silva and Calado 2003a) mentioned as significant moonrise at the major lunar standstill limit over Evoramonte hill as seen from the Almendres cromlech, and sunrise at summer solstice over the same hill as seen from the cromlech at Portela de Mogos, in a line that runs for several kilometers over four megalithic sites with large menhirs. The same author mentions that the common large menhir near the top usually aligns with other menhirs in the enclosure or to the horizon in the approximate direction of the Spring Full Moon azimuth (da Silva and Calado 2003b). Belmonte (1999) showed that the skewed square construction of the Xarez enclosure (which has now been moved to a different location owing to the construction of a dam) that would fit the summer solstice sunrise and the winter solstice sunset directions defined between the central menhir (the only one for which implantation sockets were found) and two of the opposite corners (Gomes 2000).

The preliminary survey of the circular enclosure in *Serra da Estrela* revealed a possible association with the summer solstice sunset or a lunar event around it (Pimenta and Smith 2012).

The authors of this chapter tried to consider, in a comprehensive way, all the common features of the Alentejo group of enclosures (Pimenta and Tirapicos 2008;



**Fig. 97.3** Distance to horizon profile for the Alentejo cromlechs

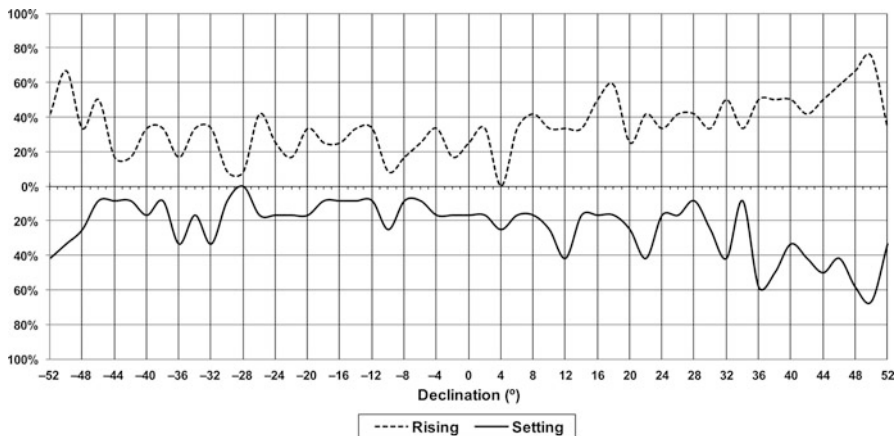
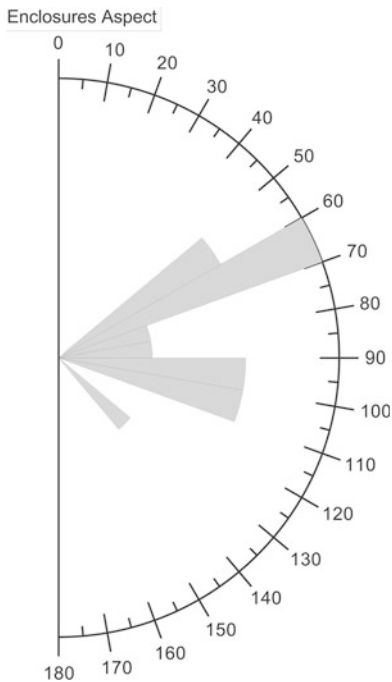
Pimenta et al. 2009). A topographic analysis was undertaken at all of the sites, to extract the distributions in azimuth of the horizon distance and elevation profiles, the slope, and the azimuth of the maximum slope (aspect). The aim was to detect, in a consistent way, possible horizon features and their corresponding declinations. For all the measurable sites, the azimuth and declination of the symmetry axis were also calculated.

## Results

The sites have an open and distant horizon to the east and northeast (Fig. 97.3) and the aspect clusters between  $54^\circ$  and  $132^\circ$  (Fig. 97.4). There is no apparent pattern for the azimuth of the highest distant peak nor of horizon features commonly occurring at particular declinations (Fig. 97.5).

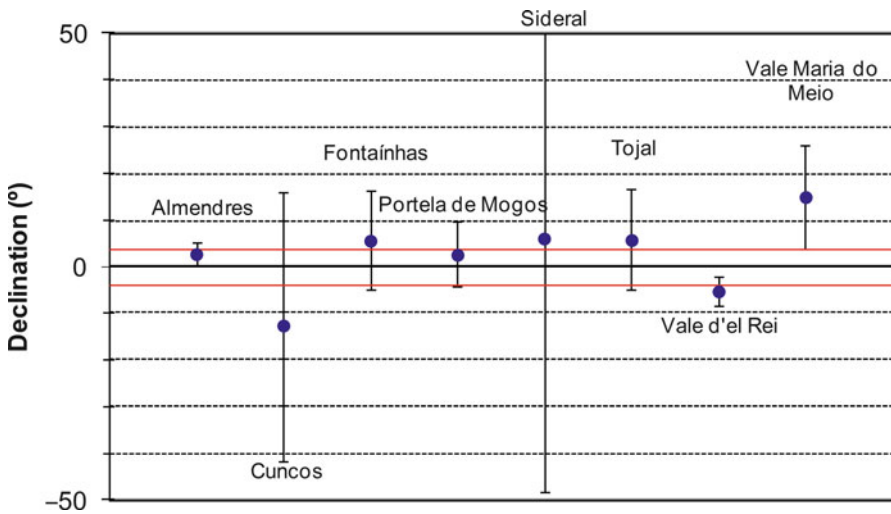
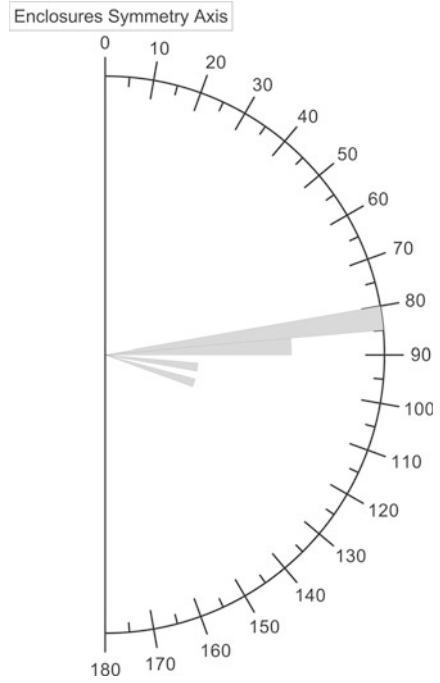
The symmetry axis orientations cluster within a range of  $35^\circ$  of azimuth (Fig. 97.6), which has a very low probability of occurring by chance (Pimenta and Tirapicos 2008; Pimenta et al. 2009). The symmetry axis declinations are presented in Fig. 97.7, assuming an uncertainty of 3 m in both east–west and north–south directions for prostrate menhirs and of  $\frac{1}{2}$  m for menhirs standing in their original sockets. The apparent interest in declinations around the equinoctial ones seems to favor an interpretation based on a Full Moon crossover (Silva and Pimenta 2012; da Silva 2004).

**Fig. 97.4** Distribution of the azimuth of maximum slope for the Alentejo enclosures

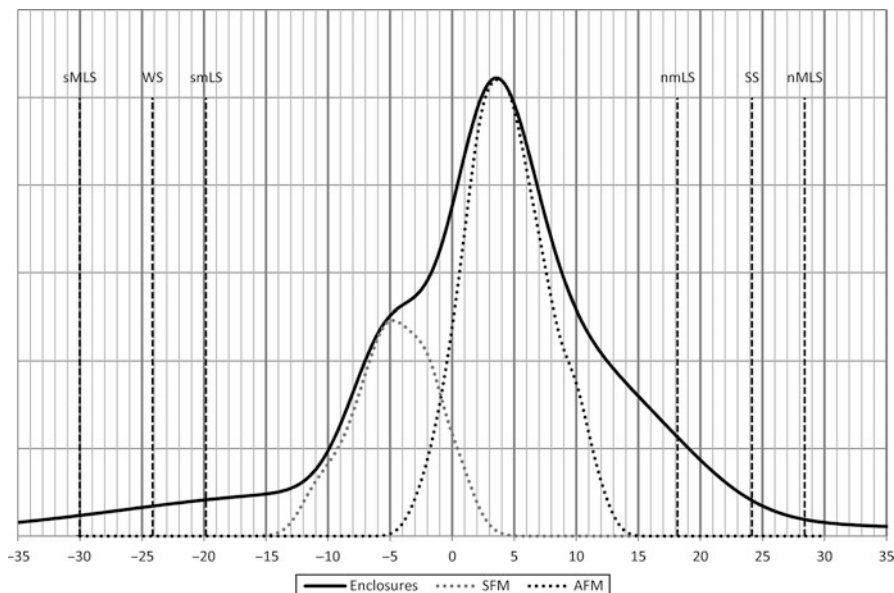


**Fig. 97.5** Distribution of the possible horizon marks in declination for the Alentejo cromlechs

**Fig. 97.6** Distribution of the symmetry axis azimuth for the Alentejo enclosures



**Fig. 97.7** Declinations of the symmetry axis for the Alentejo cromlechs, with 2-sigma error bars



**Fig. 97.8** Histogram of the consolidated data and uncertainties for the Alentejo cromlechs. The declination distributions for the Spring Full Moon (SFM) and Autumn Full Moon (AFM) crossovers moonrise models are also represented

## Testing Models

The distribution of the symmetry axis in declination was statistically compared with the models that correspond to the Spring Full Moon crossover, to the Autumn Full Moon crossover, to an interest in both crossovers, and to an orientation following the azimuth of the maximum slope (Pimenta et al. 2009).

Among the tested models, there seems to be some evidence for an interest in both crossovers and, particularly, in the Autumn Full Moon crossover (Fig. 97.8). Since the differences between the model comparison statistics are not very large and the sample is too small (including some incomplete and highly destroyed cromlechs), it is not possible to draw definitive conclusions.

## Conclusions

In Iberia, cromlechs seem to have been built in selected topographic landscapes. In the Alentejo, these sites also appear to be oriented to an astronomical range of declinations, probably the Full Moon crossovers, with a slight preference for the Autumn Full Moon; nevertheless, it cannot be proved whether events such as these were in fact the target.



A possible lunar relation in the Alentejo cromlechs has been emphasized recently (Oliveira and Silva 2006; Viana 2007). Ana Viana, for example, used the recurrent crescents in engraved menhirs – from Almendres, Portela de Mogos, and Vale Maria do Meio – to support this idea. In addition, Strabo (58 BC–25 AD), referring to Iberia in his *Geografica*, describes a widespread custom of local people: “They, the “Gaelics”, have no cult images and are reverent to a nameless divinity which families feast in nights of Full Moon dancing until dawn, in the open, outside their homes”. Interestingly, Ana Viana in her work has noted that almost every one of the engraved surfaces on surviving anthropomorphic menhirs, especially in Portela de Mogos and Almendres, face the eastern horizon.

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## Cross-References

- ▶ [Neolithic Circular Ditch Systems \(“Rondels”\) in Central Europe](#)
- ▶ [Patterns of Orientation in the Megalithic Tombs of the Western Mediterranean](#)
- ▶ [Recumbent Stone Circles](#)
- ▶ [Seven-Stone Antas](#)

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