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Interdisciplinary Approach to Megalithic Tombs in Northern Iberia

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Abstract. We present here an interdisciplinary perspective of the dolmenic phenomenon in a significant geographical area of the Iberian Peninsula. This is a north-central region, coincident with the province of Burgos, in which there is a rich catalogue of megalithic sites. We include archaeological, geographical, geomorphological and astronomical investigations as the key pillars of this approach. We identified nearly 30 dolmens with measurable orientations. In addition, we used a Geographical Information System (GIS) to analyse the relations between the megalithic tombs and the geomorphological properties of the sites. Finally, we include a review of the different C14 datations found for the sites when available. These diverse viewpoints result in a description of the "typical" dolmen in the analysed area. We demonstrate that archaeoastronomy plays a complementary and practical role in this kind of research.

1. Introduction

The Iberian Peninsula houses a wide amount of megalithic monuments used as collective sepulchres. These monuments were built during large periods of time -from the Neolithic to the Bronze Age, if not even later- and in wide areas all across Europe. In spite of their remarkable presence, they are still far from being satisfactory understood. The reason for their peculiar locations and orientations is still controversial. Several authors support the idea that dolmens are sites from where landscape can be dominated and thus are not places to be seen, but rather to control certain areas (Gonçalves & Sousa 1997). Indeed, many evidences point in that direction, but the phenomenon seems to be far more complex.

We consider here other factors that might play a key role in the description of the dolmens under study: *geomorphology*, such as the properties of the strata on which the sites are (*lithology*) and the altitude over the see level (*elevation*); *climatology*, measuring *water balance*, the difference between what it rains and what it is filter out, and *evapotranspiration*, the balance between groundwater recharge and transpiration from plants plus evaporation; *phytoclimate*, the relation between climate and flora; the impact of human agro-production (*cereal*); and, finally, *astronomy*, measuring the azimuth of the corredors, when possible, to search for a possible orientation towards a particular event on the sky.

2. Sample and Data Acquisition

The province of Burgos, the northeast of Castilla y León, has several clusters of megalithic sites spread over its area (see Fig. 1, left pannel). Moreno Gallo has a built, during many years of workfield, a catalogue of ∼300 sites for this region, with the initial purpose of a spatial archeology approach to the problem and orientations were never specifically measured (see Moreno Gallo 2002). Our first step was to identify, using photographs or sketches, those dolmens with a clear corredor, or a significant part of it, so that we could measure their azimuth. A 10% of the sample fit this requirement, i.e., apparently ∼30 dolmens have a corredor from which an orientation could in principle be estimated. Due to the present conditions of some of these sites, when we revisited the monuments the number of measured orientations was finally reduced to 26 sites (see Fig. 1, right pannel). For convenience, we have numered them in four clusters of sites.

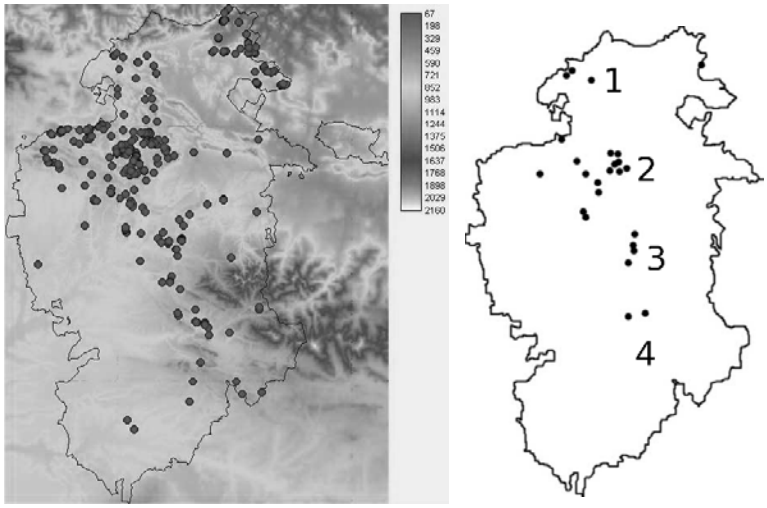

Figure 1. *Left:* The initial sample consists of ∼300 sites all in the province of Burgos, the northeast province in Castilla y León with an extension of ∼14300 km^2. *Right:* Around a 10% of the sites from the initial sample present a clear corredor or rests of it, so that orientation can be measured. We have classified them in four clusters for convenience (see text).

Most of the original geological data come from the *Mapa Geológico y Minero de Castilla y León* (1997) and the *Atlas del Territorio de Castilla y León* (1995).

Name	BP date
Valdemuriel	5670±110
Fuentepecina 2	5375±45
Ciella	5290±40
Fuentepecina 1	5270±140
Sargentes	5240±65
Moreco	5150±60
La Mina	5100±170
Arnillas	4720±150
San Quirce	3770±190

Table 1. Datation from C14 radioisotope. These dates are not calibrated, which means that 5200 BP corresponds aproximately to 4000 BC (or ∼6000 years back from now). So, the oldest BP date corresponds to ∼4400 BC and the youngest to ∼2000 BC

Climate and phytoclimate data were taken from Allué Andrade (1990). Moreno Gallo (2004) built digital georeferenced maps containing the information on the properties of the geological strata, climate and vegetation for the whole province. The number of factors included in this study is far more numerous than the presented here. Instead, we have selected the ones with the higher impact in the description of the landscape and enviroment around the selected sites.

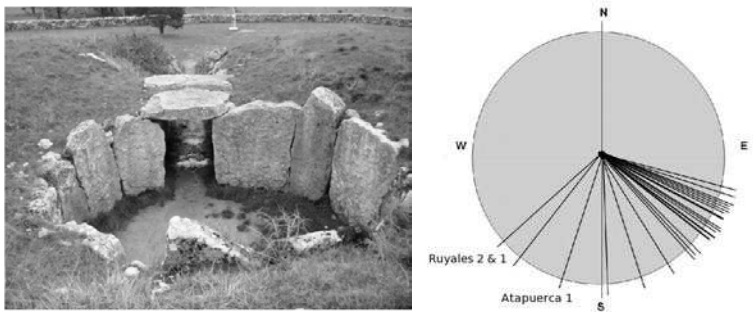

Figure 2. *Left:* The dolmen called *El Moreco* is located very close to the hamlet of Gredilla de Sedano and it is one of the best preserved megalithic sepulchres in the province of Burgos. *Right:* The azimuth of the 26 corredors. The last three to the west, corresponding to *Ruyales 2 & 1* and *Atapuerca 1* would be the only known ones in Northen Iberia with azimuth at the south-west, but see text for discussion.

We have also information from the C14 radioisotope datation for a number of dolmens excavated by Delibes de Castro, most of them located in Cluster #2 (see Delibes de Castro et al. 1993 and references therein). The values are shown in Table 1. The dates are not calibrated: a value of 5200 BP corresponds then to ∼4000 BC. All the sites are dated in the interval 5700-3600 BP, which corresponds to 4400-2000 BC. The mean value is 5065 BP.

3. Results

Using the right pannel in Figure 1 as a guide, we can describe the four labeled clusters of sites. *Cluster #1* corresponds to lime-sandstone strata, a decidous forest, evapotranspiration in the range 675-700 mm/m^2/year, water balance in the interval 200-400 mm/m^2/year and an elevation between 900-1100 mts. above see level and there is no cereal production in this area. *Cluster #2*, in spite of the area covered, strata can be described with dolomite, sandstone and clay, most of the forest is rockrose, evapotranspiration is ∼700 mm/m^2/year, water balance is 20-80 mm/m^2/year, elevation is 850-980 mts above sea level and cereal production is 75-100 tons/year. *Cluster #3* is on a marlstone stratum, surrounded by a sclerophyll forest (mainly oak), evapotranspiration is ∼750 mm/m^2/year, water balance is ∼10 mm/m^2/year, elevation ∼850 mts above sea level and cereal productions is ∼120 tons/year. Finally, *Cluster #4* is on a stratum composed of marl-sandstone, with an evergreen sclerophyll forest, evapotranspiration of ∼675 mm/m^2/year, water balance is ∼150 mm/m^2/year, elevation is ∼980 mts above sea level and cereal production is very low.

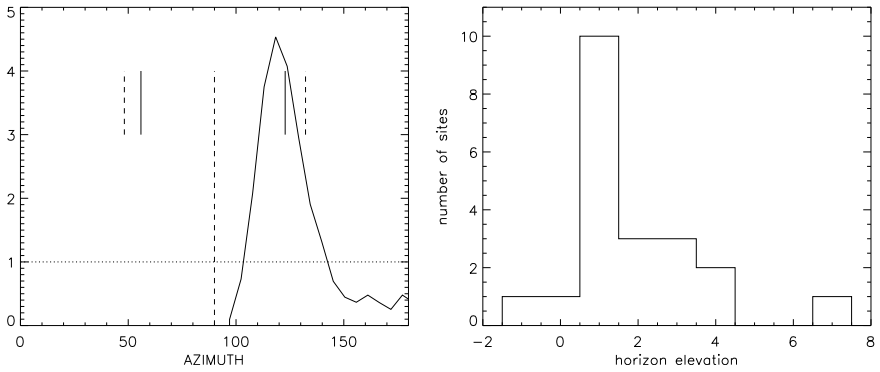

Figure 3. *Left:* Histogram of the azimuth normalized by the mean. The peak corresponds to an azimuth of 118°. The first continous line to the right of the peak is the Winter Solstice Sunrise (∼122°) and the discontinous is the Southen Major Lunistice (∼131°). *Right:* Distribution of the angle that the horizon subtends from each site, in degrees.

The orientations were measured for all these 26 sites. Right pannel in Figure 2 shows all the azimuth. Interestingly, the two ones named *Ruyales 1 & 2* –at the south in Cluster #2– with the westeast orientations, are questioned to be "real" dolmens, because most of their characteristics are very different to their neighboring sites. Some of these dolmens were already measured by Hoskin (2001), mainly from Cluster #2, and we compare this data to our azimuth in Table 2

4. Conclusion

The typical dolmen in the province of Burgos is a megalithic monument with funerary purposes, built approximately 5800 years ago (according to C14 dating, see Table 1). It is usually placed on a sandstone platform, at an altitude

Name	az	elevation	az	elevation
Moreco	126°	1°	126°	1°
Arnillas	126°	-1°	126°	0°
Cotorrita	114°	1°	113°	1°
Sargentes	116°	3°	121°	2°
Ciella	115°	0°	101°	$\frac{1}{2}$°
San Quirce	123°	0°	121°	0°

Table 2. We compare our results with those obtained by Hoskin (2001) -shaded columns- as a "sanity check". The azimuth is labeled as *az* and *elevation* is the elevation of the horizon in degrees.

of ∼1000 meter above the see level, with light rain and high evaporation, which generally describes dry areas. The vegetation surrounding the sites is rockrose and sclerophyll -oak- forest, with a high possibility of having cereal grain production closeby. These dolmens are orientated towards the Winter Solstice Sunrise (at ∼122°), with a mode azimuth of 118° and seeing a horizon that subtends an elevation of ∼1°.

At this point, it is clear that a few geo-climate and flora descriptors are enough to explain all the dolmens with corredor in the province of Burgos. Astronomically, although the significance of the peak in the distribution of the azimuth is very clear and the first conclusion could be that the orientations are sun-motivated, we cannot exclude the role of the moon in such preferred pointings (the Southen Major Lunistice at ∼131° is very close to the azimuth distribution peak). We find worth noting the practicallity of archaeoastronomy in this research, where the "non-standard" orientation of *Ruyales 1 & 2* complements with the results from other indications to doubt about their dolmenic nature. The extension of this work to adjacent provincies will help in understanding this fascinating megalithic phenomenon.

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