



A matter of scale. Assessing the visibility of circular tombs in the landscape of Bronze Age Crete



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ABSTRACT

This paper is concerned with the application of viewshed analysis to the study of the circular tombs of Early Bronze Age Crete (Greece). It aims at testing the hypothesis that these monumental burial structures were positioned so as to maximize their visual impact. The question of whether circular tombs were visually prominent has serious implications for our understanding of the social strategies at play in mortuary practices before the emergence of the Minoan palatial civilization. In order to explore the visual structure of the landscape in accordance with the scale of the human body, the issue of prominence is addressed by 1) taking account of the limit of visibility of circular tombs depending on their height and 2) comparing the settings of the tombs with their nearby surroundings instead of the whole study region. The local total viewsheds computed for the cemeteries of interest allow concluding that visibility was indeed one of the factors that were considered in the course of the decision-making process that led to the location of circular tombs in the landscape of Early Bronze Age Crete.

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1. Introduction

Since the 90s, the calculation of viewsheds has been one of the most frequent types of Geographical Information Systems (GIS) analyses to be performed in archeological research – for early applications, see e.g. Gaffney and Stančič, 1991, Gaffney and Stančič, 1992 and Ozawa et al., 1995. Such an interest for visibility in past landscapes has been sparked both by the central role played by vision in human perception of space, and by the novel possibilities offered by computer-based analyses (Wheatley and Gillings, 2000; Lake and Woodman, 2003). Technological, methodological and theoretical advances have gradually allowed going beyond some of the limitations of the earliest attempts that were rather limited in scope, and it is now possible to explore the phenomenon of visibility in a much more elaborate, critical and informed manner. Recently, viewshed analyses have for instance been performed to investigate matters of perception (Gillings, 2009; Lake and Ortega, 2013), meaning (Bernardini et al., 2013), territoriality (Montufo Martín et al., 2010; Winter-Livneh et al., 2012), social organization (Bongers et al., 2012; Garcia-Moreno, 2013), and defensibility (Martindale and Supernant, 2009; Jones, 2010; Sakaguchi et al., 2010).

Surprisingly, however, the issue of scale remains seldom addressed – but see e.g. Wheatley and Gillings, 2000, Ogburn, 2006, Trifković, 2006,

Kormann and Lock, 2014 and Murrieta-Flores, 2014. Only a few GIS studies actually deal with the limits of visibility of natural and man-made features in the landscape. In most instances, viewing radii – i.e. the maximum extent of visibility – are conventionally chosen rather than rationally defined based on conclusions drawn from physiological studies. This is not without consequences: inappropriate viewing radii can lead to an underestimate or, worse, to an exaggeration of the visual impact of archeological objects (Ogburn, 2006, 405). If we are to move towards a better appreciation of the visual experience of embodied agents, it is crucial to take better account of the scale of the human body and to acknowledge the limits of the human eye regarding the perception of features in the landscape.

This paper is concerned with the visual impact of the monumental, stone-built circular tombs of Minoan Crete (Figs. 1–2). More specifically, it aims at assessing whether these tombs were visually prominent in the landscape – that is to say, whether they were visible from a wider area than they would if they had been positioned randomly. The question of whether high visibility was sought when placing circular tombs has serious implications for understanding the attitude of the living to death and the dead, the social meanings of the burial structures, and their possible significance as territorial markers (Branigan, 1998; Murphy, 1998). The issue of spatial scale occupies a central role in the discussion and this at two levels. First, viewshed analyses rely on an estimate of how far the tombs could have been seen and recognized, depending on their size. Second, the so-called total viewshed methodology (Llobera, 2003; Llobera et al., 2010) is adapted to model the visual

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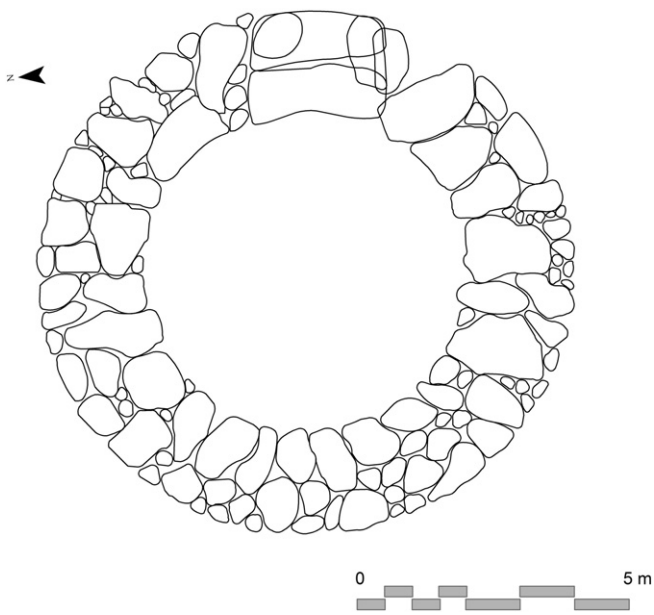


Fig. 1. Plan of Tomb A at Megaloi Skinoi with entrance to the east. Redrawn after Belli (1984), Fig. 5.

structure of the landscape of the dead in a local manner, in order to describe the settings of the tombs in comparison with a relevant neighborhood.

2. Archaeological background: the circular tombs of Minoan Crete

The Early Bronze Age in Crete was marked by a strong increase in conspicuous forms of burial. Besides the Neolithic practice of burying the dead in caves and rock shelters that continued well into the Bronze Age, stone-built tombs were constructed from the beginning of the third millennium BC (Legarra Herrero, 2009). Circular tombs (Figs. 1–2) were particularly favored in south-central Crete – which includes the Mesara plain, the Asterousia Mountains and the southern foothills of the Psiloritis mountain range – but some have also been discovered in the northern and eastern regions of the island (Fig. 3). In contrast, rectangular burial structures were more common to the north and to the east, whereas Cycladic-like tombs were adopted in a few cemeteries on the north coast.



Fig. 2. Tomb A at Megaloi Skinoi. Photo by author.

Early Bronze Age settlement data are scarce, so that burial sites constitute a major source of information regarding life and death prior to the construction of the first palaces in the Middle Bronze Age, around 1925/1900 BC. Unfortunately, their study suffers from a series of documentation issues (e.g. repeated use, looting, old excavations, summarily publications), with the result that many uncertainties persist regarding, for instance, the use life of the tombs, their structural characteristics, or the number of burials they contained. Such uncertainties in turn hinder our understanding of Minoan funerary customs. And since the socio-political organization of Early Bronze Age Crete leaves much room for interpretation, contrasting conclusions have been reached as to the nature of the human groups that built and used the tombs. In this context, landscape archeology provides a theoretical framework that allows getting round some of the limitations of the available dataset to shed new light on burial practices and their social meanings.

Circular tombs were the most monumental funerary structures of Early Bronze Age Crete. The energy that was invested in their construction and their repeated use over the centuries testify to the importance they held for the associated communities (e.g. Branigan, 1993; Branigan, 1998; Murphy, 1998). Most of them date to between the Early Bronze Age I (ca. 3100/3000–2650 BC) and the Middle Bronze Age I (ca. 2200/2150–1875/1850 BC). Given that the identification of several circular buildings as Minoan tombs is contested, the exact number of circular tombs discovered to date varies in the literature, but a total of 76 to 95 examples distributed in 56 to 70 cemeteries is generally accepted (Fig. 3) (Goodison and Guarita, 2005). They present a diversity of both size and plan. The circular chamber, which forms the core of the structure, has an inner diameter ranging between 2.7 m and 13.1 m. The mean diameter is however ca. 5.5 m, and 75% of the examples known so far fit in the range of 3.5 m to 7.5 m. The circuit wall, usually between 1 m and 2.5 m thick, is built of large blocks or boulders bound by small stones and soil. About one third of the tombs are preceded by a single entrance vestibule or by a more complex rectangular annex with multiple spaces used for burial, storage or ceremonial purposes (Pelon, 1976; Petit, 1987). Many circular tombs are found isolated, but some occur in groups of two or three, or in association with more modest types of tombs.

3. Methodology

The visibility of objects in a landscape is influenced by several factors including the limits of human visual acuity, cultural and psychological issues, the environmental constraints (i.e. light, atmospheric effects, weather conditions), but also the size, shape and arrangement of the objects themselves and their contrast with the background (Higuchi, 1988; Ogburn, 2006). The visibility of an object gradually diminishes through distance as a function of these various factors. Modeling visibility decrease is a complex process since atmospheric and weather conditions vary during the day and, for that matter, according to season. Furthermore, contrast with the background depends on the perspective of the observer, and there is as yet no set formula to calculate the visual impact of an object depending on its properties. Some studies have used fuzzy logic-based methods to calculate the probability that each cell of the DEM would be intervisible with the feature of interest, depending on predefined factors (Fisher, 1994; Ogburn, 2006). The lesson to be learned from such studies is that the visual impact of a feature cannot be summarized by a single value. Nevertheless, a quantitative summary is necessary to allow comparisons.

In parallel, some researchers have built on traditional binary viewsheds – i.e. whose cells are marked as either in-sight or out-of-sight from a single target location – to produce maps that capture the visual structure of the landscape in a more sophisticated manner. The calculation of cumulative viewsheds first gave a chance to calculate how many viewpoints (i.e. archaeological sites) are intervisible with each cell of the DEM (Wheatley, 1995). The methodology was then extended to compute what has been termed “inherent viewshed” or “total viewshed” (Llobera, 2003; Llobera et al., 2010; see also Lake et al., 1998;

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