



## New evidence of early Neanderthal disappearance in the Iberian Peninsula



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### ABSTRACT

The timing of the end of the Middle Palaeolithic and the disappearance of Neanderthals continue to be strongly debated. Current chronometric evidence from different European sites pushes the end of the Middle Palaeolithic throughout the continent back to around 42 thousand years ago (ka). This has called into question some of the dates from the Iberian Peninsula, previously considered as one of the last refuge zones of the Neanderthals. Evidence of Neanderthal occupation in Iberia after 42 ka is now very scarce and open to debate on chronological and technological grounds. Here we report thermoluminescence (TL) and optically stimulated luminescence (OSL) dates from El Salt, a Middle Palaeolithic site in Alicante, Spain, the archaeological sequence of which shows a transition from recurrent to sporadic human occupation culminating in the abandonment of the site. The new dates place this sequence within MIS 3, between ca. 60 and 45 ka. An abrupt sedimentary change towards the top of the sequence suggests a strong aridification episode coinciding with the last Neanderthal occupation of the site. These results are in agreement with current chronometric data from other sites in the Iberian Peninsula and point towards possible breakdown and disappearance of the Neanderthal local population around the time of the Heinrich 5 event. Iberian sites with recent dates (<40 ka) attributed to the Middle Palaeolithic should be revised in the light of these data.

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### Introduction

Current chronometric data are changing our views on the end of the Middle Palaeolithic, the disappearance of Neanderthals and the arrival of anatomically modern humans (AMH) in Europe. Previously, the dates for an assumed replacement or assimilation of Neanderthals by a new European population fluctuated broadly between ca. 40 and 30 ka BP (thousands of years before present), with some of the youngest dates being associated with sites in the Iberian Peninsula (Hublin et al., 1995; Maroto et al., 2005; Vaquero, 2006; Zilhão, 2006; Finlayson et al., 2008; Jennings et al., 2009; Jöris et al., 2011; García et al., 2012). This chronological

framework supported a persistence of the so-called Mousterian techno-complex and allowed for models of co-existence of Neanderthals and AMH in this region.

However, recent chronometric data from several key late Middle Palaeolithic European sites using refined sample pretreatment measures and suitable sample selection have pushed back some of the most recent radiocarbon dates for the late Middle Palaeolithic to roughly 42 ka BP, between Heinrich events 4 and 5 (Higham, 2011). The Iberian Peninsula has been subject to the same scrutiny, which affects previous arguments supporting Neanderthal persistence in the south. Specifically, young dates (<42 ka BP) such as those from Sima de Las Palomas, Carihuela and Gorham's Cave are now being questioned (Wood et al., 2013a), and the dates from Jarama VI and Zafarraya, which are central to the persistence argument, have been pushed back several millenia (Maroto et al., 2012; Wood et al., 2013a). Although the young (<42 ka BP) dates from Cueva Antón and Esquilieu remain valid (Zilhão et al., 2010;

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Baena et al., 2012; Higham et al., 2012), these sites have yielded very poor, undiagnostic lithic assemblages.

The new chronometric dates alone do not represent a sufficiently strong argument to refute hypotheses of Neanderthal persistence in Iberia, i.e., those proposing a retreat of the Neanderthal population to marginal mountain areas (Baena et al., 2012), the existence of refuge zones in the southwestern edge of the Iberian Peninsula (Finlayson et al., 2008; Jennings et al., 2011) and the ‘Ebro Frontier’ hypothesis (Zilhão, 2006), which implies a

geographic separation between Neanderthals (in southern Europe) and AMH (in northern Europe).

The occurrence of stratigraphic discontinuity and likely incidence of significant climatic cooling between the Middle and Upper Palaeolithic in the majority of Iberian sites has recently been pointed out (Aubry et al., 2011; Brädtmoller et al., 2012; Mallol et al., 2012; Schmidt et al., 2012), suggesting the existence of a hiatus between the latest Neanderthals and earliest Upper Palaeolithic in the Iberian Peninsula. In this context, El Salt, a Middle Palaeolithic site in Alcoy, Spain (Fig. 1), has yielded significant information that contributes to advance the ongoing debate. The site contains evidence of Neanderthal presence consisting of rich lithic and faunal assemblages, well preserved combustion structures and isolated, probably Neanderthal, teeth (Garralda et al., 2014). The archaeological record reveals a period of recurrent human occupation followed by sparse occupation and subsequent abandonment of the site (Garralda et al., 2014). Here we present new thermoluminescence (TL) and optically stimulated luminescence (OSL) dates obtained for the entire sequence, coupled with sedimentological data. These are relevant to the debate on the disappearance of Neanderthals from the region.

#### El Salt

Archaeological excavations at El Salt have been carried out systematically since 1986 by a research group based at the University of La Laguna, Spain, under the direction of one of the authors (BG). Ongoing work involves a comprehensive microstratigraphic study of the site towards reconstruction of site formation processes, as well as archaeological palimpsest dissection through integrated multidisciplinary analyses of the archaeological and sedimentary records.

The site is located at 700.0 m above sea level (a.s.l.) and comprises an open-air, 6.3 m-thick stratified deposit. This deposit rests against a 38 m-high Paleocene limestone wall formed at a thrust fault and covered with tufa and travertine. The stratigraphic sequence, under current investigation, was divided into 13 lithostratigraphic units (XIII–I) by Fumanal (1994) (Fig. 2). These units can be grouped into five different segments according to their macroscopic textural appearance and archaeological content (from base to top):

- 1 Unit XIII: Archaeologically sterile, horizontal travertine platform (thickness unknown; top 50 cm are exposed). The top part has been dated by uranium–thorium (U–Th) to  $81.5 \pm 2.7$  ka and  $80.1 \pm 4$  ka (Fumanal, 1994).
- 2 Units XII–IX: 1.5 m-thick, horizontally bedded fine sand with abundant archaeological remains and combustion residues (Table 1). A clastic facies consisting of several large blocks is found at its base. These units are characterized by a high presence of combustion features, including numerous simple combustion structures or hearths of variable dimensions (0.20–1.00 m in diameter) (Sistiaga et al., 2011; Mallol et al., 2013). The hearths from Unit X are central to activity areas concentrated near the travertine wall. They are commonly associated with rich archaeological assemblages comprising abundant faunal remains, flint flakes and anthropogenically modified cobbles. Use-wear investigations have shown evidence for butchery, as well as hide and wood work activity (Rodríguez et al., 2002).
- 3 Unit VIII-middle of V: 1.5–2.8 m-thick horizontally bedded predominantly geogenic sand with decreasing, spatially reduced evidence of human input. Unit VI is capped by a significant accumulation of large blocks. This segment has yielded very few, smaller, thinner combustion structures and significantly smaller



A



B



C

**Figure 1.** A) Geographic location of El Salt site in the Iberian Peninsula. B) Site setting. The excavation area is situated at the foot of the tall limestone wall (arrow). C) General view of the excavation area.

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