



Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

New magnetostratigraphic and numerical age of the Fuente Nueva-3 site (Guadix-Baza basin, Spain)



C. Álvarez ^{a,*}, J.M. Parés ^a, D. Granger ^b, M. Duval ^a, R. Sala ^c, I. Toro ^d

^a Geochronology Program, CENIEH, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain

^b Department of Earth Atmospheric and Planetary Sciences, Purdue University, West Lafayette, IN 47907, USA

^c IPHES (Institut Català de Paleoecologia Humana i Evolució Social), Àrea de Prehistòria, Universitat Rovira i Virgili, Plaça Imperial Tàrraco 1, 43005 Tarragona, Spain

^d Museo Arqueológico y Etnológico de Granada, Carrera. Del Darro 41-43, 18010 Granada, Spain

ARTICLE INFO

Article history:

Available online 10 June 2015

Keywords:

Guadix-Baza basin
Magnetostratigraphy
Cosmogenic nuclides
Electron spin resonance
Pliocene–Pleistocene
Olduvai

ABSTRACT

Sediments of the Plio-Pleistocene Guadix – Baza basin have provided a wealth of information on the first hominin populations in Western Europe. To better constrain the age of the Fuente Nueva-3 archaeological site within the basin, and to complement previous magnetostratigraphic studies, two vertical boreholes were taken that provide a continuous record of the lower part of the sequence. Results indicate that the sequence is dominated by negative inclinations, but some additional intervals with positive inclination are also identified in the lower part of the sequence. A new cosmogenic nuclide burial age of 1.50 ± 0.31 Ma helps constrain the magnetostratigraphic record. The abundance of normal polarity directions at the bottom of a borehole may indicate proximity to the Olduvai Subchron; however, further analyses are required to confirm this hypothesis.

© 2015 Elsevier Ltd and INQUA. All rights reserved.

1. Introduction

The Guadix-Baza basin, located in the Betic Mountain Range (southern Spain) contains a record of the southernmost and one of the largest Neogene-Quaternary paleolakes in Europe. The lake sediments are rich in organic material and often fossiliferous, and are continuous across the Miocene, Pliocene and Pleistocene epochs (e.g. García Aguilar and Palmqvist, 2011). They have therefore been the target of numerous geologic, paleontological, and archaeological studies. Sites such as Orce, Huéscar, Barranco León, and Fuente Nueva have yielded important information for understanding the Plio-Pleistocene, including faunal events such as the so-called “Villafranchian turnover” and climate events such as the Early-Middle Pleistocene Revolution that marks the transition to longer-period glacial–interglacial cycles (Agustí et al., 2001, 2010; Head et al., 2010). In addition, the basin holds promise to become a European reference for an unprecedented “out-of-Africa lacustrine basin” including both evidence of human occupation and a faunal record for the Pleistocene.

Fuente Nueva-3 (FN-3), in the NE Guadix-Baza basin, is currently considered as one of the oldest sites of hominin occupation in Western Europe (e.g. Martínez-Navarro et al., 1997; Oms et al., 2000b; Toro et al., 2011; Duval et al., 2012a). A previous magnetostratigraphic study at FN-3 revealed a 20 m thick composite stratigraphic section of entirely reversed magnetic polarity that was correlated to the Matuyama Chron, very likely between the Olduvai and Jaramillo Chrons, based on biochronological evidence (Oms et al., 2000b, 2010b). However, the scarcity of the outcrops available in that area and the lack of stratigraphic continuity hampered sampling and precluded a detailed study of a continuous sequence. To address this issue, two boreholes were drilled in the vicinity of FN-3 in July 2011; the paleomagnetic results are presented here. One of the pending questions addressed by this work is whether short polarity chrons, in particular the Jaramillo, are missing due to the limited availability of suitable lithologies for paleomagnetism and due to weathering at the surface. In this paper, we document a new chronostratigraphic study at FN-3 that combines new data derived from the magnetostratigraphy and from cosmogenic nuclide burial dating. These data, combined with the available electron spin resonance (ESR) age results (Duval et al., 2012b), complement the existing geochronologic framework of the site.

* Corresponding author.

E-mail address: claudia.alvarez@cenieh.es (C. Álvarez).

2. Geological context

The Guadix-Baza basin (Fig. 1) developed during the Neogene due to tectonic interactions between the Iberian block and the African plate. During the upper Miocene, it was part of the Betic corridor that connected the Mediterranean Sea to the Atlantic Ocean (Sanz de Galdeano, 1990; Sanz de Galdeano and Vera, 1992; Vera, 2000; Pla, 2009 and references therein). Later, in the latest Tortonian-early Messinian, the seaway progressively reduced and eventually closed, isolating the basin from the Mediterranean. Continental sedimentation continued in the lake basin, leaving a continuous record with a thickness of >500 m (and probably up to 2400 m) ranging in age from the Tortonian to the Pleistocene (Soria et al., 1999; Viseras Alarcón et al., 2003; Garcia Aguilar et al., 2010a,b; Hüsing et al., 2010;). During the Plio-Pleistocene, the basin was divided into two main sub-basins hosting distinct environments. The western sector (Guadix sub-basin) was dominated by a fluvial drainage flowing towards the eastern sector (Baza sub-basin), which was mainly occupied by a large and permanent lake (e.g. Viseras and Fernandez, 1992; Garcia Aguilar and Palmqvist, 2011). This duality yielded the identification of two almost coeval lithostratigraphic units for the Plio-Pleistocene deposits of the Guadix-Baza basin (García Aguilar and Martín, 2000; Pla, 2010; Pla et al., 2011): (1) the Guadix Formation, in the western part, which includes sandstones and conglomerates of fluvial and fan-delta origin; and (2) the Baza Formation, mostly exposed in the eastern part and made up of fine-grained lacustrine sediments.

The Baza Formation, the target of this study, hosts a rich mammal fauna near the Plio-Pleistocene transition. A number of Neogene Mammal (MN) zones have been distinguished, including MN 14 to MN 17 for the Pliocene, and the biozones Mm Q1 to MmQ4 defined by Agustí et al. (1987) for the Pleistocene (Agustí

and Martínez Suárez, 1984; Agustí, 1985; Agustí et al., 1987; Oms et al., 2000a; Agustí et al., 2001; Oms et al., 2010a; Duval et al., 2011). A number of magnetostratigraphic studies have been carried out to precisely constrain MN boundaries and to furnish some important time lines for lacustrine sedimentation (Peña, 1985; Oms et al., 1994; Garcés et al., 1996, 1997; Oms et al., 1996; Parés and Dinarés-Turell, 1997; Agustí et al., 1999; Oms et al., 2000a; Gibert et al., 2006, 2007; Scott et al., 2007; Oms et al., 2010b, 2011). Overall, these studies place the sequences around the upper Pliocene and Lower Pleistocene, including archaeo-paleontological sites at Venta Micena, Barranco León, Fuente Nueva, Cúllar de Baza and Huescar.

2.1. Fuente Nueva-3 section

The town of Fuente Nueva is located ~7 km east of Orce, in the northeastern part of the Guadix-Baza basin. In the Orce-Fuente Nueva-Venta Micena area, the Baza Fm. has been classically divided in three different members (Vera et al., 1984): (1) an upper member of silty limestone (lacustrine and palustrine environment), which rests on (2) a middle red detrital member (alluvial), and (3) a lower limestone member at the base (shallow lacustrine and palustrine). This formation is especially known for the numerous paleontological and archaeological sites that have been discovered over the last decades (e.g. Toro et al., 2000; Agustí et al., 2010). The most famous are undoubtedly Fuente Nueva-3 and Barranco León, currently considered among the oldest evidence of hominin presence in Western Europe (Martínez-Navarro et al., 1997; Oms et al., 2000b) and the paleontological site of Venta Micena (Arribas and Palmqvist, 1998).

In the area of Fuente Nueva, three paleontological sites have been identified, labeled as “Fuente Nueva-1”, “Fuente Nueva-2” and

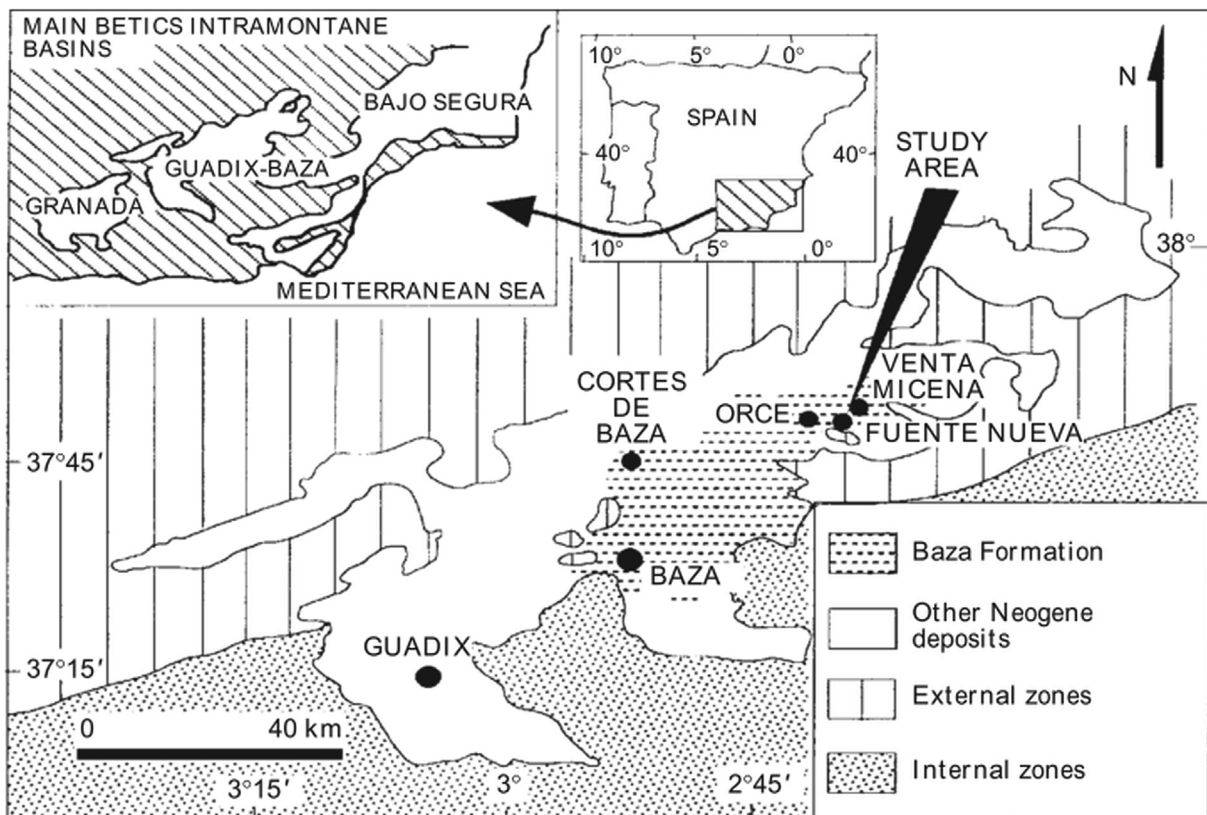


Fig. 1. Geographic location of the Guadix basin – Baza, South Spain (Modified from Martínez-Navarro et al., 1997).

Download English Version:

<https://daneshyari.com/en/article/1040491>

Download Persian Version:

<https://daneshyari.com/article/1040491>

[Daneshyari.com](https://daneshyari.com)