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Level TE9c of Sima del Elefante (Sierra de Atapuerca, Spain): A comprehensive approach

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ABSTRACT

Level TE9c of the Sima del Elefante site (Sierra de Atapuerca, Spain) is one of the oldest sites with evidence of human occupation in western Europe. We began excavating level TE9c in 2003, and the work there continues today. The studies of the archaeology, palaeontology and geology from this locality have provided an indispensable dataset with which to capture a picture in the scenario of the origin of humans in Europe. Based on these data, we raise and discuss several topics, such as the possible origin of the lineage of the first hominins that inhabited western Europe; their capacity to have active hunting or scavenging abilities; whether their subsistence strategies were successful; and what the environment and habitats where these hominin groups settled was like. The aim of this paper is to present the results and discussions obtained from the research team and to establish the primary features of early human occupations in southwestern Europe. Tentatively, we may conclude, based on the events recorded at TE9c, that the first humans were in the Iberian peninsula at around 1.2 Ma they used the caves of the Sierra de Atapuerca as shelters probably during their hunting activities; the cavities were surrounded by Mediterranean forest, rivers and water ponds, and varied habitats as suggested by the rich and diverse assemblage of fossils of vertebrates (fish, amphibians and reptiles, birds, large and small mammals); where humans possibly caught what they found in the surroundings.

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1. Introduction

The main aim of this paper is to present the results and interpretations of the study of level TE9c of Sima del Elefante from an interdisciplinary point of view. The assemblage from level TE9c has provided the most data related to the first human occupation of

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Europe. The results obtained from the remains recovered in this level correspond to different fields of research, including geology, chronology, palaeontology, zooarchaeology, taphonomy, palaeobotany, palaeoanthropology and lithic technology. These data have made it possible to reconstruct the paleoenvironment of the area surrounding Sima del Elefante during the formation of level TE9c (Fig. 1).

The Sima del Elefante site (hereafter referred to as TE) is a major cave infill with a stratigraphic succession with a thickness of 25 m and a width of 15 in the exposed section, divided into 16 litho-stratigraphic units, called TE7 to TE21, from bottom to top (Rosas et al., 2001, 2004, 2006). A palaeomagnetic analysis has detected a polarity change at the base of unit TE17. Thus, the sediments below this unit, from TE7 to TE16, have reversed polarity and have been assigned to the Matuyama chron (>780 ka) (Rosas et al., 2001; Parés et al., 2006). According to Arnold and Demuro (2015) the corresponding weighted mean TT-OSL (Thermally transferred optically stimulated luminescence) ages for units TE16 and TE17 at Sima del Elefante are 890 ± 70 ka and 789 ± 47 ka, respectively.

More recent units (TE18–TE19) containing archaeological and palaeontological records have been attributed to the second half of the Middle Pleistocene, around 250–350 ka (OIS 9–8), on the basis

of a biochronological analysis (Rosas et al., 2006; López-García et al., 2011). A uranium series (U/Th) analysis of the stalagmitic crust from the roof of level TE18 has yielded two dates, 307 ± 19 ka and 255 ± 12 ka (Bischoff, pers. comm.). These results suggest that level TE18 was formed during MIS 9 and 7, and that the chronology of TE19 is more recent than 255 ka (de Lombera-Hermida et al., 2015).

The lower levels (TE7–TE14) of the sedimentary infill constitute the Early Pleistocene stratigraphic sequence with the longest archaeo-palaeontological record in Europe. This has allowed us to propose a diachronic study in relation to the different faunal and botanical taxa identified throughout the stratigraphic succession as well as to the human groups that lived near the site about 1 million years ago. However, to carry out a diachronic study on the Early Pleistocene at Sima del Elefante, each archaeo-palaeontological level documented must first be characterized (Fig. 2).

2. Unit 9

2.1. Geological settings

The sedimentary facies of the Sima del Elefante are described in detail in Rosas et al. (2001, 2004, 2006). Unit TE9 has been described as consisting of brown mud with subangular blocks in beds markedly sloping to the north (38°) (Parés et al., 2006). In level TE9c, limestone blocks exhibit developed weathering cortices, and the decomposition of some of these blocks sometimes affect the fossils that were in contact with them.

Unit TE9 contains three subunits TE9c, TE9b and TE9a (from bottom to top).

Subunit 9c is a finely stratified stratum of 1 m thick. It is a bedset of mud and fine gravelly mud lithology. There are 2 sedimentary facies:

- Crystalline yellow and red, brown and black mud in finely stratified beds. The beds are deformed, massive and laminated.
- Crystalline yellow and gravelly mud in stratified beds. Pebble limestone gravels are polymodal (sub-rounded and altered/ weathered) within massive laminated and mud supported beds. These mud supported beds are microstratified and the mud is reddish yellow, reddish brown and pinkish white (5YR).

Subunit 9b is a stratified bedset of fine gravels and reddish brown sandy mud. The fine gravels are sandy mud supported. Subunit 9a is a coarse bed consisting of limestone breccia. The blocks and gravels are clast and reddish yellow muddy sand supported (Fig. 3).

The lithostratigraphy of level TE9c defined in this study is consistent with other analogous units of the sedimentary successions of the Trinchera del Ferrocarril. The composition formed by limestone, with developed weathering cortex and stratified reddish yellow, reddish brown and pinkish white (5YR), muds or gravelly muds, illustrates similar lithologies as those in (1) unit GIIA, especially below the vertical passage (shaft) of Trinchera Norte in the Trinchera Galeria site, and (2) the deposits of units TD8–9 and TD9 near the cave wall south of Trinchera Dolina cave. The truncated terminations of these lithostratigraphic units suggest that they are part of the sedimentary infill of subsidence or suffusion dolines (shakeholes) (Lowe and Waltham, 1995). The origin of these shakeholes in the Trinchera del Ferrocarril cave entrances is likely related to the aperture and sedimentary infill of conduits that connect the second and third floor cave passages of the karst system of the Sierra de Atapuerca.



Fig. 1. a. View of Sima del Elefante cave. b. View of surface of level TE9c of Sima del Elefante in 2014.

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