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A new complete sequence from Lower to Middle Paleolithic: El Provencio Complex (Cuenca, Spain)

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ABSTRACT

This paper presents the results of the archaeological research project on the Lower and Middle Paleolithic in the municipality of El Provencio (Cuenca, Spain). During the first 6 years of the project, an unknown archaeological complex has been defined with a large concentration of remains of lithic industry of Modes 1, 2 and 3, as well as Pleistocene faunal remains (*Mammuthus* and *Equus*), associated with the large-scale sequences of the Záncara River. The first ages obtained by two complementary dating methods are presented here: Electron Spin Resonance (ESR) and Optically Stimulated Luminescence (OSL). The absolute dates of 41 ± 2.2 ka and 836 ± 46 ka (Al–Ti mean age) correspond to the upper and lower levels of the stratigraphic sequence respectively. The archaeological potential contained in this complex suggests an effective and uninterrupted human occupation of this region during ≈800 ka.

1. Introduction and archaeological background

El Provencio Complex is a Lower to Middle Paleolithic archaeological and a Pleistocene paleontological site located in the municipality of El Provencio (39° 22′ 54″ N: 2° 34′ 30″ W) in the Province of Cuenca, Castilla-La Mancha, Spain (South sub-plateau of the Iberian Peninsula) (Fig. 1).

The geological and palaeontological value of the site is known since three decades ago. The industrial exploitation of the multiple sand quarries, that have been opened here until today, delivered a collection of dental remains (currently hosted at the Museo Nacional de Ciencias Naturales of Madrid) which has been studied and identified by several experts as *Mammuthus meridionalis* deciduous molars and other *Bison sp.* teeth (Pérez-González et al., 1990).

The research project in El Provencio began in 2013 and belongs to a bigger research program about the human origins which encompasses all three regions pertaining to the Province of Cuenca: Alcarria, Mancha and Sierra (Domínguez-Solera and Muñoz, 2014; Domínguez-Solera and Martín, 2015; Domínguez-Solera, 2019a). This specific research program started with systematic surveying and excavating of old quarries which in turn, allowed to select new excavation sites such as *El Pinar de la Vega*, *El Pinarico* or *Los Marines* among others, forming *El Provencio Complex*. This rich archaeo-paleontological area has delivered a large collection of lithic materials from Lower to Upper Paleolithic, Neolithic and Calcolithic as well as some faunal remains. To determine the chronology of these findings is basic for making archaeological interpretations thus, in 2015, several samples for Electron Spin Resonance (ESR) and Optically Stimulated Luminescence (OSL) dating were collected at *El Pinarico* and *El Pinar de la Vega* quarry profiles. Along with the scientific work (Domínguez-Solera, 2019b; Domínguez-Solera et al., 2019), the research team has done a great deal of outreach work organizing congresses, exhibitions of original pieces or even the creation of a didactic classroom provided with reproductions, digital and analogic resources.

Unlike other adjacent South sub-plateau areas (Serna, 1999; Rodríguez de Tembleque, 2005; Rubio et al., 2005; Rubio-Jara et al. 2016), the availability of Lower and Middle Paleolithic Archaeology data in the Province of Cuenca was scarce before the general systematic research program in which *El Provencio Complex* studies are integrated. These previous data consisted on bibliographic reiterative mentions of pieces about the prehistory in different localities such as Chillarón, Arcos de la Cantera, Colliguilla, Cuevas de Velasco, Cuenca, Noheda and Villar de Olalla (Osuna, 1974, 1976; Millán, 2012), all of them without a proper study of stratigraphic contexts or appreciations on human behavior. Also, in a few unpublished reports about expertise of infrastructure works and several news in some heritage management inventories where some findings in the locations of Tébar, Mota del Cuervo, La Melgosa and Fuentes among other examples were described

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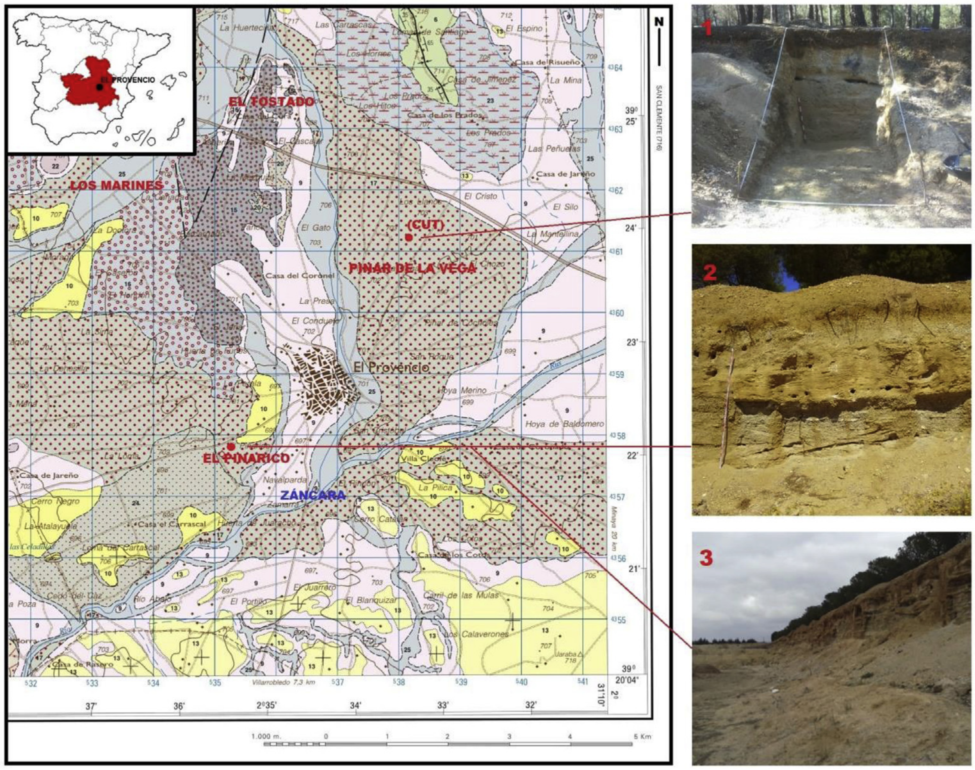

Fig. 1. Location map of the areas studied *in El Provencio Complex*. 1: *Pinar de la Vega* cut in 2017.2 and 3: *El Pinarico* quarry profiles. Cartographic base: *Mapa Geológico de España 1: 50.000, El Provencio, 715, 21–28.* S.D. Domínguez-Solera.

(e.g. Morín, 2012; Sánchez and Vizcaíno, 2013). Therefore, *El Provencio Complex* is not just one more of the dozens of points of interest recently discovered in the Province of Cuenca (Carrascosa del Campo, Fresneda, Arcas, Huete, Caracenilla, Canalejas del Arroyo, Sotoca, Garcinarro, etc. in Domínguez-Solera, 2019a) but it is one of the more studied sites, specially from a geological and archaeological point of view. The analysis of lithic artifacts has been reinforced by the first Electron Spin Resonance (ESR) and Optically Stimulated Luminescence (OSL) ages ever obtained for this region.

The aim of this paper is to present the results obtained so far in *El Provencio Complex* and to show the research possibilities that this new archaeological and paleontological stratigraphic sequence offers to the study of the extinct hunter-gather communities who lived during Pleistocene in Central Spain.

2. Geographical and geological context

The stratigraphic sequence of *El Provencio Complex* is geologically part of the Llanura Manchega Plain (Pérez-González, 1982), specifically of the oriental side of this natural region, between the Altomira-Calderina mountain ranges to the North and the Campo de Montiel-Campo de Calatrava plains to the South. *El Provencio Complex* is composed by an extensive succession of horizontally emplaced fluvial units or river terraces, rich in gravels and sands pertaining to the Záncara River deposits, one of the main tributaries of the Guadiana River. The old channel of the Záncara has been defined as Terrace +15–16 m of the Guadiana River (Pérez-González et al., 1990).

The Záncara River terraces were formed along the Pleistocene and Holocene (IGME, 2007a;IGME, 2007b). The absence of major geographical accidents in the ground favored the development of a wide and mobile river area, which basically consists in braided channels that builds up a complicated system of dissymmetric and more or less deep strata, intermingling with wind mantles. The paleohydrological conditions of the Záncara River were quite constant, transporting and depositing its charge of gravels and sands throughout the Pleistocene (Cermeño and Uribelarrea, 2019), while the upper strata formation was edaphic and took place during the Holocene (Fig. 1).

The general stratigraphy of the *El Provencio Complex* is composed of 3 main layers with an overall thickness up to 5 m and deployed in an extension of 7 km at least, following the riverbank of the Záncara River. None of the strata seem to be affected tectonically. All the Quaternary fluvial sediments were deposited over older continental materials (clays, sandstones and conglomerates) of the Paleogene era (Pérez-González, 1982; IGME, 2007a; IGME, 2007b; Cermeño and Uribelarrea, 2019). The bottommost layer (Layer 3) is characterized by sand and gravel deposits, is divided into different sublevels and is sterile of archaeological remains. Layer 2 shows inter-bedding of sands and gravel and is also sub-divided into several sub-levels. The sublevel sequence and its thickness vary across the riverbank due to the formation processes of a river with braided characteristics (Layers 2 and 3). The main concentration of lithic industry of Modes 1 to 3 and the Pleistocene faunal remains were found in this layer. The uppermost layer, Layer 1, is and edaphic soil, clay-rich and contains not eroded or rolled Mode 4 lithic industry, as well as Neolithic-Calcolithic ceramics and microliths (Fig. 2).

In the last four decades, gravel and sand quarries have been directly opened on the old course of the Záncara River forming three main groups of them, which in the present study are treated as "stratigraphic windows" and areas of fieldwork: *El Pinarico* (South), *Pinar de la Vega* (North and East) and *Los Marines* (West). The fourth area alluded in this study is *El Tostado* that seems a small rocky outcrop that channeled the river in the Pleistocene (Cermeño and Uribelarrea, 2019).

The horizontal stratigraphic scheme explained above is repeated symmetrically and consistent throughout all the quarries and profiles studied in *El Provencio Complex* (Figs. 1 and 3). The archaeological stratigraphy crosses the border of the municipal district of El Provencio, but has not been studied outside the frontiers for administrative reasons and legal permission availability yet.

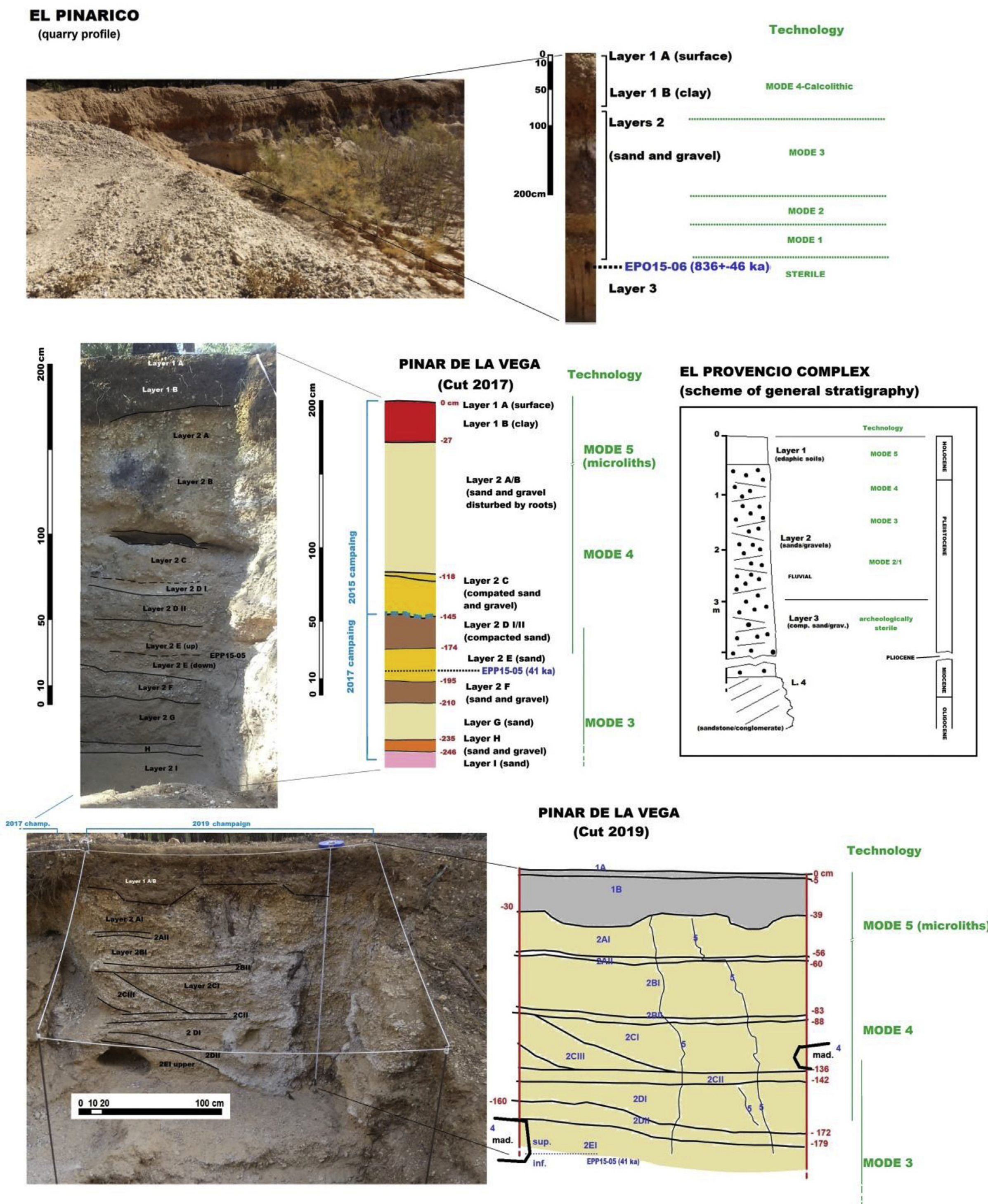

Fig. 2. Stratigraphy of *El Pinarico* (quarry profile) and *Pinar de la Vega* (cuts of 2015–2017 and 2019), in relation to the dates obtained (EPP15-05 and EPO15-06) and the types of industry contained in the layers. S. D. Domínguez-Solera.

3. Methods

3.1. Surveying and excavation

Between 2013 and 2015, several archaeological prospection campaigns were carried out in *El Provencio Complex*. This work allowed to discover new excavation places, to assess the potential of different outcrops for dating and to get a large number of surface remains. This collection unveiled a rich quartzite and flint lithic industry as well as some faunal remains concentrated on the sand- and gravel-rich layers. All this findings were geolocated using mobile app GPS and GIS mapping tools.

Although prospecting works have never been abandoned, between 2015 and 2019 different excavation campaigns were conducted at *El Pinar de la Vega* and delivered lithic artifacts in stratigraphic position. Geological studies are currently been conducted by a specialized research team.

The archaeological excavations at *El Pinar de la Vega* have consisted

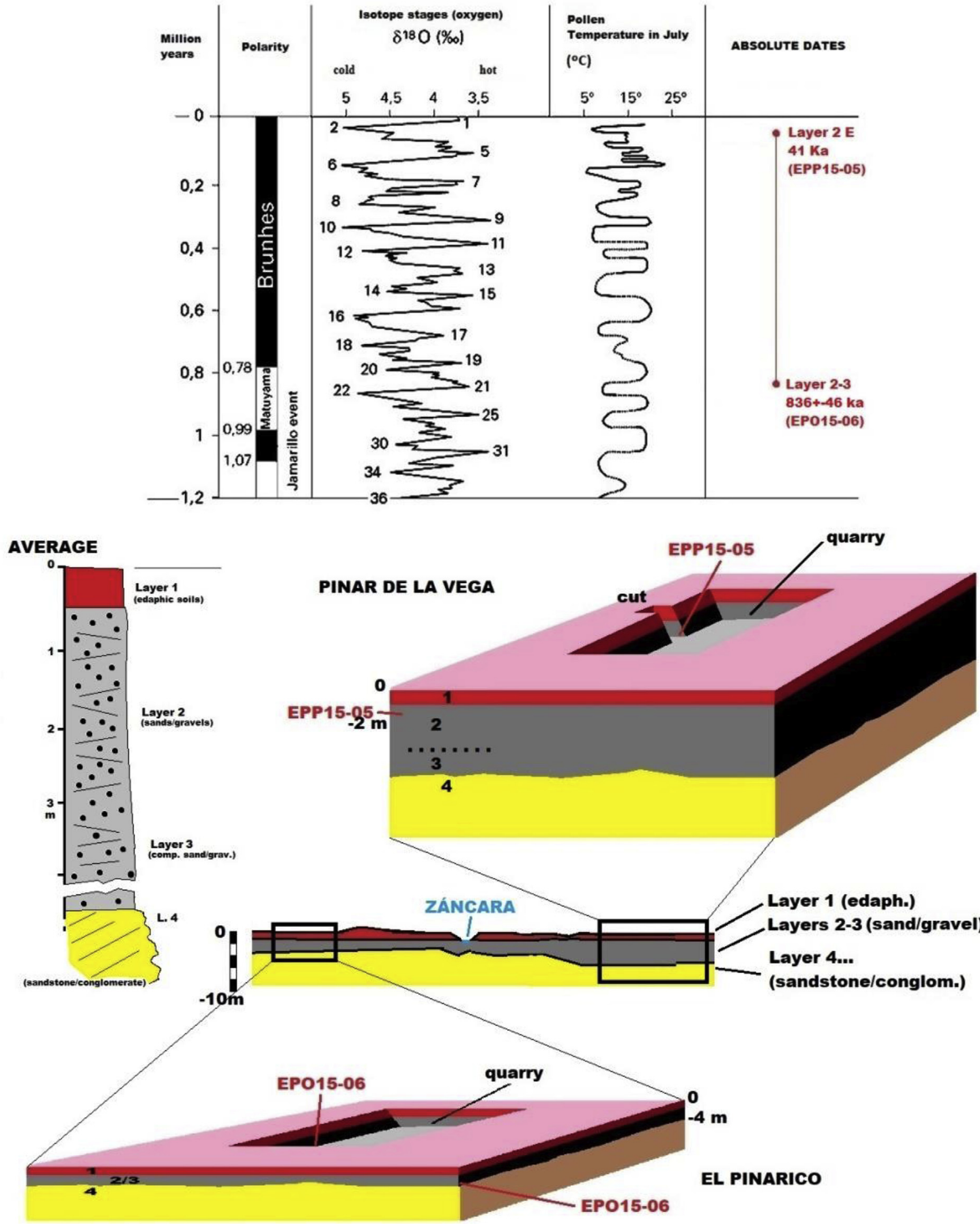

Fig. 3. Stratigraphic sketch of the two areas dated in *El Provencio Complex* and relationship of the two dates with general geochronology data. S. D. Domínguez-Solera.

of two adjacent cross-sectional trenches on the profile of an old quarry, arising an area of 16 m^2 and reaching a total depth of 2.5 m. According to the fluvial nature of the sediments, the excavation strata have been defined and numbered, distinguishing each unit using criteria close to the geomorphological phenomena that formed them. Fluvial episodes with a first phase of greater power and its consecutive reduction in drag capacity, channel edges, etc. were discriminated in different sub-layers. The entire content of each sublevel was screened by hand sieves (1 mm mesh) to separate the soil from the gravel content. Finally all the pieces with signs of anthropic facture were collected, but also the raw flint nodules for further laboratory analysis.

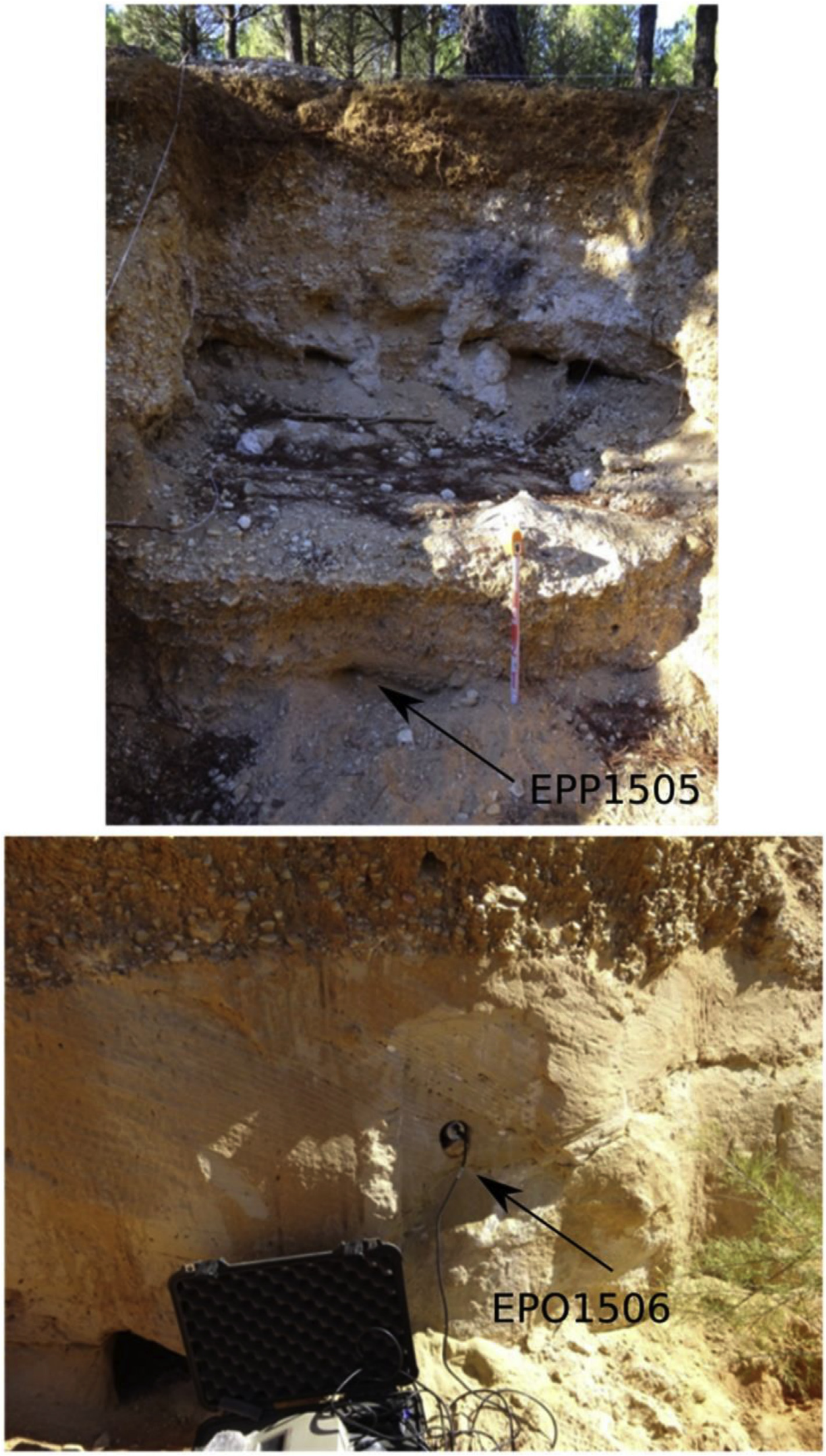

Fig. 4. Photographs of ESR and OSL samples on the respective quarry profiles from *El Pinarico* and *Pinar de la Vega*. D. Moreno.

3.2. Geochronology

3.2.1. Sampling

To establish the geochronology of *El Provencio Complex*, a fieldwork campaign with geochronological purposes was carried out in October 2015. Two samples were collected following the strategies recommended for trapped-charged dating techniques (Moreno et al., 2017) and were analyzed by two different dating methods: Electron Spin Resonance (ESR) and Optically Stimulated Luminescence (OSL). ESR sample EPO1506 was collected in the top of the sterile Layer 3 of *El*

Pinarico profile whereas OSL sample EPP1505 was retrieved from sub-level 2E at *El Pinar de la Vega* cut (Fig. 4).

3.2.2. Sample preparation

Samples were prepared following standard procedures under strict red light conditions at the Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) in Burgos, Spain. The material at the ends of each tube (≈3 cm deep) was removed under dark room conditions (< 2 μW cm^{-2}; 600–690 nm) to prevent light contamination during sampling. The material not exposed to light was wet-sieved, treated with concentrated HCl (32%) and H_2O_2 (35%) to remove carbonate and organic matter, respectively. Two steps of heavy liquid separation (SPT) at 2.62 g·cm^{-3} and 2.72 g·cm^{-3} were carried out to remove the feldspar fraction and heavy minerals, respectively (Aitken, 1985, 1998). A Frantz magnetic separator was used to remove magnetic minerals following the protocol described in Porat, 2006.

The quartz-rich fraction was then etched for 40 min using concentrated hydrofluoric acid (48%) to remove any remaining feldspars and etch away the outer alpha irradiated layer. Following etching, the quartz-rich fraction was treated with HCl (10%) during 60 min to remove any possible precipitated fluorides. After that, samples were treated with a sodium pyrophosphate solution in an ultrasonic bath during 30 min, and washed several times to remove micas from the quartz-rich fraction. Samples yielded enough amount of quartz-rich fraction to perform OSL and ESR measurements and tests.

3.2.3. ESR dating of quartz grains

The Multiple Aliquots Additive (MAA) dose approach for dating quartz grains was applied. After extraction, each sample was split into 12 aliquots. Ten of these were irradiated at different doses ranging from 100 to 20000 Gy using a calibrated Gammacell-1000 ^{137}Cs gamma source. One aliquot was conserved as natural reference and the twelfth aliquot was optically bleached for ~1500h using a SOL2 (Dr. Hönle) solar light simulator in order to evaluate the ESR intensity of the non-bleachable residual signal associated to the Aluminium center of quartz (Voinchet et al., 2003).

ESR measurements were performed at low temperature (90K) using a nitrogen gas flow system connected to an EMXmicro 6/1 Bruker X-band ESR spectrometer coupled to a standard rectangular ER4102ST cavity at the CENIEH. The angular dependence of the ESR signal due to sample heterogeneity was taken into account by measuring each series of 12 aliquots three times after a ~120° rotation in the cavity. Furthermore, data reproducibility was checked by running ESR measurements over different days. The Multiple Center approach (Toyoda et al., 2000) was also applied and the ESR intensity of Al and Ti centers were evaluated. The ESR intensity of Al center was extracted from peak-to-peak amplitude measurements between the top of the first peak (g = 2.0185) and the bottom of the 16th peak (g = 2.002) of the Al hyperfine structure (Toyoda and Falguères, 2003). The ESR intensity of the Ti center was measured from peak-to-baseline amplitude measurement around g = 1.913–1.915 (Option D; Ti–Li center) (Duval and Guilarte, 2015).

The equivalent dose (D_E) values were calculated with the Microcal Origin 8.5 software using the Levenberg-Marquardt algorithm by chi-square minimization. For the Al center, a single saturating exponential + linear function (SSE + LIN) (Duval et al., 2009) was fitted through the experimental points. For the Ti centers, the Ti-2 function initially proposed by Woda and Wagner (2007) was used (Fig. 5). Dose rate values were obtained from a combination of *in situ* and laboratory analyses using, respectively, a NaI probe connected to an Inspector1000 multichannel analyzer (Canberra) and high-precision Germanium detectors.

ESR age calculation was performed using a non-commercial software based on DRAC (Durcan et al., 2015) which takes into account the uncertainties derived from concentrations, depth, water content, *in situ* gamma dose rate, attenuations and D_E values. The errors associated with total doses, equivalent doses and ESR age results are given at 1σ.

3.3. OSL dating of quartz grains

Optical Stimulation Luminescence (OSL) was carried out on a Risø TL/OSL Reader Model DA20. Luminescence was recorded using a photomultiplier tube (9235QB15), equipped with a 7 mm Hoya-U340 filter. Samples were irradiated using a calibrated ^{90}Sr/^{90}Y source incorporated in the reader, with an effective dose rate of 0.10 ± 0.01 Gy·s^{-1}. OSL dating was determined on quartz-rich fractions (90–125 μm) using the Single-Aliquot Regenerative-Dose (SAR) protocol (Murray and Wintle, 2000) on 20 multiple-grain aliquots (2 mm diameter). An internal quartz dose rate of 0.02 Gy·ka^{-1} (Vandenberghe et al., 2008) and a contribution from cosmic rays (Prescott and Hutton, 1994) were also incorporated into the total dose rate.

3.4. Lithic and faunal remains

The lithic material was cleaned by conventional non-abrasive methods and systematically analyzed, described (morphologically and technologically), inventoried and photographed. The non-fractured pieces have been measured in length, thickness and width using a precision caliper and tabulated. The nomenclature used preferably in this work follows that proposed by Grahame Clark (1977) which use the term “modes” to classify lithic technology in a utilitarian way. Also, for the nomenclature was taking into account the cautions about its variable borders and the need for its constant redefinition (Diez-Martín, 2003). For style reasons, the names Oldowan, Acheulean and Mousterian are also used in discussion as synonyms. The erosion values (1–4) of each piece are guided by an own scale designed for the fieldwork of the general Paleolithic research project in Cuenca (Domínguez-Solera and Martín, 2015), where 1 would be items without bearing and 4 seems a total bearing that -although it allows to identify the piece as an anthropic production and even guess the reduction process-blurs all edges preventing appreciation of retouching. The “eroded index” or erosion rate of each group of pieces is simply calculated from the bearing average.

The fauna, basically obtained in quarry surveying, was fragmented and dispersed by the action of heavy machinery. Specialized cleaning, rebuilding and consolidation (publication in progress) was necessary for its taxonomical identification. Size groups have been used to classify the unidentified taxon remains (Blumenschine, 1986). Poor preservation of the cortical surfaces has hampered the taphonomic analysis in bones (Yravedra, 2006), making it impossible to discern cut, percussion, tooth or trampling marks (Domínguez-Rodrigo et al., 2009). The fracture planes are also completely eroded and it makes unfeasible to recognize green-bone fractures at least (Haynes, 2017).

4. Results

4.1. Geochronology

4.1.1. ESR dating of quartz grains

The ESR results obtained are shown in Fig. 5. The D_E values derived from Al and Ti-Option D centers are 1σ-consistent (D_E-Al = 934 ± 78 Gy and D_E-Ti = 957 ± 37 Gy). Therefore, based on the principle of the MC approach (Toyoda et al., 2000). The Al-signal of sample EPO1506 may be considered as completely bleached during fluvial transport. Ages calculated from these D_E values are Al-center age = 826 ± 48 ka and Ti-Option D center age = 846 ± 43 ka. Consequently, because both Ti and Al centers provide similar ages for this sample, a final mean age for the EPO1506 was calculated: 836 ± 46 ka (Figs. 2 and 3).

El Provencio Complex	
El Pinarico profile	EPO1506
BI (%)	53 ± 1
D_{int} (μGy/a)	50 ± 30
D_{α} (μGy/a)	11 ± 2
D_{β} (μGy/a)	532 ± 7
D_{γ} (μGy/a)	380 ± 14
D_{cos} (μGy/a)	157 ± 16
D (μGy/a)	1131 ± 37
D_E (Gy) Al	934 ± 78
D_E (Gy) Ti-Li D option	957 ± 37
Age (ka) Al	**826 ± 48**
Age (ka) Ti-Li D option	**846 ± 43**

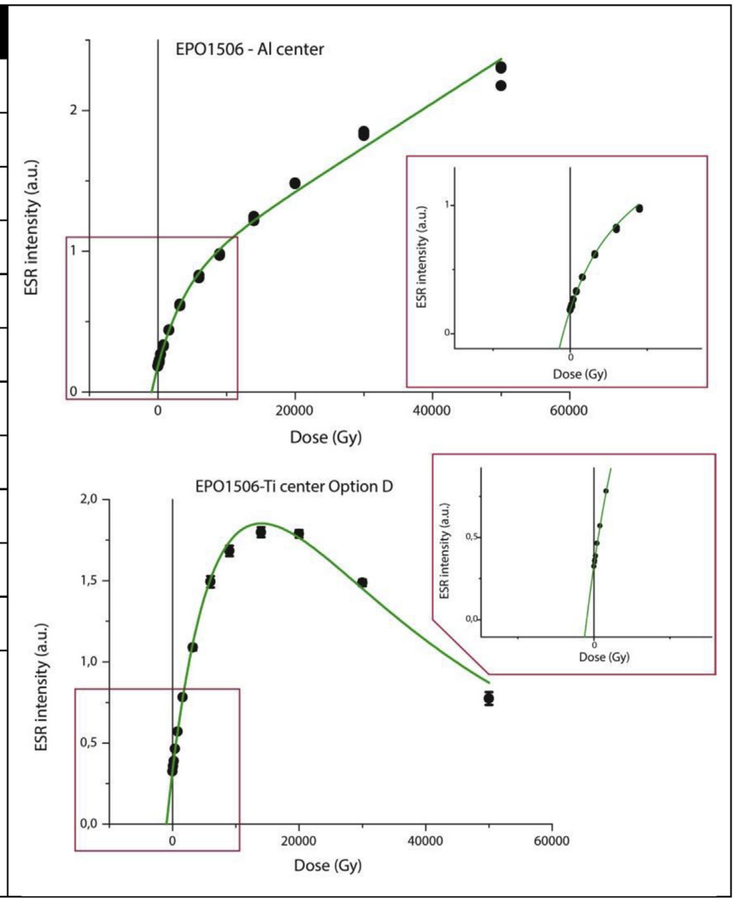

Fig. 5. Left: ESR results obtained for the sample EPO1506 from the sterile Layer 3 of *El Pinarico* profile (Bl: bleaching; D_{int}: internal dose rate; D_{α}: alpha dose rate; D_{β}: beta dose rate; D_{γ}: gamma dose rate; D_{cos}: cosmic dose rate; D: total dose rate; D_E: equivalent dose). Ages results are in bold. Right: Dose response curve (DRC) of sample EPO 1506 obtained for the Al center and Ti center – Option D. D. Moreno.

4.1.2. OSL dating of quartz grains

Collected data from samples (equivalent dose, total environmental dose rates, water content, etc …) are summarized in Fig. 6. The analyzed samples showed a good OSL signal, characterized by a fast component. OSL D_E values obtained, from a total of 20 aliquots measured in sample EPP15-05, showed a normal distribution. A Central Age Model (Galbraith et al., 1999) was used for this sample since the overdispersion of the values is considerably low (14%). The D_E mean value obtained was 18.6 ± 0.6 Gy and the total dose rare 0.45 ± 0.02 Gy·ka^{-1} typical of quartz-rich sediments. All these values gave a luminescence age of 41 ± 2.2 ka for sample EPP15-05, corresponding to Layer 2E in the stratigraphic sequence (Figs. 2 and 3).

OSL sample	
Pinar de la Vega profile	EPP15-05
Water content (%)	15.3 ± 1.5
D_{β} (μGy/a)	150 ± 10
D_{γ} (μGy/a)	150 ± 10
D_{cos} (μGy/a)	150 ± 10
D (μGy/a)	450 ± 20
D_E (Gy)	18.6 ± 0.6
Age (ka)	**41.0 ± 2.2**

Fig. 6. OSL results obtained for the sample EPP15-05 from the *Pinar de la Vega* profile (D_{β}: beta dose rate; D_{γ}: gamma dose rate; D_{cos}: cosmic dose rate; D: total dose rate; D_E: equivalent dose). Ages results are in bold. C. Pérez.

4.2. Lithic industry

1332 lithic artifacts (cores, retouched and unretouched tools and debris) were gathered and described during the extensive surface survey and excavation campaigns in the different locations from *El Provencio Complex* (*Pinar de la Vega*, *El Pinarico*, *Los Marines* and *El Tostado*). Only 67 of them (5%) are quartzite pieces and 1265 (95%) were made in flint (Fig. 7). No pieces made of other materials have been documented. They mainly come from safe stratigraphy, because they have been obtained by manual excavation in the *Pinar de la Vega* area (810 pieces, 60.8%). Up to 57.6% of the pieces have been typologically attributed to a specific technological mode, compared to 43.4% that have not been defined with sufficient certainty (Fig. 7). The density of artifacts in the *Pinar de la Vega* stratigraphy (calculated from the values by stratum of the 2019 Campaign) is 152 pieces per m^3.

The 55 identified Mode 1 artifacts (4.1%, both from excavation and surveys) are all retouched and cortical flakes made from flint or quartzite (Fig. 8), as well as cores with simple reduction strategy (unipolar and no more than 6 extractions).

There are also several examples of Mode 2 bifacial handaxes and large-format tools (only 18 artifacts, 1.3%), made all of them in flint material (Fig. 8). But, as its explained below, the small dimensions of the flint nodules available in the geologic context would make it difficult to generate bifaces, cleavers and other large utensils. Many contemporary pieces to the large format ones have been classified as Mode

Lithic inventory (2013-2019, survey and excavation) all areas		
	Number of pieces	**Percentage**
Quartzite	67	5%
Flint	1265	95%
TOTAL	1332	100%
	Number of pieces	**Percentage**
Excavation	810	60,8%
Surf. survey	522	39,2%
TOTAL	1332	100%
	Number of pieces	**Percentage**
Mode 1	55	4,1%
Mode 2	18	1,3%
Mode 3	547	41,1%
Mode 4 onwards	134	10,1%
Unidentified	578	43,4%
TOTAL	1332	100%

Lithic inventory (excavation 2019) *Pinar de la Vega*

Layer	m^3	N. of pieces	Flint tools	Flint debris	Flint cores	Quartzite tools	Quartzite debris	Quartzite cores	Total flint	Total quartzite	Density (pieces/ m^3)
1	0,3	31	8	15	3	3	2	0	26	5	103,3
2AI	0,2	25	3	13	6	3	0	0	22	3	125
2AII	0,075	23	6	14	1	0	2	0	21	2	306,6
2BI	0,6	18	4	10	3	0	1	0	17	1	30
2BII	0,1	84	24	34	19	4	3	0	77	7	840
2CI	1,05	76	26	40	8	2	0	0	74	2	72,3
2CII	0,3	12	6	5	1	0	0	0	12	0	40
2CIII	0,15	0	0	0	0	0	0	0	0	0	0
2DI	0,3	92	19	49	15	2	5	2	83	9	306,6
2DII	0,15	36	12	30	4	0	0	0	46	0	240
2DII-2EI	0,15	59	10	33	16	0	0	0	59	0	393,3
2EI upper	0,3	106	29	61	13	1	2	0	103	3	353,3
TOTAL	3,675	562	147	304	89	15	15	2	540	32	X
Average for layer	0,30	46,83	12,25	25,33	7,41	1,25	1,25	0,16	45	2,66	234,2

Lithic inventory Mode 3 pieces (excavation 2019) *Pinar de la Vega*

Method	**Number of pieces**	**Percentage**
Lev. Centripetal and recurrent	47	18
Pref. Levallois flake	10	4
Parallel Levallois	10	4
Laminar	26	10.3
Discoid	7	2.8
Quina	9	3.6
Other/NI	142	56,5
TOTAL	251	

Fig. 7. Above: Count of the lithic material studied in El Provencio from 2013 to 2019, ordered by raw material, excavation/surface survey and attributable technological mode. Middle: Sample of excavation material recovered in the *Pinar de la Vega* during the 2019 campaign, sorted by strata and raw materials. The average density of lithic items (pieces per m^3 of each stratum is also indicated). Below: Reduction method in the 251 Mode 3 pieces recovered in the 2019 excavation of the *Pinar de la Vega* area. S. D. Domínguez-Solera.

1 or Mode 3.

The largest lithic assemblage (547 pieces, 41.1%), hence the most studied thus far at *El Provencio Complex*, pertains to Mode 3 industry (Figs. 8–10). Most of the cores and the tools show a stereotypical Levallois recurrent and centripetal reduction technique but the Levallois parallel method also. Other techniques of reduction characteristic of the Musterian, such as the discoid and the Quina type, are distinguished too.

Taking as a sample the 251 Mode 3 pieces recovered in the upper Mousterian levels in the *Pinar de la Vega* area in 2019 (both excavation and surface survey around the cut) (Fig. 7), 162 (64%) show Levallois reduction method (47 or the 18% centripetal and recurrent, 10 or the

Fig. 8. Examples of lithic tools from *El Provencio Complex*. On the top: Mode 1 quartzite retouched flakes. Middle: Mode 2 bifacial handaxes, cleavers and large-format pieces (flint). Above: Mode 3 levallois flakes, points and blades (flint). S. D. Domínguez-Solera.

4% for getting a preferential Levallois flake, and another 10 pieces show parallel Levallois reduction). The Mousterian discoid knapping was recognized in 7 pieces (2.8%) and the Quina reduction in 9 (3.6%). The Mousterian laminar techniques were observed in 26 cores and tools (10.3%). There are examples of tested pebbles with 1 or 2 decortications, but it is impossible to attribute them into a specific technological mode.

Although the stereotypical characteristics of the levallois technique, the centripetal or the Quina method are clearly executed (*sensu* Boëda, 1993, 1994; Delagnes et al., 2006), in the collections of *El Provencio Complex* they appear in “simplified” or “minimalist” versions, which is explained by the poor dimensions of the primary flint nodules (small and with an irregular cortex) (Figs. 9 and 10).

Only 3 of the 251 Mousterian artifacts are completely decorticated, fact attributed to the small size of the flint nodules and the irregularity of their surfaces. A total decortication of the core is neither possible nor viable. Only 2 tool pieces classified as Mode 3 (0.8%) are non-retouched, other 2 (0.8%) are classifiable as debris (the reflection of clear Mousterian features is difficult to elucidate in debris), 90 pieces (35.8%) are nuclei and 159 (63.3%) useful tools (27 notches, 39 side scrapers, 25 denticulates, 15 end scrapers, 8 drills and 6 burins, elements that are combined always (90%) into multiple tools).

A comparative and statistical study about the sizes of the flint nodules and the lithic artifacts was carried out to prove the hypothesis that the raw flint immediately available in the old braided channels of Záncara river was used to make the Mousterian tools (Figs. 11 and 12). For the empirical testing all the flint raw nodules from the strata excavated in the *Pinar de la Vega* cut during the 2019 campaign have been recovered, measured, tabulated and compared to the sizes of the Mode 3 identified and complete preserved pieces recovered in 2019 excavation campaign. In the 3D scatter plot here reflected the nodules have proportions larger than cores and tools always. The same fact can be seen in the graphic with the maximum sizes and 95% confidence intervals.

Preliminary petrology and traceology analyses have already begun. But in the present contribution it's only possible to offer the results of the statistical work about the relative erosion of the lithic pieces (Fig. 13), calculated stratum by stratum and depending on the technological mode which they belong. It was made to prove the stratigraphic integrity of the archaeological sequence and concretely the upper part of it. The stratigraphic horizon that coincides with the end of the Middle Paleolithic and the beginning of the Upper was excavated at 2019 in the *Pinar de la Vega* area (Layers 1 to 2EI). The youngest layers contain pieces attributable to different technological modes (from 1 to 4) due to the fluvial sedimentary context (all the lithic artifacts appear in a secondary position, Behrensmeyer, 1988), and a further analysis that discriminates them is required. This fact is added to the relative bearing or erosion of each piece variable: the little or nothing rolled

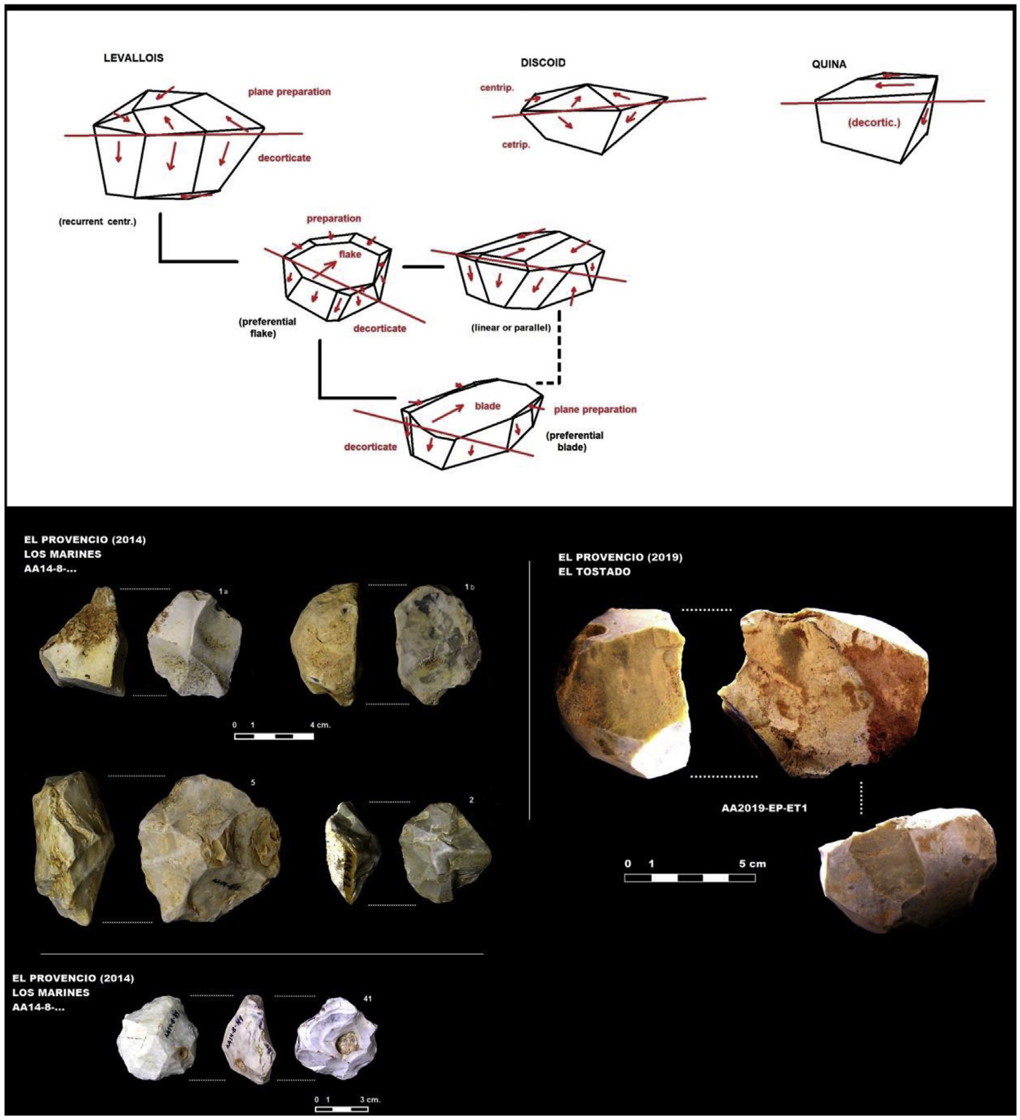

Fig. 9. On the top: Reduction Mode 3 schemes identified in *El Provencio Complex.* Below: examples of discoid (AA14-8-5, 2 and 41) and levallois (AA14-8-1a and 1b and AA2019-EP-ET1) cores from *Los Marines* and *El Tostado* areas. S. D. Domínguez-Solera.

pieces are more contemporary (at least closer in space and in time) at the moment and place of deposition/discard by human agents, in relation to the geological stratum in which they have appeared sedimented; while the pieces more eroded are older, they have accumulated a greater displacement from the moment of their genesis until they end up mixed in the stratum in which they have finally recovered. This analysis indicates that strata 1 to the top of 2EI (chronological horizon over the absolute dating of 41 ka) are formed clearly in the Upper Paleolithic. The less rolled pieces in the excavated strata are those of Mode 4 onwards, the Mousterian examples appearing quite rolled in all strata and the examples of lithic Mode 1 (mostly in quartzite) and Mode 2. The graphic expression of the average of rolling by levels and by technological modes (1, 3 and 4 onwards, eliding 2) corroborates the previous results. Mode 4 always appears as the least shot in the graph, but it is also observed how Mode 3 has fewer elements rolled close to stratum 2EI. It is from Layer 2DI when they begin to appear lithic examples attributable to Mousterian technology with an erosion index of 1 or very low bearing.

The stratigraphic lower horizon of the $\approx$800 ka has not been excavated in detail, so a typological and technological study of the lithic pieces similar to the above exposed is not possible yet.

4.3. Faunal remains

Only 2 eroded and rolled epiphyseal fragments of a middle-size-unidentified-taxon (sizes 3–4) were found during the excavation activities in the *Pinar de la Vega* cut in 2019. The activity of surface survey in *El Pinarico* quarries was more fertile in faunal remains (Fig. 14), but all the pieces were recovered from the abandoned quarry embankments. They come from a context of gravel and sand, firstly mixed by fluvial processes (Behrensmeyer, 1988) in derived position levels with lithic technology inside, so never from *in situ* localities. Finally, the fauna was fragmented and dispersed along the old industrial exploitation by heavy machinery. The complete skeletal inventory of *El Pinarico* consists in 2 dental pieces of a proboscidean (*Elephantidae)*, 3 skull/mandible flakes of the same animal, 1 M and various fragments of horse teeth and 3 fragments of diaphysis and post cranial skeleton classified as large and medium size individuals (sizes 3–6).

The proboscidean dental pieces (AA2019-EP-MR1 and MR2) are the lower thirds molars from the same mature individual. Despite the fragmentation, it has been possible to resemble the dentine fragments of an important molar segment for its attribution to a steppe mammoth (*Mammuthus trogontherii,* see discussion below). 7 dentine plates have been reconstructed, but they are estimated between 17 and 19 plates.

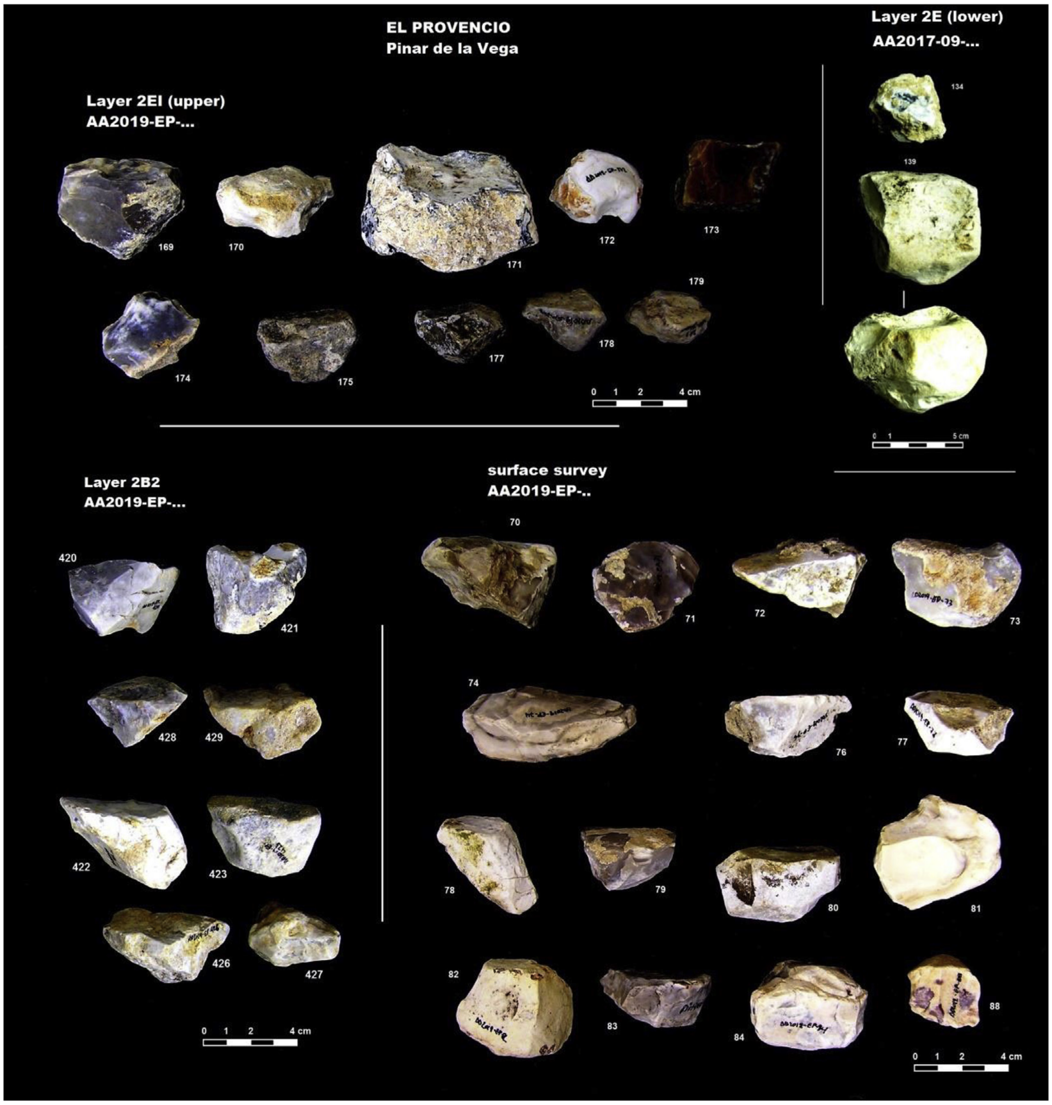

Fig. 10. Examples of Mode 3 cores recovered in *Pinar de la Vega* area (excavations and surface surveys). Levallois:AA2019-EP-70 to 74,77 to 81,84,88,169,170,172,174,175,178 to 179,420 to 423,426,427,429 and AA217-09-139. Quina:AA2017-09-134, AA2019-EP-76,82, 83,171,173 and 428. S. D. Domínguez-Solera.

The Lamellar Frequency (number of plates in a 10 cm section of the molar) is 4–5. The *Equidae* molars (probably belong to the same individual) have been identified through a tooth whose occlusal face was in optimal state of preservation.

5. Discussion

The features observed in surface and stratigraphy artifacts suggest a classification in the three earliest modes of tool-making: Modes 1, 2 and 3. The hominins that produced such artifacts may be chronologically associated to *Homo antecessor* and *Homo heidelbergensis* populations that were already present and chronostratigraphic well defined in *Atapuerca* (Carbonell et al., 2008; Moreno et al., 2012) and to *Homo neanderthalensis*. The sequence of more than 800,000 years implies the alternation of the climatic most extremes situations across the Quaternary period (Silva et al., 2017) since the MIS 21 but not a substantial modification of the flat topography (Cermeño and Uribelarrea, 2019).

On the other hand, the bottom archaeological stratigraphy documented here (up to 836 ± 46 ka) is one of the oldest ones confirmed by absolute dating in Central Iberia. While the 2.6 Ma data of the *Gona* stone tools and butchering marks or the 2.8 Ma fossil bones found in the Afar region remain as the top of the early and undiscussed human existence and as safe evidences of the first *Homo* agency (Semaw et al., 2003; Domínguez-Rodrigo et al., 2005; Villmoare et al., 2015; Domínguez-RodrigoAlcalá, 2016), in the Iberian Peninsula, the top of the human presence is 1 Ma younger than in Africa. It was certified in a 1.5 Ma frontier. The oldest fossil remains of the genus *Homo* were found in *Orce* (Toro-Moyano et al., 2013) and in *Atapuerca* (Carbonell et al., 2008; Bermúdez de Castro et al., 2011) and were dated in 1.4 and 1.2/1.3 Ma respectively. The oldest stone tools known in the Peninsula come from *Orce* (*Barranco León* and *Fuente Nueva-3*) and *Atapuerca* localities again, with 1.5 to 1.4 Ma respectively (Toro-Moyano et al., 2011; Parés et al., 2013, 2018; Blain et al., 2016; Michel et al., 2017). The oldest archaeological sites studied and dated in Catalonia, e.g. *Vallparadís*, contains Mode 1 industry with 1–0.8 Ma (Carbonell and Rodríguez, 2007–2008; García et al., 2013; Duval et al., 2015).

Closer to the study area, the Mode 1 industry of *El Pino* has been dated by ESR methodology over the 0.9 Ma (Domínguez-Solera, 2019a) by the same research team that has worked in *El Provencio Complex*. There are no exist other absolute dates as old as those of *El Pino* or *El Provencio* neither in the Province of Cuenca nor in Castilla-La Mancha region. *El Pino* Mode 1 lithic assemblage shows a very simple and little

			Knapping pieces
	Length	**Width**	**Thickness**
Alpha	0,05	0,5	0,5
Standard deviation	1,42	1,09	0,97
Sample size	198	198	198
Confidence interval	0,19	0,05	0,04
Average	3	2,4	1,43
Maximum	7,9	5,7	4,2
Minimum	0,7	0,5	0,1
			Cores
	Length	**Width**	**Thickness**
Alpha	0,05	0,5	0,5
Standard deviation	1,5	1,12	0,94
Sample size	84	84	84
Confidence interval	0,32	0,08	0,06
Average	3,56	2,73	2,18
Maximum	7,9	5,7	4,2
Minimum	1,1	0,7	0,7
			Tools
	Length	**Width**	**Thickness**
Alpha	0,05	0,5	0,5
Standard deviation	1,21	0,99	0,52
Sample size	109	109	109
Confidence interval	0,2	0,06	0,03
Average	2,64	2,19	0,89
Maximum	7	4,5	2,7
Minimum	0,7	0,5	0,1
			Raw nodules
	Length	**Width**	**Thickness**
Alpha	0,05	0,5	0,5
Standard deviation	1,53	1,05	1,09
Sample size	194	194	194
Confidence interval	0,21	0,05	0,05
Average	4,47	2,94	2,14
Maximum	9	7	12
Minimum	2	1	1

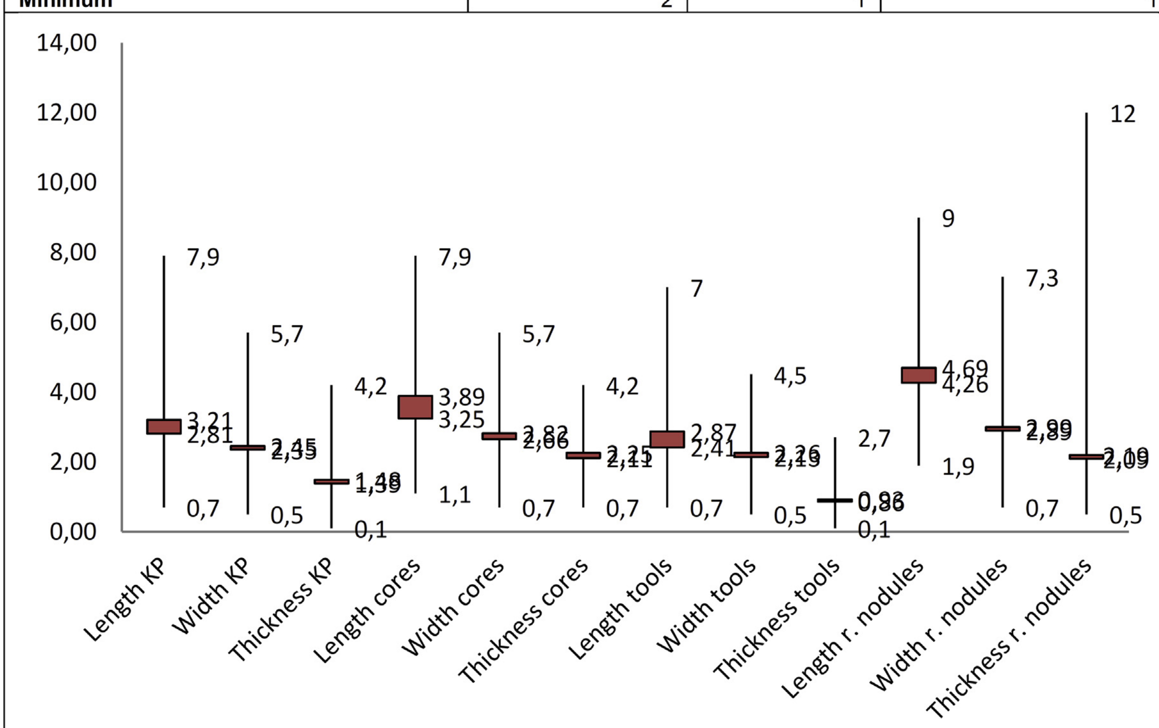

Fig. 11. Data about averages, standard deviations and 95% confidence intervals of the measurements of flint raw nodules and flint knapping materials obtained from Layer 2 during the 2019 excavation campaign in the *Pinar de la Vega* area. All measures are in cm. S. D. Domínguez-Solera.

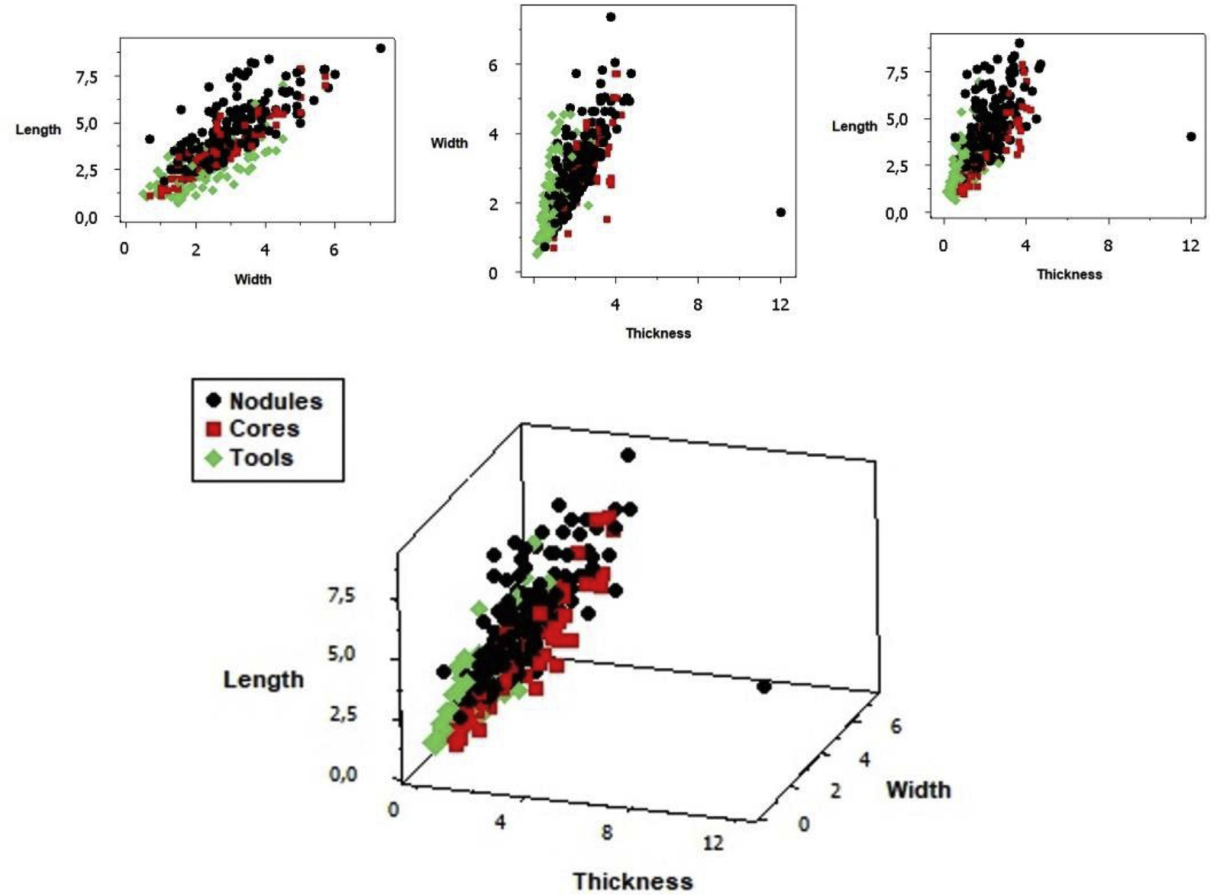

Fig. 12. 2D and 3D 2d and 3d scatter plot on the measurements of lithic artifacts (cores and tools) compared to the dimensions of the raw flint nodules from level 2 and the 2019 excavation campaign in the *Pinar de la Vega*. All measures are in cm. S. D. Domínguez-Solera.

expeditious knapping methods of the quartzite pebbles (cortical retouched and unretouched flakes generation and unipolar reduction), as well as the examples of Mode 1 of *El Provencio Complex* and the aforementioned Oldowan industry 1 million years older analyzed in Africa (Semaw et al., 2003). Mode 1 industry of *El Pino* is better preserved than in *El Provencio* and there have been possible in it a traceological analysis, proving that the choppers were never used as tools and that each flake was used to work different materials before being discarded (Domínguez-Solera and Martín, 2015). The Mode 1 industry from Orce, *Vallparadís* or *Atapuerca* oldest strata (de Lombera-Hermida, 2015; Titton et al., 2020) seems to be more complex than the lithic assemblage recovered in *El Provencio*, *El Pino* or other localities studied in Cuenca (Domínguez-Solera, 2019a) or to be made through other patterns as the concurrence of anvil techniques (García et al., 2013). The notorious variability of the Iberian Mode 1 record could be explained by successive migratory episodes or/and by independent evolution during the Early Pleistocene and would suggest the development of regional technological traditions (Martínez and García, 2014). The oldest industry of *El Provencio* and the rest of the Province of Cuenca brings a new example of variability to the debate.

The abundance of artifacts detected in *El Provencio Complex* may imply a continuous and intense human occupation between the Lower and Middle Paleolithic in this central region of the Iberian Peninsula. This is a different point of view from that traditionally contributed by certain authors, who defend that the population size in the Iberian Lower Paleolithic was marginal or intermittent in correlation to other European zones (Roebroeks, 2001) and the abundance of Paleolithic artifacts and populations during the Middle Pleistocene is concentrated near the coast (Straus et al., 2000; Finlayson, 2008; De la Torre et al., 2013: S325; De la Torre, 2017). There are other closer deposits where the continuity of human settlement has been proved: *Puente Pino* Site (Alcolea de Tajo, Toledo) shows an intense and recurrent frequent use of this point of the Tagus terraces during the Acheulian (Rodríguez-Tembleque et al., 2010). But the example of the Jarama and Manzanares valleys (Madrid) clearly shows mainly by giving strong evidences that the human occupation of the center of the Iberian Peninsula has occurred without interruptions for 800 ka (Panera et al., 2002; Panera et al., 2010; Panera et al., 2019; Rubio-Jara and Panera, 2019). Although it was thought that the occupation density of the center of the Iberian Peninsula decreased during the cold stages, the ETB-HO2 site, placed in the Manzanares valley, exemplifies (through the fauna consumed therein) the human presence under different climatic conditions (Yravedra et al., 2019). In the same way, the recent analysis of the open-air sites, rock shelters and caves in the Province of Guadalajara confirms that Central Iberia was effectively, non-marginally and continuously occupied during the Middle Palaeolithic and the transition to the Upper Palaeolithic (Alcaraz-Castaño et al., 2017a, 2017b).

Perhaps, due to the limitations of the too small flint nodules in *El Provencio Complex*, very few bifaces or big format Mode 2 tools have been documented. It doesn't means an interruption or a decrease in the intensity of human occupations. The continuity of lithic repertoire has been corroborated in all strata of *El Provencio Complex*, geologically described with a strictly gradual and uniform formation by an uninterrupted river from the base of the Lower Pleistocene to the top in the Upper (Pérez-González, 1982; Cermeño and Uribelarrea, 2019).

Other immediate archaeological open-air areas in the Province of Cuenca studied within this research program and also characterized by absolute dates of ~250 ka, as the Mayor River terraces in Huete -richer

Layer	N. of pieces	Mode 1	Average EI	Mode 2	Average EI	Mode 3	Average EI	M 4 onwards	Average EI	Unidentified	Average EI
1	31	3	2,6	0	0	9	2,5	1	2	18	1,9
2AI	25	3	3,3	0	0	2	4	6	2	14	2,7
2AII	23	0	0	0	0	1	4	5	1,4	17	2,8
2BI	18	0	0	0	0	5	2,8	1	1	12	2,5
2BII	84	3	3,6	0	0	25	2,9	16	1,8	40	2,3
2CI	76	2	2,5	0	0	25	2,8	5	1,6	44	2,5
2CII	12	0	0	0	0	3	3	1	1	7	2,7
2CIII	0	0	0	0	0	0	0	0	0	0	0
2DI	92	9	3	0	0	14	2,6	13	2,1	56	2,5
2DII	36	0	0	0	0	11	2	1	1	34	2,3
2DII-2EI	59	0	0	0	0	18	2,9	4	1,5	30	2,3
2EI upper	106	1	3	1	4	30	2,7	6	1	68	2,1
TOTAL	562	21		1		143		59		340	

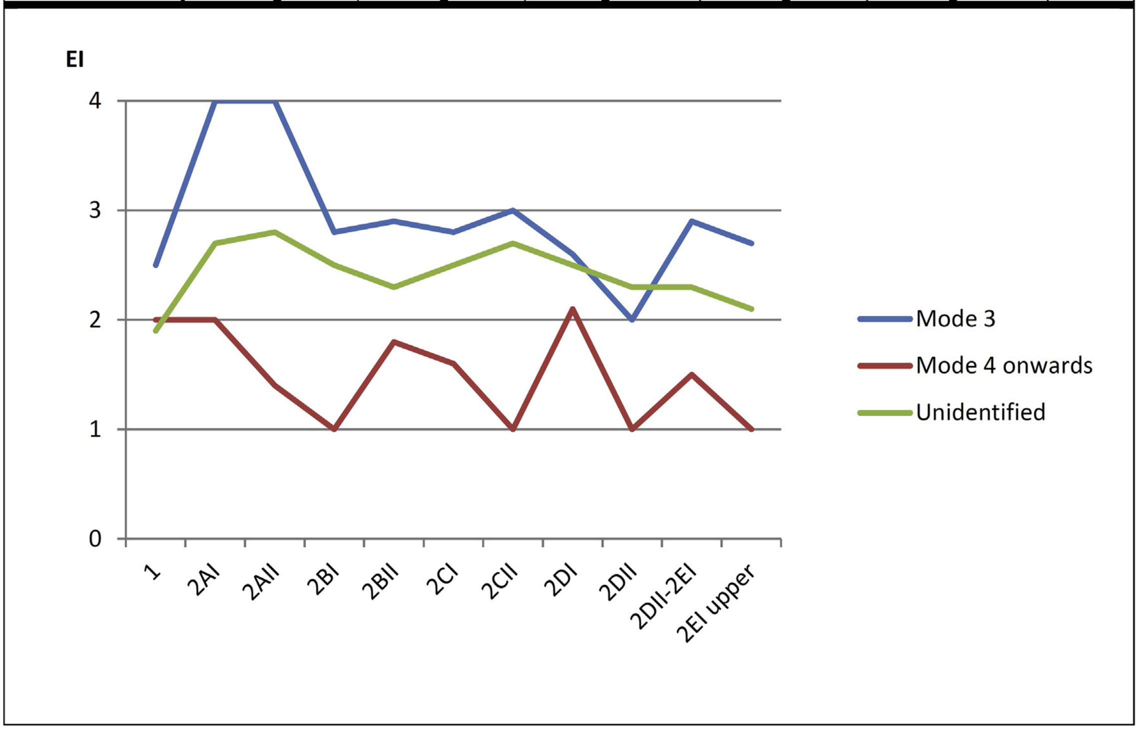

Fig. 13. Lithic excavation materials recovered in 2019 in the *Pinar de la Vega* area. Evolution of the relative erosion of the pieces ordered by levels and according to technological modes. Averages of the "Eroded Index" (EI) over a minimum index of 1 (not rolled/eroded) and a maximum of 4. S. D. Domínguez-Solera.

in raw materials of greater proportions that permit the toolmaking of Mode 2 stereotypical pieces (Domínguez-Solera, 2019c)- or the lower areas of the Guadiana river basin in Ciudad Real, Toledo and Albacete (Rodríguez de Tembleque, 2005; Rubio et al., 2005) are more suitable than *El Provencio Complex* for dealing with the latest debates on the Acheulian in the Iberian Peninsula, the consideration that it reached western Europe through Gibraltar, its possible subsequent overlap and mutual influence with the Mousterian industries and the related discussion about human migrations (Santonja and Pérez-González, 2010; Santonja et al., 2016).

In the same way, a preferential usage of the poor-quality and small-size but abundant local raw materials to make the three modes of industry and a continuity of the same operational chains in Mode 3 expanded across 150 ka in *El Provencio Complex* is also argued. During all the Middle Paleolithic, the use of Mousterian levallois techniques (recurrent centripetal, preferential or parallel centripetal), discoid and Quina would allow further efficient exploitation of the cores, as all Mode 3 examples documented in this work. The almost universal presence of cortex in Mousterian knapping products is also consequence of the availability of quite marginal nodules in terms of size and cortical regularity.

Furthermore, it has been argued that the discoid method into the Mousterian was an adaptive way against the scarcity of raw material and a solution to manage efficiently little and low quality flint cores, although discoid reduction can also be understood from the perspective of maintaining a concrete technique through mechanisms of cultural transmission due to the mobility of human groups over millennia (Thiébaut, 2013). Anyway, the employment of the discoid reduction

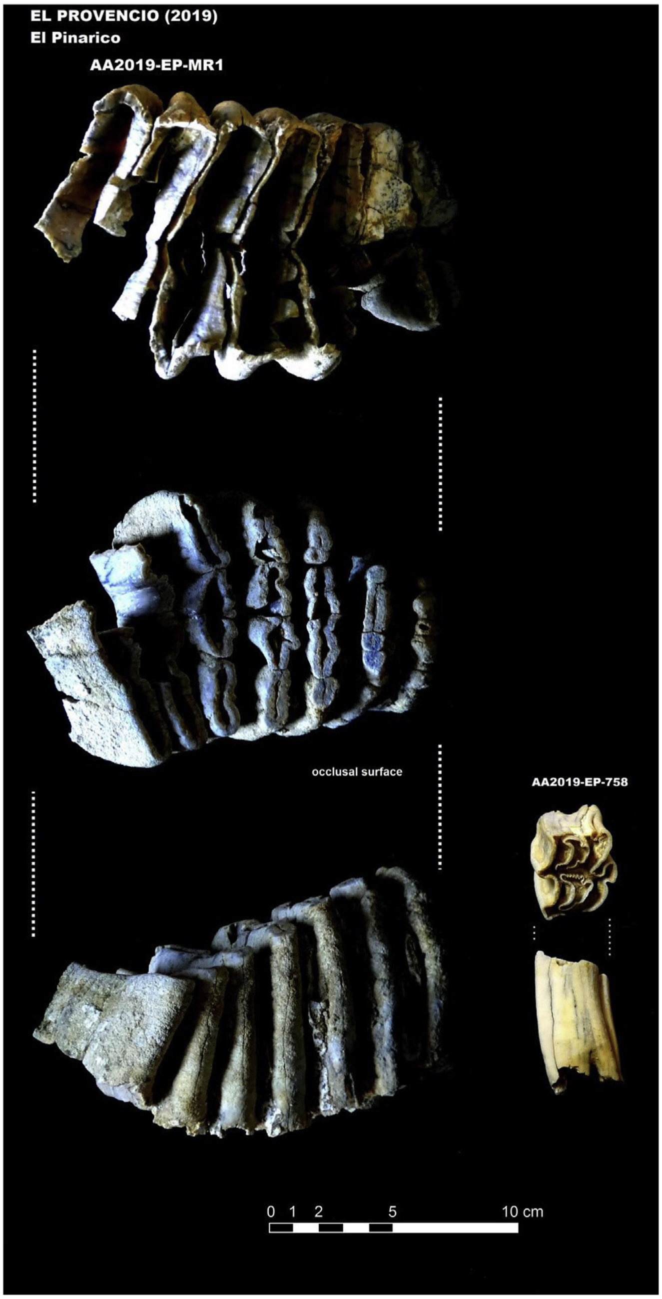

Fig. 14. Most outstanding faunal remains from *El Provencio Complex* recovered in 2019 in *El Pinarico*. AA2019-EP-MR1 = *Mammuthus trogontherii* lower molar. AA2019-EP-758 = *Equus sp*. molar. S.D. Domínguez-Solera.

method, as well as the most stereotipical levallois knapping and the Quina method (Boëda, 1993, 1994; Cabrera Valdés et al., 2000; Carrión and Baena, 2003; Delagnes et al., 2006; Rosendahl, 2006) carry efficiency in the use of scarce nodules or of poor characteristics always, as documented in outdoor contexts relatively close to La Mancha, such as Alicante (Molina, 2016), Madrid (Torres and Baena, 2015), Murcia and Albacete (López-Campuzano, 1993–1994).

Other archaeological scenarios in the center of the Iberian Peninsula serve to explain that the recurrent frequenting of the same space by Neanderthals and other humankinds does not respond to a single cause, but to different circumstances, such as the biotic resources, the favorable topography of the ground and the availability of lithic raw materials (Molina, 2016). The Neanderthals of the center of the Peninsula (e.g. Madrid: Torres and Baena, 2015; Baena et al., 2008) adapted their foraging strategies effectively to various situations of resource access, climate changes and geomorphological scenes. The revised lithic and faunal record of the *Cueva del Niño* site (Albacete) (García et al., 2014), nearest the research area of *El Provencio Complex*, shows that the Neanderthals who inhabited there in the last part of the Mousterian and the beginning of the Aurignacian were very mobile (carriying of resources to the cave from distant zones). *El Provencio* seems a different part of the same scenario: would be one of these resource catchment areas, where exogenous elements, at least lithic raw materials, would not be brought, taking advantage of the activities strictly on the flint available on the banks of the Záncara River.

The youngest sub-level, Layer 2E, dated by OSL gave an age of 41 ka (MIS 3). But there are more levels with unrolled Mode 3 industry above (Layers 2A, 2B, 2C and 2D). Although the limit of Mousterian or Neanderthal history in South Europe was established 30–24 ka BP (Garralda, 2005; Finlayson et al., 2008) not only for deposits on the coasts of Murcia and Andalusia (Zilhão, 2006), but also for locations in the interior (Jordá, 2010) it has been proven that these dates depend on significant age underestimation ($\approx$10 ka) due to contamination of dating samples (especially in certain uncontrolled radiocarbon techniques, Wood et al., 2013; Higham et al., 2014), undiagnostic lithic records or stratigraphic problems. This chronology is not currently considered as the end of the Mousterian. A recent review of the dating of the *Cueva de los Casares* (Riba de Saelices, Guadalajara) points towards the 42,000 calendar years ago as the most plausible date for the abandonment of interior Iberia by Neandertals (Alcaraz-Castaño et al., 2017). Among other localities, the dating results in the *Abrigo del Molino* place the latest Neanderthal occupation of the Central Peninsula at around 45 to 41 ka (Kehl et al., 2018). Climate deterioration is argued at least and a later survival of them in Iberia in the southern coasts not far beyond 37 ka. Although the hypothesis that the record in *El Provencio* could point towards a little later maintenance of the Mousterian in relation to areas in the northernmost part of the interior of Iberia was kept open during the first campaigns, due to its position to the south of the Province of Cuenca and its geographical connection with the Albacete and Murcia coast (Domínguez-Solera, 2019b; Domínguez-Solera et al., 2019), the results of the 2019 excavation campaign in *Pinar de la Vega* here exposed are consolidated in the idea of the obtained age of 41 ka (the presence of Mode 4 pieces starts directly over the Layer 2E) would be one more example within the rereading on the final chapter of the Neanderthal timing in Central Peninsula.

Situations of chronological overlap between modes 3 and 4 and mutual influence possibilities are defended (Baena and Carrión, 2006; Carrión et al., 2011–2012). Although the derivate-riverine and open-air archaeological context of *El Provencio* it can be located in this chronological border between species and technologies and provides new data, it has no resolution enough to extend the debate of the causes and the ways of cultural change and population extinction better than the examples in caves studied in the periphery of Cuenca (García et al., 2014; Alcaraz-Castaño et al., 2017a, 2017b).

The *Elephantidae* remains documented before this research program were originally identified as southern mammoth or *Mammuthus meridionalis* (Pérez-González et al., 1990), but this taxon has a chronological range between 2.5 and 1.5 Ma (Shoshani, 1998; Lister, 2004; Lister et al., 2005). They appeared in *El Pinarico* quarry, whose deepest stratum was dated in 836 ± 46 ka. Thus the new recovered proboscidean molars have been identified as *Mammuthus trogontherii* or steppe mammoth. The living range of this animal is 600–300 ka (Shoshani, 1998; Lister, 2004; Lister et al., 2005), taxonomic attribution that best matches the chronology argued here. Both the old and new molar pieces are not rolled or eroded and they doesn't come from deeper layers.

According to the morphology of the tooth (number of plates, lamellar frequency, dentine design and thickness or estimated maximum height and length) (Virág and Gasparik, 2012; Lister and Sher, 2001), the proboscidean remains recovered in *El Provencio Complex* in 2019 (AA2019-EP-MR1 and MR2) they can belong to an individual with archaic characteristics and close to the transition from *Mammuthus meridionalis* to *Mammuthus trogontherii* carried out in Eurasia between 1 and 0.6 Ma (Lister and Stuart, 2010): it has around 18 plates and a Lamellar Frequency of 4–5 plates in 10 cm of crown. The possibility of belonging to a more recent woolly mammoth or *Mammuthus primigenius* (150 ka) is discarded because they show a greater number of plates in their teeth (Virág and Gasparik, 2012; Lister and Sher, 2001). It is also ruled out that the specimen was a *Mammuthus intermedius* (Foronova, 2014), a transitional taxon between the steppe mammoth and the woolly mammoth, due to the calculated number of plates. Nor is it a *Palaeoloxodon antiquus,* because the molar portion has not lozenge-shaped enamel ridges or the more conspicuous midline sinuses on the oclussal surface of the molars that characterize the Loxodonta genus (Sanders et al., 2010).

The tooth AA2019-EP-758 has been identified as an equine (*Equus sp*.), not as an old hipparionine due to the presence of a loop (protoloph) rather than an exempt protocone in the lingual side (MacFadden, 1992: 109). Since their original stratum is not known, there is a wide range of possibilities from Lower to Upper Pleistocene for the remains of equine: *Equus altidens, sussenbornensis, hydruntinus, ferus, caballus …* (Garrido et al., 2010; Martínez-Navarro et al., 2018; Boulbes and van Asperen, 2019). It is suggested that the horse remains are also from an old taxon due to the presence of plications in the fossette of the occlusal surface, but more complete teeth are needed to be able to specify.

Both identified species (*Mammuthus trogontherii* and *Equus sp.*) allude to a flat and relatively open environment but it has not been possible to know the exact moment when the individuals who represent them lived. Due to the non-identification of cut or tooth marks, the butchering interaction over *Proboscididea* cannot be treated either, an activity that has been proved in the Madrid area: EDAR Culebro 1 (Yravedra et al., 2014) or Aridos 2 (Yravedra et al., 2010).

6. Conclusions

The only two dates so far obtained (41 $\pm$ 2.2 and 836 $\pm$ 46 ka) have become essential for the correct chronological characterization of the lithic and faunal record. The uppermost/youngest one has been employed to determine the final frontier of the Mousterian cultures in the context and the beginning of the Mode 4 lithic industries. The ESR age of $\approx$800 ka obtained for the upper extreme of the Layer 3 gives a *terminum ante quem* for the beginning of Mode 1 in *El Provencio Complex*.

Over the last 800 ka, human hunter and gatherer bands of different species (*Homo antecessor, heidelbergensis, neanderthalensis* and *sapiens*) came recurrently on an uninterrupted way (independently of the different stages of climate change until MIS 21), to the old Záncara margins attracted by the different animal and vegetable resources that there were concentrated here. Despite the mediocrity of the flint nodules available in the Záncara ancient environment, these groups would use local raw materials (flint and quartzite), reducing, processing and elaborating tools as well as discarding them *in situ*. The sedimentary complex has also demonstrated its potentiality to provide data on the fauna that summoned the river channel for almost a million-year-range.

Even though much work is yet to be done, the geochronological data obtained so far corroborates the archaeological findings. Future work is not only envisioned towards new excavation campaigns, Zooarchaeology, Palaeobotany or Paleoclimatology (the few faunal remains that were found until now are all surface and very eroded materials) but also to obtain a better chronostratigraphical control of *El Provencio Complex*. The potential of the research possibilities in *El Provencio Complex* shows promise and could provide valuable information related to the last 800 ka in the central region of the Iberian Peninsula.

Declaration of competing interest

All authors declare that the work presented here is the result of our investigations, that we have the respective administrative permits and that all the persons involved in the project are cited. In the same way we declare that there are no conflicts of interest with other ongoing projects or with other publications.

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