SUPPLEMENTARY INFORMATION

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Supplementary Information A. Cave and stratigraphic information

The general elevation around the Fuyan Cave in Daoxian ranges between 200 and 600 m. The Fuyan Cave lies in the southwest part of a series of interconnected pipeline karstic systems within a 150 m high hill. The hill itself, composed of the Devonian and Carboniferous limestone, is situated in a small karst valley that lies at 350 m above sea level. The well-developed fold and proximate grade fault, as well as vein intrusion and schistosity, provide the many different order and form of passages in the adjoining rock, and as a result, it increases the water permeability and forms the base of the karst system. The cave was formed by the fracture water dissolution along the vein and joint fracture with vertical vadose fashion in the early stage, and then transfer to horizontal vadose which becomes the dominant resorption pattern of the karst development resulting into the large pipeline karstic cave system. The main entrance of the cave is about 20 m wide and 5 m high, and the main chamber narrows slightly from the south to the north becoming a phreatic passage of average 5-10 m wide and 10-20 m high, runs over 100 m in length and covers an area of over 3000 m^2. The sedimentary sequence of the main chamber comprises clastic sediments with intercalating small speleothem fragments and a top calcitic floor in which the thickness of the calcite-cemented deposits/flowstone range from 20 to a few centimeters. The main components below the continuous cap calcitic/flowstone floor are mainly massive cohesive clay changing to alternating bedded gravels. The cave was excavated for the first time in 1984, and a rich and diverse mammalian fossil assemblage was discovered[64]. From 2011 to 2013 systematic excavations yielded forty-seven hominin teeth and an abundant mammalian assemblage. To present, no stone tools have been found[31].

Supplementary Information B. Taphonomy

Biological, chemical and mechanical processes can act on a fossil assemblage after burial and generate alterations ranging from slight to highly significant. The study of post-depositional damage provides fundamental data for knowing the history of a site and recreating the environmental conditions during the sedimentary formation processes[65]. Most of these alterations can significantly mask the signatures left by other agents or modify the anatomical structure of some skeletal elements and, therefore, hinder the palaeontologic studies. In our case, most of the teeth show a deformation associated to polish and rounding affecting mainly roots. The alteration is so high in some cases that some teeth only preserve their crowns. Some processes may explain this phenomenon, which seems to be related to a differential preservation according to material density and its composition.

In this line, leaching is a chemical process involving both the loss and gain of soluble matter, causing corrosion on the fossil surfaces according to their density and composition[66]. This mechanism influences the preservation of skeletal elements, leading even to make them disappear in the most extreme cases. Winnowing effect of stream action could enhance calcium dissolution on bone in a humid karstic environment. The sedimentary properties are basic in such preservation, since they can accentuate the dissolution of calcium. For example, the bacterial action can be inhibited in basic sediments, and the properties of acid sediments can dissolve the mineral fraction of the skeletons; circumstance directly related to the degree

of acidity and the characteristics of water percolation. Chaplin[67] noted that decomposition by dissolution is directly linked to the porosity of the bone elements, thus the density is an important determinant in the development of these fossil-diagenetic processes. In this line, Gordon and Buikstra[68] emphasize the influence of pH on the preservation of fossils. They suggest an inverse relationship between the degree of preservation and pH level –that is, if the pH decreases, the process of alteration (in this case destructive) increases. However, this statement must be qualified, since a slightly basic pH acting over a long period of time can also be highly aggressive on organic tissues[69].

This type of processes may have altered significantly the fossil assemblage from Daoxian, affecting mainly those elements with high organic matter content. So, bones could be poorly preserved (or not preserved), and teeth could suffer a differential preservation. According to Hillson[70], there is a significant difference in the composition of enamel and dentine; while the first one contains between 96 and 97% of inorganic matter, dentine only shows between 74.5 and 75.4%. Thus, fossil-diagenetic processes could be the reason for the total or partial dissolution of bones and teeth roots, which would not affect (or would affect in low degree) crowns.

Nevertheless, we do not rule out other possible scenarios to explain this damage at the site and only a thorough taphonomic study will provide the necessary data to uncover the responsible agent/process for this damage. Some authors have pointed out that the preferential/exclusive preservation of dental crowns could be a common taphonomic event in Southeast Asian caves attributed to the activities of porcupines [2,71-73]. Porcupines would collect the dry bones to chew in order to wear down their incisors[72] or to increase the intake of calcium or phosphorus[72]. At Lang Trang site from Vietnam, more than 10,000 tooth crowns were found and almost all of them exhibit gnawing damage[73].

Supplementary Information C. Faunal remains

The percentage of extinct species in a fauna assemblage can be used as a useful indicator of the geological age of a site, but it also depends on the correct taxonomic identification of the fossils and whether they are the dominant or relict species in the collection. The mammal fossil assemblage found at Daoxian is composed of 38 species, including 5 extinct species (*Ailuropoda baconi*, *Crocuta ultima*, *Stegodon orientalis*, *Megatapirus augustus* and *Sus* sp.), which account for a 19% of the large mammal sample (see Extended Data Table 1). Although most of the extinct species of large mammals from Daoxian also had a few Holocene records in South China[74], the whole composition is typical of the Late Pleistocene in this region. The Daoxian collection has more extinct species than the assemblage from Liujiang Man Site which only bears 3 extinct species (*Stegodon orientalis*, *Megatapirus augustus* and *Rhinoceros sinensis*) that account for a 23% of the large mammals. The high percentage in this case could be attributed to an insufficient study and deficient identification of the remains. The Daoxian sample has the same number of extinct large mammals than the Zhiren Cave in Guangxi (it accounts for a 25% of the assemblage), and less than at Huanglong Cave in Hubei (9 extinct species which account for a 25% of the large mammals). Therefore, the analysis of the fauna is consistent with an age from the early to middle part of Late

Pleistocene, i.e. between the ages of Liujiang (ca. 70 kyr[75,76]), and the Zhiren Cave (ca. 110 kyr[33]). The direct radiocarbon dating of one of the faunal remains (>43 kyr cal BP; see Supplementary Information E) supports its attribution to the early-to-middle-Late Pleistocene rather than to the end of the Pleistocene.

Supplementary Information D. Radiocarbon Dating

According to the results of analysis of the deposition process, only bone samples, observed *in situ* during the excavation, were collected for radiocarbon dating. We selected four samples from layer 2 of Region IIB, three faunal bones (BA140122 is a tooth and BA140120 and BA140121 are fragments of tibiae) and a human tooth (labeled as BA14023). All samples were observed under the microscope, to evaluate their preservation condition. The four samples then were selected for further treatment, as follows: surfaces of the selected bone samples were cleaned, including by ultra-sonic in distilled water, and the bones were broken into small pieces. AAA procedures were followed to treat the samples and extract the bone collagen[77]. The acid solution we used is 0.5 N HCl, and the alkali solution is 1 N NaOH. Next, we hydrolyze the collagen using a pH 2-3 HCl solution, keeping it at 90℃ for 24 hours. After centrifugation, the solution is lyophilized, which allows us to obtain gelatin. After the process, only one sample produced the enough gelatin in good quality. We analyze the carbon and nitrogen content of the gelatin using Elemental Analyzer – ELEMENTAR, vario EL, made in Germany. The C/N value of the gelatin sample is 2.92 which fell within the range of 2.9 – 3.6[78]. The sample was weighed according to the carbon content and sealed with Copper oxide and Silver in quartz tube under a vacuum system. The combustion temperature was 850℃. The CO_2 from the tubes was purified and transferred into the gas container separately. The reduction from CO_2 to graphite was performed with H_2/Fe in our graphitization lines. The Fe catalyst has to be cleaned and activated under 450℃ with O_2 and H_2 separately before reduction[79]. The graphite was formed at 540℃ with Magnesium perchlorate used to trap the water[80]. AMS radiocarbon measurements were performed at the AMS Center, School of Physics, Peking University (BA). The AMS system is based on a National Electrostatics Corp. (NEC) 1.5SDH-1 0.5MV pelletron with 40-sample MC-SNICS ion source. The accuracy of this system is better than 0.4% and the machine background is lower than 0.03pMC. Only one of the faunal bones provided results. The remaining three failed to yield any separable collagen for dating. Collagen or tooth proteins can be degraded or removed in nature by many processes, these include (but are not limited to) bleaching by the sun, leaching by water, partial heating, burning or cooking, microbial activities, replacement by other mineral species (typically SiO2 or CaCO3) or natural degradation due to extreme age (typically bones in excess of 20,000 years show depleted collagen contents unless preserved under optimal burial conditions). The only date obtained is 39150±270 BP (uncalibrated) from sample BA14021. The calibrated age is 43154-42731 (Cal BP, 68.2%) and 43397-42553 (Cal BP, 95.4%) (OxCal v4.2.4[81]; IntCal13 atmospheric curve[82]). This is close to the organic material background of AMS radiocarbon dating in Peking University (PKU) lab. Thus, 39150±270 BP is beyond the limits of the radiocarbon technique at the lab. The real age of the sample could be older than this but we cannot precise it because 40 ka is the organic material background of AMS radiocarbon dating in PKU and thus, the limit of age detection for

organic samples in this lab. Thus, biostratigraphy, U-Th and paleomagnetism were applied in order to solve the dating issue (see Supplementary Information C, E and F).

Supplementary Information E. U-Th dating

Speleothem fragments and stalagmite sampling methods

Nine speleothem fragments were sampled from Layer 3 to Layer 2 at Region I and II throughout the excavation, after they had been photographed and their location had been confirmed with the sedimentary layers. Layer 1, which is comprised of flowstone/calcite-cemented deposits, is continuous across the floor of the cave so it prevents younger material from being introduced into the underlying deposits. There was a small stalagmite grown on the top of the carbonate cemented deposit (Layer 1) at region IID. Two sub-samples were drilled from the stalagmite for dating purposes. We did not find qualified samples for U-series within dating Layer 1 because the calcite was cemented with the clay and no pure calcite was found during the excavation. Fortunately, the stalagmite grown on Layer 1 is reliable to constrain the age of this layer and hence, the minimal age of the fossils in Layer 2.

Speleothem fragments were prepared by breaking the sample into pieces several millimeters in diameter with a stainless steel chisel. These fragments were examined under a microscope and pieces showing signs of detritus were discarded. The remaining pieces were ultrasonically cleaned in Milli-Q clean water twice and then rinsed individually in clean water and dried. The fine pieces were discarded.

U-Th dating of the speleothem and the stalagmite

The chemical U and Th separation procedure is similar to that described by Edwards et al. (1987)[83]. Samples of 200-300 milligrams of speleothem fragments and carbonate powder from the stalagmite were dissolved by first adding several drops of clean water, then slowly adding 14N HNO_3 drop by drop. The sample was then spiked and dried, fumed with 2-3 drops concentrated $HCLO_4$. It was then dissolved in 2N HCl and ~ 2 mg of Fe in chloride solution was added. The U and Th were then co-precipitated with Fe by the addition of ammonium hydroxide. The mixture was centrifuged and the solution discarded. The residue was then rinsed with clean water and centrifuged twice, and then dissolved in concentrated HNO_3, dried and re-dissolved in 0.5 ml of 7 HNO3. This solution was loaded on an anion exchange column (Dowex AG 1×8 resin) with a volume of 0.5 ml. Fe was eluted using 7N HNO_3, the Th was then eluted with 6N HCl and the U fraction with Milli-Q clean water. The U and Th fractions were then dried, dissolved with 14N HNO3, fumed with 1 drop of $HClO_4$, dried, and dissolved in 14N HNO_3, dried, and dissolved in 0.1N HNO3 with HF.

U and Th isotopic measurements were made on the Thermo-Scientific Neptune MC-ICP-MS. This instrument has been described by Wieser and Schwieters[84]. All measurements were made using an Aridus II desolvating nebulizer. Argon flow rates were set at ~15 l/min for plasma gas, 0.8 to 1.0 l/min for auxiliary gas and 0.7 to 0.9 l/min for sample gas. An ESI-50 nebulizer with an uptake rate of 40–70 µl/min was used, with a sweep Ar flow of 5–6 l/min and N_2 between 0.05–0.10 l/min. Temperatures of the spray chamber and desolvator were set

at 110 ºC and 160 ºC, respectively.

We use the data acquisition protocol of peak-jumping on the SEM, similar to those described in Cheng et al. (2000)[85], Shen et al. (2002)[86] and Cheng et al. (2013)[9]. We used MasCom multipliers with Cu-Be dynodes. To reduce the uncertainty in dead time correction, we set the largest beam intensity at no more than 300,000 cps for sample measurements (with the exception of the ^{232}Th beam).

For U, we measured ^{233}U, ^{234}U, ^{235}U, and ^{236}U sequentially in peak-jumping mode with the RPQ on, and used the ^{236}U/^{233}U ratio to correct for instrumental mass fractionation. We run the Th fraction from a sample immediately before or after the U fraction for that same sample. We then use the ^{236}U/^{233}U ratio from the U run to correct the previous or subsequent Th run for instrumental fractionation. Th was also run in peak-jumping mode, with ^{229}Th, ^{230}Th, and ^{232}Th measured sequentially.

Here we use the bulk earth value with large error of 50%, i.e., $4.4\pm2.2\times10^{-6}$, for the initial thorium correction because the ^{230}Th/^{232}Th atomic ratios of most samples are greater than 50×10^{-6} and the influence of initial ^{230}Th from the detrital component is negligible.

The stalagmite was formed after the fossils were buried and it provides the minimum age constraint on the fossils below it. The widely distributed ages of the speleothem fragments in layer 2, i.e., from ~556 kyr BP to 120.7 kyr BP, herald that the maximum age of the fossils could be younger than 120.7 kyr BP (but older than 80 kyr BP) if the fossils were parautochthonously buried after the youngest fragment deposited, or even older if the fossils were capped by these speleothem fragments and then allochthonously redeposited. However, considering the fauna assemblage excavated and the abundant distribution of the fauna with the human teeth at the site, which is hard to be explained by re-deposition, we conservatively assume that fossils are not older than ~120 kyr BP. Therefore, the minimum buried age of these fossils can be anchored at ~80 kyr BP and the maximum inferred age is ~120 kyr BP.

Supplementary Information F. Paleo- and rock-magnetism analysis

Methods

Two oriented hand samples were taken from the Daoxian Cave. Sample D1 was taken from the flowstone (Layer 1) that caps the fossil-bearing sediments (Layer 2), while the D2 sample was a speleothem taken from unit layer 2 (see Extended Data Figure 4). The samples were of sufficient size for several (10cc) specimens. Three specimens were demagnetized using alternating field (AF), Thermal (Th) and a hybrid of AF-Th demagnetization methods. AF steps were: 0, 5, 7.5, 10, 15, 20, 25, 30, 40, 45, 50, 60, 70, 80 and 100 mT. Hybrid steps were: 20ºC, 150ºC followed by 5, 7.5, 10, 15, 20, 25, 30, 40, 45, 50, 60, 70, 80 and 100 mT. Finally, the thermal steps were: 20, 150, 200, 250, 300, 400, 450, 500, 530, 550, 590 and 640ºC. The remaining natural remanent magnetization (NRM) was measured after each AF or Th demagnetization step with a SRM 755 4K DC-SQUID magnetometer with a built-in AF demagnetizer (2G Enterprises). The instrument sensitivity is $3\text{x}10^{-12}$ Am^2, with a low-field

(<5 nT) environment at the sample loading position. Thermal demagnetization of the NRM was performed with an ASC thermal demagnetizer (residual field < 20 nT). For rockmagnetic purposes two AF demagnetized specimens (D1A and D2D) were used to obtain an Isothermal Remanent Magnetization (IRM) acquisition curve up to 1T using a 2G pulse magnetizer (2G Enterprises). After each step the NRM was measured using the SRM magnetometer. Finally, specimen D1A had its progressive stepwise stepwise Th demagnetization of an IRM up to 1 T measured (using the above mentioned equipment).

Results

Intensities of the samples ranged from $4.5x10^{-6}$ to $1.7x10^{-5}$ A/m well above the noise level of magnetometer used. Demagnetization diagrams were visually inspected using the Virtual Paleomagnetic Directions (VPD) software (e.g., Ramón and Pueyo[87)] and Characteristic Remanent Magnetization (ChRM) directions were calculated using least-squares principal component analysis[88] on at least 4 steps. Two quality labels were designated, both suitable for interpretation. Quality 1 samples had their vector ends close to the origin and thus were not anchored to it (see Extended Data Figure 4). Quality 2 samples had their vector endpoint deviating from origin and for this reason were anchored towards it. All ChRM directions had maximum angular deviation (MAD) smaller than 15 degrees.

AF demagnetization diagrams of the Daoxian samples show a very stable remanent magnetization, and some intensity of the NRM is still present after 100 mT. IRM acquisition curves confirms the presence of one or possibly two high coercivity components (see fig x of SI). The high coercivity components are possibly goethite and/ or hematite while the low coercivity component is magnetite. Thermal IRM confirms the presence of hematite and the presence goethite remains possible.

Discussion

For speleothems a hybrid of AF-thermal demagnetizations is recommended as thermal demagnetization may cause mineral alteration and expansion of the calcite[89, 90]. We did perform full thermal demagnetization on additional specimens of our samples. However, the Zijderveld diagrams of these samples and of hybrid demagnetization are of lower quality (more scattered) than the fully AF demagnetizations. The NRM is carried by (possibly) goethite, magnetite and hematite.

The characteristic remanent magnetization (ChRM) directions and the corresponding VGP´s (see Extended Data Figure 4) of the two samples differ strongly. Sample D1 has a normal Paleomagnetic orientation which differs slightly from the present day field at the site (358, 39°; VGP 70, 296.4 E). The D2 sample has VGP´s latitudes which are more than 40° off the present day and can be labelled excursional[91]. This data corresponds with the observation in the field that the top flowstone, of which sample D1 was taken, remains in situ, while the flowstone blocks of the lower units have been transported (see Extended Data Figure 4). This is important as it supports the age of the dated stalagmite that grew on top of this flowstone as a minimum age of the fossils below it.

Supplementary Information G. Material and terminology

This study includes 47 human teeth (45 permanent and two deciduous) found from the excavations at the Daoxian site. The detailed list including specimen number, dental class, crown measurements, wear degree (Molnar, 1971)[36], time of discovery, region and stratigraphic level is provided Extended Data Table 2. The sample includes 1 lower lateral incisor, 2 lower canines, 2 lower third premolars, 4 lower first molar, 3 lower second molars, 4 lower third molars, 3 upper canines, 3 upper third premolars, 4 upper fourth premolars, 12 upper first molars, 4 upper second molars, 3 upper third molars and 2 deciduous upper second molars.

In the text the term "fully modern" humans/morphology is employed to refer to those samples that can be unequivocally attributed to *H. sapiens*. Fully modern humans do not show the mosaic of modern and primitive features that are usually found in anatomically modern humans. Thus, fully modern humans are similar to contemporary modern human populations and more derived than anatomically modern humans. The term "anatomically modern humans" is employed to refer to the Late Pleistocene samples that despite their allocation to *H. sapiens* show a mosaic of "archaic" and modern traits whose taxonomic significance is not immediately clear[5]. The use of the term "anatomically modern humans" is equivalent to that of "early modern humans"[19] and refer to most of the Late Pleistocene *H. sapiens* samples that are "on the verge of anatomical modernity but not yet fully modern"[37].

Supplementary Information H. Detailed morphological comparison of the dental samples

Upper canines (C^1)

In labial view, the shape of the crown is generally symmetric. From the lingual view, we identify a grade 2 (DX2 and DX7) and grade 3 (DX37) shovel shape. The tuberculum dentale is absent in DX2 and slightly expressed in DX37 (grade 1). There is no distal accessory ridge and no mesial canine ridge. Except for a slight reflection of the marginal ridges, the labial surface is featureless and simple. No cingulum or basal bulging is identified. The roots are single and narrow. Despite the presence of moderate shovel shape, this feature does not reach the strong degrees of expression found in Neanderthals and other Late Pleistocene populations such as Xujiayao[10]. There is no distal accessory ridge, no mesial canine ridge and no cingulum. Daoxian canines present typical morphologies of *H. sapiens* and are more derived than other Late Pleistocene canines such as that from Huanglong Cave, Qafzeh and even Dolni Vestonice, where the essential ridge is more inflated, there is a moderate basal bulging and the buccal surface is crossed by several longitudinal grooves. In addition, Daoxian canines lack the mass-additive features combination that is also typical of Neanderthals[16-18], and in their simplicity they are closer to the later Dolni Vestonice specimens and contemporary modern humans.

Upper third premolar (P^3)

Except for DX42, the rest of the Daoxian P^3s have extensive occlusal and interproximal wear that obliterates most of the occlusal morphological traits. The occlusal outlines of all the Daoxian P^3s are mesiodistally compressed and oval-shaped with a comparatively narrower lingual half. The occlusal outlines of all the Daoxian P^3s are quite symmetrical. The buccal and lingual cusps are separated by a continuous central groove (grade 0 for transverse crest). The tips of the lingual cusps are slightly mesially displaced in relation to the tips of the buccal ones. The essential crests of both cusps are single (grade 1 for buccal and lingual essential crests), although there is an enamel crack on the buccal cusp that obscures its assessment. Only DX42 presents a small mesial accessory ridge. The crown buccal surfaces of the Daoxian P^3s are smooth without any particular feature. The roots are single and narrow towards the tip. Although the morphology of the buccal essential crest is highly variable in both fossil hominins and recent human populations[92], the single crest is predominant in both fossil and contemporary *Homo sapiens*. Bifurcated essential crests are more frequently observed in Middle and Late Pleistocene from Asia such as Zhoukoudian, Hexian, Tongzi, Chaoxian and Panxian Dadong[10,12,28,42,93,94] as well as Neanderthals[17]. In contemporary humans, the single lingual essential crest is usually weakly expressed and even in some cases is absent. Particularly, the featureless buccal surface, the lack of cingulum, the comparatively narrower lingual half of the occlusal surface is typical of *H. sapiens*[95]. The roots of the Daoxian P^3s are single, short and slender, as it is typical of contemporary modern humans.

Upper fourth premolar (P^4)

All the P^4s are severely worn so it precludes the assessment of most of the morphological features although the sagittal grooves of DX26 and DX40 are continuous (grade 0 for transverse crest). The occlusal contour is oval and symmetrical. In lateral view, the buccal surface is featureless and no cingulum can be identified. The roots are single and short, mesio-distally compressed, and narrow strongly towards the tip. All the preserved features are typical of *H. sapiens* species[17,95].

Upper first molar (M^1)

The occlusal outlines of all the Daoxian M^1s are approximately squared. All the M^1s display at least four main cusps. All teeth exhibit large metacones (grade 4) and small to large hypocones (66.6% grade and 33.3% grade 3). Three out of nine Daoxian M^1s display a small cusp 5 in the distal margin, delimited by a V-shaped groove (DX28 grade 2, and DX25 and DX35 grade 3). The sizes of C5s are variable ranging from small tubercle to medium-sized cusps (grade 1 to 3 of ASUDAS). The crista obliqua is conspicuous and continuous in the whole Daoxian M^1 sample. In three out of the eleven M^1s, we identify Carabelli's complexes ranging from grade 1 (DX1) to grades 5 (DX28) and 6 (DX24). Enamel extensions are observed on the crown buccal side near the cemento-enamel junction of three Daoxian M^1s ranging from grade 1 to grade 3 of ASUDAS.

All of them display three roots: one mesiobuccal, one distobuccal, and one lingual. The bifurcation occurs at about one third of the root length from the cemento-enamel junction. All the roots of the Daoxian M^1s are slender and short.

In general, the morphologies of the Daoxian M^1s are strongly derived resembling those of anatomically and contemporary *Homo sapiens*. The occlusal morphology is simple. The Daoxian M^1s roots look short, gracile and barely divergent. Indeed, they convergent curvature of root apices it is typical of *H. sapiens*. This pattern is even more derived than that found in other Late Pleistocene fossils from Asia, such as the M^1s of the early Late Pleistocene hominin from Xujiayao, characterized by remarkably longer and more robust roots[12]. All the Daoxian M^1s are relatively squared as it is typical of anatomically and contemporary *H. sapiens* and markedly different from the rhomboidal and skewed outlines of the M^1s from the Neanderthal lineage[11,96] or the buccolingually elongated M^1s from other Asian localities from the Middle and Late Pleistocene such as Chaoxian and Hexian and Xujiayao[10,12,94]. The M^1 relative cusp areas of Daoxian follow the *H. sapiens* pattern (protocone>paracone>metacone>hypocone) and when compared with those of modern Chinese (Extended Data Table 4), the differences are minimal, from 0.6 % for the paracone to 1.1% for the rest of the cusps. The occlusal polygon is relatively large, compared to *H. neanderthalensis* and falls within the range of variation of *H. sapiens*. Interestingly, the absolute and relative cusp size of Qafzeh M^1s is comparatively less derived than Daoxian, showing a departure from the typical *H. sapiens* pattern of cusp proportions and angles as it was previously noticed by Bailey (2004)[11].

Upper second molar (M^2)

The occlusal contour of the Daoxian M^2s is an asymmetrical trapezoid with a narrower lingual side due to the hypocone reduction (grade 2 in DX12 and DX36 and grade 3 in DX14), and the protocone occupy most of the lingual half of the crown. The metacone is also small (grade 3) and the C5 is absent. In general, the occlusal morphology of the Daoxian M^2s is simple with no complicated secondary fissures and crests. Neither Carabelli's structure nor parastyle is identified on the Daoxian M^2s. On the buccal side of the crown, near the root bifurcation, there are clear enamel extensions (grade 2 of ASUDAS) in all the specimens. The reduction of the hypocone in combination with the simplicity of the occlusal surface is typical of contemporary *Homo sapiens* although it can be also present in the Middle Pleistocene sample from Sima de los Huesos[17]. However, the roots are also shorter, simple, narrow and do not diverge. The bifurcation occurs at the cervico-enamel junction or within the first fourth of the length root. All the morphological features make the Daoxian M^2s resemble those of fossil and contemporary *Homo sapiens* although the relatively reduction of the hypocone in Daoxian is more pronounced than in other Late Pleistocene samples like Qafzeh, Dolni Vestonice and especially, Xujiayao.

Upper third molar (M^3)

The occlusal contour is oval or heart-shaped due to the strong reduction of both the hypocone (grade 1 in DX17 and Grade 2 in DX38 and DX21) and the metacone (grades 2 in DX39 and grade 3 in DX17 and DX21). DX21 presents a small cuspule in the place of the C5 (grade 2). The crista obliqua is absent. No Carabelli's cusp or parastyle are present. All the three Daoxian M^3s exhibit enamel extensions on the buccal side of the crown, close to the cemento-enamel junction (grade 1 of ASUDAS). From the buccal aspect no cingulum is expressed. As

in M^1 and M^2, all the Daoxian M^3s have three roots that are narrow, slender and basically rectilineous except for DX39 where they are taphonomically/pathologically engrossed. Only DX17 has its three roots well separated, but they barely diverge. In the other two Daoxian M^3s, roots tend to be fused, the lingual with the distobuccal root in the case of DX21 and the three roots in the case of DX39.

Daoxian M^3s are derived and similar to those of modern humans with simplified crown and root morphology. The morphology of the Huanglong Cave and Tubo M^3s resemble that of the Daoxian hominins in most aspects although they present a more complicated occlusal surface, with conspicuous essential crests, and robust roots.

Lower lateral incisor (I_2)

In the labial view, the crown of the Daoxian I_2 is a symmetrically trapezoid with its incisal edge wider than the base region. The crown lingual surface is flat and featureless, and shovel shape is absent. The labial surface is almost flat (grade 1). The root is narrow, mesiodistally compressed and rectilineous with slight mesial deviation of its apex. The lack of labial convexity, shovel shape, tuberculum dentale, as well as the gracile root of the Daoxian I_2 resembles those of fossil and mostly contemporary *Homo sapiens*. The morphology of the Huanglong Cave and Qafzeh Cave I_2 resemble that of Daoxian in most crown and root features, but they present a more pronounced lingual basal eminence, the root is comparatively more robust and the root tip more rounded. Also, Daoxian presents less convexity than Dolni Vestonice, resembling contemporary humans rather than other Late Pleistocene samples.

Lower canine (C_1)

The crowns of the Daoxian C_1s are generally symmetrical and incisor-like. The lingual surface is concave with clear mesial and distal marginal ridges that conform a grade 2 and grade 3 shovel shape. No median essential ridge or mesial and distal accessory ridges are identified. No cingulum or basal bulging is expressed on their labial aspect. Both the Daoxian C_1s have single, short and slender roots. Neanderthal C_1s are usually characterized by the expression of mass additive traits such as a more pronounced essential ridge, tuberculum dentale, mesial canine ridge and certain bulging at the crown labial base[16-18,97]. The general trend for these traits is decreasing in frequency in anatomically and contemporary *Homo sapiens,* being fully absent in the Daoxian specimens as it is typical of contemporary *Homo sapiens*.

Lower third premolar (P_3)

The two P_3s show a slightly asymmetric oval contour due to the disto-lingual projection of a small platform-like talonid without accessory cusps. The buccal surface is vertical and featureless, similar to Dolni Vestonice specimens and unlike Qfazeh, where there is a buccal basal bulging and longitudinal grooves are present. Overall, the crown morphology together with the expression of a slender single root makes Daoxian teeth closer to *H. sapiens*. All of them lack the typical Neanderthal conformation, with compressed and centered occlusal

polygon, lingually displaced metaconid and conspicuous projection of the buccal surface on the occlusal view[15]. The root is single, short and mesiodistally compressed.

Lower first molar (M_1)

All the four Daoxian M_1s have a roughly rounded square-shaped occlusal outline with similar mesiodistal and buccolingual dimensions of the crown. In occlusal view, at least three of them have five main cusps arranged in a Y-groove pattern. In the less worn M_1 (DX15) we identify a lineal anterior fovea (grade 1). No mid-trigonid crest is expressed but there is a continuous distal trigonid crest in one of the three M_1s where it can be scored (DX15). The C7 is absent in the 75% of the sample, and only in DX45 we can see small cusp (grade 2). On the buccal surface of two of the crowns, the buccal groove ends in a pit-shaped depression that can be classified as ASUDAS grade 1 protostylid. Both DX15 and DX25 display slender mesial and a bucco-lingual roots that become thinner towards the tip. Compared with various Late Pleistocene hominins, and fossil and contemporary *Homo sapiens*, the morphology of the Daoxian M_1s more resemble those of anatomically and contemporary *Homo sapiens* with simplified crown structure and less robust roots. The typical continuous mid-trigonid crest of Neanderthals is absent and the anterior fovea is linear and long instead of pit-like or short as it would be typical of Neanderthals[17,98]. The continuous distal trigonid crest is a feature that can be found in variable but small percentages in Neanderthals (14.3%), early (10%) and contemporary (3.9%) modern humans[17]. No taurodontism is identified in the sample.

Lower second molar (M_2)

The occlusal contour of the Daoxian M_2s is that of a rounded-square. The hypoconulid is small in DX9 and medium-sized in DX19 and well-centered in the distal margin. The protoconid and entoconid are in contact in a "X-pattern" in the two molars where this feature can be scored. This groove pattern is predominant in contemporary *H. sapiens* groups, less frequent in early modern humans and uncommon in Neanderthals[17,92]. There is no mid-trigonid crest nor C6 or C7. The roots of all the specimens are narrow, relatively rectilineous and they barely diverge. In two cases they tend to fuse/coalesce from the second third. The lack of a continuous mid-trigonid crest and a pit-shaped anterior fovea makes Daoxian closer to *H. sapiens* than to *H. neanderthalensis*[17,98]. Compared to other Chinese Late Pleistocene fossils, Daoxian M_2s present more slender and less divergent roots and smaller crown size than Huanglong Cave, Zhiren Cave and Luna Cave[26,44].

Lower third molar (M_3)

Daoxian M_3s present atrophied/atypical crown conformations, as it is more common in this dental class, which obscures the identification of the main cusps. No mid-trigonid crest is present but all the M_3s present a distal trigonid crest that in both DX22 and DX27 is continuous and in DX10 is discontinuous. The C5 is large in DX22 (grade 4) and very small (grade 1) in DX10 and DX27 (grade 1). No cusp 6 observed in any of the Daoxian M_3s. All the Daoxian M_3s have two roots that are separated in two of them and completely fused in the third one. This morphology is typical of anatomically and contemporary modern humans and

very different from the Late Pleistocene M_3s from Xujiayao, with highly crenulated occlusal surfaces and stout well-seprated roots that bifurcate at the cervical third[10].

Upper second deciduous molar (dm^2)

The occlusal morphology of the two dm^2s from Daoxian is simple, and the occlusal outline relatively squared and unlike the typical skewed contour of Neanderthals. Roots are thin and diverge as it is typical in deciduous teeth and similar to the patterns usually found in fossil and contemporary *H. sapiens*. Both dm^2s have four main cusps and the size sequence is paracone > metacone > protocone > hypocone. A grade 4 Carabelli's is observed in one of the specimens and no parastyle and enamel extensions were identified.

The morphology of the Daoxian dm^2s is derived and resembles that of modern humans. They lack cingulum, secondary grooves and complex enamel crests. The size of the crowns is within the variation range of fossil and contemporary *Homo sapiens*.

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