A new approach to the chronology of Caves 268/272/275 in the Dunhuang Mogao Grottoes: combining radiocarbon dates and archaeological information within a Bayesian statistical framework

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ABSTRACT. The construction chronology of three of the earliest Dunhuang Mogao Grottoes (Caves 268, 272, and 275) has been the subject of ongoing debate for over half a century. This chronology is a crucial topic in terms of further understanding of the establishment of the Dunhuang Mogao Grottoes, early Buddhism in the Gansu corridor, and its relationship with Buddhism developed in the Central Plains. Building upon archaeological, art historical and radiocarbon (^{14}C) dating studies, we integrate new ^{14}C data with these previously published findings utilising Bayesian statistical modeling to improve the chronological resolution of this issue. Thus, we determine that all three of these caves were constructed around AD 410–440, suggesting coeval rather than sequential construction.

KEYWORDS: Bayesian modeling, Buddhism, Dunhuang Mogao Grottoes, OxCal.

[Notes to typesetter. Running header author: *G Qinglin* et al.

Running header title: *OxCal and Dunhuang Mogao Grottoes*]

INTRODUCTION

The complex of the Dunhuang Mogao Grottoes is widely known as one of the largest and best-preserved ancient Buddhist sites in the world. These caves, dating from various dynasties, were built in the Mingsha mountains, approximately 25 km northeast of the modern Dunhuang city in Gansu province, northwestern China. Today, the Dunhuang complex comprises a total of 715 caves, 2145 statues, and approximately 45,000 m^2 of wall paintings, and is therefore sometimes referred to as the "Thousand Buddha Grottoes." Owing to the importance of the site for the history of art, the study of East–West connections, as well as the transition and transformation of Buddhism into China, Dunhuang was designated a UNESCO World Heritage Site in 1987 (Figure 1).

Figure 1 Location of the Dunhuang Mogao Grottoes, Gansu Province, China.

Chronological Studies of the Dunhuang Caves

Around the time that the Han empire defeated Xiongnu, extending its reach into the Gansu corridor (133 BC–AD 89), Buddhism started to move into western China, having originated in India in the 6th century BC. Later periods, such as Northern Wei (AD 386–534), Sui (AD 581–618), and Tang

(AD 618–907), witnessed an increasing effort and dedication channeled into Buddhism, which is perhaps best evidenced by the rapid development of the Dunhuang Mogao Grottoes (Nagahiro 2011).

A stele erected during the Tang dynasty (AD 618–907) by Li Huairang has been recovered from Cave 323 of the Dunhuang Mogao grottoes. It describes the beginning of the construction of the Dunhuang Mogao Grottoes in AD 366 (Dunhuang Academy 2000). The stele records a narrative that a monk named Yuezun had a vision of a thousand Buddhas bathed in golden light while he stopped at the Mingsha Mountains. Therefore, he made the decision to build a cave there for meditation and worship. Unfortunately, no more detailed information is provided about, for instance, whether or not the cave was a pre-existing natural feature prior to Yuezun's arrival, or who were the craftsmen to dig or extend the cave and to draw the wall paintings.

While this stele, which was erected roughly 300 years later than the event it has recorded, may contain important indications of the beginnings of the Dunhuang Mogao Grottoes, the complete temporal framework of the various Buhhda caves, together with many associated details, has been subject to a long history of interdisciplinary debate, spanning archaeology, art history, Buddhism studies, transmitted texts, and radiocarbon (^{14}C) dating (e.g., Yan 1951, 1980; Xie 1955; Mizuno 1958; Soper 1958; Bussagli 1963; Dunhuang Academy 1982; Fan et al. 1982; Wang 1983; Wang 1985; Jin 1988; Su 1989; Zhao 1991; Guo et al. 2010). Inherent to many branches of archaeology, dating needs to take into account a range of considerations and types of information. In the case of the Dunhuang Caves, these include inscriptions (e.g., specific dates, names of specific person(s)/sponsors), typological comparisons (e.g., statues, wall paintings, structure of the grottoes), technological progress, and stratigraphic sequence (relative positions between different caves). Among them, probably the most straightforward and convincing evidence for chronology is inscriptions with specific dates. The earliest inscribed date in Dunhuang Mogao is attributed to Cave 285. On the north wall of the cave, two inscribed dates have been uncovered, namely "Datong [the dynasty of Western Wei] fourth year" (i.e. AD 538) and "Datong fifth year" (AD 539), implying at least that the wall paintings were completed around these two years and that the cave itself must originate even earlier.

In parallel, by being intrinsically associated with the development of Buddhism, it is also possible, for instance, to link the symbols, stories and styles of the Buddhas illustrated in the wall paintings to accounts in specific manuscripts and postulate the potential range of dates for the initial construction. This topic is so fundamental that its results or interpretations may exert vital influence on the scholarly interpretations on the direction and dynamics of the process of Buddhist development along the Silk Road into China. Investigation into the chronology of each cave at Dunhuang Mogao has never ceased and more focused studies have been published over the past 70 years (see references above).

Caves 268, 272, and 275

A particularly significant issue is the chronology of Caves 268, 272, and 275 of the Dunhuang Mogao complex. Details of these three caves are very well illustrated by Fan et al. (2013, Figure 2). It has been commonly agreed that these are probably the earliest surviving caves of Dunhuang (Yan 1980; Fan et al. 1982; Su 1989; Zhao 1991; Dunhuang Academy 2000; Guo et al. 2010). Attempts to date them have been made since around the 1940s, initially by a renowned Chinese painter, Zhang Daqian, who once spent nearly three years at Dunhuang hand-copying 276 sections of mural paintings. He proposed that the styles of the wall paintings in Cave 275 appear broadly less mature than those in the other two caves, and therefore considered this to be the earliest, dated to early

Northern Wei (AD 386–534). To him, Cave 268 appears to be dated to the later Sui dynasty (AD 581–618; National Palace Museum 1985).

Figure 2 Illustrations of the four caves of Dunhuang in this paper (wall paintings and statues of Buddha from the four caves of Dunhuang discussed herein).

Numerous different opinions have been expressed since those of Zhang Daqian, and it was not until the 1980s that some agreement, yet in a very broad sense, began to be reached. Scholars at Dunhuang Academy published a much more systematic and comprehensive chronological study of the caves, which they dated to the Northern dynasties (AD 386–581; Fan et al. 1982). Like many typo-chronological studies, these scholars undertook a two-stage process. In the first stage, by comparing a considerable number of aspects (structure of the caves, the features of Buddha, the styles, elements and content of the wall paintings), all of the associated caves, which can be roughly dated to the Northern Dynasties, are divided into four groups, with Caves 268, 272, and 275 assigned to the first group. The aim of the second stage is to find out the relative and absolute chronology for each of these four groups. A range of features present in the first group appears to be absent from the other groups. For instance, the statues of flying apsaras in these three caves are designed in U shapes and their performance seems rather stark and clumsy. Meanwhile, the first and second group of caves share a certain number of characteristics, such as the strong style of the Western Regions presented through the clothes in the wall paintings and the drawing skills (Ao-tu hua, or receding-and-protruding painting; Fong 1981). This connection between the first and second groups reveals a potential inheritance and indicates a relatively earlier date for the first group compared to the remaining three.

To assign absolute dates to these groups, a thorough comparison is required to sites elsewhere that have more secure chronologies (i.e. based upon inscriptions at these sites). Fan and her colleagues suggested that their first group at Dunhuang Mogao can be associated with those dated to the first phase of the Yungang Grottoes in modern Shanxi province (AD 460–465). Similar affinities can also be drawn with the stone inscription on the tower of Ma Dehui at Jiuquan (Northern Liang), Cave 169 at Bingling temple (AD 420) and pottery figures excavated at Asita in Turpan, Xinjiang (AD 455). The major caves of the first phase of Yungang were constructed by the distinguished monk named Tanyao, who initially traveled from the Gansu area. It is therefore likely that the construction of the caves of the first phase of Yungang had been influenced by those made earlier in Gansu. Moreover, Fan et al. emphasize that the governor of the Northern Liang controlling Gansu (AD 421–439) was a follower of Buddhism and sponsored several constructions of Buddhist-related caves and temples. It would therefore, they suggest, not be surprising for the earliest three caves at Dunhuang to have been augmented under his support (Fan et al. 1982).

While the work of Fan et al. (1982) has exerted a considerable influence in this sphere, a different view has been articulated by Su (1989). Su was rather doubtful about the evidence proposed by Fan and her colleagues that Caves 268, 272, and 275 are the earliest surviving at Dunhuang. Very few stylistic affinities, argued Su, can be observed between these three caves and those which are already confidently dated to as early as the Northern Liang elsewhere (e.g., Caves 1 and 2 of the Tianti Mountains; the stone towers distributed around Jiuquan, Dunhuang or Turpan; and the statues of Bingling Temple in Eastern Gansu). Instead, he chose to focus on the layout and upper structure of the cave, the design of the statues of Buddha and the arrangement of the wall paintings. After carefully listing all sorts of information and comparing them to the counterparts in the first as well as the second phase of Yungang (AD 471–494; see also Su 1978), Su concluded that the three caves of Dunhuang appear to be more consistent with the second phase of Yungang rather than the first (ca.

AD 460; Su 1989). He further points out that it is more likely to have been Yungang that impacted upon Dunhuang, rather than vice versa, since Yungang is situated in the suburban areas of Pingcheng, the capital of the Northern Wei, which was undoubtedly the main political and cultural center during that time (i.e. assuming central to peripheral diffusion). Therefore, the construction of the three caves at Dunhuang can be no later than AD 484–494 (Su 1989).

A different approach to this question is exemplified by Zhao (1991). This author proposed that the Buddhist stories in the wall paintings of Cave 272 were actually derived from the manuscripts named Xianyu Jing (贤愚经, Damamūka), which, according to the text Youlu (祐录), were created in AD 445 (see also Chen 1964). Considering this, Zhao believes that Cave 272, along with Caves 268 and 275 which exhibit the same styles, was presumably made no earlier than AD 445.

While the issue of chronology relating to these caves of Dunhuang Mogao has been debated for decades, it is not yet possible to reach a firm consensus. Figure 3 summarizes the chronological ranges of construction of Caves 268, 272, 275, and 285 ascribed by different groups of scholars based upon different pieces of evidence, involving typological analysis of wall paintings and statues, the illustrated Buddhist stories, manuscripts or stratigraphy. While the discrepancy proposed between these various scholars is readily apparent, a general consensus apparent from this figure might be that Cave 285 was highly likely to be the latest of them all. As mentioned above, in accordance with the two inscribed dates, Cave 285 should have been completed by around—or at least no later than—AD 538–539. Nevertheless, the disparities between the results of different investigations, particularly of the three early caves, raise serious obstacles to other related subjects and become inextricably entangled with models of the dispersal of Buddhism in China. As exemplified by the cases of Dunhuang and Yungang mentioned above, dating plays a defining role in our understanding of the past, and can dramatically alter our interpretation of various archaeological remains, transmitted texts and Buddhist manuscripts

Figure 3 Summary of the existing date estimates for Caves 268, 272, 275, and 285. The length of the bar represents the possible period during which the targeted cave was constructed, and the colors illustrate different sources of information.

The application of ^{14}C dating sheds some new light on this discussion. The short-lived plants used to make the basal layer for wall paintings and statues offer excellent materials to date their initial construction. To this end, Guo et al. (2010) published 35 accelerator mass spectrometry (AMS) dates of straw, chaff, and fibers from the basal layer of wall paintings from Caves 268, 272, 275, and 285. These are all short-lived (perhaps even from a single growth year) materials and cannot be stored for years before making the wall paintings or statues, which allows us to circumvent the potentially problematic issue caused by the in-built age of some plant material, such as wood. However, despite the high-quality raw AMS data, a rather broad age range is produced through the process of calibration. This is the result of the plateau in the calibration curve during the period AD 400–550 (Reimer et al. 2013; Figure 5). Through calibrating the dates and plotting them individually, Guo and his colleagues suggested that Caves 268, 272, and 275 were constructed between ca. AD 380 and AD 530 (Cave 268: AD 406–532; Cave 272: AD 391–533; and Cave 275: AD 382–531; Figure 4). In contrast, the results for Cave 285 can be grouped into several distinct stages. These groupings reveal the long and complicated construction history of Cave 285, such as repair or redecoration in later times. Similar observation can be seen in the case of Cave 275.

Figure 4 Calibrated ^{14}C ages (68.2%) presented by Guo et al. (2010).

Figure 5 Equivalent-precision raw radiocarbon ages (± 20 ^{14}C yr) (red) producing either: (1) an imprecise age (grey); or (2) a more tightly constrained age (grey) when coinciding with either: (1) a plateau; or (2) steeper (non-plateau) structure in the calibration curve (blue).

The paper by Guo and colleagues marked a new and critical attempt to resolve the chronology of the Dunhuang Grottoes. This study demonstrated how scientific dating techniques can contribute to the ongoing chronological debate. While the conclusion of Guo et al. (2010) agrees with several important interpretations by art historians and archaeologists based on different information and methods, the fact that each of the calibrated dates extends over one hundred years (68.2% probability range) cannot be said to be entirely satisfactory. In addition, using a probability range of 68.2% (approximating 1σ uncertainty for normally distributed data) instead of 95.4% (~2σ) is not adequately rigorous. Furthermore, since the construction of the three caves occurred during a period during which the government of Dunhuang was rapidly changing (Former Liang, AD 320–376; Former Qin, AD 376–386; Later Liang, AD 386–403; Western Liang AD 403–421; Northern Liang, AD 421–439), aligning an individual cave to a specific dynasty is therefore problematic. Increasing chronological precision is hugely important because the establishment of Buddhist caves is strongly indicative of important changes in social contexts and regional interactions, which is almost certainly linked to the inclinations of the ruling elites.

As noted above, one factor that causes the large age ranges is the shape of the calibration curve and the coincidence of this time period with a ^{14}C plateau (Reimer et al. 2013). So merely increasing the density of ^{14}C dates and taking a simple average will not be particularly fruitful. Instead, a Bayesian statistical approach provides a means to increase chronological precision, making use of additional prior information that can be incorporated into the modeling process (Buck et al. 1992; Bronk Ramsey 2009). Therefore, in this paper we not only present more ^{14}C dates, but also, for the first time, apply a Bayesian statistical approach for the chronological study of the Dunhuang Grottoes.

RESEARCH OBJECTIVES

The objective of this paper is to apply a new perspective on the chronology of the Dunhuang Grottoes based on modeling of the published—as well as some new—^{14}C dates combined with archaeological information within a Bayesian statistical framework, with emphasis on what are believed to be the earliest of the Grottoes, Caves 268, 272, and 275. We argue that a much higher chronological resolution can be achieved if we carefully combine all types of information (stylistic studies and inscribed dates) together into this Bayesian modeling framework.

METHODS AND RESULTS

In addition to the ^{14}C dates published by Guo et al. (2010), this paper presents fifteen new results based on the analyses of plant materials extracted from the early three caves, as well as Cave 285. These results were obtained through cooperation between Dunhuang Academy, Nagoya University and the National Research Institute for Cultural Properties in Japan. The details of these samples are listed in Table 1.

Table 1 New radiocarbon results for the three putative early caves and Cave 285.

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Sample pretreatment and AMS measurement were performed at Nagoya University. The analytical protocol was exactly the same as that used by Guo et al. (2010). In summary: samples of plant

materials (~100 mg) were first mechanically cleaned with distilled water in an ultrasonic bath. Next, samples were chemically pretreated as follows: (1) 1.2M HCl at 90ºC for 3 hr (repeated four times); (2) 0.12–1.2M NaOH solution, depending on the deterioration of the sample, three or four times for 2 hr at room temperature; (3) 1.2M HCl, repeated three or four times; (4) distilled water after each stage and for final rinsing (repeated until pH=7). After freezing and drying, around 6–7 mg of each prepared sample was combusted in the presence of granular CuO in evacuated, flame sealed glass for 8–10 hr at 850°C. The resultant CO_2, having been purified through successive liquid nitrogen, ethanol, and liquid nitrogen and n-pentane traps, was reduced to graphite with Fe power as the catalyst at 650°C in a Vycor tube. Finally, the graphite samples were pressed into aluminium holders and for AMS analysis.

BAYESIAN CHRONOLOGICAL MODELING

The Bayesian chronological modeling presented herein was performed using the statistical software OxCal (v4.3.2; Bronk Ramsey 1994, 1995, 1998, 2001, 2017) with the objective of narrowing the age range for likely construction of the three caves. The first assumption explicitly incorporated within the OxCal model is that the starting date of the construction of Cave 285 (modeled as a starting "Boundary" in OxCal) should post-date the completion of the three earliest caves (268, 272, and 275). This is consistent with all of the proposals published by art historians and archaeologists (Figure 3). The second assumption incorporates the prior information from the inscribed dates in Cave 285 (i.e. AD 538 and AD 539). These two specific dates suggest that the wall paintings were highly likely to have been finished around that time and, therefore, the construction is prescribed in the model to be no later than AD 538–539.

In order to operationalize these two prior assumptions, we represented the three earliest caves as individual sub-Phases within a broader collective "Phase," which was constrained to lie earlier than the Phase for Cave 285. Meanwhile, a *terminus ante quem* (TAQ, AD 538–539) was applied after the Phase for Cave 285, in order to signify its completion date. Within the collective Phase, no assumption was made about the chronological relationship between the individual sub-Phases (for Caves 268, 272, and 275). The OxCal code for the model can be found in the online supplementary document.

Both before and after each model Phase and sub-Phase, we apply "Boundary" functions in OxCal to determine the start and end of each Phase. In this context, these Boundaries therefore provide the probability density functions (PDFs) reflecting the start and end of the complete construction process of each of the caves included within the model. Within each of the Phases, the ^{14}C data were included using "R_Date" functions. Additionally, "Date" functions were included to provide summary statistics for the time ranges represented by each of the respective Phases (i.e. periods of cave construction).

Figure 6 shows that, compared to the results of Guo et al. (2010; Figure 4), the probability distributions for the construction of the earliest three caves have been significantly narrowed and shifted. With a very good level of confidence (ca. 84.5%), it is possible to date all of the caves to a period within around thirty to forty years. This resolution enables scholars to solve two specific issues. Firstly, it appears very likely (ca. 87% probability) that Caves 268, 272, and 275 of Dunhuang were built before the Yungang I and II stage (AD 460–465 and AD 471–494, respectively). Secondly, assigning these caves to one or two specific dynasties (namely Western Liang: AD 403–421; Northern Liang: AD 421–439) becomes feasible.

Figure 6 Summary Date functions representing the time range over which construction of each of the caves (268, 272, and 275) took place. Horizontal bars under each probability density function represent the 68.2% and 95.4% highest probability density ranges, respectively.

Using the "Order" function in OxCal (Table 2), we show that these three early caves were most likely constructed during the Northern Liang dynasty, rather than that of the Western Liang. As mentioned above, a few historical reasons can be highlighted in favor of this result. The royal family of the Northern Liang themselves were Buddhists, or followers of Buddhism, sponsored a variety of Buddhist temples and grottoes in different places (Fan et al. 1983).

Table 2 The probabilities that the three early caves (268, 272, and 275) were constructed during the Western Liang or Northern Liang dynasties.

	Western Liang (AD 403–421)	Northern Liang (AD 421–439)	Western Liang *or* Northern Liang (AD 403–439)
Cave 268	12.67%	73.58%	86.25%
Cave 272	9.30%	77.26%%	86.57%
Cave 275	10.46%	74.72%	85.19%

In addition, it is possible to present the relative chronological sequence between the three caves in a quantitative manner. This issue has been highly debated among the previous studies of Dunhuang Mogao. For instance, Cave 268 has been suggested by some scholars as been constructed earlier than the others (Figure 3; Ma 1996; Wang 1985) considering that it is the smallest in size and thus the relatively easiest to dig. Different opinions can be found from Zhao (1991), however, arguing that Cave 272 appears more likely to be earlier than Cave 268 or 275. Again applying the Order function in OxCal, we calculate the likelihood that one cave was constructed earlier or later than the others and, we find that the probability that any of the three caves was constructed earlier than either of the other two is close to 50%. This provides further support for the assertion above that each of the caves was constructed within a very short time of each other, if not contemporaneously, rather than sequentially.

CONCLUSIONS AND FUTURE WORKS

The chronology for the three early caves at Dunhuang has been sufficiently improved by incorporating ^{14}C dates with archaeological information within a Bayesian statistical framework. There appears little doubt that none of these caves can be the earliest at Dunhuang Mogao, as indicated by the Tang dynasty inscription (AD 366). Rather, it is more likely that these three caves were constructed between AD 410 and AD 440, a period in which Dunhuang was controlled by the Western Liang and the later Northern Liang dynasties. This finding creates a more focused window through which scholars can correlate the construction of these early Buddhist caves to other forms of historical evidence, such as the spread of Buddhism. Given the fact that the rulers of the Northern Liang dynasty were devout followers of Buddhism, and that our chronological modeling suggests that the construction of the caves most likely falls into this reign time, we can now be more confident to suggest that the construction of these three caves was sponsored by the Northern Liang rulers. Moreover, from the perspective of ^{14}C dating, the probability that these three caves were constructed at different times/sequentially during different periods appears very small. This is consistent with a number of results from previous scholarship, but here we are able to show this probability in a quantitative way.

The chronology of the dispersal of Buddhism into China via the Silk Road is an enormously interesting but highly debated subject. As with the introduction of bronze technology in the first and second millennia BC, China must have experienced a series of crucial transitions and

transformations after Buddhism was introduced. One of the fundamental limitations in these studies is that sometimes the chronology of various Buddhist remains, such as the wall paintings, statues, temples, caves and manuscripts, is not sufficiently resolved. As demonstrated by this paper, combining ^{14}C dates and archaeological observations through Bayesian statistical modeling may help to improve this situation, or at least test the existing chronological frameworks in a quantifiable way. This can certainly make vital contributions to our understanding of the process through which Buddhism moved into China and was subsequently transferred and transformed into different regions.

ACKNOWLEDGMENTS

Richard A. Staff is supported by an Early Career Fellowship from the Leverhulme Trust (grant: ECF-2015-396). Michael Dee is principal investigator on the European Research Council ECHOES (ERC Action No. 714679). Prof. A. Mark Pollard is also principal investigator on the European Research Council Project FLAME (1300505). Both Prof. Dame Jessica Rawson and Ruiliang Liu are part of FLAME. We are also very grateful to Prof. A. J. Timothy Jull and two anonymous reviewers for their helpful suggestions in revising an earlier version of the manuscript.

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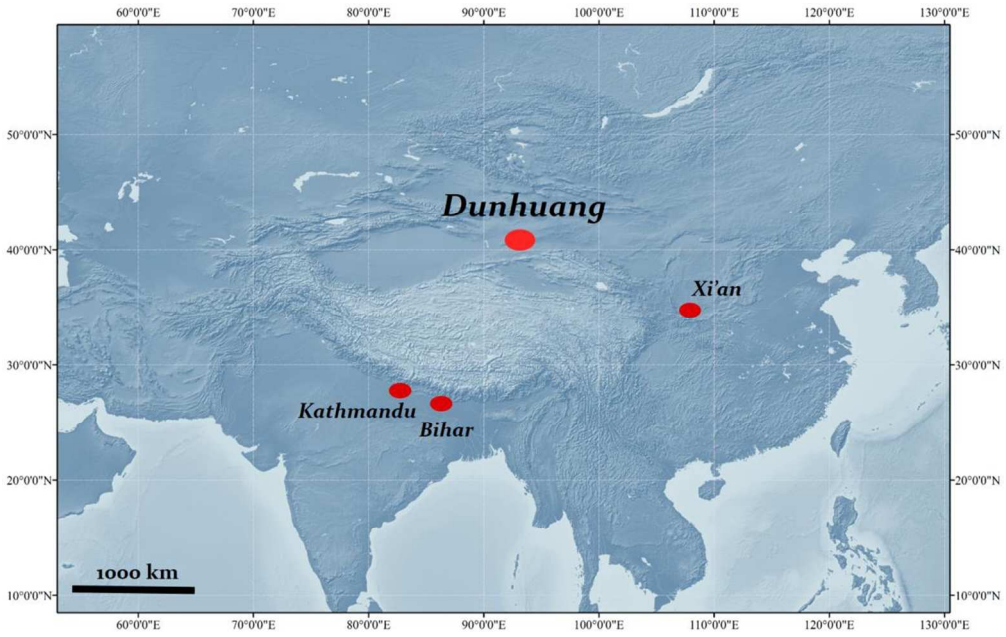
[Table 1]

Lab nr (NUTA2-)	Sample nr	Sampling location	Sample material	$\delta^{13}C_{VPDB}$ (‰)	Conventional ^{14}C age (yr BP)	Calibrated age (cal AD; 68.2%)	Calibrated age (cal AD; 95.4%)	References
13689	C268-4-1	Cave 268，western wall of the main chamber	Straw	–24.4	1580 ± 20	427–534	421–539	This paper
13688	C272-5-1	Cave 272，northern wall of the main chamber	Straw	–26.1	1585 ± 20	424–534	420–538	This paper
13691	C272-7-1	Cave 272，eastern wall of the main chamber	Straw	–23.5	1560 ± 23	431–531	425–551	This paper
13696	C275-10-1	Cave 275，statue of the main chamber	Reeds	–23.0	1557 ± 20	431–542	426–551	This paper
13697	C275-11-1	Cave 275，statue of the main chamber	Reeds	–22.7	1555 ± 20	431–544	427–553	This paper

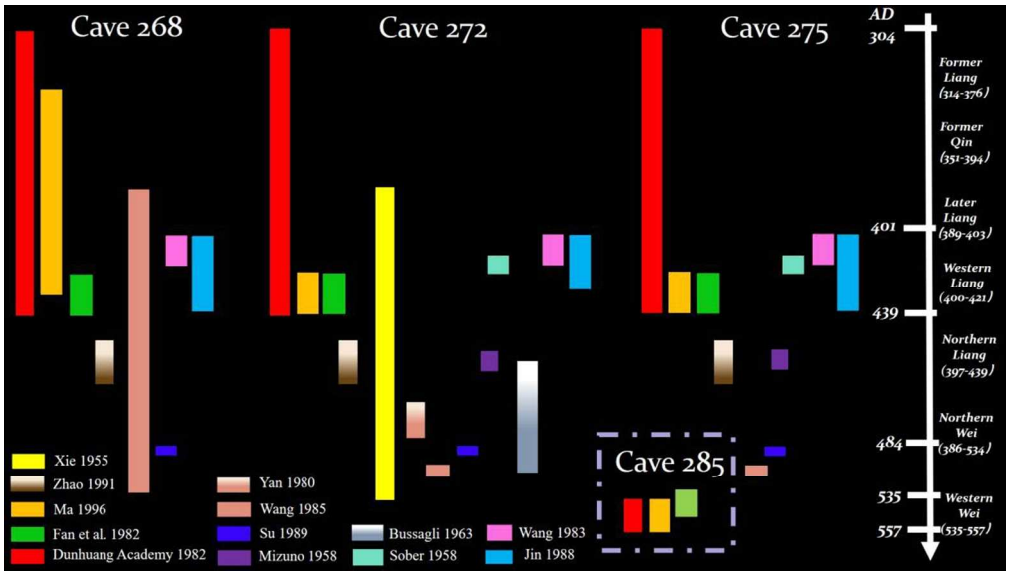
13698	C275-12-1	Cave 275 ，statue of the main chamber	Reeds	–23.1	1542 ± 20	433–557	427–571	This paper
13704	C285-24-1	Cave 285, surface of the western wall of the front room	Straw	–23.1	1123 ± 19	893–967	886–979	This paper
13705	C285-28-1	Cave 285, middle part of the northern wall in the corridor	Straw	–23.2	1111 ± 19	898–971	891–983	This paper
13706	C285-31-1	Cave 285, Buddha altar in the middle of the main chamber	Straw	–24.5	924 ± 20	1045–1155	1036–1160	This paper
13707	C285-32-1	Cave 285, Buddha altar in the middle of the main chamber	Plant fibers	–26.1	964 ± 20	1025–1147	1020–1154	This paper
13708	C285-33-1	Cave 285, Buddha altar in the middle of the main chamber	Plant fibers	–24.6	969 ± 19	1022–1147	1019–1152	This paper
13711	C285-34-1	Cave 285, the second Buddha tower on the northern wall from the west	Plant fibers	–29.8	889 ± 23	1052–1205	1045–1215	This paper
13712	C285-35-1	Cave 285, the first Buddha tower on the northern wall from the west	Straw	–23.8	837 ± 22	1169–1224	1164–1254	This paper
13713	C285-36-1	Cave 285, the first Buddha tower on the southern wall from the west	Straw	–24.9	860 ± 20	1167–1210	1058–1225	This paper
13714	C285-37-1	Cave 285, the fourth Buddha tower on the southern wall from the west	Straw	–24.6	855 ± 19	1169–1213	1156–1244	This paper
11251	C268-1	Damaged area on left arm of clay statue in the niche on W wall in main chamber	Straw from statue core	–25.6 ± 1.0	1611 ± 22	403–530	395–535	Guo et al. 2010
11252	C268-2	Fractured area on upper E side of S wall in main chamber	Chaff in rendering	–25.3 ± 1.0	1601 ± 22	413–532	405–536	Guo et al. 2010
11253	C268-3	Exposed rendering layer at W side of ceiling in main chamber	Chaff in rendering	–24.9 ± 1.0	1617 ± 22	398–529	389–535	Guo et al. 2010
11254	C272A-1	Damaged area in neck of clay statue in exterior niche (272A)	Straw from statue core	–24.8 ± 1.0	1591 ± 22	420–534	415–538	Guo et al. 2010
11255	C272-1	Damaged area on left arm of clay statue in the niche on W wall in main chamber	Straw from statue core	–25.2 ± 1.0	1609 ± 22	405–530	397–536	Guo et al. 2010
11258	C272-2	Fractured area on upper E part of S wall in main chamber	Chaff in rendering	–24.5 ± 1.0	1630 ± 22	390–428	350–534	Guo et al. 2010
11259	C272-3	Exposed rendering layer at W part of N wall in corridor	Chaff in rendering	–24.4 ± 1.0	1615 ± 26	399–530	390–536	Guo et al. 2010
11260	C275-1	Damaged area on left arm of clay statue on W wall in main chamber	Straw from statue core	–24.8 ± 1.0	1644 ± 24	383–425	339–530	Guo et al. 2010
11261	C275-2	Lower S part of E wall in main chamber	Chaff in rendering	–24.3 ± 1.0	1651 ± 24	381–422	335–526	Guo et al. 2010
11262	C275-3	Central S part of E wall in main chamber	Chaff in rendering	–25.2 ± 1.0	1621 ± 24	395–528	385–536	Guo et al. 2010
11263	C275-4	Lower W part of N wall in main chamber	Chaff in rendering	–25.5 ± 1.0	1614 ± 24	400–530	392–536	Guo et al. 2010
11789	C285-1	Exposed rendering layer in SE corner of main chamber	Chaff in rendering	–24.5 ± 1.0	1594 ± 23	418–534	411–538	Guo et al. 2010
11791	C285-3	Exposed rendering layer at E side of S wall in main chamber	Chaff in rendering	–31.3 ± 1.0	1544 ± 23	432–555	427–570	Guo et al. 2010
11797	C285-4	Exposed rendering layer of S wall between 1st and 2nd meditating niches from E in main chamber	Chaff in rendering	–23.5 ± 1.0	1560 ± 24	431–541	425–552	Guo et al. 2010
11792	C285-5	Damaged area of mural painted on N side in S niche on W wall	Chaff in rendering	–24.3 ± 1.0	1553 ± 23	431–545	426–560	Guo et al. 2010
11798	C285-6	Damaged area in right arm of Buddha statue in main niche on W wall in main chamber	Straw from statue core	–23.5 ± 1.0	1543 ± 22	433–557	427–579	Guo et al. 2010
11809	C285-7	Damaged area of clay relief sculpture in N side of main niche on W wall in main chamber	Straw from statue core	–22.6 ± 1.0	1569 ± 23	430–536	422–545	Guo et al. 2010

11810	C285-8	Damaged area in neck of clay statue in N side niche on W wall in main chamber	Straw from statue core	–23.4 ± 1.0	1578 ± 23	428–535	420–541	Guo et al. 2010
11793	C285-9	Damaged area around E side of entrance of first meditating niche from W on N wall in main chamber	Straw from statue core	–23.5 ± 1.0	1585 ± 24	424–534	415–540	Guo et al. 2010
11794	C285-10	Damaged area on mural in W side of N wall in main chamber	Chaff in rendering	–21.2 ± 1.0	1606 ± 27	405–533	398–537	Guo et al. 2010
11799	C285-11	Damaged area around entrance of 4th meditating niche from W of N wall in main chamber	Chaff in rendering	–26.7 ± 1.0	1551 ± 25	431–547	426–566	Guo et al. 2010
11800	C285-12	Damaged area of mural in lowest layer at S side of W wall in antechamber	Chaff in rendering	–24.2 ± 1.0	1529 ± 23	435–574	429–598	Guo et al. 2010
11802	C285-15	Damaged area of mural at border of NE corner of slope ceiling in main chamber	Chaff in rendering	–24.4 ± 1.0	1562 ± 25	430–540	423–553	Guo et al. 2010
11808	C285-20	Damaged area on E side wall in 3rd meditating niche on N wall from W in main chamber	Chaff in rendering	–24.6 ± 1.0	1550 ± 23	431–549	427–563	Guo et al. 2010
11814	C285-22	Damaged area of mural at lower N part of E wall in main chamber	Chaff in rendering	–24.7 ± 1.0	1593 ± 24	419–534	411–538	Guo et al. 2010

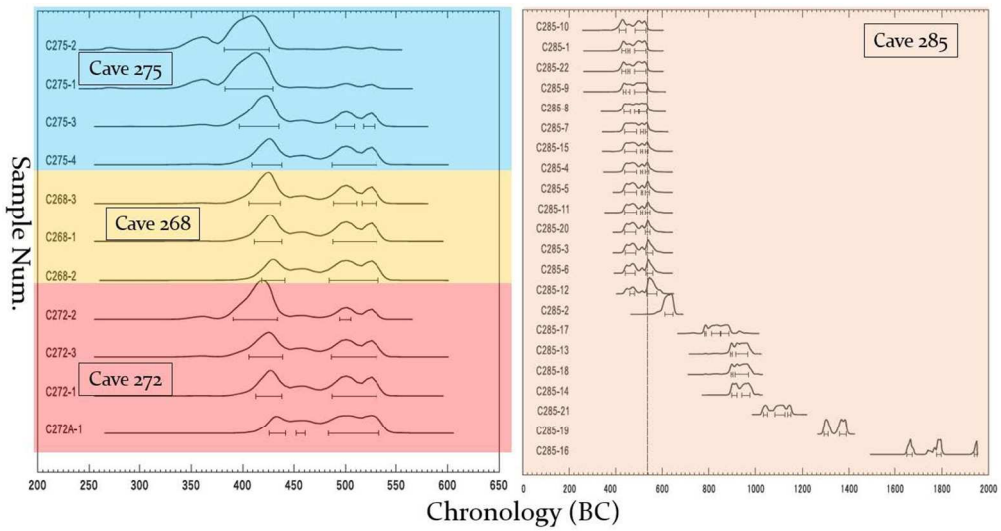


157x98mm (200 x 200 DPI)

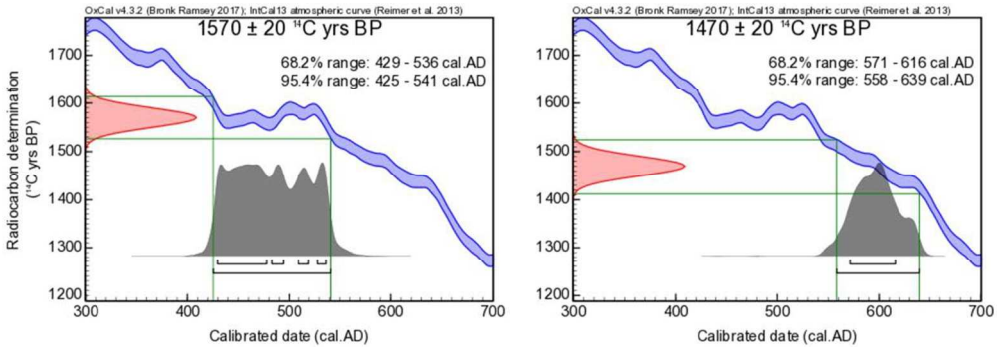
150x80mm (200 x 200 DPI)



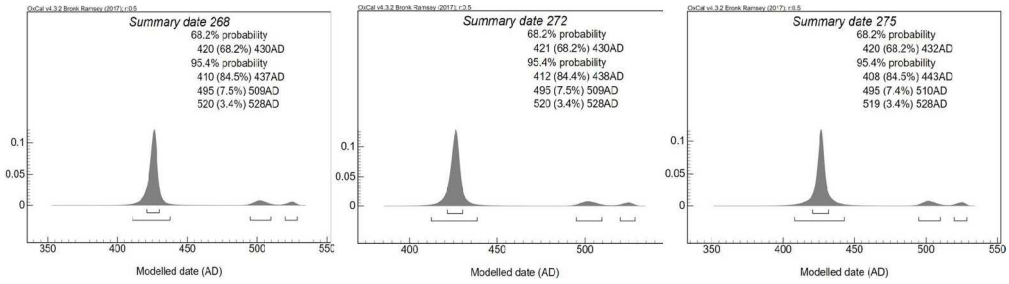
157x88mm (199 x 199 DPI)



159x84mm (204 x 204 DPI)



159x54mm (199 x 199 DPI)



211x57mm (215 x 215 DPI)