Site and ^{14}C Sample Selection for the YDB and LST

Our simulations included only those ^{14}C measurements that are associated with samples from materials located within the YDB or LST stratigraphic layers. In this section, we list the sites with ^{14}C measurements taken on samples from these layers and describe those samples. Where applicable, we detail why certain sites or samples were excluded from the simulations.

1.1. YDB Sites and ^{14}C Samples

We compiled a preliminary list of ^{14}C measurements for the YDB based on those samples that Kennett et al. (1) present as originating from within a YDB layer. From there, we assessed each primary source to ensure the accuracy of each measurement and its provenience. The table below outlines the decisions made for each sample. Two samples that Kennett et al. (1) identified as originating from the YDB, yet were excluded in our simulations, are described in rows highlighted in orange. Twenty-one rows highlighted in blue describe samples that other publications describe as associated with a YDB layer while Kennett et al. (1) indicate otherwise. We did not include these samples in our simulations.

Lab Number	Reported ^{14}C		Material	References
	μ	σ		
Abu Hureyra, Syria				
UCIAMS-105429	11,070	40	Charcoal	(2, 3)
OxA-172	10,900	200	Charred Seed	(2, 4, 5)
OxA-430	11,020	150	Charred bone	(2, 4, 5)
OxA-468	11,090	150	Charred bone	(2, 4, 5)
BM-1718R	11,140	140	Charcoal	(2, 4, 5)
Discussion				
UCIAMS-105429 is the only sample that Kennett et al. (1) report as directly associated with the YDB layer at Abu Hureyra. However, Wittke et al. (2) indicate that this sample is *not* associated with the YDB layer. Sample OxA-172 (5) was originally interpreted by Wittke et al. (2) as being located within the YDB layer at Abu Hureyra. However, Kennett et al. (1:SI8) state that OxA-172 is "adjacent" to sample UCIAMS-105429, but not within the YDB layer. We default to Kennett et al. (1) regarding the provenience of these samples and have included sample UCIAMS-105429 but not sample OxA-172 in our simulations. Bunch et al. (4) identified samples OxA-430, OxA-468, and BM-1718R as close to the YDB layer via an age-depth model, although it is not clear that these samples were located within the YDB layer. Given their unsecure spatial relationship to the Abu Hureyra YDB layer, we deferred to Wittke et al. (2) and Kennett et al. (1) and excluded these samples from our simulations.				
Arlington Canyon, California, United States				
UCIAMS-47239	11,105	30	Charcoal	(6)
UCIAMS-36308	11,095	25	Wood	(6)
UCIAMS-42816	11,095	25	Wood	(6)
UCIAMS-36307	11,070	25	Wood	(6)
UCIAMS-36961	11,440	90	Carbon elongate	(6)
UCIAMS-36960	11,185	30	Carbon spherule	(6)
UCIAMS-36962	11,110	35	Wood	(6)
UCIAMS-36959	11,075	30	Glassy carbon	(6)
Beta-161032	10,860	70	Charcoal	(6)
UCIAMS-36306	11,375	25	Wood	(6)
UCIAMS-36305	11,235	25	Wood	(6)
UCIAMS-36304	11,105	30	Wood	(6)
Discussion				

Kennett et al. (1) indicate that all 12 of these samples are associated with the YDB at Arlington Canyon. We have included all 12 measurements in our simulations.				
Barber Creek, North Carolina, United States				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Big Eddy, Missouri, United States				
AA-27486	11,900	80	Charcoal	(7)
AA-26654	10,710	85	Charcoal	(2, 8)
AA-25778	10,260	85	Wood charcoal	(7)
AA-72612	10,959	54	Charcoal	(2, 9)
Discussion				
Kennett et al. (1) designated two samples as associated with the YDB, AA-27486 and AA-26654. Wittke et al. (2) identified a peak in nanodiamonds between 327 and 335 cm below surface, leading Kennett et al. (2015) to differentiate samples within these depths from samples taken at other depths within the same stratum. In contrast, Hajic et al. (7) do not distinguish these two samples from an additional four samples within that stratum. Although located within the YDB layer, Kennett et al. (1) rejected AA-25778 as an outlier based on an OxCal age-sequence model and we have thus excluded it from our simulations. Wittke et al. (2) identify AA-72612 as associated with the YDB, although Kennett et al. (1) indicate that this sample is from a context stratigraphically above the YDB. We excluded AA-72612 from our simulations.				
Blackwater Draw, New Mexico, United States				
SMU-1880	10,780	110	Soil humate	(2, 10)
Discussion				
Wittke et al. (2) report that sample SMU-1880 is located within the YDB at Blackwater Draw (measurement originally reported by Johnson & Holliday (10)). However, Kennett et al. (1) do not include this sample in their narrative description, figures, or tables. Their supplemental OxCal code indicates that this sample was incorporated into an age-sequence model as a potential outlier. No other potential YDB samples are reported in the literature. Since Kennett et al. (1) do not explicitly identify SMU-1880 as associated with the YDB, we do not include this measurement in our simulations.				
Blackville, South Carolina, United States				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Bull Creek, Oklahoma, United States				
Beta-184854	11,070	60	Sediment organics	(11)
Discussion				
Bement et al. (11) identified a Late Holocene peak in nanodiamonds not associated with the YDB.				
Daisy Cave, California, United States				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Geldrop-Aalsterhut (Aalsterhut), Netherlands				
GrA-49524	10,840	75	Charcoal	(12)
GrA-49509	10,865	55	Charcoal	(12)
GrA-49515	11,020	75	Charcoal	(12)
GrA-49570	10,735	45	Charcoal	(12)
GrA-49521	10,765	50	Charcoal	(12)
GrA-49516	10,765	50	Charcoal	(12)
GrA-49507	10,920	50	Charcoal	(12)
GrA-49527	10,960	60	Charcoal	(12)
GrA-49529	10,755	55	Charcoal	(12)
GrA-49573	10,860	45	Charcoal	(12)
GrA-49574	10,845	45	Charcoal	(12)
GrA-49569	10,895	45	Charcoal	(12)
GrA-49514	10,880	110	Charcoal	(12)
GrA-49575	10,900	50	Charcoal	(12)
Discussion				

van Hoesel et al. (12) report 14 ^{14}C sample measurements from the charcoal-rich Usselo Horizon, which they identify as a stratigraphic marker with the potential to evaluate the Younger Dryas Impact hypothesis. Kennett et al. (1) exclude 11 of these sample measurements on the basis that they originate from the upper portion of the Usselo Horizon, which does not have nanodiamond markers. In their OxCal age-sequence model, Kennett et al. (1) placed these three YDB samples stratigraphically below the remaining 11 samples. In our simulations, we only included ^{14}C measurements from these three samples.				
Indian Creek, Montana, United States				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Lake Cuitzeo, Michoacán, Mexico				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Lake Hind, Manitoba, Canada				
UCIAMS-29317	10,610	25	Charcoal	(13)
Discussion				
Kennett et al. (1) indicate that the single YDB ^{14}C sample is located below a peat layer, citing Firestone et al. (13). Firestone et al. (13), however, do not describe the sample used for the ^{14}C measurement. Firestone et al. (13) describe black mats, microspherules, glass-like carbon, and magnetic grains associated with the YDB, but they do not describe the context of the sample.				
Lindenmeier, Colorado, United States				
I-141	10,780	135	Charcoal	(14–16)
Discussion				
Kinzie et al. (15) state that there were no ^{14}C samples obtained from the nanodiamond rich layer that they define as the YDB. They indicate that sample I-141 is stratigraphically directly above the YDB (15). We follow Kennett et al. (1), who indicate that this sample dates the YDB layer, and have included it in our simulations. I-141 was first published as 10,780±375 ^{14}C BP (14) and later corrected to 10,780±135 ^{14}C BP (16). Like Kennett et al. (1), we use the corrected error term.				
Lingen, Lower Saxony, Germany				
Beta-369246	10,870	40	Charcoal	(1)
Discussion				
Wittke et al. (2) identify the YDB layer at 42-45cmbs by an abundance of charcoal combined with the presence of impact-related spherules. Kennett et al. (1) rely on this identification for their association of this sample with the YDB.				
Lommel, Belgium				
UCIAMS-46303	11,480	100	Charcoal	(2)
N/A	10,950	50	N/A	(2, 17)
Discussion				
Kennett et al. (1) do not identify any ^{14}C samples from within the YDB, conflicting with a previous publication. Wittke et al. (2) report an AMS measurement on charcoal from the Lommel YDB layer (UCIAMS-46303). They also include an AMS measurement on charcoal of 10,950±50 ^{14}C BP, although it lacks provenience information or a laboratory ID (2). Wittke et al. (2) cite van Geel et al. (17)as the source for this measurement. However, van Geel et al. (17) appear to have estimated the ^{14}C age of the onset of the Younger Dryas rather than report a ^{14}C measurement on a sample material. This likely explains why this value is not associated with a provenience or laboratory ID, it is not a ^{14}C measurement. Kennett et al. (1) indicate that UCIAMS-46303 is stratigraphically below the YDB, and they do not include the latter ^{14}C estimate. No explanation is provided for these discrepancies with Wittke et al. (2). Due to the uncertain provenience of these ^{14}C samples, we followed Kennett et al. (1), and did not include any ^{14}C samples for the Lommel YDB in our simulations.				
Melrose, Pennsylvania, United States				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Mucuñuque, Venezuela				
No sources report ^{14}C measurements on samples recovered from the YDB layer.				
Murray Springs, Arizona, United States				
A-1045	10,760	100	Charcoal + F_2	(2, 18)

TX-1045	10,260	140	Humates + F_2	(18)
TX-1044	12,600	2440	Charcoal + F_2	(18)
TX-1462	10,930	170	Charcoal	(2, 18)
Discussion				
Wittke et al. (2) indicate that charcoal sample TX-1462 dates the YDB, but this sample is missing entirely from the narrative, figures, and tables in Kennett et al. (1). An additional conflict is that TX-1462 is apparently included in their OxCal age-sequence model for Murray Springs (1), despite being absent elsewhere in the text. Further confusion arises from the fact that Wittke et al. (2) did not include TX-1045 or TX-1044 in their age estimations of the YDB. Of note are several Murray Springs ^{14}C measurements that are incorrectly listed as OSL ages in Wittke et al. (2): Table S1 (AA-26212, A-1045, and TX-1462). We suspect that this is a typographic error that did not impact their analyses. We deferred to Kennett et al.'s (1) list of YDB ^{14}C samples for Murray Springs, thereby excluding TX-1462. Given the extreme ^{14}C measurement error for TX-1044, we also excluded this sample in the simulations presented in our main paper. We did, however, include this sample in simulations of an alternative dataset presented in Section 5.				
Ommen, Netherlands				
UCIAMS-46307	11,440	35	Charcoal	(2)
Discussion				
Kennett et al. (1)report that no ^{14}C samples were recovered from the Ommen YDB. This conflicts with Wittke et al. (2), who report that AMS sample UCIAMS-46307 was recovered directly from charcoal in the YDB. Kennett et al. (1) report that this sample originates from a context stratigraphically *below* the YDB. For our simulations, we deferred to Kennett et al. (1)and did not include any samples from Ommen.				
Santa Maira, Spain				
Beta-75225	11,020	140	Charcoal	(19)
Discussion				
We followed Kennett et al. (1) and included this single sample for the Santa Maira YDB.				
Sheriden Cave, Ohio, United States				
UCI-38249-(C)	10,915	30	Bone Clovis point	(20)
Beta-127909	10,840	80	Wood charcoal	(21)
Beta-127910	10,960	60	Wood charcoal	(21)
Discussion				
Kennett et al. (1) indicate that all 3 of these samples are associated with the YDB at Sheriden Cave, which is visible as a discontinuous ash layer. We have included all 3 measurements in our simulations.				
Talega, California, United States				
Beta-196150	11,070	50	Charcoal	(22) in (1, 2)
Discussion				
We followed Kennett et al. (1) and included this single sample for the Talega YDB.				
Topper, South Carolina, United States				
AA-100294	10,958	65	Charcoal	(23)
Goodyear (23) provided one ^{14}C sample from charcoal associated with the Clovis layer at Topper. Wittke et al. (2) define the YDB as immediately above the Clovis layer from which this date derived. We deferred to Kennett et al. (1) and included this ^{14}C sample in our simulations.				

1.2. LST Sites and ^{14}C Samples

Many of the samples described here were originally summarized in Baales et al. (2). Three rows highlighted in orange describe ^{14}C samples recovered from within the LST and summarized by Baales et al. (2) yet excluded in our simulations for reasons specified in the associated discussion paragraphs. Ten rows highlighted in blue describe ^{14}C samples recovered from stratigraphic contexts near the LST, but not from within it. Since these samples likely do not date the Laacher See volcanic eruption, we excluded them from our simulations.

	Reported ^{14}C	**Material**	**Original Reference**

Laboratory Number	μ	σ		
Brohl Valley				
HV-11774	11,075	185	Plant remains	(24)
HD-17900	11,277	26	Tree 1/4, rings 1–38	(25)
KN-3800	11,240	100	*Populus*	(26)
KN-3801	11,260	95	*Populus*	(26)
KN-3802	11,280	100	*Populus*	(26)
KN-3803	11,510	90	*Populus*	(26)
Unknown	11,085	90	Charcoal	(27, 28)
HD-17100	11,206	20	1a ca. 50 rings	(25)
HD-17145	11,223	22	3a ca. 50 rings	(25)
HD-17101	11,121	28	5b ca. 50 rings	(25)
Discussion				
Neither Frechen (27) nor Schweitzer (28) report the laboratory number for the unknown sample.				
Glees				
GrA-?	10,680	85	Charcoal	(29)
Discussion				
Frechen (29) provides the laboratory but not the sample number.				
Kruft				
HD-19098	11,063	30	*Populus* 9 rings 1-20	(25, 30)
HD-18438	11,065	22	*Populus* 8 outer rings	(25, 30)
HD-19092	11,066	28	*Populus* 9 rings 21-30	(25, 30)
HD-18622	11,073	33	*Populus* 9 rings 31-40	(25, 30)
HD-19037	11,075	28	*Populus* 9 rings 41-50	(25, 30)
HD-18648	11,037	27	*Populus* 1 rings 31-40	(25, 30)
Discussion				
Four of these measurements (HD-19098, HD-19092, HD-18622, and HD-19037) originate from the same tree (*Populus* 9). For this reason, we only included the sample corresponding to rings 1-20 (HD-19098) in our simulation. This sample logically corresponds to the only *Populus* 9 measurement that could plausibly date the calendar year of the Laacher See eruption. The other three samples must precede the eruption it in the order indicated by their ring sequences.				
Miesenhein IV				
OxA-3584	11,190	90	*Alces alces* bone	(31)
OxA-3585	11,310	95	*Alces alces* bone	(31)
OxA-3586	11,190	100	*Alces alces* bone	(31)
Discussion				
Hedges et al. (31) note that the *Alces* remains predate the Laacher See eruption as there was time for moss accumulation prior to deposition of the LST. While not enough time elapsed to fully surround the remains in the pre-LST layer, the event must necessarily have followed the death of the animal, and we have therefore excluded these measurements.				
Nette Valley				
W-525	10,800	300	Charcoal	(29)
N/A	10,880	95	Charcoal	(32)
Discussion				
In their supplementary data, van den Bogaard & Schmincke (32) note that the second ^{14}C measurement is from a personal communication with Geyh in 1976.				
Soppensee				
ETH-5290	10,760	80	Macrofossils	(33, 34)
ETH-6930	11,190	80	Macrofossils	(33, 34)
ETH-6932	10,540	150	Macrofossils	(33, 34)
ETH-12617	11,040	90	Macrofossils and wood/bark	(34)
ETH-12615	11,370	90	Macrofossils and wood/bark	(34)
ETH-12613	11,220	90	Macrofossils and wood/bark	(34)

ETH-12610	11,180	100	Macrofossils and wood/bark	(34)
Discussion				
Hajdas et al. (34) report the bottom four ^{14}C measurements on samples from 1-2 cm sediment slices that also contain ash from the Laacher See eruption. However, the relationship between the sample materials and the ash within each slice is unknown. ETH-5290 and ETH-6930 are from materials "stratigraphically close" to Laacher See ash (33), although it is unclear how close the ash is to each sample or if the samples originate from within ash. Hajdas et al. (34) subsequently estimated that ETH-5290 postdates the LST by 20 ^{14}C years and ETH-6930 predates the LST by 60 ^{14}C years. ETH-6932 was originally reported by Hajdas et al. (33), but they did not describe this sample as associated with Laacher See ash. Hajdas et al. (34) later estimated that this sample predates the LST by 140 ^{14}C years. Although these measurements all appear to originate from sample organisms that died chronologically near the Laacher See eruption, the exact chronological relationships between each sample and deposition of the LST are unclear. In some cases, samples appear to postdate the LST, which is an issue that our simulations do not account for. As such, we excluded these measurements from our simulations.				
Thelenberg				
HD-?	10,950	190	Charcoal	(29)
Discussion				
Frechen (29) provides the laboratory but not the sample number.				
Tönnisstein				
W-528	11,150	200	Charcoal	(35)
GrA-?	11,025	90	Charcoal	(29)
Discussion				
Frechen (29) provides the laboratory but not the sample number for the latter sample.				

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