Towards New Demography Proxies and Regional Chronologies: Radiocarbon Dates from Archaeological Contexts Located in the Czech Republic Covering the Period Between 10,000 BC and AD 1250

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DATA PAPER

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ABSTRACT

The dataset described in this paper represents the largest and most comprehensive collection of radiocarbon dates from the Czech Republic to date. The dataset offers 1579 samples from 357 archaeological sites dating from the Early Mesolithic (10,000 BC) to AD 1250. Published in a simple spreadsheet format, it offers researchers a quick tool for further analyses.

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radiocarbon dates; Czech Republic; database; Holocene; prehistory

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(1) OVERVIEW

CONTEXT

The dataset was created within the project "Land use, social transformations and woodland in Central European Prehistory. Modelling approaches to human-environment interactions"(in Czech "*LAnd use, SOciální změny a LESy v pravěku střední Evropy. Modelovací přístupy k interakcím člověka a životního prostředí*", acronym LASOLES) funded by the Czech Science Foundation (19-20970Y). One of the main aims of the project was to study population dynamics during prehistory and compare it with quantitative models of woodland dynamics during the Holocene in the Czech Republic. This project combined data on archaeological sites, information from available palaeoecological archives and databases of recent vegetation covering the whole study region. The project focused on the Neolithic and Bronze Age. However, in order to have a longer temporal perspective and several reference periods, we decided to use the same temporal scale (10,000 calBC–AD 1250) for the radiocarbon dataset as is available in our database of archaeological sites [1].

Prehistoric population dynamics can be studied through several approaches [2, 3], but currently the most wide-spread methods are based on summed probability distributions of radiocarbon dates [4–8].Two databases of radiocarbon dates from archaeological contexts created earlier included material from the Czech Republic [9, 10]. However, these faced several problems including spatial precision, chronological scope, missing updates for several years and insufficient coverage of data from publications written in Czech. To achieve the main aims of our project, we systematically collected all available radiocarbon dates from the study area and period, critically evaluated them and offered them for wider scientific use.

It is important to highlight that the dates we have collected came only from archaeological contexts, which means that we have excluded some radiocarbon dates produced through palaeoecological research without a direct relationship to past human activities, such as pollen records or samples from fossilized trees in river beds (see [11] for examples of fossilized trees).

SPATIAL COVERAGE

Description: The dataset spatially covers the area of the Czech Republic (borders as in 1993) which is 78,866 km^2.
Northern boundary (WGS 84): 51.055556, 14.314722
Southern boundary (WGS 84): 48.5525, 14.333056
Eastern boundary (WGS 84): 49.550278, 18.858889
Western boundary (WGS 84): 50.251944, 12.091389

TEMPORAL COVERAGE

10,000 BC–AD 1250.
To ensure a broad temporal perspective, we collected radiocarbon dates from most of the Holocene. The temporal coverage starts with the beginning of the Mesolithic around 10,000 BC, and covers the Neolithic (ca. 5,500 BC–4,000 BC), Eneolithic (ca. 4,000–2,200 BC), Bronze Age (ca. 2,200–850 BC), Iron Age (ca. 850 BC–AD 568), Early Medieval period and High Middle Ages (ca. AD 550–1250) in the local chronological system (***Table 1***).

Table 1 Archaeological periods and cultures from the area of the Czech Republic, their regional specificity, acronym code used in archaeological databases, English name, period, absolute dating and an indication if this dating differs in the regional chronologies of Bohemia and Moravia.

REGIONAL_ DETERMINATION	CODE	CULTURE_ PHASE_PERIOD	PERIOD	BOHEMIA_ DATE_MIN	BOHEMIA_ DATE_MAX	MORAVIA_ DATE_MIN	MORAVIA_ DATE_MAX	DIFFERRENCE_ BOHEMIA_ MORAVIA
NO	mezoli	Mesolithic	Mesolithic	–9600	–5401	–9600	–5401	n
NO	ne.lin	Linear Pottery Culture (LBK)	Neolithic	–5400	–4851	–5400	–4801	y
NO	ne-en	Neolithic and Eneoltihic	Neolithic and Eneoltihic	–5400	–2101	–5400	–2001	y
NO	pr.zem	Agricultural Prehistory	Neolithic-Iron Age	–5400	–371	–5400	–371	n
NO	ne.st	Early Neolithic	Neolithic	–5400	–4701	–5400	–4701	n
NO	neolit	Neolithic	Neolithic	–5400	–4301	–5400	–4301	n
NO	ne.sar	Šárec Group	Neolithic	–5000	–4901	–5000	–4901	n
Moravia	ne.zel	Želiezovce Group	Neolithic	NA	NA	–4950	–4851	NA
Bohemia	ne.obe	Oberlauterbach group	Neolithic	–5000	–4601	NA	NA	NA
NO	ne.vyp	Stroked Pottery Culture	Neolithic	–4950	–4501	–5000	–4601	y

(Contd.)

REGIONAL_ DETERMINATION	CODE	CULTURE_ PHASE_PERIOD	PERIOD	BOHEMIA_ DATE_MIN	BOHEMIA_ DATE_MAX	MORAVIA_ DATE_MIN	MORAVIA_ DATE_MAX	DIFFERRENCE_ BOHEMIA_ MORAVIA
NO	ne.mm1	Lengyel Culture, stage I	Neolithic	–4700	–4501	–4700	–4501	y
NO	ne.ml	Late Neolithic	Neolithic	–4700	–4301	–4700	–4301	y
NO	ne.len	Lengyel Culture	Neolithic	–4700	–4251	–4700	–4101	y
NO	lengye	Lengyel Culture	Neolithic	–4700	–4251	–4700	–4101	y
Moravia	ne.mm2	Lengyel Culture, stage II	Neolithic	NA	NA	–4500	–4101	NA
Moravia	en.mm2	Lengyel Culture, stage II	Eneolithic	NA	NA	–4500	–4101	NA
NO	en.ca	Proto-Eneolithic	Eneolithic	–4300	–3951	–4300	–4001	y
NO	eneoli	Eneolithic	Eneolithic	–4300	–2101	–4300	–2001	y
NO	en-br	Eneolithic and Bronze Age	Eneolithic and Bronze Age	–4300	–801	–4300	–801	n
NO	en.jor	Jordanów Culture	Eneolithic	–4300	–3951	–4150	–4051	y
Bohemia	en.mic	Michelsberg Culture	Eneolithic	–4200	–3801	NA	NA	NA
Bohemia	en.sch	Schussenried Culture	Eneolithic	–4200	–3801	NA	NA	NA
NO	en.nal	Funnel Beaker Culture	Eneolithic	–4000	–3101	–4000	–3101	n
NO	en.rbk	Retz-Bajč-Křepice Group	Eneolithic	–4000	–3501	–4000	–3501	n
NO	en.st	Early Eneolithic	Eneolithic	–3950	–3351	–4000	–3351	y
NO	en.bad	Baden Culture	Eneolithic	–3650	–3101	–3650	–3101	n
NO	en.kan	Baden Culture	Eneolithic	–3650	–3101	–3650	–3101	n
Moravia	en.ohr	Ohrozim Phase	Eneolithic	NA	NA	–3650	–3100	NA
NO	en.sd	Middle Eneolithic	Eneolithic	–3350	–2901	–3350	–3001	y
NO	en.bos	Bošáca Group	Eneolithic	–3150	–2601	–3100	–2501	y
NO	en.ml	Eneolithic Late	Eneolithic	–3100	–2151	–3100	–2501	y
Moravia	en.riv	Řivnáč Culture	Eneolithic	–3100	–2501	NA	NA	NA
NO	en.jev	Jevišovice Culture	Eneolithic	–3000	–2501	–3100	–2501	y
NO	en.kul	Globular Amphorae Culture	Eneolithic	–2900	–2451	–2900	–2551	y
NO	en.snu	Corded Ware Culture	Eneolithic	–2900	–2151	–2600	–2000	y
NO	en.cha	Cham Culture	Eneolithic	–2900	–2501	NA	NA	NA
NO	en.mlp	Late and Final Eneolithic	Eneolithic	–2900	–2151	NA	NA	NA
NO	en.zvo	Bell Beaker Culture	Eneolithic	–2650	–2151	–2500	–2151	y
NO	en.pun	Proto-Únětice Culture	Eneolithic	–2450	–1951	–2450	–1951	n
Moravia	en.po	Final Eneolithic	Eneolithic	NA	NA	–2650	–2001	NA
Moravia	en.kca	Kosihy-Čaka Group	Eneolithic and Bronze Age	NA	NA	–2500	–1701	NA

(Contd.)

REGIONAL_ DETERMINATION	CODE	CULTURE_ PHASE_PERIOD	PERIOD	BOHEMIA_ DATE_MIN	BOHEMIA_ DATE_MAX	MORAVIA_ DATE_MIN	MORAVIA_ DATE_MAX	DIFFERRENCE_ BOHEMIA_ MORAVIA
Moravia	en.chl	Chłopice Group	Eneolithic	NA	NA	–2400	–2101	NA
NO	en/br	end of the Eneolithic, beginning of the Early Bronze Age	Eneolithic and Bronze Age	–2300	–2001	–2300	–2001	n
NO	br.st	Early Bronze Age	Bronze Age	–2300	–1551	–2200	–1551	y
NO	br.a	Bronze Age, stage A	Bronze Age	–2300	–1551	–2200	–1551	y
NO	br.s-s	Early and Middle Bronze Age	Bronze Age	–2300	–1251	–2200	–1301	y
NO	bronz	Bronze Age	Bronze Age	–2300	–751	–2200	–801	y
NO	br-ha	Bronze Age and Hallstatt Period	Bronze Age and Iron Age	–2300	–371	–2200	–371	y
NO	br.une	Únětice Culture	Bronze Age	–2300	–1651	–2100	–1651	y
Moravia	br.nit	Nitra Culture	Bronze Age	NA	NA	–2250	–1701	NA
NO	br.vet	Věteřov Group	Bronze Age	–1900	–1451	–1900	–1451	n
NO	br.s/s	end of the Early Bronze Age, beginning of the Middle Bronze Age	Bronze Age	–1700	–1551	–1650	–1551	y
NO	br.sd	Middle Bronze Age	Bronze Age	–1700	–1251	–1650	–1301	y
NO	br.moh	Tumulus Culture	Bronze Age	–1650	–1301	–1650	–1301	y
NO	br.msd	Middle Danube Tumulus Culture	Bronze Age	–1650	–1251	–1650	–1301	y
Bohemia	br.mcf	Bohemian-Palatinate Tumulus Culture	Bronze Age	–1650	–1251	NA	NA	NA
NO	br.a/b	Bronze Age, stage A/B	Bronze Age	–1600	–1551	–1600	–1551	n
NO	br.b	Bronze Age, stage B	Bronze Age	–1600	–1501	–1600	–1501	n
NO	br.c	Bronze Age, stage C	Bronze Age	–1500	–1301	–1500	–1301	n
NO	br.luz	Lusatian Culture	Bronze Age	–1300	–1026	–1300	–1101	y
NO	ppole	Urnfield Culture	Bronze Age	–1300	–801	–1300	–801	y
NO	br.d	Bronze Age, stage D	Bronze Age	–1300	–1201	–1300	–1201	n
NO	br.m-h	Late Bronze Age and Hallstatt Period	Bronze Age and Iron Age	–1300	–371	–1300	–371	n
Bohemia	br.sas	Saxonian – Lusatian Culture	Bronze Age	–1300	–751	NA	NA	NA
Moravia	br.vel	Velatice Culture	Bronze Age	NA	NA	–1300	–1001	NA
NO	br.ml	Late Bronze Age	Bronze Age	–1250	–1001	–1300	–1001	y
NO	br.m-p	Late and Final Bronze Age	Bronze Age	–1250	–751	–1300	–801	y
Bohemia	br.kno	Knovíz Culture	Bronze Age	–1250	–951	NA	NA	NA
Bohemia	br.mil	Milaveč Culture	Bronze Age	–1250	–976	NA	NA	NA
NO	br.ha	stage Hallstatt A	Bronze Age	–1200	–1001	–1200	–1001	n

(Contd.)

REGIONAL_ DETERMINATION	CODE	CULTURE_ PHASE_PERIOD	PERIOD	BOHEMIA_ DATE_MIN	BOHEMIA_ DATE_MAX	MORAVIA_ DATE_MIN	MORAVIA_ DATE_MAX	DIFFERRENCE_ BOHEMIA_ MORAVIA
Bohemia	br.che	Cheb Group	Bronze Age	–1200	–1001	NA	NA	NA
NO	pp.slp	Silesian-Platěnice Culture, Silesian and Platěnice Phases	Bronze Age and Iron Age	–1100	–451	–1100	–371	y
NO	br.slp	Silesian-Platěnice Culture, Silesian Phase	Bronze Age	–1100	–801	–1100	–801	n
NO	br.pod	Podolí Culture	Bronze Age	–1025	–751	–1000	–751	y
Bohemia	br.sti	Štítary Culture	Bronze Age	–1025	–751	NA	NA	NA
NO	br.po	Final Bronze Age	Bronze Age	–1000	–751	–1000	–801	y
NO	br.poz	Final Bronze Age	Bronze Age	–1000	–751	–1000	–801	y
NO	br.hb	stage Hallstatt B	Bronze Age	–1000	–801	–1000	–801	n
Bohemia	br.nyn	Nynice Culture	Bronze Age	–975	–751	NA	NA	NA
Bohemia	br.bil	Billendorf Culture	Bronze Age and Iron Age	–950	–451	NA	NA	NA
NO	br/ha	transition between the Bronze Age and the Hallstatt Period	Bronze Age and Iron Age	–850	–751	–850	–751	y
NO	ha.slp	Silesian-Platěnice Culture, Platěnice Phase	Iron Age	–800	–371	–800	–371	y
Moravia	ha.hor	Horákov Culture	Iron Age	NA	NA	–800	–461	NA
NO	ha-la	Hallstatt and La Tene Periods	Iron Age	–800	–31	–800	–21	y
NO	ha.st	Early Hallstatt Period	Iron Age	–800	–541	–800	–541	n
NO	halsta	Hallstatt Period	Iron Age	–800	–371	–800	–371	n
NO	ha.c	stage Hallstatt C	Bronze Age	–800	–601	–800	–601	n
NO	ha.bil	Billendorf Culture, HaC stage	Iron Age	–800	–626	NA	NA	NA
NO	ha.byl	Bylany Culture	Iron Age	–800	–531	NA	NA	NA
NO	ha.moh	Hallstatt Tumulus Culture	Iron Age	–800	–531	NA	NA	NA
NO	ha.dla	Hallstatt Period, Stage D / La Tene Period A	Iron Age	–625	–371	–480	–371	y
NO	ha.d	Hallstatt Period, stage D	Iron Age	–600	–461	–600	–451	y
NO	ha.ml	Late Hallstatt Period	Iron Age	–540	–461	–600	–501	y
NO	la.cas	Early La Tene Period	Iron Age	–480	–371	–480	–391	y
NO	la.a	La Tene Period, stage A	Iron Age	–480	–371	–480	–391	y
NO	laten	La Tene Period	Iron Age	–480	–31	–480	–21	y
NO	la-ri	La Tene and Roman Periods	Iron Age	–480	400	–480	380	y

(Contd.)

REGIONAL_ DETERMINATION	CODE	CULTURE_ PHASE_PERIOD	PERIOD	BOHEMIA_ DATE_MIN	BOHEMIA_ DATE_MAX	MORAVIA_ DATE_MIN	MORAVIA_ DATE_MAX	DIFFERRENCE_ BOHEMIA_ MORAVIA
NO	ha.po	Final Hallstatt Period	Iron Age	–460	–371	–500	–371	y
Bohemia	pp.tur	Turnov Type	Iron Age	–410	–321	NA	NA	NA
NO	la.b-d	La Tene Period, stages B-D	Iron Age	–400	–26	–400	–21	y
NO	la.b	La Tene Period, stage B	Iron Age	–400	–251	–400	–251	n
Bohemia	la.pod	Podmokly Group	Iron Age	–400	–131	NA	NA	NA
Moravia	la.puc	Púchov Culture	Iron Age	NA	NA	–175	–21	NA
NO	la.sd	Middle La Tene Period	Iron Age	–370	–171	–390	–250	y
NO	la.c	La Tene Period, stage C	Iron Age	–250	–131	–260	–116	y
NO	la.m-p	Late and Final La Tene Period	Iron Age	–170	–31	–170	–21	y
NO	la.d	La Tene Period, stage D	Iron Age	–130	–26	–125	–21	y
NO	la.po	Final La Tene Period	Iron Age	–130	–31	–125	–21	y
Bohemia	la.kob	Kobyly Group	Iron Age	–110	–91	NA	NA	NA
Moravia	la.prw	Przeworsk Culture	Iron Age	NA	NA	–100	–1	NA
NO	ri.a	Roman Period, stage A	Roman Period	–30	–5	–30	30	y
NO	rim	Roman Period	Roman Period	–30	400	–30	380	y
NO	ri.st	Early Roman Period	Roman Period	–30	180	–30	180	n
NO	ri-sn	Roman and Migration Periods	Roman and Migration Periods	–30	580	–30	580	n
Bohemia	ri.pla	Plaňany Type	Roman Period	–30	–6	NA	NA	NA
NO	ri.b	Roman Period, stage B	Roman Period	10	180	31	180	y
Moravia	ri.pzw	Przeworsk Culture	Roman	NA	NA	161	420	NA
NO	ri.c	Roman Period, stage C	Roman Period	181	400	181	380	y
NO	ri.ml	Late Roman Period	Roman Period	181	400	181	380	y
NO	sn.st	Early Migration Period	Migration Period	381	480	381	490	y
NO	snarod	Migration Period	Migration Period	381	580	381	580	n
NO	sn.ml	Late Migration Period	Migration Period	481	580	481	580	n
NO	rs.1	Early Medieval Period 1	Medieval Period	581	650	551	650	y
NO	rs.cas	Early Medieval Period 1	Medieval Period	581	650	551	650	y

(Contd.)

REGIONAL_ DETERMINATION	CODE	CULTURE_ PHASE_PERIOD	PERIOD	BOHEMIA_ DATE_MIN	BOHEMIA_ DATE_MAX	MORAVIA_ DATE_MIN	MORAVIA_ DATE_MAX	DIFFERRENCE_ BOHEMIA_ MORAVIA
NO	rstred	Early Medieval Period	Medieval Period	581	1200	551	1200	y
NO	stredo	Medieval Period	Medieval Period	581	1500	551	1500	y
NO	st-no	Medieval and Post-Medieval Periods	Medieval and Post-Medieval Periods	581	1800	551	1800	y
NO	rs.2	Early Medieval Period 2	Medieval Period	651	800	651	800	n
NO	rs.hra	Early Medieval Periods 2–4	Medieval Period	651	1200	651	1200	n
NO	rs.2–4	Early Medieval Periods 2–4	Medieval Period	651	1200	651	1200	n
NO	rs.3	Early Medieval Period 3	Medieval Period	801	950	801	950	y
NO	rs.4	Early Medieval Period 4	Medieval Period	951	1200	951	1200	y
NO	rs/vs	Early Medieval Period / High Middle Ages	Medieval Period	1151	1250	1176	1225	y
NO	vs.1	High Middle Ages 1	Medieval Period	1201	1300	1201	1275	y
NO	vstred	High Middle Ages	Medieval Period	1201	1500	1201	1500	y
NO	vs.2	High Middle Ages 2	Medieval Period	1301	1500	1276	1410	y

(2) METHODS

SAMPLING STRATEGY AND STEPS

We collected the radiocarbon dates in three steps. Firstly, we collected and merged uncalibrated dates from the two already existing online datasets. The RADON dataset created and managed at Kiel University provides data from the Neolithic to the Early Bronze Age in central Europe and Scandinavia [9]. Archaeological Chronometry in Slovakia (Bratislava dataset) spatially covers not only Slovakia, but also the Czech Republic and the neighbouring regions of Austria, Poland and Hungary [10]. In contrast to the RADON database, this latter dataset covers a broader temporal span – from the Mesolithic to the Middle Ages. From both databases, we extracted the available radiocarbon dates for the area of the Czech Republic. Neither datasets have been updated after 2016 and 2014, respectively, therefore an update was crucially needed. As a result, 1579 radiocarbon dates were collected, of which 36 came from the RADON dataset, 511 from the Bratislava dataset and 1032 were compiled by us.

Secondly, as we had indications that neither of the above-mentioned databases included all published dates, we collected the remaining radiocarbon dates through a comprehensive search of Czech archaeological literature published since 2000. We went through all national and regional journals as well as monographic series. The number of articles and monographs cited in our database exceeds 200.

Lastly, we standardized the data and the terminology (relative chronology and context categorisation), added some variables (see Quality control) and adjusted localisation wherever possible (see below for details).

Each radiocarbon date received its own unique ID (column "ID_Date"), and geographical coordinates of the site or the civil parish in which the sample was obtained (see below for details). Sampled archaeological contexts were categorized by behavioural activities (column "Activity_CZ" in Czech, column "Activity_ENG" in English) and an area of activities (col. "Site_category_CZ"/"Site_category_ENG") as defined in the Archaeological Database of Bohemia [12], Archaeological Map of the Czech Republic [13] and used in our previous database of sites [1]. The archaeological periodisation of the contexts originating in published literature was similarly standardised (e.g. "Neolithic", col. "Context_dating_AMCR"). Because our dataset partially follows the terminology commonly used in Czech large-scale archaeological databases, we used both Czech and English terminology.

QUALITY CONTROL

Considering that the data came from various primary and secondary sources, it was necessary to carry out steps providing basic quality control and adjustment of the data. In the first step, duplicates were deleted and the laboratory codes were unified into a specific format ("ABC-1234") to avoid duplication issues in the future. Dates that were published without sufficient information (e.g. without uncalibrated date) were deleted or labelled as dating errors (see below).

The quality of samples leading to possible dating errors varied also through time and from site to site. Furthermore, some archaeological features may have been contaminated by later activities; or some features contained datable material (e.g. bones, charcoal) but did not supply the archaeologists with chronologically specific artefacts. In the inclusive approach used here, problematic measurements like these were not deleted but instead labelled as dating errors (col. "Dating_error") and the nature of their error was described in separate a column (col. "Description_of_dating_error"). This will allow future researchers to filter out these samples or, conversely, to keep them during their statistical analyses, depending on their own criteria.

The most common dating error was the discrepancy between the radiocarbon dating and the typochronological dating of the same archaeological context. In several cases, the archaeological context was without any chronologically sensitive artefacts, so its dating relied solely on radiocarbon dates.

The Bratislava dataset [10] provided notes on measurements if there were any circumstances that could indicate contamination of the sample. We kept these notes (col. Measurement_note_Bratislava) and labelled these samples as dating errors as well.

It is to be noted that we were not able to verify every single date from secondary sources with information published in primary sources. We managed to correct errors or highlight possible errors only when they were obvious to us or when the authors of the secondary source indicated them. Future users of our database can verify chosen data using the list of primary sources (col. Primary_Source).

Subsequently, geographical coordinates were adjusted. The RADON database [9] provided geographical coordinates of the samples, but it was unclear whether these coordinates were representing archaeological sites, centroids of civil parishes or centres of towns and villages. For this reason, the coordinates from the RADON dataset were not used at all. In addition, the Bratislava dataset did not provide any geographical coordinates. As a result, we added manually the coordinates of sites wherever possible. If accurate geographical coordinates were not obtainable from existing literature, coordinates of the geometric centre of a civil parish were used (col. Localisation_accuracy). The dataset is therefore still of use for spatial analyses at a larger spatial scale.

During our own data collection, we dealt with spatial accuracy similarly. Some papers provided geographical coordinates of the sites with high accuracy (within a few metres), while some sites had to be localised manually from maps and field plans published in other papers. For some data, the only available geographical information was the civil parish in which they were obtained. In these cases, we used the geometrical centre of the civil parish in the manner described in the previous paragraph.

CONSTRAINTS

Some radiocarbon dates were not published with sufficient amount of information so we were not able to fill all variables of each observation in our database.

(3) DATASET DESCRIPTION

The whole dataset consists of one table where each radiocarbon measurement has its own line and is described by several variables in columns. At the end of August 2021, the dataset consisted of 1579 measurements from 357 sites. Radiocarbon dates are not distributed evenly in space (***Figure 1***) but cluster mostly in regions with a long tradition of archaeological research and/or in regions rich in archaeological finds. The concentration of the radiocarbon dates around cities with major archaeological research institutes (Prague, Brno, Olomouc) is also apparent. The majority of sites provided only one measurement. However, there are a few sites with a long history of archaeological research, such as Mikulovice u Pardubic, Vliněves, Vedrovice, Kolín, or the mining area in Krumlovský les, which provided an extraordinarily large number of measurements (***Figure 1***). The number of measurements also varied in different time periods: the majority of the samples come from the Neolithic, Eneolithic and Early Bronze Age, while few come from the Roman Period (***Figure 2***). Combining this information into one graph (***Figure 3***), we observe that a few individual sites dated to the Neolithic, Eneolithic and Bronze Age provide us with an extraordinary amount of radiocarbon dates, whereas sites from other periods were dated by significantly lower numbers of radiocarbon dates.

OBJECT NAME

LASOLES_14C_database.csv
LASOLES_14C_references.csv
LASOLES_14C_references.rdf
LASOLES_14C_cultures_periods.csv

DATA TYPE

Primary, secondary, processed and interpreted data.

DATASET VARIABLES

ID_Date

Unique ID for each date in form "CzArch_123".

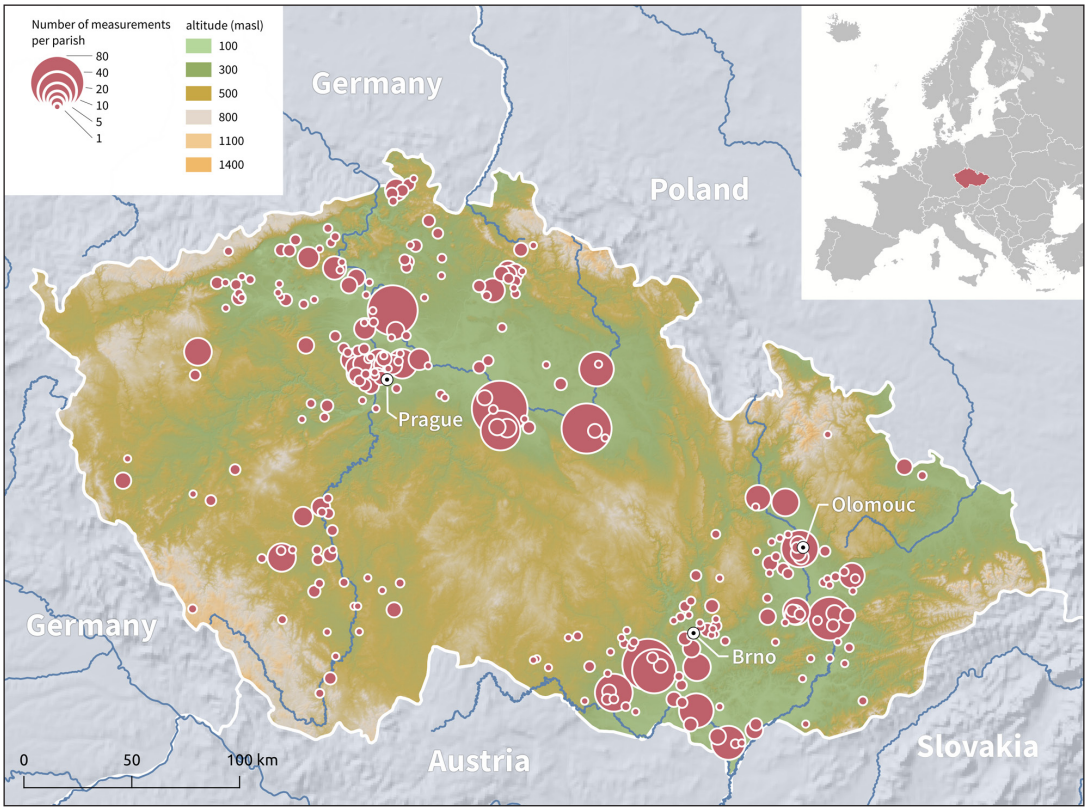

Figure 1 Map of the Czech Republic with pink dots showing the spatial distribution of radiocarbon dates. Dots represent civil parishes from which radiocarbon measurements were collected. The size of dots represents the number of measurements in each parish.

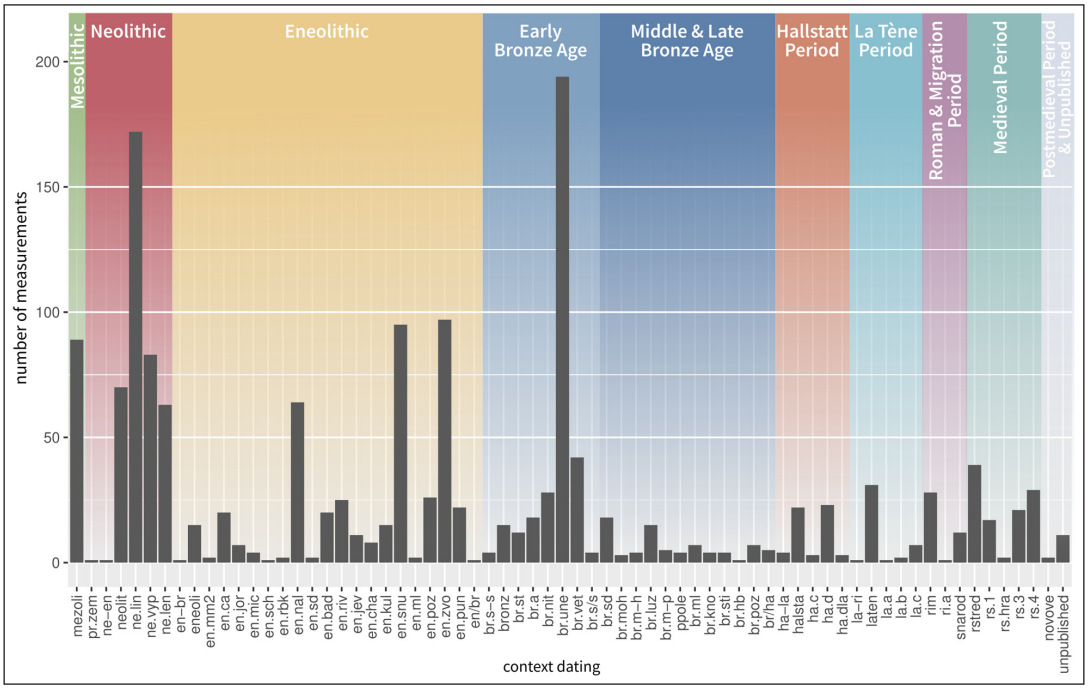

Figure 2 Barplot showing the number of measurements divided into categories based on typochronological dating of contexts from which the measurement samples were required. For coding explanation see Table 1.

Lab_code

Seeing that the form of publishing laboratory codes varied in different databases, journals and papers, we unified them into a common form: ABC-1234 (or ABC-1234-A, ABC-1234-1,...). However, in some cases the laboratory code was not published in the original publication. In such cases, we added the value 'unpublished' in this field to the respective radiocarbon date.

Laboratory

Standardized name of the laboratory, as listed in *https://radiocarbon.webhost.uits.arizona.edu/sites/default/*

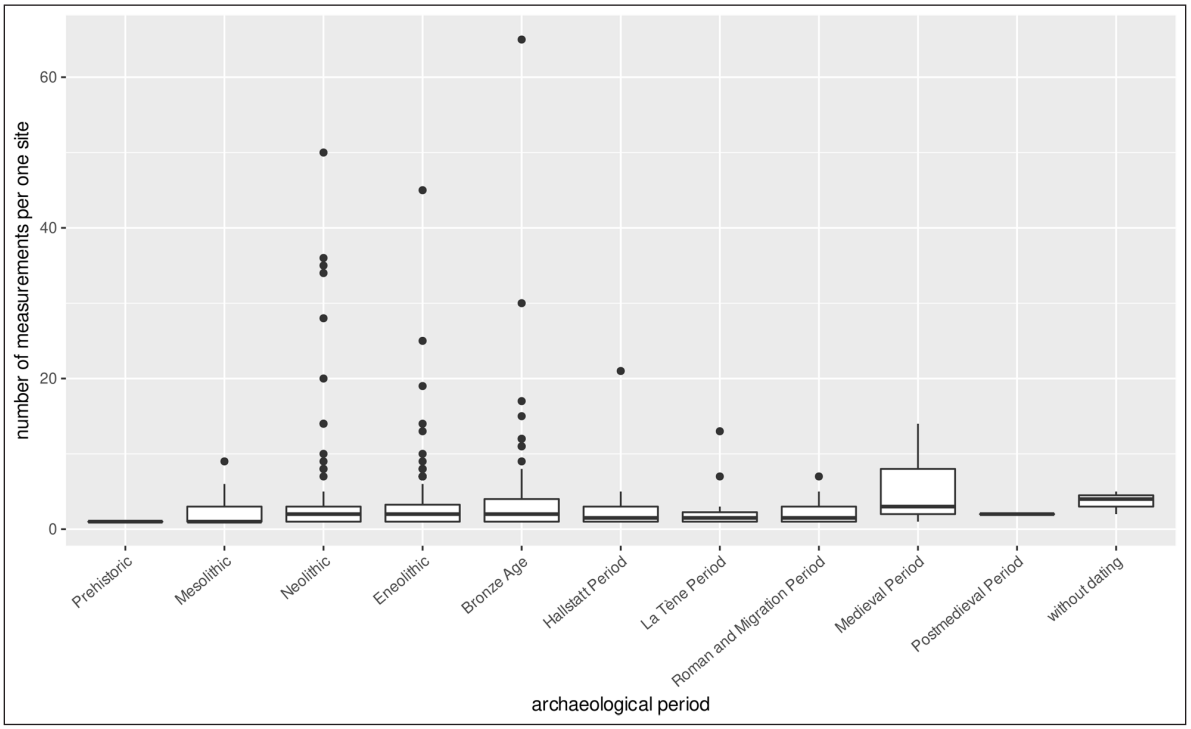

Figure 3 Boxplot showing the number of measurements at single sites, divided by archaeological periods. It is apparent that the number of measurements in the vast majority of sites is smaller than 5. Higher variation in the Neolithic, Eneolithic and Bronze Age is caused by larger numbers of measurements in these periods.

files/Labs-2021_09_03.pdf, with some exceptions, such as "MOC" (samples from the Czech town of Most from an unknown laboratory), "DSH" (CIRCE – Center for Isotopic Research on Cultural and Environmental heritage, Italy), "UGAMS"(University of Georgia "AMS" laboratory), DeA (AMS laboratory in Debrecen, Hungary, or in one single case "By" (unknown laboratory or a typo?).

Age14C

The uncalibrated conventional radiocarbon date. In a few cases, the sample was too small for measurement (ID: CzArch_28, CzArch_29, CzArch_1422, CzArch_1423). This fact is marked as "not measurable".

SD14C

Standard deviation. In one case, the value of the standard deviation was unpublished (ID: CzArch_27). This fact is marked as "unpublished". In two cases mentioned above, the sample was too small to be measured (ID: CzArch_ 28, CzArch_29). This fact is marked here as "not measurable".

Delta_13C

Delta 13C values of radiocarbon sample.

Measurement_note_Bratislava

Note on sample measurement originally from the Bratislava dataset.

Country

Code "CZ" was added to all records, since all measurements were from the Czech Republic. This could help other researchers to recognise the origin of the sample after merging this database with databases from other countries.

District, Civil_parish, Civil_parish_ID, Local_part

Localisation of the archaeological site according to the administrative division of the Czech Republic. Civil parish (in Czech "katastrální území") is the smallest administrative unit in the Czech Republic. Each civil parish has its unique ID number, as assigned by the Czech authorities. Local part is mentioned in cases when a civil parish is large and subdivided.

Site_name, Site_note

Name of the archaeological site. Although the name is in most cases arbitrary, we tried to use the names as established in archaeological literature or as ascribed by the excavators. In several cases the site name used in literature does not correspond to the name of a civil parish. Keeping both information combined with geographical coordinates ensures future clarity in site identification.

Please note that Site_name has only indicative meaning and in many cases the name of the actual site is missing in the literature. It may be described vaguely as "hillfort", "brickyard", or a site with the same name exists in different civil parishes. We tended not to create new site names to avoid confusion with other Czech archaeological databases. Therefore, for the precise identification of individual sites the variable Site_ID should be used, e.g. when performing quantitative analyses.

We defined a site as a spatially continuous set of archaeological finds, in which the finds can originate

from one or more periods and could be functionally different. Nevertheless, we understand that the term 'site' is quite ambiguous and that in most cases we relied on observations by the archaeologists during their field research and on information in primary sources. Moreover, we understand that a site is not only the result of past human activities but also of formation processes and, last but not least, of fieldwork methods [1, 13]).

Site_ID
Unique ID for each site. In most cases unique sites were successfully identified. However, some publications did not allow for this. In uncertain cases, where it was unclear whether the samples belong to one or more sites, we tended to separate them into different sites as published in the primary source. In other cases, we merged some sites together, when it was clear that they belonged to one large site with spatially continuous areas with archaeological features. This is, for example, the case of the medieval hillfort site Pohansko (Site_ID 30) with three large parts that are more than 1000 m apart but with the area between them continuously occupied. The three parts were given the same Site_ID but are still distinguishable by different site names ("Pohansko – Jižní **Předhradí**", "Pohansko – VĬmožský dvorec",...) and by their own coordinates.

Context_name; Context_type; Context_structure
Context name corresponds in most cases to the original numbering of features during the excavations. Context type refers to functional categories of excavated features (e.g. grave, pit, hearth, posthole) and context structure is assigned to a sample when it comes from a larger structure such as a house, enclosure or a burial mound. All this information comes from the literature or the databases used as sources of radiocarbon dates. We checked all of them in primary sources and updated them.

Activity_CZ, Activity_ENG
Basic behavioral category of human activity related to a sample, e.g. residential, funeral, mining, hoarding. Czech coding is used in the column "Activity_CZ" and an English translation in the column "Activity_ENG".

Site_category_CZ, Site_category_ENG
Basic functional category of an activity area related to a sample, such as "settlement", "graveyard", or "hillfort". The activity area can differ from the activity, e.g. one can have a sample of human remains from funeral activity excavated at a graveyard but also at a settlement. Czech coding is used in the column "Site_category_CZ" and an English translation in the column "Site_category_ENG".

Context_dating
Simple description of dating as used in the primary sources. Mostly assignment to a period, phase or an archaeological culture. In cases when chronologically sensitive artefacts were missing, as described above, the date was deduced from the radiocarbon date by the authors of the primary sources.

Context_dating_AMCR
The information on typochronological dating of contexts was standardised. We used the coding system for archaeological periods, phases and archaeological cultures characteristic and routinely used in the Archaeological Map of Czech Republic (***Table 1***).

Dating_error
Binary variable marking the presence or absence of a dating error. Presence is marked when there is evidence or even suspicion that the dating sample could be contaminated, or when the radiocarbon date is different from the typochronological date based on artefacts from the context or other dating methods. This evaluation was made mainly by the authors of the primary sources but in cases of obvious discrepancy between radiocarbon dating and typochronological dating also by us. These instances were marked in the column as yes/no option (y/n).

Description_of_dating_error
Type of the dating error. This field allows future researchers to filter out or leave specific errors in their analyses according to their standards or needs. The most common errors are contamination, unexpected dates or samples without associated artefacts.

Context_note
Additional information available from secondary sources or added by us.

Sample_name
Name of the radiocarbon sample as published in the primary sources. Typically, a specific number assigned to a sample during the excavation or laboratory work.

Sample_material
Categorical variable of the material of the radiocarbon sample.

Sample_species
If the sampled material was determined to the level of a biological species or genera, this information was recorded in Latin here.

Sample_note
Additional information on the sample.

Primary_Source
List of references where the original information can be found.

Secondary_Source
Reference on secondary dataset from which the radiocarbon date was added to our dataset ("Bratislava" [10]; "RADON" [9]; "Lasoles" – radiocarbon dates collected during our project).

Latitude_WGS84, Longitude_WGS84
Geographical coordinates in the WGS84 system. "Latitude_WGS84" = decimal degrees of WGS84 latitude (Y-axis), "Longitude_WGS84" = decimal degrees of WGS84 longitude (X-axis)

Localisation_accuracy
Categorical variable on the accuracy of geographical localisation of the radiocarbon sample: "parish" – Geographical coordinates are localised in the centroid of a civil parish; "site" – Geographical coordinates are localised approximately to the centre of an excavated area.

FORMAT NAMES AND VERSIONS
.csv
.rdf

CREATION DATES
The database was created between the 1st of January 2019 and the 31st of August 2021.

DATASET CREATORS
Peter Tkáč was responsible for creating and managing the whole dataset. Jan Kolář added some records, suggested several structural changes and acquired funding. Both wrote the paper describing the dataset.

LANGUAGE
English

LICENSE

REPOSITORY LOCATION
10.5281/zenodo.5728242

PUBLICATION DATE
07/10/2021

(4) REUSE POTENTIAL

Large radiocarbon datasets serve currently for creating palaeodemographic proxies for periods without written records. However, due to their common research bias, the European radiocarbon datasets often cover only specific periods (e.g. Neolithic), and do not provide a long-term perspective. The presented dataset is currently the largest publicly available collection of archaeological radiocarbon dates from the Czech Republic covering most of the Holocene. It was created to analyse and quantify human activities over several thousands of years and it can be used as a complementary data source to databases of sites and finds from the same region [1]. Radiocarbon dates are routinely used in the form of summed probability distribution to estimate past population dynamics [14–18]. The outcomes in the form of summed probability distribution are easily quantifiable and comparable with other proxies, especially from the natural sciences (***Figure 4***).

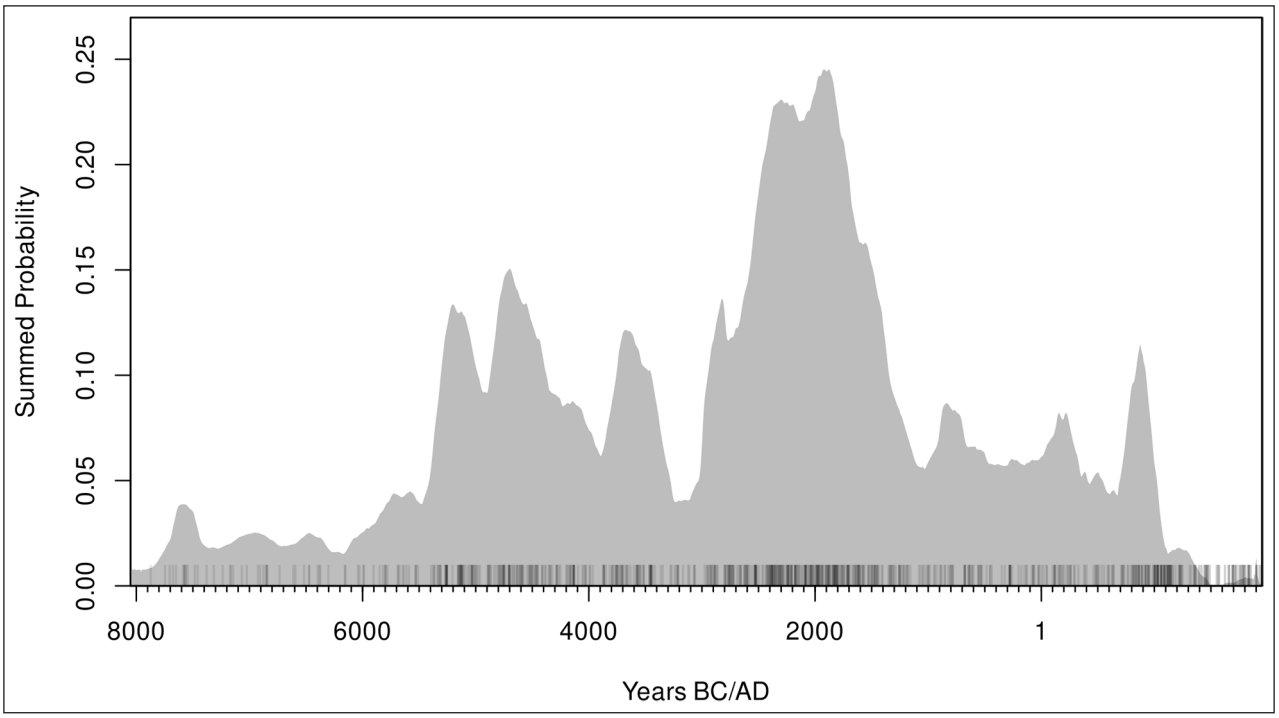

Figure 4 Summed Probability Distribution of radiocarbon dates can be used as population dynamics proxy. Binning method was used here to avoid bias caused by sites with large amounts of data [8].

As the dataset contains plenty of additional information on the samples, it allows for a wide range of uses in various analyses. For example, the determined species of the sampled organisms can be used to analyse the temporal dynamics of crop use, the spread of farming and animal husbandry [similarly to 19] or the spread of certain burial customs. Moreover, in combination with the usual archaeological data on artefacts, burial customs, architecture or other material remains dated by the collected radiocarbon dates, the presented dataset can be useful for revising regional archaeological chronologies and constructing new ones, possibly applying novel theoretical and computing approaches [e.g. 20].

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COMPETING INTERESTS

The authors have no competing interests to declare.

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