Ralf Lehmphul, Bernhard Heeb, Alexandru Szentmiklosi †, Astrid Stobbe and Rüdiger Krause

The Genesis of the Fortification of Corneşti-Iarcuri near the Mureş Lower Course (Romanian Banat) – A Phase Model on the Chronology of the Settlement and Fortification Structures

The large fortification of Cornești-Iarcuri is located on the Mureș River in Romania and comprises four rings of defensive ramparts. With the outermost rampart encircling a total area of 17.65 km², Cornești-Iarcuri is thus considered the largest Bronze Age fortification in Europe. New intensive research began in 2007 with the six-year project "Investigations on settlement structures and the chronology of the Late Bronze Age fortification of Cornești-Iarcuri in Romanian Banat", funded by the German Research Foundation (DFG). The project terminated in the autumn of 2017. Now the goal is to evaluate the data collected during the last eleven years and to develop the first syntheses. As part of the new excavations, a total of 109 radiocarbon datings from different contexts (ramparts, ditches, pits, house structures, etc.) were obtained. The subsequent phase model based upon these data essentially refers to the dating of ramparts I and II and to pits associated with house contexts. Thus, it enables a site biography for Cornești-Iarcuri to be outlined for the first time and four settlement phases to be distinguished.

Introduction

The large fortification of Corneşti-Iarcuri is located on the eastern edge of the Great Hungarian Plain on the lower reaches of the Mureş River, where the westernmost foothills of the Carpathian Mountains join the lowlands. It encompasses four ring-shaped, earth-wood ramparts, with the outermost rampart enclosing a total area of 17.65 km². In view of the immensity, Corneşti-Iarcuri is considered the largest Bronze Age fortified enclosure in Europe. An intensive phase of new research began in 2007 and was funded by the German Research Foundation (DFG).[1] In the course of the excavation campaigns during the past eleven years samples for radiocarbon dating were taken from the respective different find contexts and structures, for example, from ramparts, house structures, pits and the infill of ditches in front of the ramparts. These efforts were meant to achieve, on the one hand, more precision in datings, while, on the other hand, to enable the chronological assignment of finds associated with these contexts using methods that are independent of typology. The questions also changed according to the investigated structures. In the beginning investigations were mainly concerned with the basic dating of the complex.[2] Was Corneşti-Iarcuri indeed a fortification of the Bronze Age, and if this were the case, what was the temporal relationship between the different defensive ramparts? Were they erected in succession, at the same time or immediately one after the other, or were they built during different epochs in time? How intensively and at what times was the fortification system in use?

With the increase in radiocarbon datings and finally the growing certainty that the fortification does indeed date to the Late Bronze Age, the focal approach ultimately became on achieving the most precise dating of the individual fortification

---

1 The project "Investigations on settlement structure and chronology of the Late Bronze Age fortress Corneşti-Iarcuri in Romanian Banat" ("Untersuchungen zu den Siedlungsstrukturen und zur Chronologie der spätbronzezeitlichen Befestigung von Corneşti-Iarcuri im rumänischen Banat") is funded by the DFG (Deutsche Forschungsgemeinschaft). Applicant and director of the project: Prof. Dr. Rüdiger Krause, PD Dr. Astrid Stobbe, both of the Institut für Archäologische Wissenschaften der Goethe-Universität Frankfurt, and Prof. Dr. Matthias Wemhoff, Museum für Vor- und Frühgeschichte Berlin.

2 Heeb *et al.* 2008.

rings and phases, as well as their relationship to the evidence for settlement structures. Intensified research and accompanying combination of different methods (surface prospection, geomagnetic measurements, excavations) have brought forth an increased density in the evidence of massive traces of fire in the first two fortification rings (I and II). In addition, comprehensive geomagnetic measurements revealed that not only had the first and second rampart burned completely, but also large areas of the settlement structures. These results were supported by surface prospections as well as individual excavation sections, from which comparably large amounts of burned clay were retrieved. With that, the indications increased to at least one, possibly two or even several conflagrations, in whose course large areas in the centre of the fortified complex were destroyed.[3]

Following the premise that there was one single fire event and in view of the excavated features and their dating, the question arose as to how the individual building phases and use-horizons prior to and after the fire can be reconstructed. An important basis for answering this question is the most precise datings, yet even more essential, the context-related datings and the chronological models based upon them. Even though the dating intervals distinguished in 14C measurements remain uncertain due to their probabilistic character,[4] the chronological modelling and the resulting relationship between the fortification rings and settlement structures are the foundation for the reconstruction of the genesis of settlement and the interpretations based on it.

A further aspect plays an important role in the genesis of settlement in Cornești-Iarcuri and the reconstruction of phases, events and use-horizons: the unusual dimensions of the fortification system and its location in a naturally divided landscape. As a rule, terms such as 'site' or 'findspot' circumscribe local, closely delimited areas. Yet in the case of Cornești-Iarcuri, these terms fall short. This particular complex is part of a landscape, designated the Vinga Plain, on the eastern fringe of the Great Hungarian Plain. The outermost of the four defensive ramparts (Ring IV) encompasses a total area of 17.65 km^2, in view of which the complex is considered the largest Bronze Age fortification in Europe.[5] The dimensions of the outermost Ring IV can only be seen from an aerial perspective. In addition to the three smaller fortification ramparts – of which the smallest Ring I still has a diameter of one kilometre – Ring IV includes an entire landscape, which was inhabited in different periods. In the centre of the landscape are two valleys running northeast-southwest, which divide not only the landscape but also the complex itself. Whereas Ring I lies on the plain between the two valleys and is flanked by them, Ring II encloses or transects parts of the northern and the southern valley (**Fig. 1**). In particular, the valley to the south – the "Valea Lacului" – is still fed by a spring, whose source lies in the centre of Ring II. This was a major factor when this site was chosen for settling, not only during the Late Bronze Age, but also during all of prehistory; moreover, it was crucial to the conception of the fortification system and the structure of the settlement. This aspect and the associated methodological issues for the evaluation of individual 14C data from features, as well as the conception of a chronological phase model with an emphasis on the relationships between the first two fortification rings (I and II) and their inner settlement, will be discussed in the following.

Preliminary methodical and source-critical remarks

Of the 15 excavation trenches that were installed as part of the various projects and campaigns in recent research history on the Cornești-Iarcuri site, 12 trenches have been radiocarbon dated (**Fig. 1**). The remaining three trenches have been dated basing on find material and structural contexts (trenches IX and XV) or were not dated at all due to the lack of diagnostic finds (trench III).[6]

With the completion of field research in early autumn 2017 and continuing with the datings and later dates for individual contexts, we now dispose over a total of 109 context-related radiocarbon datings.[7] The number of data per trench varies considerably. The contexts of the individual features were sampled in different ways: according to

3 Lehmphul *et al.* 2018, 43.
4 Schier 2013, 268.
5 Lehmphul *et al.* 2018.
6 Heeb *et al.* 2012, 54.
7 In the following, reference to the date Poz-53350: 7490 ± 90 will be made solely in statistical considerations, but not graphically represented due to its high age.

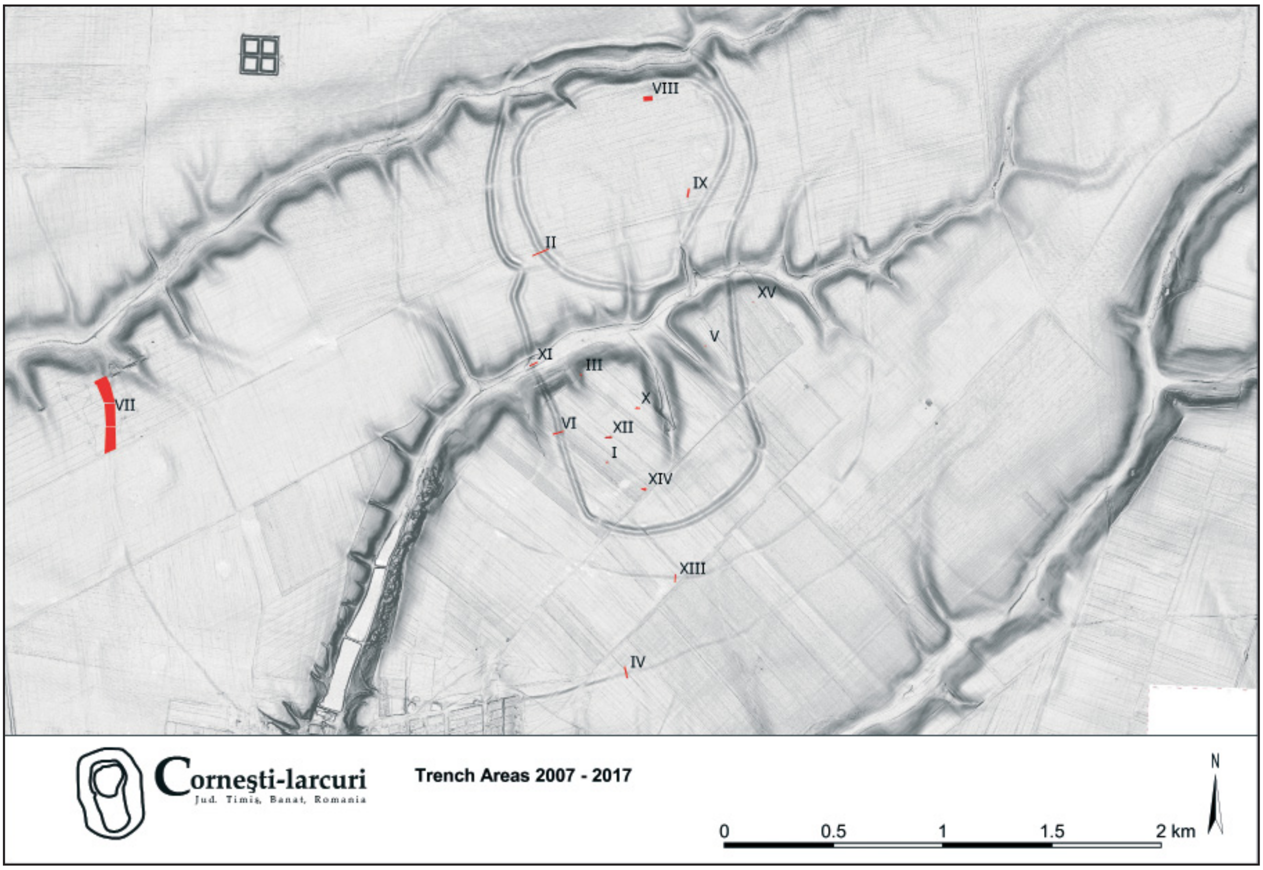

Fig. 1 Corneşti-Iarcuri. Location of excavation trenches I to XV from the past eleven years of field research (graphic: Corneşti Project, D. Schäffler)

the size of trenches, the presence of datable sample material, the density of feature contexts, the specific research question or the specific feature context. The samples were analysed and radiocarbon dated in three laboratories: Poznan Radiocarbon Laboratory in Poznan, Beta Analytic in Miami/ Florida and Klaus-Tschira-Archäometrie-Zentrum in Mannheim, with the AMS method (Accelerator Mass Spectrometry) (**Tab. 1**).

Until 2013 radiocarbon dating was carried out only on the basis of charcoal samples. The focus during that phase of research was mainly on the dating of the ramparts and/or the ditches in front of them, the latter which as a rule held very few finds. The strategy employed in taking samples was enhanced by the partially burnt fortification rings, because this condition offered datable material, occasionally found still *in situ*.[8]

Already partly in 2013 and then completely during the excavation campaign of 2015,[9] the sampling strategy was adjusted and from then on solely macro remains were dated, which had been archaeobotanically identified beforehand. This short-lived sample material provided not only reliable datings, but also aided in avoiding potential sources of error and subsequent unclear results due to the problem of the 'old wood effect' in long-lived oak wood. However, especially in the field campaign of 2017 an aspect became apparent in short-lived macro remains, which is of importance from a source-critical view: Several features which could be definitely assigned to the Late Bronze Age basing on the pottery, provided not only Late Bronze Age dates, but also considerably older dates (Early Bronze Age) as well as younger dates (Sarmatian times). The causes for this large range are complex and likely due primarily to taphonomic processes. Consequently, questions arose not only as to when the dated material was removed from its life-cycle,[10] but also

8 Szentmiklosi *et al.* 2011 Fig. 5.

9 Trench IX was excavated in 2014 basing on the geomagnetic images. Contrary to expectations, the structures discovered there proved to be from the Copper Age (Tiszapolgár culture, phase B2). Scientific datings on these Copper Age contexts are planned.

10 It is at that moment that the measurable decay of the radioactive isotope 14C begins.

Trench designation	Year	Investigated structures	No. of 14C datings
I	2007	Settlement trench in Ring II (posts and pits)	1
II	2008	Ring I	5
III	2010	Settlement trench in Ring II (pits, posts, not dated)	–
IV	2011	Ring IV	6
V	2011	Settlement trench in Ring II, ring structure (ascribed to the Vatina culture)	2
VI	2012	Ring II	10
VII	2013	Rescue excavation in Ring IV (area of gate)	7
VIII	2013	Settlement trench (house structures, pits) in Ring I	26
IX	2014	Settlement trench in Ring I (Copper Age)	–
X	2015	Settlement trench in Ring II (house context, pits)	6
XI	2016	Ring II	10
XII	2016	Settlement trench in Ring II (house structures, pits)	15
XIII	2017	Ring III and ditch	3
XIV	2017	Settlement trench in Ring II (house structures, pits)	18
XV	2017	Settlement trench outside of Ring II (storage pit, material of the Sarmatian period)	–

Tab. 1. Cornești-Iarcuri. Trench designation, excavation year, investigated structures and number of radiocarbon datings obtained (n = 109)

when and how it finally arrived in the dated context. To approach this problem, aspects which can influence the chronological model-building will be discussed in the following.

Because of the large number of datings, statistical tendencies can be derived to a certain extent, which also can influence the model-building as probable assumptions *(priore)*.[11] In particular, macro remains of only few millimetres' size are subject to a certain carbonisation probabilistic. The presupposition is that seeds and stored reserves of different cultivated plants represent valuable goods, because they ensured the subsistence of prehistoric societies during winter months. Thus, aside from, for example, accidents that could lead to fire in a house, the probability of carbonisation can be graded as low. Oppositely, combustibility will increase rapidly in the course of an extensive fire event, such as that which we could discern in Cornești-Iarcuri. In the moment of combustion most of the seeds and stored goods burn completely. However, the probability also increases that many and probably also many contemporaneous seeds are carbonised at the same time. They then become part of taphonomic processes, or in the course of increased soil dynamics they frequently enter features and cultural layers.[12]

The increase in combustibility is reflected in events (fire events, fire places, field fires), which – depending on the particular event – resulted in varying large amounts of charred macro remains. A second decisive factor is the probability of dislocation. This can be discerned only after several datings have been made from relative-chronologically secure feature contexts. Viewing the great number of 14C datings in Cornești-Iarcuri, statistically measurable tendencies towards an increased dislocation are recognisable, as well. And with these tendencies the aforementioned problem of the widely differing datings within a single feature context becomes clear: They reflect rather a taphonomic process, involving the secondary – possibly frequent – dislocation of dated macro remains.

In Cornești-Iarcuri the discrepancy between the datings based on macro remains and those based on charcoal is twice as high. The gradation of sample contexts in four categories according to qual-

11 *'Priore'* can be differentiated as informative and not informative. Especially informative *'priore'* are those that are often based on stratigraphic information (cp. Seidel *et al.* 2016, 233. 247).

12 The extent to which these considerations are quantifiable basing on settlement contexts in Cornești-Iarcuri must still be shown in further analyses.

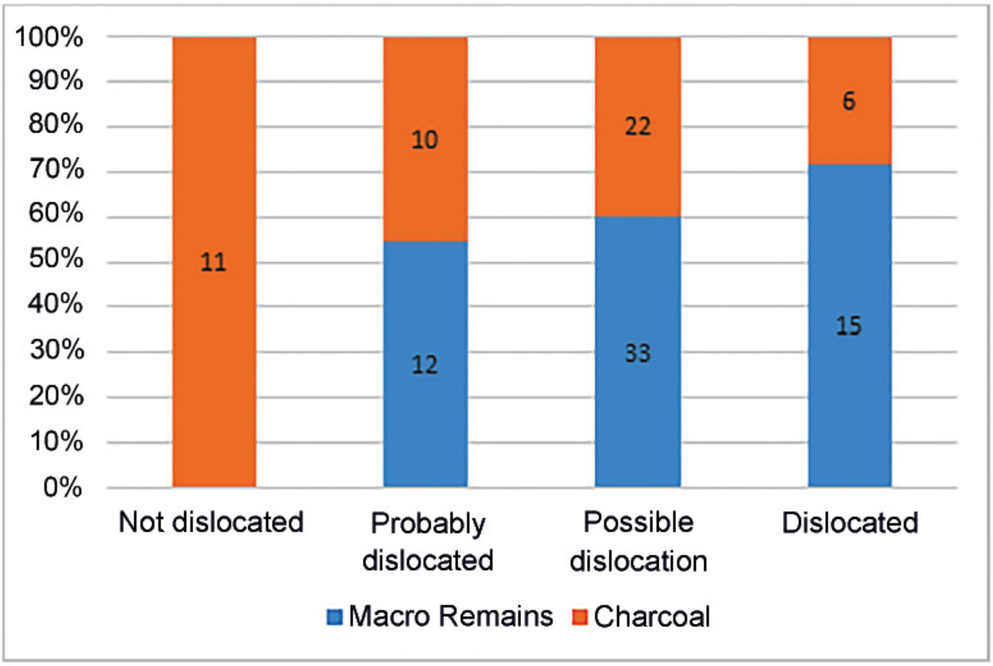

Fig. 2 Corneşti-Iarcuri. Probability of dislocation among 14C datings gained from charcoal and macro remains (graphic: Corneşti Project, R. Lehmphul)

ity ranges from 'definitely not dislocated' samples to 'definitely dislocated' samples; recognisable in this scale is the tendential increase in the probability of dislocation among macro remains. In the case of macro remains classified as 'dislocated', this is expressed in the comparably numerous as datings classified as 'outliers' (**Fig. 2**, outer right). The marked difference between charcoal and macro remains in Corneşti-Iarcuri can be explained, on the one hand, by soil conditions in the surrounding landscape. However, on the other hand, concealed here is yet another aspect: the datings also allow conclusions about the settlement history of the landscape within the fortification as well as in its surroundings. The evidently locally limited appearance of accumulations of 'outliers' among securely classified contexts of the Late Bronze Age and Early Iron Age is thus a disadvantage for an accurate chronological assignment of structures, yet this can be viewed as a positive aspect for the evaluation of archaeological settlement processes. These can be used as indirect settlement indicators, as horizontal displacement over long distances is rather unlikely.

First, some remarks about the prevalent soil conditions in the landscape around Corneşti-Iarcuri. The soils were recently classified as chernozems and phaeozems.[13] Characteristic features of these black earth soils – aside from their dark colour which can be ascribed to their high humus content – are a thorough mixing caused by bioturbation as well as an increased content of chalk and clay. Especially the latter in combination with specific three-layered clay minerals, smectites, leads to strong swelling and shrinking processes, which together with heightened bioturbation cause a marked soil dynamic and increased, mostly polygonal crack formation (**Fig. 3**).[14]

Considering the thorough mixing of soils ever since the erection of Ring I and lasting three and one-half thousand years, amplified even more in the course of intensive agricultural activities (deep ploughing, heavy machinery), it is quite probable that some of the merely millimetre-sized macro remains were dislocated over time, even if only locally. They ultimately settled through soil dynamics along the soil cracks in the fill of the features.[15] Moreover, it is likely that some of the older dated macro remains probably entered the feature contexts already during the erection of ramparts, houses and pits during the Late Bronze Age and/or Early Iron Age.

[13] Nykamp *et al.* 2015, 78; see Gumnior/Stobbe in this volume.

[14] Details on this in Gumnior/Stobbe in this volume; Fritzsch in this volume.

[15] In 2015 a particularly long and deep dry soil crack could be followed as deep as underneath level 2, that is, ca. 0.5 m below the recent surface.

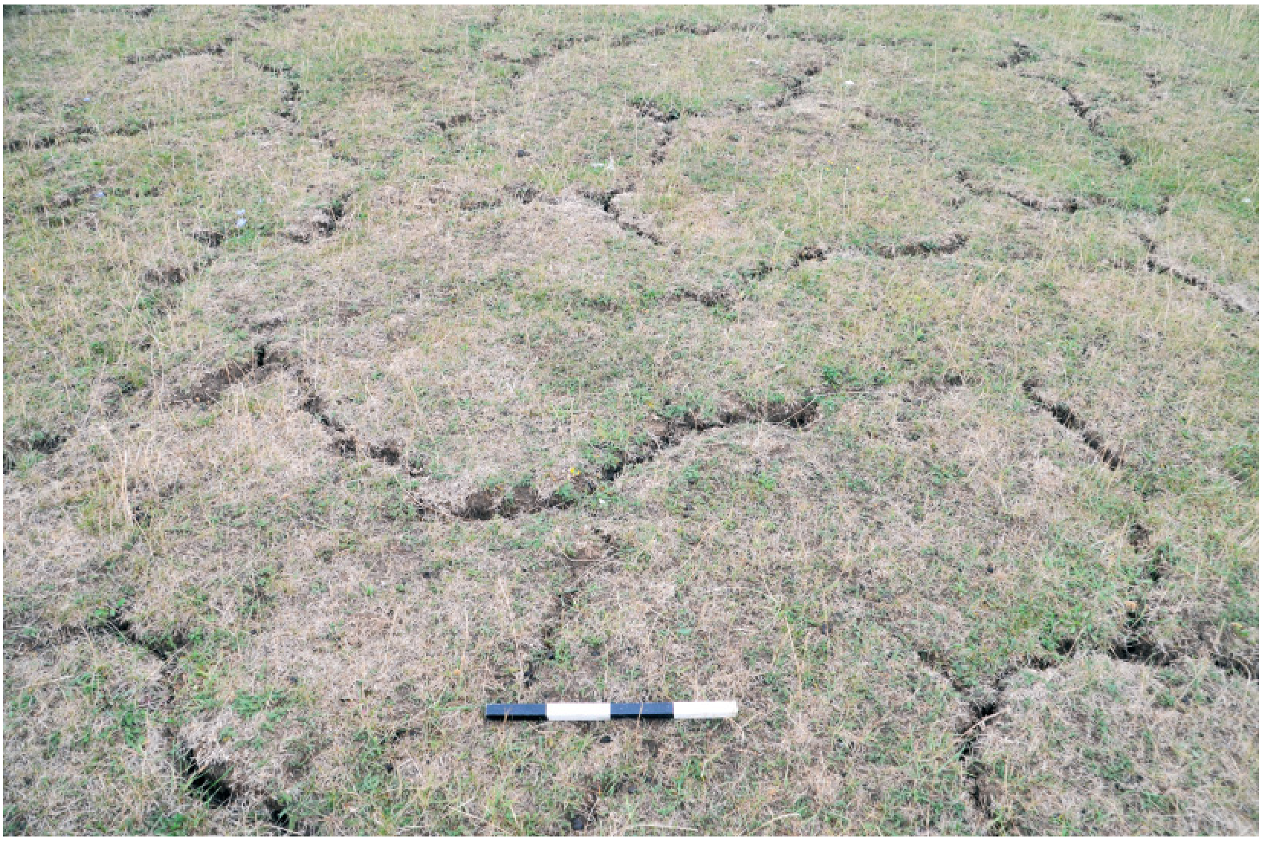

Fig. 3 Corneşti-Iarcuri. Cracks in the soil recorded in the late summer of 2017 in *Valea Lacului* at the height of Ring III (photo: R. Lehmphul)

The connection between processes of soil formation and the potentially possible dislocation of macro remains is of relevance from a methodical view and in view of the evaluation scientific datings, yet it holds a certain potential error. Consequently, since 2015 complex features have been sampled several times and at different levels of their filling, in order to be able to identify as well as to evaluate 'outliers' as such in these contexts.

The settlement history of the landscape around Corneşti-Iarcuri in the light of radiocarbon datings

The 2σ-probability range of hitherto gained dating intervals, with reference to the course of the calibration curve, but also without a differentiated observation of the specific sample contexts, sample material or Bayesian modelling, nevertheless allows the recognition of an increased density of dates in the second half of the 2nd millennium BC (**Fig. 4**). Almost 85 % of the datings fall into this period. The find contexts of the datings derive from fortification structures, settlement pits, house contexts and cultural layers in Corneşti-Iarcuri. In addition, other periods have also been documented on the basis of the datings, which confirm the settlement of the landscape in and around Iarcuri in different prehistoric and early historic epochs and periods. Until now concrete feature contexts from the Copper Age and pre-Roman Iron Age or early Roman Iron Age have been found in trenches IX and XV (**Tab. 1**).

As mentioned above, the different datings for macro remains offer the opportunity to make further statements about the settlement history of the landscape within and around Corneşti-Iarcuri. Aside from time, context and location, the datings also reflect the factor of space. The spatial distribution of 14C dates provides an additional approach for explaining the locally varying concentration of single time periods in specific areas. Hence, the dates can basically be drawn in reference – and this without clearly defined contexts – as indicators of settlement activities before the erection of the ramparts and their use-phases as well as afterwards, that is, after the site was abandoned. **Fig. 5** illustrates the distribution of the datings gained from archaeological fieldwork, de-

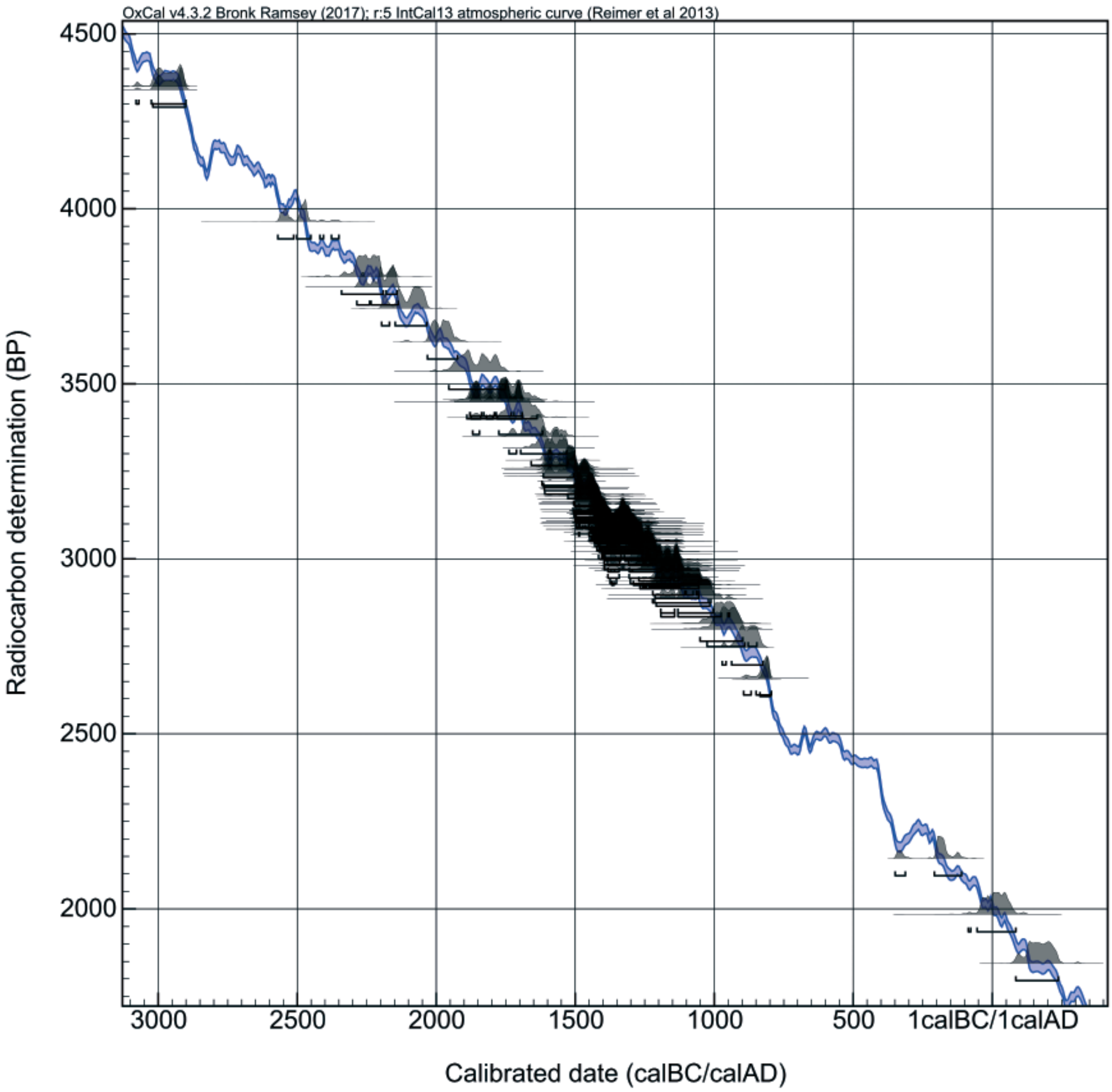

Fig. 4 Corneşti-Iarcuri. Distribution of the 2σ dating intervals of 108 datings in the course of the calibration curve (graphic: Corneşti Project, R. Lehmphul)

noted in colour according to epochs and periods as well as the transition to the individual periods (for example, Middle/Late Bronze Age).[16]

Thereby it becomes clear that the diversity among considerably older and younger datings in the settlement trenches XII and XIV is especially great. The map illustrates a distribution, which – following the aforementioned reasons – is less likely the result of concrete contextual association, and derives far more from spatial relationships. The excavation trenches lie at a short distance from the above-mentioned spring. It is located at the beginning of the erosion gully in the centre of Ring II, south of the main valley, and was a central if not decisive factor in the supply of water for settlement communities during all attested periods in time. This is confirmed not only by the datings for the Early-, Middle- and Late Bronze Age or even Sarmatian times that were gained from charred remains of cultural plants, but also the Copper Age settlement. Thus, already in 2009, by means of geomagnetic survey, it was possible to confirm the presence of a settlement of the Copper Age Tiszapolgár culture, divided in several concentric ditches immediately east of the water source.[17]

[16] Exceptions are trench IX (Copper Age) and trench XV (Sarmatian period). Their contexts were dated solely by means of the find material.

[17] Szentmiklosi *et al*. 2011, 832 Fig. 14.

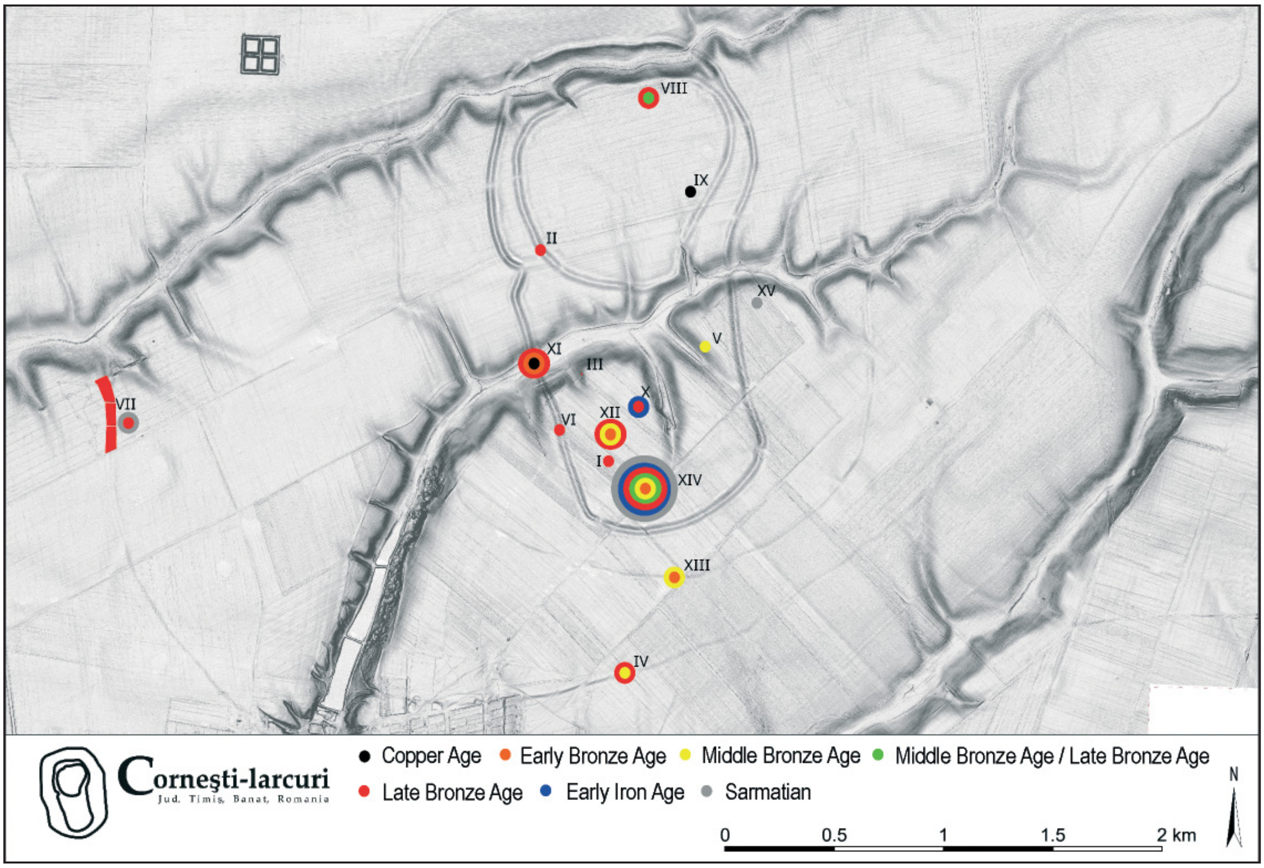

Fig. 5 Corneşti-Iarcuri. Spatial distribution of 14C datings for the individual excavation trenches; colours denote epochs and periods (graphic: Corneşti Project, D. Schäffler/R. Lehmphul)

In addition to local associations, evidently diachronic relationships show up in the spatial distribution as well, which can be used to reconstruct settlement focal points. Following the premise that the carbonisation probability of macro remains, when comparing the settlement with the settlement periphery, must have been higher within the settlements: Therefore, the datings reflect a spatial component, which allows conclusions to be made about the older and younger settlement areas. It remains to be seen in the future whether and to what extent the temporal division of finds from surface prospections can be confirmed by means of scientific data on observed associations and considerations.

The Late Bronze Age to Early Iron Age dating of Corneşti-Iarcuri

Fig. 6 shows the sum calibration of all 14C datings, from which an estimation of the probability density for a particular time period can be deduced, during which the majority of events took place. The distribution has one to three distinct peaks between 1500 and 1250 cal BC. As will be shown, present in these datings or in this time period is also the majority of dated timbers from Ring I and II. This is also the period of time in which the archaeologically, meaning stratigraphically proven phase B of Ring I[18] as well as Ring II, which was investigated in two trenches, were erected.

Moreover, the course of the sum calibration shows that both prior to as well as after this time period there were activities on the ramparts as well as in the settlement area enclosed by them. Compared to datings for the Copper Age and the Early and Middle Bronze Age, the probability density is significantly higher and reaches a peaked increase again during the Early Iron Age, around 800 BC.

All in all, a total of 91 datings are directly associated with Late Bronze Age to Early Iron Age contexts and originate from stratified pit fills, construction elements of the ramparts, the fills of the ditches in front of them, cultural layers and several house structures belonging to Rings I and II (i.e., posts, ditches and pits). Accordingly, these data show several events as well as entire construction and

[18] Cp. Szentmiklosi *et al.* 2011 Fig. 4.5.

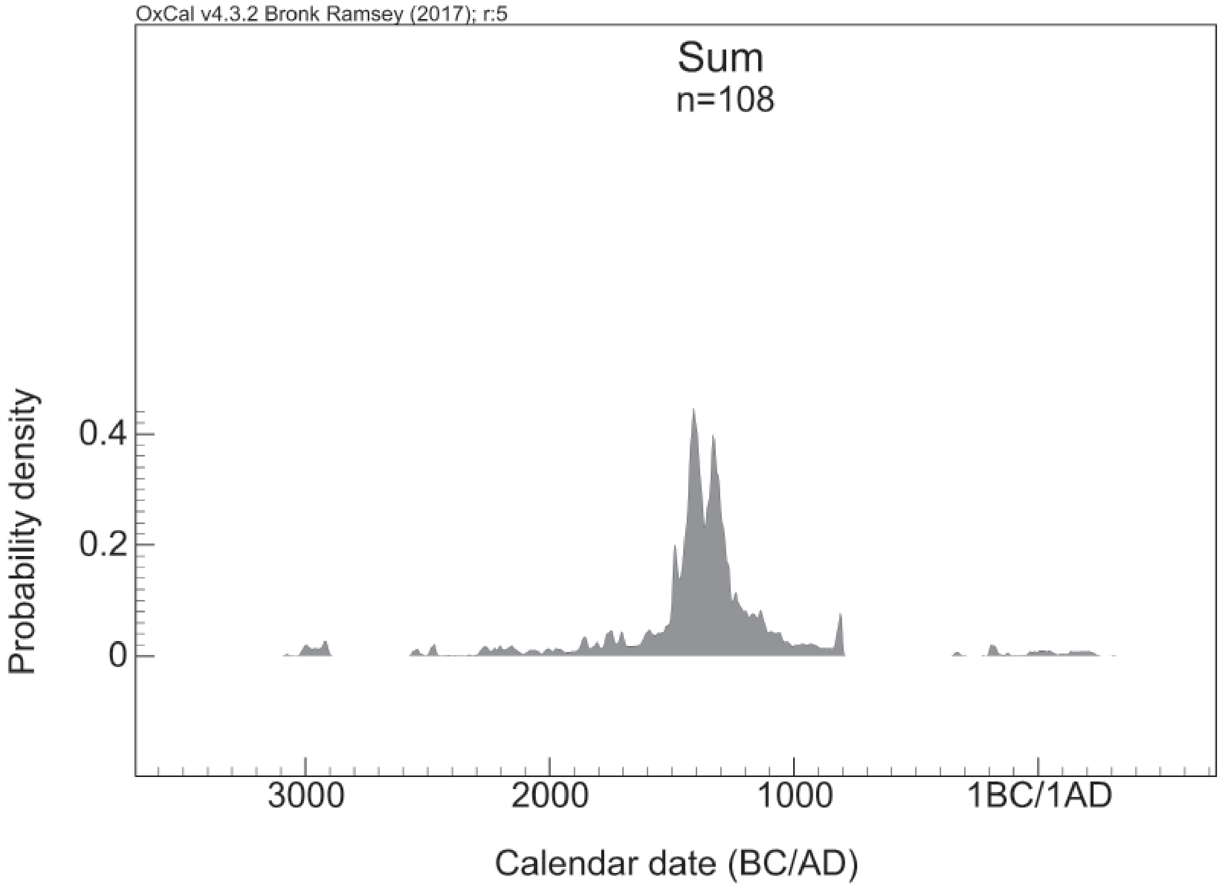

Fig. 6 Corneşti-Iarcuri. Sum calibration of 108 14C datings

use-horizons. The majority of construction phases is usually linked with charcoal data, that is, either building timber that was found *in situ* or charcoal found in the fill of postholes. Theoretically, these might vary due to the 'old wood effect', because the wane (the last original outer edge of the wood) is seldom recognisable and/or is datable only on the charred remains of planks and trunks; or the samples from the fill of postholes are too fragmented.[19] In contrast, the short-lived macro remnants are based on one-year events. The initial substance of the sample is more distinct and, compared to charcoal, can provide more reliable datings.

Fig. 7 shows the sum calibration of the 91 Late Bronze- to Early Iron Age datings, differentiated according to macro remains (n=50) and charcoal (n=41). Direct comparison enables a better judgment of the potential differences in the course of the curves. For example, a systematic offset in the curves would be an indication of an 'old wood effect'; then the charcoal datings would be significantly older than those for macro remains, and that although both samples theoretically could originate from the same time period. In comparison, there are hardly any differences between the two kinds of samples. Both the majority of the data obtained from charcoal and the macro remains are scattered with a significantly increased probability density between 1500 and 1250 cal BC. As the dating intervals and with them also the sum calibration are dependent upon the course of the calibration curve and the plateaus in it, so-called 'wiggles', the data always are indistinct to a certain extent. If there is indeed an 'old wood effect', it will not show at least in the majority of datings. This leads to the conclusion that the events leading to the construction of phase B of Ring I, to the construction of Ring II and also to those events in which the majority of the macro remains charred, have a certain temporal proximity to each other. Evidently, they fall together in one and the same section of the calibration curve – without a recognisable 'old wood effect' (**Fig. 7**).

For further discussion additional information is needed, with which the dating probabilities of the

[19] Determination of wood structure (hardwood, sapwood) was not undertaken.

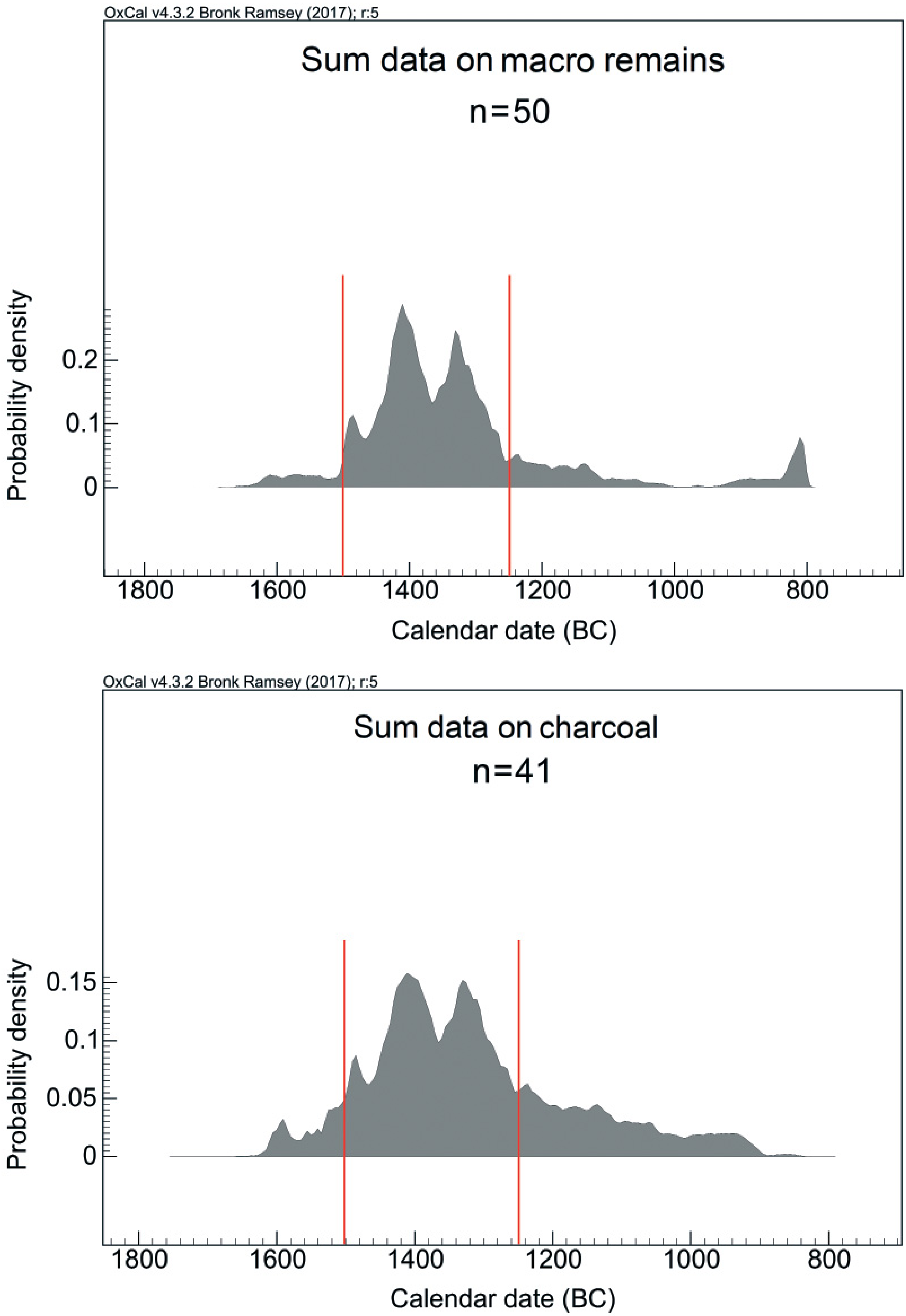

Fig. 7. Corneşti-Iarcuri. Sum calibration of 91 Late Bronze- to Early Iron Age 14C datings, differentiated according to macro remains (n=50) and charcoal (n=41) (graphic: Corneşti Project, R. Lehmphul)

Lab-No.	Sample material	Context	14C Age [Year BP]	±	cal BC 1-sigma	cal BC 2-sigma
Poz-45667	Charcoal	Front of the rampart, beam No. 2 (phase B)	3070	30	1393–1287	1415–1236
BETA-258645	Charcoal	Context 327, wood from the inner fortification (phase A), dislocated	2970	40	1263–1128	1375–1055
BETA-258642	Charcoal	Front of the rampart, beam no. 11, construction (phase B)	3040	40	1378–1211	1397–1128
BETA-258641	Charcoal	Front of the rampart, beam no. 7, construction (phase B)	3110	40	1420–1301	1449–1260
BETA-258640	Charcoal	Front of the rampart, beam no. 6, construction (phase B)	3060	40	1390–1260	1417–1208

Tab. 2. Corneşti-Iarcuri. 14C dates (unmodelled) with laboratory number, sample material and feature context from trench II (2008)

intervals can be more differentiated or delimited. This would include, for example, stratified contexts of different samples from the fill of a feature, like a pit, or construction elements, such as several datings for a house structure or still interconnected rampart structures. With the assistance of these archaeological contexts and pre-suppositions, improved posteriori probabilities (that is, shorter intervals) can be modelled from the dating probabilities using Bayesian statistics. All of the datings discussed and modelled here in the following are in reference to the 2σ-range, because solely the 2σ-range enables an argumentatively justifiable measure for the probability with the general valid significance level in statistics of 95 %.[20] The modelled intervals shown in the tables are rounded off to five years. Smaller deviations of a few years can appear in every modelling or statistical calculation.[21] Furthermore, the modelled intervals are presented in italic script, following convention, in order that they are distinguishable from calibrated datings.

Context of samples from Ring I (trench II)

Tab. 2 presents the feature contexts and the sampled material as well as the datings (unmodelled) from trench II in Ring I. With the exception of "BETA-258645", all of the samples can be stratigraphically assigned to phase B of this first rampart. Some of the datings have already been published,[22] and will be augmented by a new date ("Poz-45667"). The latter date, like the other dates, comes from a charred beam, found horizontal *in situ*, in phase B in Ring I.

The construction or the erection of the investigated section of the rampart represents –according to the pre-supposition – an event, in whose course the timber used was felled relatively quickly and subsequently used for building. Just as a swift and timely renewal of the entire fortification may be reckoned here, there is also the high probability that the timber was struck in a perhaps young forest and used for renovation.[23] Therefore, in such cases the potential of an 'old wood effect' would be negligible. This is also supported by the fact that no great differences can be recognised in dating intervals that were not modelled. On the premise of same-aged construction timbers from

[20] Schier 2013, 268.

[21] Cp. Bayliss *et al*. 2011, 21; Seidel *et al*. 2016, 249.

[22] Szentmiklosi *et al*. 2011 Tab. 1. Fig. 9.

[23] It is noteworthy that traces of posts that stood in the post holes in the Ring I indicate a diameter of only a few decimetres. The model reconstructed from this has a maximal diameter of 25 cm with a mean of 22.5 cm (cp. Krause *et al*, in print, Tab. 6). In view of the enormous consumption of wood, just for the erection of the first two rings, it can be assumed that mainly young trees, perhaps only a few decades in age, were felled. Through this, the 'old wood effect' – at least in wood for constructing the fortifications – would likely be relativised.

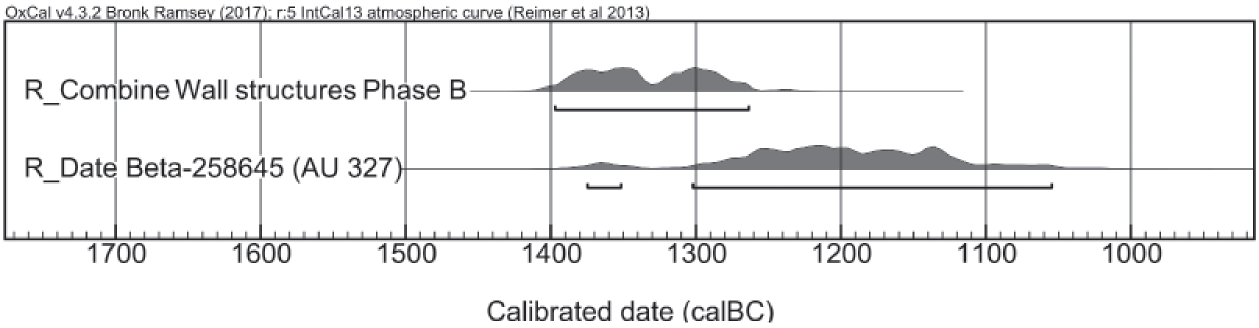

Fig. 8. Corneşti-Iarcuri. Combined probability density of the four radiocarbon datings from phase B of Ring I (graphic: Corneşti Project, R. Lehmphul)

Fig. 9. Corneşti-Iarcuri. The six dated posts of the front of rampart Ring II (easterly direction) (photo: Corneşti project, A. Szentmiklosi)

a presumed young forest, the datings that originate solely from beams in the front of the rampart can be combined with one another.

The modelled dating interval lies in the 2σ-range, between 1400–1250 cal BC, from which a *terminus post quem* after 1400 BC can be derived for the construction of phase B of Ring I. From this follows a *terminus ante quem* for phase A of this first rampart, that is, an erection before 1400 BC (**Fig. 8**). The single date "BETA-258645" indicates an overlapping with the others within the 2σ-range, but it was not drawn in reference. Either it belongs to this phase, or it came into secondary position through anthropogenic or biogenic activities.

Context of samples of Ring II (trench VI and trench XI)

The ten datings that were gained from trench VI in the year 2012 are displayed in **Tab. 3**. As was the case with phase B of Ring I, solely charcoal samples were used for dating, of which six samples originate from six different post features in the front of the rampart and therefore stood in structural association with one another (**Fig. 9**). Two other samples were taken from different posts in the back row of posts: sample "Poz-53351" originates from a stratigraphically deeper post in level 3, and sample "Poz-53347" – from a collapsed layer in the upper part of the rampart (**Tab. 3**). Sample "Poz-53350", from the fill of a post in the back row of posts, yielded a late Mesolithic date. Because of its obviously secondary dislocated position there, it was not considered in the following discussion. The preservation of the charcoal – similar to that in Ring I – can be attributed to the fact that this investigated section of the rampart had burned down during both phases.

The same premise as for Ring I, phase B, applies to this rampart-section and the samples obtained from it, too: the timber originated presumably from a young forest; the trees were felled within a short time and used for construction at the same time. The maximal diameter of larger posts is given

Lab-No.	Sample material	Context	14C Age [YearBP]	±	cal BC 1-sigma	cal BC 2-sigma
Poz-53342	Charcoal	AU 41 – Post, front of the rampart (row of posts)	3085	35	1409–1299	1430–1261
Poz-53343	Charcoal	AU 39 – Post, front of the rampart (row of posts)	3105	35	1422–1304	1442–1273
Poz-53344	Charcoal	AU 37 – Post, front of the rampart (row of posts)	3095	30	1413–1304	1429–1280
Poz-53345	Charcoal	AU 38 – Post, front of the rampart (row of posts)	3100	30	1416–1304	1431–1283
Poz-53346	Charcoal	AU 115 – Post, front of the rampart (back row of posts)	3050	30	1385–1263	1401–1226
Poz-53347	Charcoal	AU 12 – collapsed layer, back side of rampart	3095	35	1414–1302	1432–1267
Poz-53349	Charcoal	AU 42 – Post, front of the rampart (row of posts)	3020	35	1374–1214	1395–1129
Poz-53350	Charcoal	AU 170 – Post, front of the rampart (back row of posts)	7410 (TOC, 0.3mgC)	90	6402–6214	6435–6084
Poz-53351	Charcoal	AU 186 – Post layer 3	3075	35	1397–1292	1423–1233
Poz-53352	Charcoal	AU 40 – Post, front of the rampart (row of posts)	3085	35	1409–1299	1430–1261

Tab. 3. Corneşti-Iarcuri. 14C datings (unmodelled), with laboratory number, sample material and feature context, from trench VI (2012)

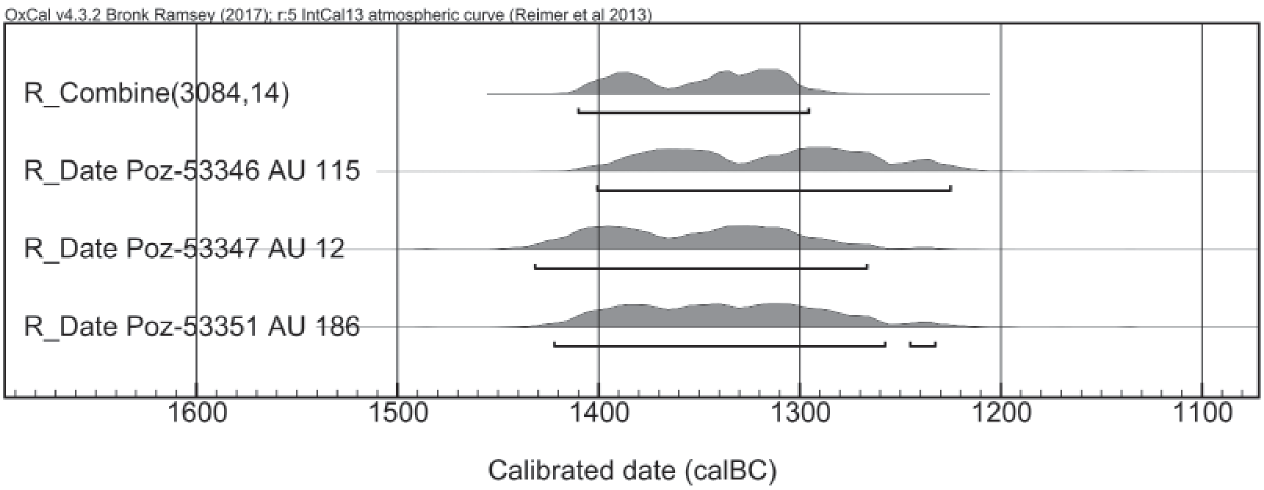

Fig. 10. Corneşti-Iarcuri. Combined probability density of the six radiocarbon datings from the front of rampart Ring II (graphic: Corneşti Project, R. Lehmphul)

as 20 cm,[24] so that here as well a similar average age for rather young trees can be assumed. Two different models can be derived from the sample contexts. In the first model only the six posts from the front of the rampart are combined, while the other posts are not included. The six samples from the posts represent the younger phase as archaeologically proven by the profile of Ring II (**Fig. 10**).

The combination of the datings yielded an interval between 1410–1295 cal BC, and with that a high dating probability in the 2σ-range for the erection of the Ring II during the 14th century BC.

[24] Krause *et al*, in print, Tab. 7.

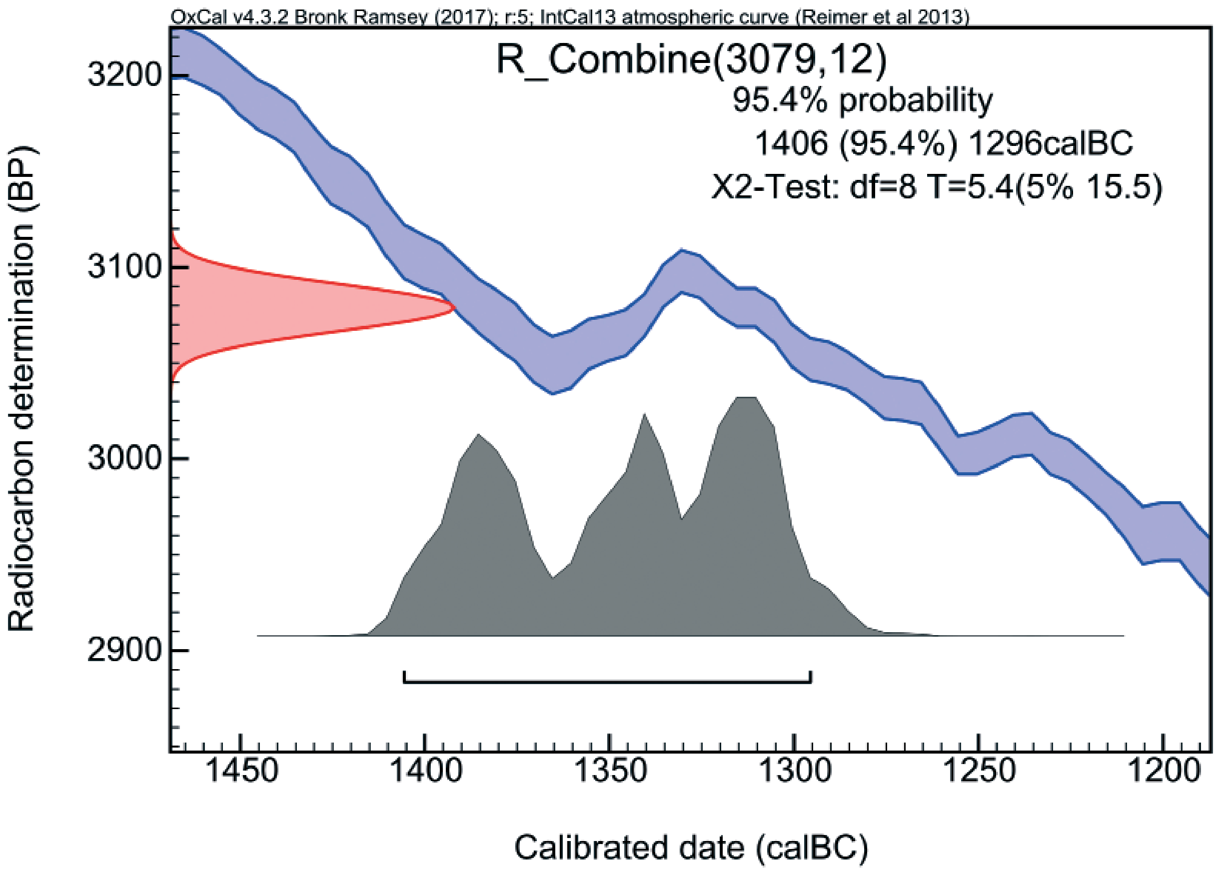

Fig. 11. Corneşti-Iarcuri. Combined probability density of the nine radiocarbon datings from trench VI in Ring II (graphic: Corneşti Project, R. Lehmphul)

In the second model all of the datings are combined. This is based on the assumption that the three remaining contexts (older posts, samples from the older [?] collapsed layer, posts from the back row of posts) also originate from wood, that was cut relatively quickly and was used for the construction of the fortification. The result corresponds largely with that of the first model and further limits the dating probability in the 2σ-range: a time span between 1405–1295 BC (**Fig. 11**).

Even though two stratigraphically separate phases can be recognised in the course of the profile of the rampart trench VI,[25] datings at disposal until now do not provide any indications for the erection of the second fortification ring before 1405 cal BC. The combined dating intervals allow the assumption that both phases occurred within a relatively short period of time. As could be shown for phase B of Ring I, here as well a *terminus post quem* around/after 1400 BC is probable.

This result is supported by the datings for trench XI. This trench was made in early summer 2016 within the framework of the LOEWE project "Research on Prehistoric Conflict". Trench XI is located within the "Valea Lacului", in a part of Ring II that crosses the valley and thereby blocked it. The composition and structure of the construction elements of the body of the rampart are – compared to Ring I and II (trench VI) – essentially similar. Here as well there are stratigraphic indications of a second phase, in which the body of the rampart was renewed at least in the upper part, after fire had damaged the front of the rampart.

In contrast to trenches II and VI, an alternative dating or sampling strategy was tested in trench XI; solely those macro remains were dated that originated from posts and layers in the body of the rampart. The aim thereby was to improve the posteriori probabilistic with this short-lived sample material and its stratigraphic information. This of course changed the premises and/or pre-suppositions with regard to the formation of the respective sample contexts. In specific, the carbonisation process of macro remains inside the body of rampart – opposite burnt timbers – is unlikely. The macro remains must have already been carbonised and entered the

[25] Heeb *et al.* 2017, 220.

Lab-No.	Sample material	Context	14C Age [YearBP]	±	cal BC 1-sigma	cal BC 2-sigma
MAMS-29739	Macro remain	Au 759 Post, front of the rampart	3126	21	1430–1326	1443–1306
MAMS-29740	Macro remain	Au 006 Colluvium in front of the rampart	2938	20	1206–1115	1213–1057
MAMS-29741	Macro remain	Au 070 Ditch behind rampart	3102	21	1413–1310	1427–1299
MAMS-29742	Macro remain	Au 007 Erosion layer	3165	22	1491–1417	1496–1411
MAMS-29743	Macro remains	Au 749 Post, in front of the rampart	4341	25	3009–2906	3017–2902
MAMS-29744	Macro remains	AU 051 Rampart layer	3776	21	2274–2143	2285–2138
MAMS-29745	Macro remains	Au 756 Post, in front of the rampart	3160	21	1487–1414	1496–1406
MAMS-29746	Macro remains	Au 13 Erosion layer from the body of rampart	3104	21	1414–1311	1428–1300
MAMS-29747	Macro remains	Au 757 Post, in front of the rampart	3101	21	1412–1310	1426–1299
MAMS-29748	Charcoal	Cor1 334 Core drilling below the rampart	4350	28	3010–2911	3078–2903

Tab. 4. Corneşti-Iarcuri. Datings (unmodelled), with laboratory number, sample material and feature context from trench XI (2016)

layers and contexts through the massive movement of earth in the course of erecting the rampart. The time span between carbonisation and final deposition of macro remains is an unknown factor in this model, but nevertheless it should be regarded when considering the dating. Accounting for the amount of time that passed from carbonisation to deposition of macro remains, a *terminus post quem* for the erection of the fortification derived from this model would be too early.

The data displayed in **Tab. 4** show that in addition to the Late Bronze Age, the Copper Age and the Early Bronze Age are represented, too. This is not surprising, as the prehistoric settlement activities as well as the erosion caused by them on the edges of the valleys likely increased greatly.[26]

The Bayesian model is based upon stratigraphic contexts and with an agreement-index-value (A_{model}) of 106.1 principally, it indicates good accordance with the unmodelled A-priori-probabilities (**Tab. 5**, **Fig. 12**). The date of sample "MAMS-29742" was not regarded in this calculation and was marked as an 'outlier', because in the course of the computation this sample showed statistically only slight accordance; evidently it represents the result of a deposition at a considerably later time. Considering the modelled datings and the two stratigraphic phases discerned in the rampart profile, a comparably shorter time span can be derived for both the erection as well as the renewal of the rampart. Accordingly, the date of the beginning of the construction of the first phase lies between 1480 and 1330 cal BC. The beginning of the second phase dates between 1430 and 1325 cal BC; the end is between 1420 and 1265 cal BC. Since both the erection and the renewal as well as the destruction of the fortification likely reflect

[26] This is impressively confirmed by the massive colluvial material, which was deposited in the valleys ever since the Copper Age (cp. Gumnior/Stobbe in this volume; Nykamp *et al.* 2016).

Sequence Ring II Trench XI A_{model}**=106.1 /** $A_{overall}$**=111.9**	**Unmodelled date** 2σ (95.4 %)	**Modelled date** 2σ (95.4 %)
R_Date MAMS-29744 (AU 051)	**2286–2137** cal BC	***2286–2137*** cal BC
Boundary Begin Phase 1		***1480–1330***
R_Date MAMS-29739 (AU 759)	**1445–1305** cal BC	***1445–1400*** cal BC
R_Date MAMS-29745 (AU 756)	**1497–1406** cal BC	***1435–1395*** cal BC
R_Date MAMS-29747 (AU 757)	**1427–1298** cal BC	***1430–1380*** cal BC
Boundary End Phase 1/ Begin Phase 2		***1430–1325***
R_Date MAMS-29741 (AU 070)	**1428–1299** cal BC	***1420–1315*** cal BC
R_Date MAMS-29746 (AU 013)	**1429–1300** cal BC	***1420–1305*** cal BC
Boundary End Phase 2/ last Activities		***1420–1265***
R_Date MAMS-29742 (AU 007) ?	**1497–1410** cal BC	***1495–1410*** cal BC
R_Date MAMS-29740 (AU 006)	**1214–1056** cal BC	***1215–1055*** cal BC

Tab. 5 Corneşti-Iarcuri. Modelled and unmodelled datings from trench XI (2016)

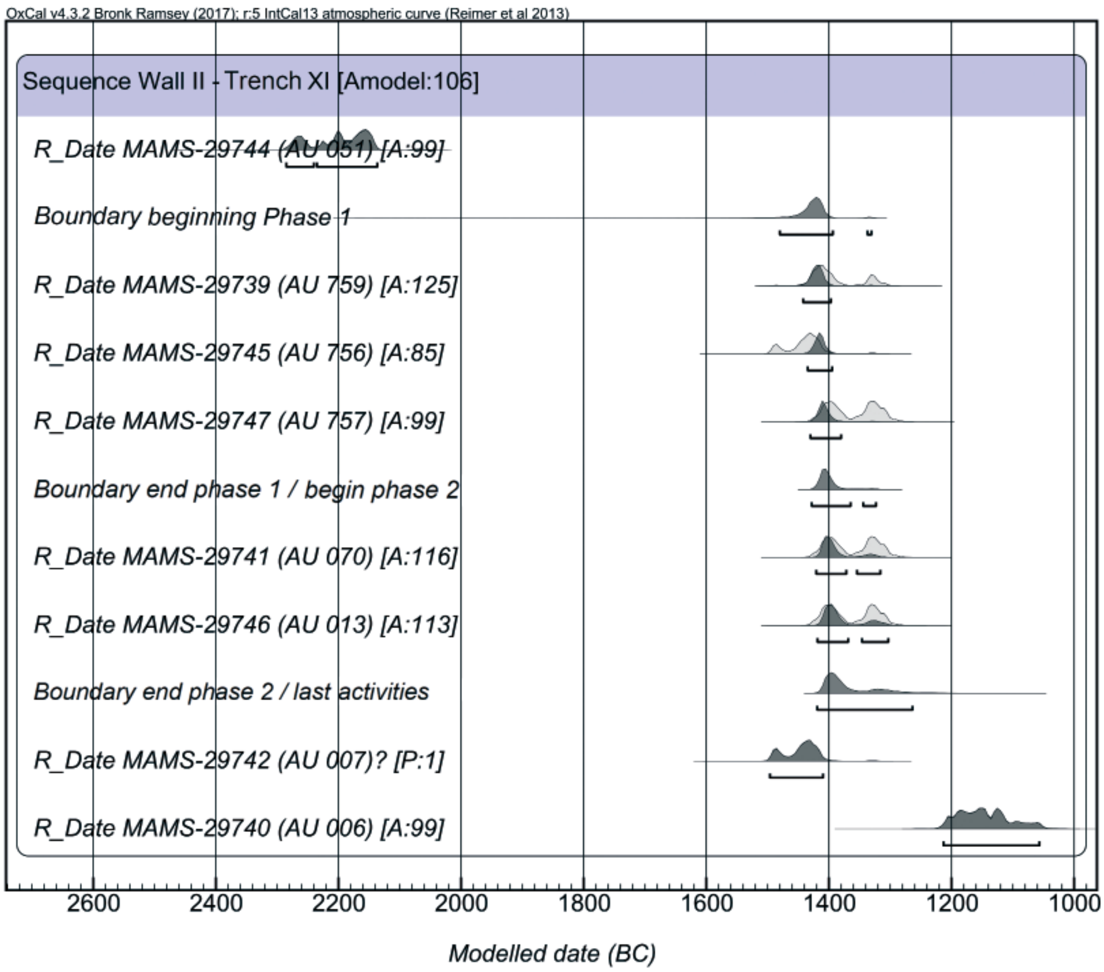

Fig. 12. Corneşti-Iarcuri. Posteriori probabilities of the dating model for Ring II in trench XI (graphic: Corneşti Project, R. Lehmphul)

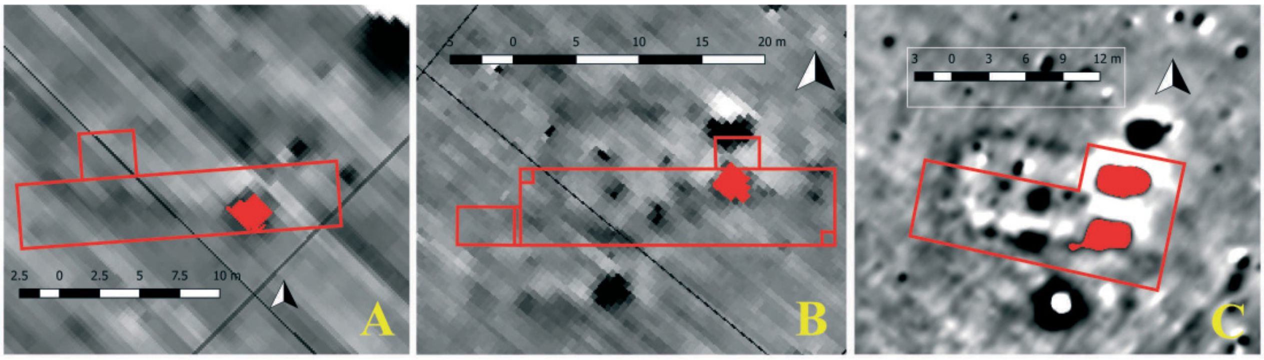

Fig. 13. Corneşti-Iarcuri. Magnetogram of house contexts with excavation trench boundaries within the settlement area of Ring II. The pits that belong to the investigated house contexts are marked red. A: excavation in 2015/ AU 057; B: excavation in 2016/ AU 013, C: excavation in 2017/ AU 001 in the south and AU 002 in the north (graphic: Cornesti Project, R. Lehmphul)

comparably brief events, the dating probabilities derived from the model testifies to a comparably high dynamic during this time.

In the following, the dating probabilities of both models for trench VI and trench XI will be correlated and discussed. Both date to Ring II. Furthermore, both models are based on different sample types, which can be used to make different conclusions based on their contexts. The charcoal samples from trench VI supply a *terminus post quem* of around/after 1400 cal BC, but they date foremost to the stratigraphically younger phase. The stratigraphic contexts of macro remains from trench XI allow the probabilistic modelling of the time span, during which the rampart was erected (phase 1: 1480 to 1325 cal BC) or renewed (phase 2: 1430 to 1265 cal BC) (**Tab. 5**).

Since the two phases proved in these trenches were obviously built in relatively short succession and since the timber attested in trench VI could be easily combined, there is a high dating probability for the construction of the first phase of Ring II at the end of the 15th and beginning of the 14th century BC. Taking into account a certain time span from the point in time of carbonisation to the deposition of the dated macro remains, the dating probability is supported by the second model from trench XI and for the 2σ-range, i.e. at a high level of significance. (**Fig. 12**). Finally, the models from trenches IV and XI complement each other in that one and the same structure was dated.

Context of samples from the settlement area of Ring II (trenches X, XII and XIV)

In the course of the excavations in 2015, 2016 and 2017, basing upon magnetometer data it was possible to identify the site of individual houses and also – at the end of the excavation campaign in 2017 at the latest – to verify these places by the distribution of find densities in the cultural layers.[27] Of central significance for the chronology of Corneşti-Iarcuri is the relationship between house sites and pits, the latter mostly pairwise, but also single and of elongated oval form. When existent, the pits lie regularly on the eastern narrow side of the houses (**Fig. 13**).[28] In all of the hitherto excavated examples (2015: context AU 057; 2016: context AU 013; 2017: contexts AU 001 and AU 002) a notably similar scheme could be observed in the fill of the pits: The lower fill layer contained – aside from animal bones – individual vessels, some almost completely preserved. No traces of fire were noted on the finds from this layer; burned clay was likewise absent in the fill. The second stratigraphically younger level consisted of a compact layer with partly slagged burned clay and secondarily burnt pottery. The top was formed by a pack of layers that are difficult to differentiate,[29] which again contained secondarily burnt pottery as well as burned clay and merged evenly into the culture layer. There occasional, unburnt finds were observed.

27 Lehmphul *et al.* 2018; Bălărie *et al.* 2016.

28 Cp. Lehmphul *et al.* 2018.

29 Micromorphological analyses could show that the sediments in the upper fill of the pit are marked by post-depositional, pedogenic processes (cp. Fritzsch in this volume). This possibly also explains the dislocation of macro remains, mentioned in the introduction, or the outliers in the dating of some feature contexts.

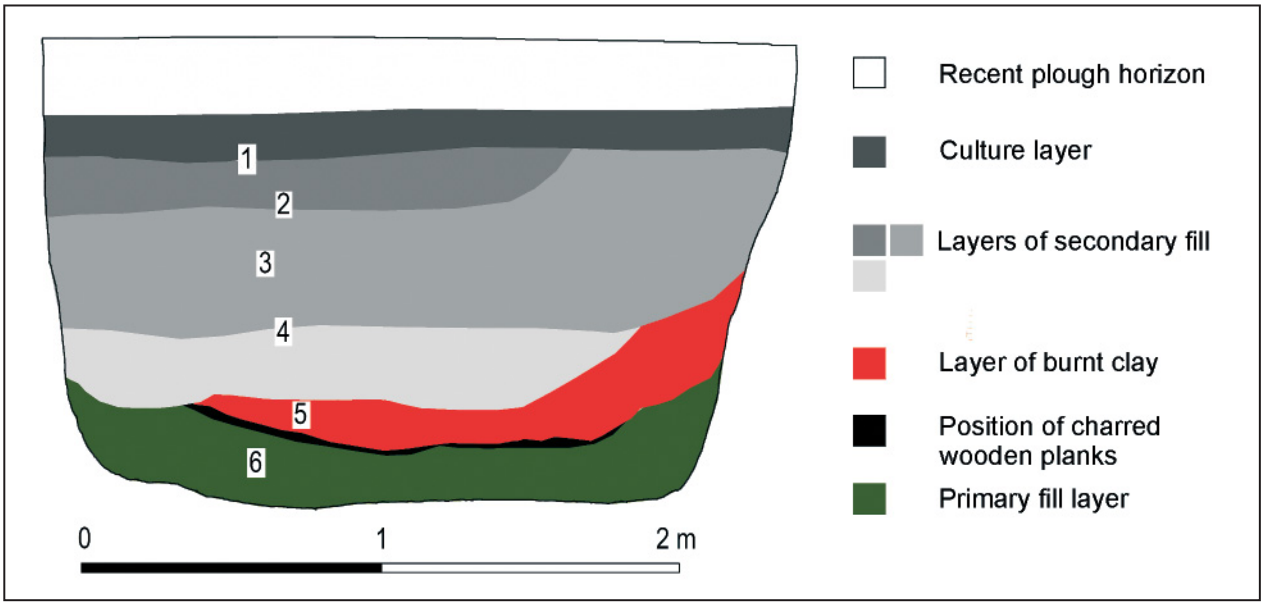

Fig. 14. Cornești-Iarcuri. Typical scheme of the infill of pits. Here: AU 013 (2016). The numbers mark the position of micromorphological samples (cp. Fritzsch in this volume) (graphic: Cornesti Project, R. Lehmphul)

The chronological significance of the stratified pit fillings is based on their generally similar filling pattern, their location in relation to the house structures and, finally, the depth in time that they possess. Thereby, the burned clay layer forms a rupture that marks the horizon of destruction described above. The enclosed macro remains in the layers of the pit fills can represent, in principle, very different events: Whereas in the primary layer the time of the use of the pits appears with theoretically several differing events, the succeeding burned clay layer most probably derives from one single event, in the course of which the probability of the burning or carbonisation of macro remains is quite high. Therefore, the destruction horizon also marks the end of a settlement phase and the point in time at which the house burned down.

The formation of the stratigraphically youngest layers resulted from successive infilling, during which surrounding material (burned clay, charcoal etc.) came into the pit (**Fig. 14**). Of principal importance is that micromorphological analyses could show that the composition of this package of layers can be attributed to processes of disposal, which cannot be associated exclusively with fire. This was because both burnt and unburnt material reached the upper fill of the pits.[30]

Table 6 lists the radiocarbon datings that were gained from the fills of pits that accompanied the houses. In view of the stratigraphically similar contextual fills and their relation to the house structures, a relative contemporaneity of use and event horizon among the pits is assumed in the following. In consequence, the stratified contexts are summarised in one single stratigraphic model and modelled.

In the stratigraphic-chronological model for pits accompanying the houses, the datings for the primary fill of the features (AU 057, AU 013, AU 001 and AU 002) are summarised and separated from samples from younger contexts. The separation is given both by the similar layer sequence and by the very differently preserved layers of charred wooden planks (2016: AU 013 and 2017: AU 002).[31] Thus, also a relative closeness can be assumed for the older contexts. In addition, of the total of eight data from the older phase, four were from macro remains from the filling of almost complete vessels. And these allow the possibility of their dislocation, such as through bioturbation, to be largely excluded.

The A-posteriori probabilities derived from the model generally show good agreement with the a-priori probabilities. Thus, the Agreement-Index-Value (A_{model}) lies at 91.4 (**Fig. 15**, **Tab. 7**). Only one dating, sample MAMS-35955 from the primary fill of pit AU 001, was not regarded in the calculation and was marked as an outlier. This sample either derives from a younger layer, was secondarily deposited, or entered the fill directly prior to the de-

[30] Cp. Fritzsch in this volume.

[31] Lehmphul *et al.* 2018.

Lab-No.	Sample material	Context	14C Age [Year BP]	±	cal BC 1-sigma	cal BC 2-sigma
Trench X						
MAMS-26691	Macro remains	AU 057 (upper fills)	3085	25	1409–1317	1423–1294
MAMS-26692	Macro remains	AU 057 (bottom of pit)	3170	27	1491–1418	1499–1407
Trench XII						
MAMS-30423	Macro remains	AU 013, 30-40cm under layer 1	3106	18	1415–1318	1428–1303
MAMS-30432	Macro remains	AU 013 (burned clay above charred wood construction)	3116	24	1426–1320	1437–1301
MAMS-30433	Macro remains	AU 013 (vessel 1)	3200	18	1497–1448	1502–1432
MAMS-30434	Macro remains	AU 013 (vessel 2)	3138	19	1434–1404	1487–1320
MAMS-30435	Macro remains	AU 013 (vessel 4)	3223	18	1507–1454	1526–1443
Trench XIV						
MAMS-35575	Macro remains	AU 001 (upper fill) layer 2	3099	18	1410–1310	1422–1299
MAMS-35576	Macro remains	AU 001 (lower fill) layer 6 (ceramic concentration)	3179	18	1494–1430	1497–1422
MAMS-35577	Macro remains	AU 002 (upper fill) 30–40 cm under layer 2	3130	19	1432–1396	1445–1311
MAMS-35578	Macro remains	AU 002 (vessel 7) bottom of pit	3204	20	1498–1452	1505–1431
MAMS-35579	Macro remains	AU 001 (upper fill) 50-60 cm under layer 2	3044	19	1376–1264	1390–1230
MAMS-35580	Macro remains	AU 002 (upper fill) layer 2	3128	18	1430–1331	1441–1312
MAMS- 35955	Macro remains	AU 001 (lower fill)	3071	23	1391–1292	1408–1270
MAMS-35957	Macro remains	AU 002 (lower fill)	3132	22	1434–1329	1486–1306

Tab. 6. Corneşti-Iarcuri. Unmodelled 14C dates with laboratory number, sample material and feature contexts from the pits accompanying the houses in trenches X, XII and XIV

struction.[32] In order to delimit the time of destruction, the fill of the stratigraphically youngest layer is defined as the potential end of the destruction horizon, and it is assumed that the pit was filled shortly afterwards or sedimented relatively soon thereafter.

According to the model, the beginning of settlement, that is, when the pits began to be filled, can be dated to the end of the 16th or the beginning of the 15th century BC (1520–1435 cal BC). This however presupposes that the pits were not cleaned out in the meantime. If this were the case, then theoretically the time of their use would be longer or the feature older. The end of the use-phase is calculated at between 1485 and 1395 cal BC, from which a *terminus post quem* after 1395 cal BC is derived for the postulated destruction horizon. The end is dated on the basis of modelled dates between 1410–1305 cal BC, thus, in the 14th century BC.

32 The dislocation probability is higher for this sample, because there was no preserved wood in the context, or else it could not be detected.

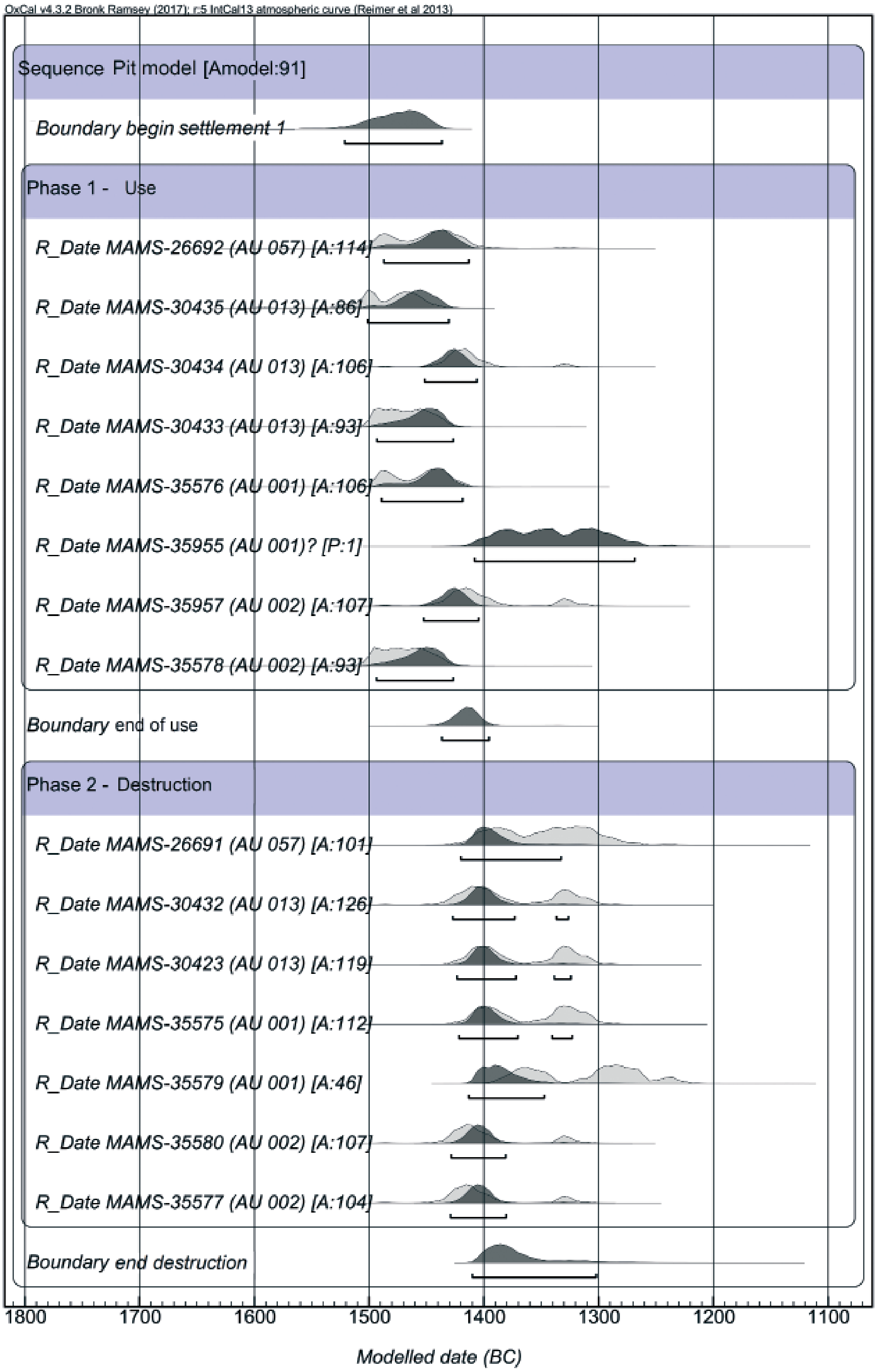

Fig. 15. Cornești-Iarcuri. A-posteriori-probabilistic of the model for pits accompanying houses in Ring II (trenches X, XII, XIV) (graphic: Cornești Project, R. Lehmphul)

Sequence pit model A_{model}**=91.4 /** $A_{overall}$**=96.6**	**Unmodelled date** 2σ (95. 4 %)	**Modelled date** 2σ (95. 4 %)
Boundary: beginning of settlement		***1520–1435***
Phase 1 – use		
R_Date MAMS-26692 (AU 57)	**1501–1406** cal BC	***1490–1415*** cal BC
R_Date MAMS-30435 (AU 13)	**1527–1443** cal BC	***1500–1430*** cal BC
R_Date MAMS-30434 (AU 13)	**1488–1320** cal BC	***1450–1405*** cal BC
R_Date MAMS-30433 (AU 13)	**1503–1433** cal BC	***1495–1405*** cal BC
R_Date MAMS-35576 (AU 001)	**1498–1422** cal BC	***1495–1425*** cal BC
R_Date MAMS-35955 (AU 001) ?	**1409–1269** cal BC	***1410–1270*** cal BC
R_Date MAMS-35957 (AU 002)	**1452–1307** cal BC	***1490–1410*** cal BC
R_Date MAMS-35578 (AU 002)	**1506–1431** cal BC	***1495–1430*** cal BC
Boundary: end of use		***1435–1395*** cal BC
Phase 2 – destruction		
R_Date MAMS-26691 (AU 57)	**1416–1280** cal BC	***1420–1335*** cal BC
R_Date MAMS-30432 (AU 13)	**1438–1301** cal BC	***1430–1325*** cal BC
R_Date MAMS-30423 (AU 13)	**1429–1302** cal BC	***1425–1325*** cal BC
R_Date MAMS-35575 (AU 001)	**1422–1300** cal BC	***1420–1325*** cal BC
R_Date MAMS-35579 (AU 001)	**1391–1229** cal BC	***1415–1350*** cal BC
R_Date MAMS-35580 (AU 002)	**1442–1311** cal BC	***1430–1380*** cal BC
R_Date MAMS-35577 (AU 002)	**1446–1311** cal BC	***1430–1380*** cal BC
Boundary: end destruction		***1410–1305*** cal BC

Tab. 7. Corneşti-Iarcuri. Unmodelled and modelled datings for the pits that were associated with houses inside Ring II (trenches X, XII, XIV)

On the genesis of settlement and fortification of Corneşti-Iarcuri – summary of the phase model

In the following, the models based upon radiocarbon datings and archaeological contexts from the different trenches are correlated and a phase model for the genesis of Corneşti-Iarcuri is discussed (**Tab. 8**). One essential aspect concerned here is a model. 'Bayesian', thus 'modelled' chronologies are both context-related as well as interpretative. They are changeable and strongly dependent upon the assumptions and the number of data contained in the models. [33]

By the end of the excavation campaign in 2017, Rings I and II as well as the settlement area enclosed within them had been almost entirely prospected geomagnetically. The magnetogram shows that not only both of the ramparts, but also – contrary to earlier assumptions – the enclosed settle-

[33] Cf. among others, Bayliss *et al.* 2011, 19–21; Schier 2013, 270 n. 56.

Trench / Year	Features/ Structure	Modelled dating interval 2σ (95.4 %)	Dating model	Settlement phase
Trench II (2008)	Ring I Phase A	not dated	*terminus ante quem* 1400 cal BC for the erection of phase A of Ring I	Phase 1
Trench II (2008)	Ring I Phase B	1400–1250 cal BC	*terminus post quem* 1400 cal BC for the erection and destruction of the second phase (Phase B) of Ring I	Phase 2
Trench VI (2012)	Ring II	1405–1295 cal BC	*terminus post quem* around/after 1405 cal BC for the erection of the first and the second phase of Ring II and its destruction (model 2)	Phase 2
Trench XI (2016)	Ring II	Beginning/end of first phase: 1480–1330 / 1430–1325 cal BC End of second phase: 1265 cal BC	These periods describe both the earliest possible beginning for the construction of the first phase and the latest possible end of the 2nd phase of Ring II.	Phase 2
Trench X (2015) Trench XII (2016) Trench XIV (2017)	Primary fill in pits (AU 057) (AU 013) (AU 001) (AU 002)	1520–1395 cal BC	This time span dates the earliest beginning of use of the accompanying house pits, as well as their latest possible end, and thus provides a *terminus post quem* after 1395 cal BC for the destruction of the house structures.	Phase 1
Trench X (2015) Trench XII (2016) Trench XIV (2017)	secondary fill in pits (AU 057) (AU 013) (AU 001) (AU 002)	1410–1305 cal BC	This time span 1305 cal BC marks the latest possible end for the destruction horizon.	Phase 2

Tab. 8. Corneşti-Iarcuri. A summary presentation of the models reconstructed from the trenches for settlement phases 1 and 2

ment area had burnt down over large areas. This observation enabled the correlation of the models developed separately for each trench. Thereby, the dated event or destruction horizon functions here as a kind of guiding horizon. However, it proved to be difficult that two phases are confirmed in Ring II in both trenches VI and XI. Traces of fire are more or less visible in both phases.

Moreover, the respective stratigraphically youngest phase was obviously not renewed. Two phases are likewise documented in Ring I. However, only the younger phase B displays traces of fire. And here as well no visible repairs or renewals undertaken after the damaging fire were attested. Consequently, the most recent phase at the fortification Rings I and II is linked to the destruction horizon found in the pits accompanying the houses. The correlation bases upon the observation of the absence of repairs or renewals, both at the fortifications and at the house locations investigated within Ring II in trenches X, XII and XIV.

The beginning of settlement phase 1, and with that also the beginning of the Late Bronze Age settlement of Corneşti-Iarcuri, dates to the end of the 16th century BC, or at the transition from the 16th to 15th century BC. This first settlement phase is probably represented in phase A of Ring I. The areas inside the fortification ring were loosely settled and buildings were found mainly in the northeast, not far from the northern valley, "Valea Caraniului". The datings of the house structures investigated in 2013 confirm early as well as later activities there.[34] Further, there is the possibility

[34] On the datings for trench VIII, cf. Krause *et al.* in print; Harding 2017 Tab. 1; Heeb *et al.* 2017, 224.

Lab-No.	Sample material	Context	14C Age [Year BP]	±	cal BC 2-sigma	Settlement phase
Trench XII						
MAMS-30426	Macro remains	AU 001 lower pit filling	2947	18	1221–1059	Phase 3
MAMS-30436	Macro remains	AU 091 (Pl. 1.5-2)	2970	18	1258–1123	Phase 3
MAMS-30427	Macro remains	ceramic concentration 6 AU 091	2987	18	1271–1129	Phase 3
Trench X						
MAMS-26689	Macro remains	AU 003 (Layer 5)	2747	27	972–823	Phase 4
MAMS-26690	Macro remains	AU 003 (Layer 3)	2661	27	895–794	Phase 4
Trench XIV						
MAMS-35586	Macro remains	AU 014 sample of ridge post, in secondary position	2657	19	835–799	Phase 4

Tab. 9. Corneşti-Iarcuri. Representation of the datings gained from individual trenches for settlement phase 3 and 4

that initially the settlement area within Ring I was not enclosed by a rampart. Independently of this, a large-scale settlement to the south of the "Valea Lacului" and to the west of the erosion gully already existed at that time – indeed, at the origin of the spring, which is still intact today. This settlement was with high probability not fortified at this early stage.

At the turn from the 15th to the 14th century BC, or shortly thereafter, a certain dynamic emerged. External factors, presumably perceived as threats, led to a reaction that is reflected in the conception and erection of Ring II. This action marks the transition to the second settlement phase in Corneşti-Iarcuri. Settlement phase 2 dates to the 14th century BC and marks a turbulent episode in Corneşti-Iarcuri: during this time Ring II, which had been built shortly before, burned down twice. After the (partial?) destruction of the first phase or the rampart of Ring II, it was renewed at the front of the rampart with a comparable construction principle. Judging from the datings, during the same period of time phase B of Ring I was erected. As the first phase A had not burned down, evidently after an initial conflict it was necessary to repair Ring I as well.

Still during the 14th century BC the entire complex, that is, Ring I/phase B and the second phase of Ring II as well as the enclosed settlement areas, was destroyed – a caesura in the habitation of Corneşti-Iarcuri, which at the same time marks the end of the second settlement phase. This interpretation is supported by datings in the sum calibration together with the concept of an increased carbonisation probability in the course of fire events.

Although this was likely a crucial break, it did not necessarily signify the end of settlement in Corneşti-Iarcuri. This is demonstrated, on the one hand, by the sum calibration of datings at disposal, in which there is a high density of data also for the 13th and 12th centuries BC. However, on the other hand, above all and in relation to the investigated areas, individual settlement features from later times have been repeatedly detected. So, here of importance is that the number and density of the scientific datings do not indicate a break in settlement, a factor that is indicative of continuous settlement.

Settlement phase 3 is detectable in individual features and datings, the latter to the 13th, 12th and 11th centuries BC. The intervals in the dates in the 2σ-range for features show hardly any overlapping between older intervals and none at all in younger intervals (**Tab. 9**). Two features were found in trench XII (2016): a storage pit (AU 001) and a trough-shaped pit, whose function was evidently different (AU 091). One single date (MAMS-29740) derives from a colluvial layer in Ring II (trench XI), which enabled the recognition of at least a few activities in this area (**Tab. 4**). Further data come from the bottom of the ditch in front of Ring IV, which provide indications about the use of the complex during settlement phase 3 – even though they do not date the point in time of the erection of the wood-earth rampart.

Settlement phase 4, dated by radiocarbon datings to the 10th and 9th centuries BC, that is, the Early Iron Age, likewise yielded features (**Tab. 9**). In 2015 a pit in trench X was investigated. Basing upon two datings for macro remains and on the ceramic inventory, the pit could be dated to the Early Iron Age.[35] A further dating comes from the context of a roof beam of the Late Bronze Age house in trench XIV. Evidently, the sample material was secondarily dislocated. Finally, a dating was gained from the charcoal in a core-drilling profile in the upper region of the "Valea Lacului". This sample stems from colluvium in a depth of 2 m and is considered an indicator for settlement activities during this time (phase 4).[36]

Judging by the 14C datings, the settlement in Corneşti-Iarcuri ceased during the Early Iron Age. After a hiatus of a few hundred years, at the end of the 4th century BC, groups of Sarmatians settled at the periphery of the valleys and areas within the ramparts, which were certainly still impressive at that time.

Summarising observations

In the area of the largest Bronze Age fortification in Europe (more than 17 km^2) a total of 108 14C datings have been gained from various contexts (ramparts, ditches, pits, houses etc.) since the start of new investigations in 2007. With the phase model presented here, which basically refers to the dating of Ring I and II as well as the pits that belong to house structures within Ring II, the possibility emerges for the first time to sketch a site biography for Corneşti-Iarcuri. According to the biography, a total of four settlement phases can be identified at present, basing on the one hand upon a large-scale destruction horizon dated to the 14th century BC, and on the other hand upon individual settlement features of later date.

Methodically, within the framework of model-building, the size of the fortification system as well as the enclosed settlement landscape were drawn into consideration, in addition to specific feature contexts and various types of samples. Beyond the relation of space and time, which is reflected in every radiocarbon dating due to its spatial context and chronological intervals, diachronically effective interrelations and the beginnings of settlement foci of older and younger epochs are tangible as well. Although the latter were not immediately connected with the Late Bronze Age and Early Iron Age history of Corneşti-Iarcuri, they nevertheless offer the possibility in the future to investigate questions concerning settlement continuity and origins. The data show that in the Copper Age, at the latest since the Early Bronze Age, continuous settlement activities occurred in the settlement area of Corneşti-Iarcuri (**Fig. 16**).

Included in the model-building are feature contexts as well as assumptions derived from statistical analyses, which take into account the different burning or carbonisation probabilities of different types of samples as well as the probability of relocation, that is, taphonomic processes. The probability of dislocation of sample material is enhanced, on the one hand in Corneşti-Iarcuri through the prevailing soil-dynamic processes, while on the other hand it is influenced by older and younger settlement activities.

The destruction horizon recorded in the most of the excavation trenches and geomagnetic surveys forms a horizontal – sometimes also a vertical – stratigraphic and a guiding horizon relating solely to Corneşti-Iarcuri, with which the different chronological models can be correlated and associated with one another. The statistically comprehensible concept of the increased carbonisation probability – also found in the sum calibration – supports this approach. Thus, the phase model presented here provides a framework – first on a local level – for the typochronological discussion of the find material in general as well as for individual feature-inventories. The model shows the different intensity of the proven use-horizons in Corneşti-Iarcuri. In addition, this model does justice to the desideratum to date and to chronologically assign Bronze Age fortifications independently of find-typology and reinforced by scientific datings. In this sense, A. F. Harding presented a still very fragmentary phase model and pointed out the few scientifically dated fortifications of the Bronze Age in Central Europe.[37]

35 Bălărie *et al.* 2016.

36 Gumnior/Stobbe in this volume, Figs. 3–4.

37 Harding 2017; cp. Metzner-Nebelsick 2013, 343.

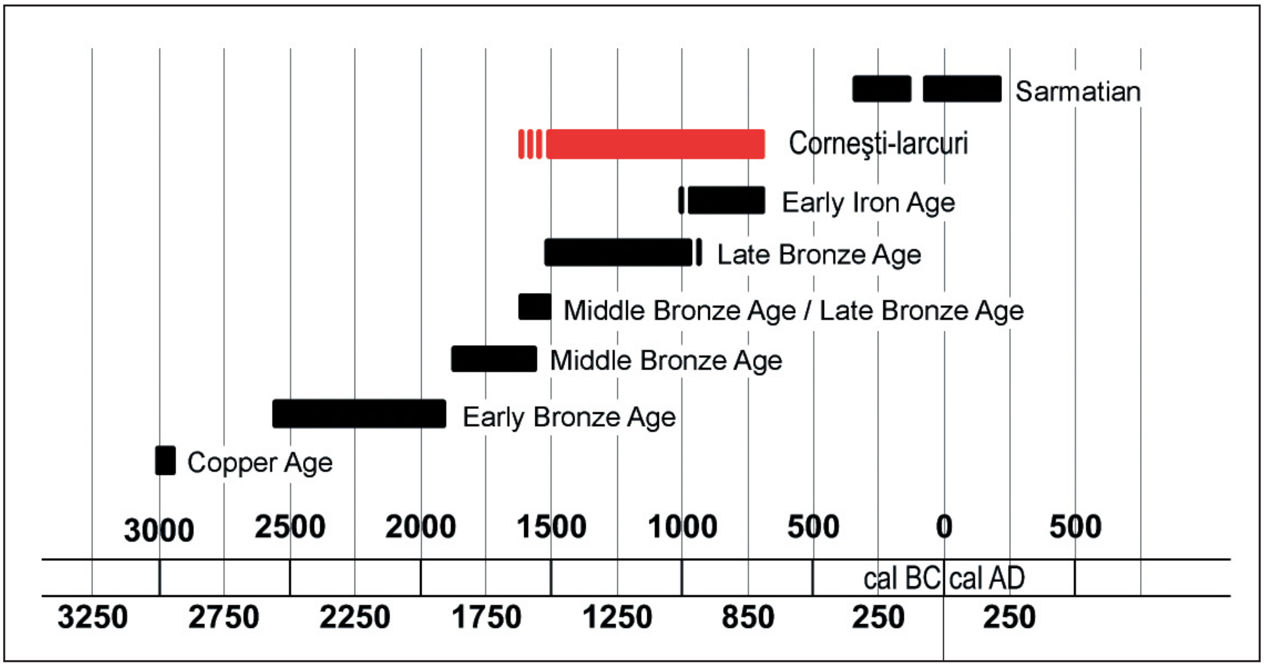

Fig. 16. Corneşti-Iarcuri. Epochs and periods or transitional periods (black) in relation to fortification and settlement contexts (red) in Corneşti-Iarcuri, based upon 14C datings from the site of Corneşti-Iarcuri (graphic: Cornesti Project, R. Lehmphul)

The significance of scientifically dated and chronologically modelled contexts, especially for the mega-sites in the Hungarian Plain and in the Romanian Banat is highlighted in this volume with the contribution on a further mega-site in Banat: Sântana-Cetatea-Veche.[38] The presentation of raw data and the model generated from them suggest that the destruction and probably the erection of the third fortification in Sântana should be dated to the 14th century BC, too. This increases the probability that both the complex in Corneşti-Iarcuri and that in Sântana were not only destroyed during the same time period, but also existed at the same time. This result is critical for answering future questions; it not only contributes to the general understanding of mega-sites, but also of regional Late Bronze Age settlement dynamics, social structures and economic aspects. Lastly, from it emerges a completely new perspective for comprehending and assessing conflict in prehistory, which is indeed the focus of the LOEWE project.

References

Bălărie *et al.* 2016
A. Bălărie/B. S. Heeb/A. Szentmiklosi/K. Teinz/R. Krause/M. Wemhoff/A. Harding, Erste Ergebnisse der Feldforschung an der spätbronzezeitlichen befestigten Siedlung Corneşti-Iarcuri im Sommer 2015. Acta Praehistorica et Archaeologica 48, 2016, 51-54.

Bayliss *et al.* 2011
A. Bayliss/J. von der Plicht/C. Bronk Ramsey/G. McCormac/F. Healy/A. Whittle, Towards generational timescales: the quantitative interpretation of archaeological chronologies. In: A. Whittle/F. Healy/A. Bayliss (eds.), Gathering Time. Dating the Early Neolithic Enclosures of Southern Britain and Ireland 11 (Oxford 2011) 17–59.

Harding 2017
A. Harding, Corneşti-Iarcuri and the rise of mega-forts in Bronze Age Europe. In: B. S. Heeb/A. Szentmiklosi/R. Krause/M. Wemhoff (eds.), Fortifications: The rise and fall of defended sites in Late Bronze and Early Iron Age of South-East Europe. International Conference in Timişoara, Romania from November 11th to 13th, 2015. Berliner Beiträge zur Vor- und Frühgeschichte 21 (Berlin 2017) 9–13.

Heeb *et al.* 2008
B. S. Heeb/A. Szentmiklosi/J. M. Wiecken, Zu den Wallringen von Corneşti-Iarcuri, Jud. Timiş, Rumänien – Forschungsgeschichte und neueste Untersuchungen. Praehistorische Zeitschrift 88, 2008, 179–188.

[38] Cp. Sava *et al.* in this volume.

Heeb *et al.* 2012
B. S. Heeb/A. Szentmiklosi/A. Harding/R. Krause, Die spätbronzezeitliche Befestigungsanlage Corneşti-Iarcuri im rumänischen Banat – ein kurzer Forschungsbericht der Jahre 2010 und 2011. Acta Praehistorica et Archaeologica 44, 2012, 47–58.

Heeb *et al.* 2017
B. S. Heeb/A. Szentmiklosi/A. Bălărie/R. Lehmphul/R. Krause, Corneşti-Iarcuri – 10 years of research (2007–2016). Some important preliminary results. In: B. S. Heeb/A. Szentmiklosi/R. Krause/M. Wemhoff (eds.), Fortifications: The rise and fall of defended sites in Late Bronze and Early Iron Age of South-East Europe. International Conference in Timişoara, Romania, from November 11th to 13th, 2015. Berliner Beiträge zur Vor- und Frühgeschichte 21 (Berlin 2017) 217–228.

Krause *et al.* im Druck
R. Krause/M. Wemhoff/A. Szentmiklosi/B. S. Heeb/R. Lehmphul/K. Teinz/A. Bălărie/C. Herbig/A. Stobbe/J. Schmid/D. Schäffler, Vorbericht zu den Feldforschungen der Jahre 2013 und 2014 an der Befestigung Corneşti-Iarcuri im rumänischen Banat. Eurasia Antiqua 2018, im Druck.

Lehmphul *et al.* 2018
R. Lehmphul/A. Georgescu/B. S. Heeb/A. Szentmiklosi/A. Bălărie/K. Teinz/R. Krause/M. Wemhoff, Häuser, Gruben und ein „Lausitzer" Gefäß. Ergebnisse der Feldforschungen 2016 und 2017 an der spätbronzezeitlichen Siedlung Corneşti-larcuri, im rumänischen Banat. Acta Praehistorica et Archaeologica 50, 2018, 31–44.

Metzner-Nebelsick 2013
C. Metzner-Nebelsick, Gedanken zur Frage des kulturellen Wandels in der Zeit um 1600 v. Chr. in Nordwest-Rumänien und Nordost-Ungarn. In: H. Meller/F. Bertemes/H.-R. Bork/R. Risch (eds.), 1600 – Kultureller Umbruch im Schatten des Thera-Ausbruchs? 4. Mitteldeutscher Archäologentag vom 14. bis 16. Oktober 2011 in Halle (Saale). Tagungen des Landesmuseums für Vorgeschichte Halle 9 (Halle/Saale 2013) 327–353.

Nykamp *et al.* 2015
M. Nykamp/B. S. Heeb/D. Knitter/J. Krause/R. Krause/A. Szentmiklosi/B. Schütt, Linking Hydrological Anomalies to Archaeological Evidences – Identification of Late Bronze Age Pathways at the Fortification Enclosure Iarcuri in Western Romania. In: D. Knitter/W. Bebermeier/O. Nakoinz (eds.), Bridging the Gap – Integrated Approaches in Landscape Archaeology, Special Volume 4. E-Topoi Journal of Ancient Studies 2015, 77–92.

Nykamp *et al.* 2016
M. Nykamp/P. Hoelzmann/B. S. Heeb/A. Szentmiklosi/B. Schütt, Holocene sediment dynamics in the environs of the fortification enclosure of Corneşti-Iarcuri in the Romanian Banat. Quaternary International 415, 2016, 190-203.

Schier 2013
W. Schier, Zeitbegriffe und chronologische Konzepte in der Prähistorischen Archäologie. Praehistorische Zeitschrift 88 (1-2), 2013, 258–273.

Seidel *et al.* 2016
U. Seidel/E. Stephan/H.-P. Stika/E. Dunbar/B. Kromer/A. Bayliss/N. Beavan/F. Healy/A. Whittle, Die Zeit der großen Gräben: Modelle zur Chronologie des Michelsberger Fundplatzes von Heilbronn-Klingenberg „Schlossberg", Stadtkreis Heilbronn, Baden-Württemberg. Praehistorische Zeitschrift 91 (2), 2016, 225–283.

Szentmiklosi *et al.* 2011
A. Szentmiklosi/B. S. Heeb/J. Heeb/A. Harding/R. Krause/H. Becker, Corneşti -Iarcuri – a Bronze Age town in the Romanian Banat? Antiquity 85, 2011, 819–83.