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NEW RADIOCARBON DATES FROM THE BALKANS (DUBENE-SAROVKA): APPROACH TO THE EARLY BRONZE ABSOLUTE CHRONOLOGY IN UPPER THRACE

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ABSTRACT. This paper addresses the absolute chronology of the earlier Yunatsite and Ezero cultures in Upper Thrace (South Bulgaria), from Early Bronze I and the beginning of Early Bronze II. The two newly obtained radiocarbon dates from Early Bronze Dubene-Sarovka (the Upper Stryama Valley) are published and discussed in a detailed stratigraphic and comparative Early Bronze I–Early Bronze II context. Date Bln-5233 (3490–3120 cal BC) is the first ^{14}C date from the Upper Maritsa valley from Early Bronze I with well-defined stratigraphic context and values earlier than 3100 BC. This date adds new arguments to the discussion of the ^{14}C dates from Yunatsite 15 and Plovdiv–Nebet Tepe, and addresses the question of the comparative chronology of Yunatsite I and Ezero I cultures from the late fourth millennium BC.

The sample of the date Bln-5231 (2870–2620 cal BC) comes from a level on the border between Early Bronze I and Early Bronze II. On one hand, its values preceded the values of the earlier-obtained ^{14}C dates from IIB layer and confirmed the stratigraphic sequence at Dubene-Sarovka tell. On the other hand, the calibrated values seem to be later than the vast comparative chronology of the end of the Dubene IIA—the beginning of Dubene IIB (ca. 3000 BC). Similar problems occur with dates from Yunatsite and Ezero. The published new dates from Dubene-Sarovka are part of the project on complex elaborating of the Early Bronze absolute chronology in the Balkans, and especially on contextual analysis of the ^{14}C dates.

INTRODUCTION

Our objective here is to provide two new radiocarbon dates with their stratigraphic context from the newly investigated tell in the Upper Stryama valley–Dubene-Sarovka, to consider their interrelations, and to put them together in the newly considered EB I-II comparative chronology of Upper Thrace.

The Middle and Upper Maritsa (Upper Thrace, central south and southeast Bulgaria) and its tributaries (e.g. the Stryama) are a key region for the elaboration of the Early Bronze (EB) ^{14}C chronology of the Balkans. The archaeological sites from this region have provided a solid record foundation—long stratigraphic sequences, numerous ^{14}C dates, and contact data with close and distant cultures (Nikolova and Görsdorf 1998; Nikolova 1999a). Nevertheless, recent interpretations of the ^{14}C dates from the eastern and western parts of Upper Thrace have resulted in contradictory hypotheses about the absolute chronology of the Early Bronze cultures in the region (Ezero and Yunatsite cultures, respectively). The main reason is the difference in the ^{14}C dates from both key sites—Ezero and Yunatsite tells. Then, it has become apparent that we need to complete the EB absolute chronology of the different micro-regions in the Maritsa valley, to include them in the comparative characteristics of the mentioned popular sites in order to compile a detailed EB absolute chronology of Upper Thrace cultures.

Dubene-Sarovka: Stratigraphy and Relative Chronology

Dubene-Sarovka is a low tell in northwest Thrace at 315 m above sea level. It is situated on the left side of the valley of the Upper Stryama, one of the biggest tributaries of the Maritsa River (Figure 1), in the Karlovo Hollow, which is divided from the Maritsa basin by the middle ranges of the Sredna Gora Mountains. Passes of the western Sredna Gora Mountains connect the Karlovo Hollow with

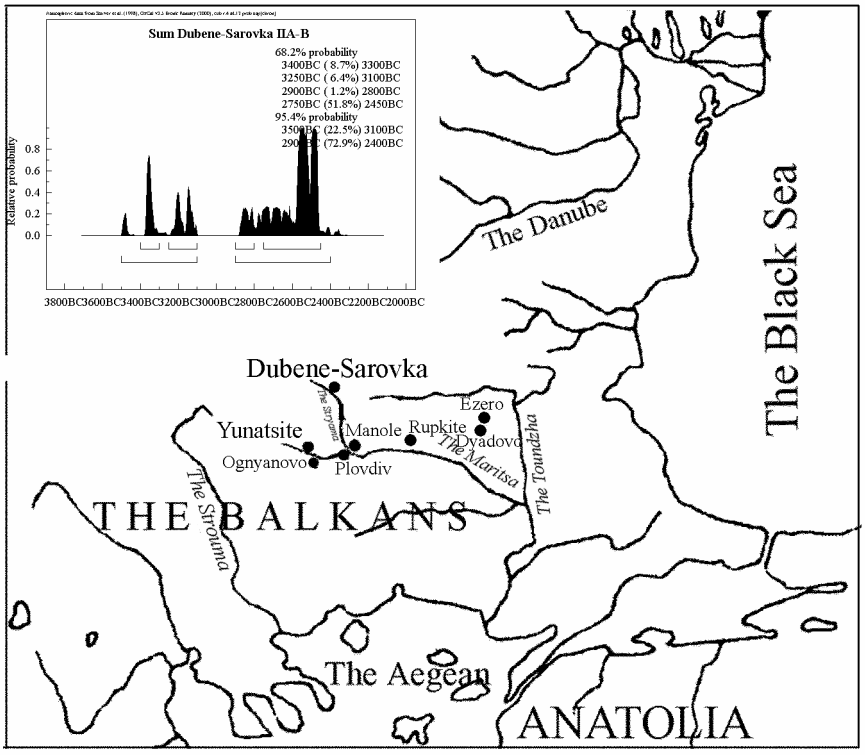


Figure 1 Map of the Balkans showing the main sites studied here. Inset: chart of the sum-probability of Dubene-Sarovka IIA-B ^{14}C dates (n=4).

Sofia Field in southwest Bulgaria and farther with the Morava valley in eastern Serbia, while to the east there are small interrelated hollows connecting the upper Stryama valley with the vast Upper Toudzha valley.

The systematic excavations of the Dubene-Sarovka tell began in 1992[1]. During eight seasons, the site was recovered over more than 4000 m^2 at a depth of 0.50–1.00 m below the surface, while control trenches reached the subsoil at about −2.00 m from the datum. As a result, thick cultural layers from Late Copper (Karanovo VI culture) and Early Bronze I-II (Yunatsite culture I-II) have been documented (Nikolova 1999b). The stratigraphic data were supplemented by a bountiful ceramic record and by archaeomagnetic (Kovacheva et al. 1995; also excavation campaign 1999) and ^{14}C samples (Nikolova and Görsdorf 1998). The complex results from these sites contributed considerably to the modern Early Bronze chronology of the Balkans (Nikolova 1999a, 1999b).

The Early Bronze levels at Dubene-Sarovka have been divided into two main stages, IIA and IIB, respectively. The surface data and some pits documented a third stage (IIC), from Early Bronze III, characterized by pointed-bottom cups and plain pottery. The levels of that stage had been destroyed during the agricultural activity over the tell area.

[1]Since 1992, the excavations at Dubene-Sarovka have been directed by Dr Lolita Nikolova. In 1993 and 1994 Dr Alexander Bonev was the first director who continued to participate in the following campaigns as a supervisor of the excavations. The investigations in 1999–2000 were executed thanks to the volunteer assistance of undergraduate students from the Department of Archaeology at Veliko Turnovo University (Bulgaria).

Dubene-Sarovka IIB (EB II) is, for now, the best-excavated layer on the tell. House structures with a horizontal and vertical stratigraphic correlation have been excavated. The IIB layer is about 1 m thick and comprises three to six house levels preserved in different sectors of the tell. Characteristic of the IIB levels is the encrusted pottery that defines the ceramic style of most of the Early Bronze II Balkan cultures. The superimposed house levels along with ceramic data infer three phases: Dubene-Sarovka IIB1-3, which corresponds to Yunatsite 14-9, Ezero 10-4, Pernik II, Coţofeni II-III, Sitagroi Va, Kostolac, and Vučedol[2], etc., dated from the Early Bronze II (Nikolova 1999b: 62-70). There are two ^{14}C dates from Dubene-Sarovka IIB (Nikolova and Görsdorf 1998):

Bln-4903 4003 ± 36 BP, 2570–2470 cal BC (68.2% confidence), 2630–2450 cal BC (95.4% confidence)[3] (Layer IIB1)
Bln-4900 3993 ± 36 BP, 2565–2465 cal BC (68.2% confidence), 2620–2400 cal BC (95.4% confidence) (Layer IIB2)

In general, the values of the dates confirm the contemporaneous occupation of Dubene-Sarovka IIB1 and Yuntasite 14-13, and Dubene-Sarovka IIB2–Yunatsite 12-11 within the first half of the third millennium BC (see the discussion in Nikolova 1999b:64–5), although we need additional samples for a precise chronology of the levels to which they belonged.

The Dubene-Sarovka IIA layer is comprised of pottery typical of Early Bronze I in the Balkans—mostly plain burnished with emblematic channels and initiated encrusted ceramics. For the time being, the thickest sector cultural layer is about 1 m and consists of four house levels.

The Early Bronze I layer has been initially documented by a house on the southern steep periphery of the tell, as well as by a pit near that house (P15-93). The pottery from that stage has parallels at Yunatsite 17-15, Ezero 13-11, Baden, Cernavoda, Sitagroi IV, etc., dated from Early Bronze I. In 1999, the control trench (H18-4) in the northern central part of the tell (Nikolova 1999b:43–5, Figure 1.1) documented several levels that stratigraphically and ceramically corresponded to the IIA phase, as well as to the transition from IIA to the IIB phase. The last is represented by a hearth floor structure at a depth of 1.44 m from the date over which a burnt level has been documented with fragments of saucer; below there was another level with a published zigzag encrusted bowl (Nikolova 1999b: Figure 2.3). One ^{14}C sample was obtained from the level at a depth of –1.44 m (Bln-5231). The ceramics have analogies at Yunatsite 15-14, but the stratigraphic situation infers that the levels belonged to the end of Early Bronze I, and was contemporaneous with Yunatsite 15, respectively with the end of Pernik I, Baden, Coţofeni I, Ezero 11, and Sitagroi IV, as well as with earlier Cernavoda II and Pit Grave Culture in the Balkans. However, calibrated values of the ^{14}C date point to later chronology (see below).

In the sector under discussion, three more levels, characterized by plain and channel pottery have been recovered in depth, below being a layer with mixed and sparsely distributed Karanovo VI and Yunatsite I sherds. The second new ^{14}C sample from Dubene-Sarovka (Bln-5233) was obtained from the last layer. Hence, the sample has very clear stratigraphic characteristics—below the lowest floor from Early Bronze I in the excavated area. The absence of ^{14}C dates from Yunatsite 16-17, as well as the calibrated values of that ^{14}C date (see below) considerably increases the recent results from Dubene-Sarovka excavations.

[2]See the radiocarbon dates for these cultures in Nikolova 1999a: Table A, Srdoć D et al. 1987; Srdoć D et al. 1989.

[3]Cp. the calibrated values with 3.0 version of Oxcal in Nikolova 1999b: Table A (2850-2450 cal BC). In the context of the comparative chronology, the end of IIB1 phase at Dubene-Sarovka to which the sample belongs, is ca. 2850–2800 cal BC.

The New Radiocarbon Dates

Chemical pretreatment of the samples was completed through AAA treatment (Mook and Streurman 1983). The dating was performed with gas proportional counters of the Houtermans-Oeschger type using methane at 133.3 kPa pressure as filling gas. Measurement control and data processing was executed using computers (Görsdorf 1990). Modern electronics have been used in such a way that the preamplifier, pulse amplifier, comparator, pulse shape and anti-coincidence units were located in a box (19 cm × 10 cm × 5 cm) directly connected to the counter. To reach measurement accuracy, detection of the variations of environmental radiation and the inspection of the long-term stability of the electronics was necessary (Görsdorf 2000).

The $\delta^{13}C$ determinations have been studied at the Leibniz-Labor at the University of Kiel, Germany and reported in permil relative to PDB-standard. Using the measured $\delta^{13}C$ values, the datings are correct for isotopic fractionation, while the ^{14}C ages are calibrated by the OxCal program, version 3.5 (Ramsey 1995, 1998, 2000) and employing the decadal calibration curve (Stuiver et al. 1998) as a first approximation for all samples. The calibration intervals are represented with a confidence of 68.2% and are rounded off to 10 years. Table 1 shows the dating results together with locations. The relatively large calibration intervals of both dates are due to the wiggle shape of the calibration curve.

Table 1 Radiocarbon dates from Dubene-Sarovka (Upper Thrace) and their calibrated individual distribution (68.2% probability)

Lab nr Sample	Dubene-Sarovka site (Stratigraphic data)	$\delta^{13}C$ (PDB ‰)	^{14}C age	Calibrated age ranges (68.2% probability)	Calibrated age ranges (95.4% probability)
Bln-5233 Charcoal	H18-4 Depth: –1.90–2.46 m (+313.10/312.54 m)	–26.8‰	4571 ± 32 BP	3490 BC (1.4%) 3470 BC 3370 BC (35.0%) 3330 BC 3220 BC (14.2%) 3180 BC 3160 BC (17.5%) 3120 BC	3500 BC (8.0%) 3460 BC 3380 BC (40.7%) 3300 BC 3240 BC (46.7%) 3100 BC
Bln-5231 Charcoal	Sq. H18-4 Depth: –1.44 m (+313.56 m)	–26.2‰	4145 ± 29 BP	2870 BC (13.4%) 2830 BC 2820 BC (4.5%) 2800 BC 2780 BC (1.0%) 2770 BC 2760 BC (39.8%) 2660 BC 2650 BC (9.5%) 2620 BC	2880 BC (93.7%) 2620 BC 2610 BC (1.7%) 2590 BC
Bln-4903 Charcoal	Sq. K12 Depth: –1.39 (+313.61)	–24.95‰	4003 ± 36 BP	2570 BC (44.0%) 2515 BC 2500 BC (24.2%) 2470 BC	2630 BC (95.4%) 2450 BC
Bln-4900 Grain	Sq. F16 Depth: –1.10 m (+313.90 m)	–24.52‰	3993 ± 36 BP	2565 BC (40.8%) 2520 BC 2500 BC (27.4%) 2465 BC	2620 BC (94.0%) 2450 BC 2420 BC (1.4%) 2400 BC

DISCUSSION AND CONCLUSIONS

The long stratigraphy of Dubene-Sarovka, the numerous contact data in the context of rich and well-stratified archaeological material, the vast excavated area, and the interacted method of recording including archaeological and natural sciences all contribute to the elaboration of an accurate and complete chronology of the region. This gives reason for the ^{14}C dates to have a high recording value even though for the time being there is sole such evidence from the different levels.

Conclusions based on new stratigraphic and ^{14}C data from Dubene-Sarovka concern two periods in the Balkans—Early Bronze I, as well as the beginning of Early Bronze II. For these periods in Upper Thrace, there are ^{14}C dates from Dubene-Sarovka, Yunatsite, Plovdiv-Nebet Tepe, and possibly Manole (Yunatsite culture), and from Rupkite-Kaleto, Ezero, and Dyadovo tell (Ezero culture)

Table 2 Radiocarbon dates from Early Bronze I and earlier Early Bronze II in Upper Thrace[a]

Site	Lab nr	Sample type	^{14}C age (BP)	Comments (see calibrated values in Figure 2)
Yunatsite Culture (Western Upper Thrace)				
Dubene-Sarovka IIA	Bln-5233	Charcoal	4571 ± 32	EB I. From a cultural level with a few EB I and Late Copper (Karanovo VI culture) sherds.
Dubene-Sarovka IIA/B	Bln-5231	Charcoal	4145 ± 29	End of EB I, or beginning of EB II according to the calibrated values. Hearth.
Yunatsite 15	Bln-3675	Grain & seed	4280 ± 60	End of EB I. The only date from the level that corresponds to the comparative chronology.
Yunatsite 15	Bln-3677	Grain & seed	4080 ± 70	End of EB I. The calibrated values correspond to EB II.
Yunatsite 15	Bln-3678	Grain & seed	4050 ± 50	
Yunatsite 15	Bln-3676	Grain & seed	4030 ± 70	
Plovdiv-Nebet Tepe "10"	Bln-4353	Charcoal	4610 ± 80	The steep character of the terrain might have resulted in imprecise stratigraphy; the pottery from the site (unpublished) comprises typical EB I shapes and ornamentation.
Plovdiv-Nebet Tepe 11	Bln-4355	Charcoal	4280 ± 55	The date corresponds to the end of EB I – EB II. But see the next note.
Plovdiv-Nebet Tepe 11	Bln-4330	Charcoal	4070 ± 40	Later EB II, cp. above and the note on the stratigraphic problems of the site.
Manole-Razkopanitsa 4	Bln-813	Grain & seed	4350 ± 100	According to the diagnostic published pottery, the tell is from EB III and later periods; the published stratigraphy is not precise and the material is not completely published; among the published finds is a figurine that can be dated from EB I.
Ezero Culture (Eastern Upper Thrace)				
Rupkite-Kaleto	Bln-3429	Charcoal	4790 ± 60	Both dates are from ditches; among the preliminary published material there is typical of EB I pottery.
Rupkite-Kaleto	Bln-3773	Charcoal	4250 ± 150	

Table 2 Radiocarbon dates from Early Bronze I and earlier Early Bronze II in Upper Thrace[a] (*Cont'd.*)

Site	Lab nr	Sample type	^{14}C age (BP)	Comments (see calibrated values in Figure 2)
Ezero 13	Bln-1840	Charcoal	4590 ± 100	EB I. All the samples are from a depth of 3.20–3.45 m from the date. Some of the dates with low values originate from similar context with one of the dates that have the highest values. But for instance, Bln-905 and Bln-1838 from a depth of 3.20 m may indicate longer occupation of the level and just partially overlapping of the different houses. Nevertheless, even this interpretation cannot accept the values after 3100 BC which is the latest possible dating of the end of Ezero 13.
Ezero 13	Bln-1920B	Charcoal	4500 ± 50	
Ezero 13	Bln-1786	Charcoal	4450 ± 85	
Ezero 13	Bln-1843	Charcoal	4430 ± 50	
Ezero 13	Bln-1841	Charcoal	4420 ± 50	
Ezero 13	Bln-1837	Charcoal	4415 ± 40	
Ezero 13	Bln-1920	Charcoal	4390 ± 50	
Ezero 13	Bln-1158	Charcoal	4363 ± 100	
Ezero 13	Bln-1838	Charcoal, grain & seed	4305 ± 65	
Ezero 13	Bln-1256	Charcoal	4300 ± 80	
Ezero 13	Bln-904	Charcoal	4143 ± 100	
Ezero 13	Bln-905	Charcoal	4113 ± 100	
Ezero 13	Bln-1159	Charcoal	4099 ± 100	
Ezero 12	Bln-1836	Charcoal	4160 ± 55	EB I. The calibrated values are later than the comparative chronology of the level.
Ezero 12	Bln-903	Charcoal	3935 ± 100	
Ezero 11	Bln-902	Charcoal	4360 ± 100	End of EB I.
Ezero 10	Bln-727	Grain & seed	4315 ± 100	Beginning of EB II.
Ezero 10	Bln-726	Grain & seed	4285 ± 100	
Ezero 10	Bln-1835	Grain & seed	4260 ± 45	
Ezero 10	Bln-725	Grain & seed	4120 ± 100	
Dyadovo 10	Gak-20464	Charcoal	4510 ± 60	EB I. Unpublished ceramics from that level excavated by the Bulgarian team; the date corresponds to EB I, and to Ezero 13 in particular.
Dyadovo 10 Floor A	Gak-20465	Charcoal	4340 ± 60	EB I. The published pottery by the Japanese team has analogy at Ezero 13. But some typical of the last level ornamentation motifs are missing in light of recent limited evidence.
Dyadovo 10 Floor B	Gak-20466	Charcoal	4490 ± 60	
Dyadovo 10 Pithos 1	Gak-20467	Charcoal	4530 ± 120	

[a]Comments: All dates are calibrated with Oxcal 3.5 by Bronk Ramsey (2000). Reference to the original publications of the dates see in Nikolova 1999. References: Nikolova (1999a); Sekime and Kamuro (2000: tables 6 & 7).

(Nikolova 1999a[4]; Sekime and Kamuro 2000). The comments in Table 2 reflect the complexity of the problems that face the stratigraphic analyses of the ^{14}C dates. Figure 2 shows the calibrated values of their individual distribution (n=36) and the sum-probability that covers the very long period from approximately 3400 to 2550 BC (by 68.2% probability).

As Figure 2 shows, Bln-5233 preceded all the values from Early Bronze at Yunatsite 15, however, it is close to one date without a clear stratigraphy from Plovdiv-Nebet Tepe, the main site from the Yunatsite culture in the recent Plovdiv region. The Dubene-Sarovka sample indirectly confirms that the Plovdiv-Nebet Tepe ^{14}C date originated from Early Bronze I level. In comparison to the Ezero

[4]See in the cited monograph the reference to the original publications of the ^{14}C dates compiled in Table 2.

culture, Bln-5233 is close to some dates from Ezero 13 (Nikolova 1999a: Table A), as well as from earlier dates from EB Dyadovo (Sekine and Kamuro 2000). In this group of dates, Bln-5233 is noteworthy as it is considered that the genesis of the Yunatsite culture was before 3300 BC (based on comparative stratigraphy and chronology) and possibly confirms the legacy of the disputed dates such as the one from Plovdiv-Nebet Tepe. Of special importance is the fact that the values of the radiocarbon date completely verify the contemporaneous process of genesis of the Early Bronze I cultures in Upper Thrace. It is an objective of further investigation to determine more precise comparative characteristics of the beginning of the different Early Bronze I sites in Upper Thrace. At this time, it can be assumed that the beginning of Dubene-Sarovka IIA had preceded Yunatsite 17 (the earliest Early Bronze documented horizon on the tell).

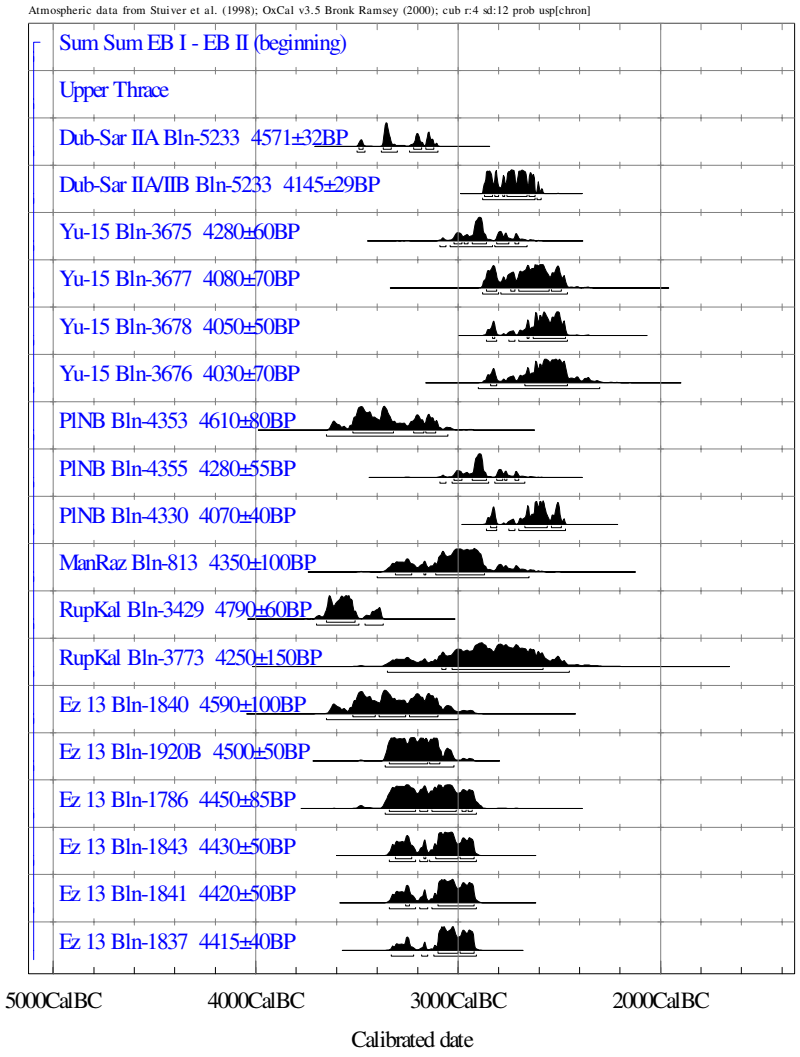


Figure 2A Individual distribution and sum probability of the calibrated ^{14}C dates from Upper Thrace. Early Bronze I to the beginning of Early Bronze II (n = 36). Data from Table 2.

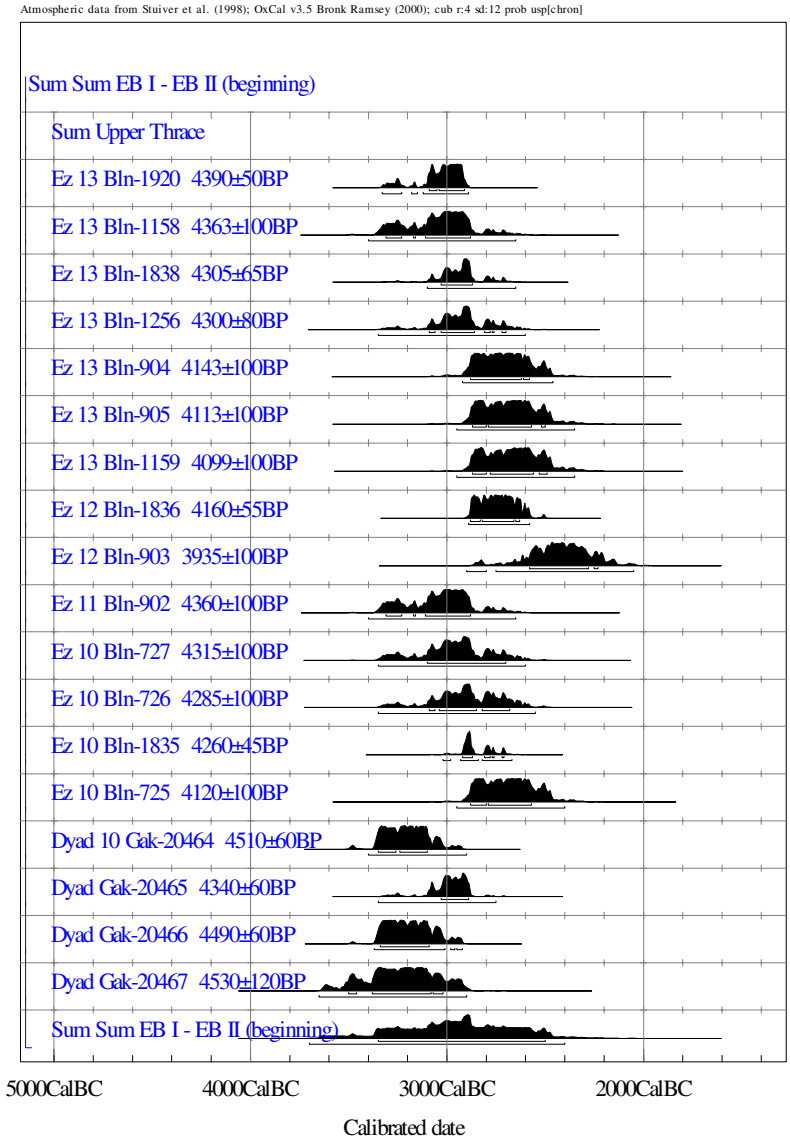


Figure 2B See Figure 2A

The next point concerns the interrelation between the duration of the Early Bronze I sites and the thickness of the cultural layers. The thickness of the stratigraphic levels from Dubene-Sarovka IIA does not exceed 1 m, according to the recent investigation, and is similar to that of Ezero 13-11. In addition, a clear development of the ceramic style is documented at Dubene-Sarovka, which makes it difficult to believe there was an existence of sensitive temporary hiatus during that stage. The accumulation of Early Bronze I on Yunatsite 17-15 is about 1.50 m. It is thicker than Dubene-Sarovka IIA in trench H18-4. The problem requires continued discussion, but for now, the suggestion is that there is a complex interrelation between the different accumulated strata of the prehistoric tells (respectively multilevel settlement); the thickness of those strata cannot be used for any straightforward

chronological conclusions. The multilevel settlements combine many characteristics not only of the vertical but also of the horizontal stratigraphy and a variety of accumulation processes.

Furthermore, Bln-5231 concerns the beginning of Early Bronze II in Thrace and in the Balkans. Based on recent complex data, it is dated from around 3000 BC (Nikolova 1999a). The calibrated values of Bln-5231 correspond to such chronology that they date the end of level about 2800–2870 BC (as the earliest possible), but stratigraphically and ceramically, level 1 in H18-4 is closer to the end of EB I. Similar problems have posed the other ^{14}C dates from Dubene-Sarovka IIB and especially those from Yunatsite 13 and 11, as well as some of the dates from early Ezero, in particular Ezero 12. Further ^{14}C dates from Upper Thrace will probably better explain the reason for this controversy.

As far as earlier the Early Bronze age in Upper Thrace is concerned, with 68.2% confidence, the values of the ^{14}C dates in Figure 2 are distributed in the period between 3400 and 2550 BC, hence, it covers EB I and the whole EB II (see Nikolova 1999a). That statistical situation corresponds to the peculiarities of many of the individual dates, which have relatively low values. With 95.4% confidence, the earliest possible chronological border of the beginning of EB I is even 3700 BC. But the radiocarbon dates from Early Bronze I are again still not enough for more detailed considerations.

In conclusion, the Dubene-Sarovka excavations have been accomplished as an integrative project for excavation of the prehistoric site, the goal of which has been employing the different opportunities of the archaeological and natural sciences with interrelated and coordinated tasks and levels of investigations. After the terrain achievement of documenting precise stratigraphy and obtaining different kinds of samples from one and the same levels, the results of the integration at the theoretical level of research confirms that the absolute chronology requires complex interactive research.

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