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Bullion mixtures in silver coinage from ancient Greece and Egypt

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10 'Declarations of interest: none'.

Abstract. Was silver coinage minted from fresh metal newly extracted from the mine or was it from recycled silver deriving from older coins, silverware, or cult objects? The answer helps understand the provenance of the coins and their circulation. Using Pb isotopes, the present work proposes a method to disentangle the sources of 368 silver-alloy coins from Athens, Corinth, Aegina, Thasos, Thrace, Macedonia, and Ptolemaic Egypt. We outline a new mixing model based on Principal Component Analysis and allowing for multiple steps of bullion recycling. The first component accounts for 94-99% (typically 97-99%) of the total variance, which indicates that the data form a well-defined alignment indicative of a nearly binary mixture between two source ores referred to as 'end-members'. Isotopic evidence establishes the subordinate but pervasive practice of remelting. The strong skewness of the first principal component distribution shows that lead is dominated by the binary mixing of end-members. The geologically young end-member has high ²⁰⁶Pb/²⁰⁴Pb and is best exemplified by the Laurion ore used in Athenian coinage. With the possible exception of Ptolemaic samples, the second end-member attests to the persistence of a low-²⁰⁶Pb/²⁰⁴Pb, geologically much older, end-member. In most cases, the distributions of a further two other principal components are nearly symmetric and can be considered normal. If they represent ore sources, their very small contribution to the variance qualifies them as 'noise' (random isotopic fluctuations in the ores and analytical issues). We find that the Pb isotope ratios in the coinage issued by each minting authority are distributed as a power law. The slope of this distribution varies from one mint to another, with the steepest slopes (Corinth and Ptolemaic Egypt) indicating the predominance of freshly mined silver. The shallow slope of Macedonia demands a larger proportion of geologically old Pb. Silver supplied to the mint of Athens shifted from a mixture of high- and low-²⁰⁶Pb/²⁰⁴Pb in the late 6th c. BCE to a predominance of unmixed high-²⁰⁶Pb/²⁰⁴Pb ore from the mines of Laurion thereafter and fell back to a mixture with intermediate Pb isotope compositions in the second half of the 4th c. BCE. The limitation of the present study resides in the relatively small number of Pb isotope data for each mint, which, in most cases, prevents a statistically significant analysis of these data by periods. Nevertheless, the quasi-binary nature of most silver mixes stands out as a new and strong first-order, albeit somewhat counterintuitive, inference from the present data.

There is little historical evidence for how the mints of ancient Greek city-states (*poleis*), leagues (*koinonia*), and kingdoms obtained their supplies of silver for minting coins, especially when they lacked domestic natural resources. Was bullion minted fresh from the mine, or exported and only minted or turned into other silver products on demand, or simply hoarded by, for example, the Achaemenid kings? To what extent was silver recycled multiple times, especially by melting down older coinage and temple offerings and striking new coinage, as illustrated for example by the Coinage Decree of Athens and allied cities (Melville-Jones, 2007). Refining (Van Alfen, 2004) and recycling of bullion were the ultimate mechanisms by which silver of

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different origins mixed, such as in the case of the Persians (Blichert-Toft et al., 2022, Olivier et al., 2017). Silver moved around the Mediterranean through the agency of Phoenician and Greek traders and mercenaries (Davis, 2012), and by payment of tribute (Thuc. 1.96.1-2; 2.13.3), booty (Plut. *Cimon* 9.4), ransom (Hdt. 5.74.3), and reparations (Thuc. 1.101.3). Attempts were made by imperial Athens to mandate use of Athenian coinage (*IG* $\tilde{\rho}$, 1453) and to deal with the problem of foreign and counterfeit coins being brought into the economy (Dem., 24.212-4, *Hesperia* 1974, 157-88). There is evidence of *poleis* and kingdoms requiring the use of their own coinage within their territory necessitating exchange for a small fee, though some major coinages, notably of Athens, would have had wide acceptance (Xen. *Poroi* 3.2; cf. discussion in Melville Jones, (2007), *SIG*³, 218 for Olbia; *P.Cairo Zen.* 59021, ‘The Revenue Papyrus of Ptolemy Philadelphus’, Column 74 for Ptolemaic Egypt). Other than that, we are in the dark. Here we use the distribution of lead isotopes in said silver coinages to address the question of the extent to which pure and mixed sources of silver were accessed by a selection of Greek, Macedonian and Ptolemaic mints.

The geological association of lead and silver in ore matrices provides the justification for the use of Pb isotopes for sourcing the silver metal used for coinage and artifacts since lead was required to cupellate silver and traces of it remain in the final product. With the exception of Southern Iberia and a few other localities where argentiferous sulfates were formed by the weathering of sulfide seams, it is now clear that the major sources of silver were sulfidic ores, typically galena (PbS), and sulfosalts usually scattered throughout sulfidic ores (Chutas et al., 2008, Sack et al., 2002). This meant that non-local (exotic) Pb rarely needed to be added to cupellate the silver.

A major uncertainty overarches the focus of the present work. To what extent does a particular Pb isotope composition represent a specific mine district rather than a mixture created by remelting and/or restriking of coins and artifacts from different origins? To address this issue, we measured the Pb isotope compositions of 112 coins from Athens (ca. 525-290 BCE, including 19 *Wappenmünzen* and the rest owls including 7 pi-style owls dating to 353-290 BCE), 56 from Corinthia (ca. 500-250 BCE, including 44 coins from Corinth and the rest from Sicyon and the *koinon* of Acarnania including Leucas), 18 from Aegina, and 38 from Thasos. More regional data are 50 coins from Thrace (east of the Strymon river but including Thasos), 48 from the kingdom of Macedonia (525-168 BCE), and 46 from Ptolemaic Egypt (Ptolemy I to Ptolemy XII) (Lorber, 2018, Lorber, 2023). Among these, Aegina and Corinth were not primary silver producers but early major trading states relying on externally obtained sources to supply their mints (Gale et al. 1980). Egypt, tectonically restricted to the pan-African domain, also did not possess domestic silver ores (Price and Waggoner, 1975).

The Pb isotope data on coins show a broad scatter but with distinctive trends within the spread. Multiple potential factors account for Pb isotope variability: (1) The tectonic age of the ore, which is the time of separation of Pb from U and Th (radiogenic ingrowth); (2) the U/Pb and Th/U ratios of the source precursor; (3) mass-dependent isotope fractionation due to natural processes taking place at low temperature, such as weathering, hydrothermal activity, and Pb(II)/Pb(IV) equilibration between heterovalent oxidation states; and (4) mass-dependent isotope fractionation due to incomplete yields of Pb during purification by ion-exchange chromatography and erroneous correction of mass bias in the mass spectrometer during Pb isotope analysis. These problems have been reviewed elsewhere (Albarède et al., 2020).

An important aspect is the choice of isotope used to normalize Pb isotope ratios, most commonly ²⁰⁶Pb or ²⁰⁴Pb, because it provides different insights into the processes of interest.

105 Normalization to ^{206}Pb provides smooth arrays but only because radiogenic ingrowth and mass-dependent fractionation spread the data in the $^{208}\text{Pb}/^{206}\text{Pb}$ vs $^{207}\text{Pb}/^{206}\text{Pb}$ plot in nearly parallel directions, which leads to unresolvable ambiguity. Here, normalization to ^{204}Pb , e.g., in the $^{207}\text{Pb}/^{204}\text{Pb}$ vs $^{206}\text{Pb}/^{204}\text{Pb}$ plot, was chosen because the angle between the two isotopic effects resulting from radiogenic ingrowth and mass-dependent fractionation, respectively, is now obtuse, and this optimizes information about which process controls the overall spread of the Pb isotopic data.

110 The problem of mixed sources of lead in archaeology was discussed by Stos-Gale (2001) who pointed out that binary mixtures in diagrams involving isotopic ratios should plot on the straight-line joining the points representing the masses of metal involved in the mixing. This important point should be corrected by the caveat that it is true *only* for isotopic ratios using the *same* normalization isotope. In particular, the statement fails for a plot such as $^{208}\text{Pb}/^{204}\text{Pb}$ vs $^{207}\text{Pb}/^{206}\text{Pb}$, in which the mixing curve is a hyperbola (Albarède, 1995, Albarède et al., 2021) and not a straight-line. The same confusion arises when Pb isotopes are plotted as a function of any of the geochemically informed parameters, such as Pb model ages (Wood et al., 2017). For all these reasons, we restrict ourselves to ^{204}Pb -normalized data.

120 Isotopic variability is due to two compounding factors: (1) mixing between end-members (not to be confused with principal components); and (2) random noise due to mass fractionation in the ore, in the chemistry lab, and in the mass spectrometer plus intrinsic geochemical variability in the ore deposit (Fig. 1). For complex mixtures, Principal Component Analysis (PCA) is the method of choice (Baxter and Gale, 1998) see a review of recent literature in (Tomczyk and Żabiński, 2023). By an appropriate sequence of rotations in the original space of Pb isotope ratios, PCA reduces the number of dimensions in which large data sets are originally embedded to a new transformed representation that still contains most of the information contained in the original data set, but with a smaller number of dimensions.

130 In the absence of noise, the proportion of total variance explained by each principal component is key to the assessment of the number of metal sources.

- 135 a. If 100% of the variance (variability) of the data is explained by *one* principal component, the data define a *straight-line* in both the original and transformed spaces. Mixing between two end-members manifests itself by a *straight-line passing through the end-members*. The straight-line indicates that the data set is accounted for by *two* different sources (*binary mixture* of two end-members). Large numbers of isotopically identical coins minted from pure ore seem unusual, which suggests that the shop would normally take advantage of scrap silver accumulated in the mint. An example of end-members would be that a particular artifact could be formed by mixing silver from two distinct provenances (e.g., Laurion and Pangaion). Each projection will show linear relationships between the isotopic ratios.
- 140 b. If *two* principal components are required to account for 100% of the variance, the data plot within a 3-dimensional *triangle* and *three* sources are required (*ternary mixture*). Binary plots will show scatter, except if the triangle is projected sideways: such a configuration explains the remarkable regularity of the widely used $^{208}\text{Pb}/^{206}\text{Pb}$ vs $^{207}\text{Pb}/^{206}\text{Pb}$ plots (Albarède et al., 2020).
- 145 c. If the variance needs *three* principal components to be fully explained, no structure is discernable in the 3-dimensional space and *at least four* end-members are needed. No projection shows regularity.

150 The component scores (=loadings) of a particular sample are simply its coordinates in the principal component representation. The breakdown into components is not a model or an

assumption; it is a description of the mass conservation principle with the same certainty as death and taxes.

155 In the absence of mixing, noise manifests itself as a well-centered volley of buckshot. The combination of both mixing and noise produces scatter in isotopic plots. Fortunately, Principal Component Analysis (PCA) can see through the combination of mixing and noise. When only two end-members can be seen, potential additional end-members are drowned in the noise and hence do not show up in the data. These additional end-members may be multiple, but evidence for their existence is missing.

160

Figure 1

165 Finally, it can be speculated that missing sources (end-members) have blended with each other to the extent that they appear to form a single component. Such mixtures would require a large number of melting/striking cycles for the original sources to escape disentanglement by PCA. In addition, such unnoticeable mixtures are expected to fall in an empty part of the isotopic space or, even worse, point to an apparent provenance for which evidence is faint or nonexistent.

170

The local statistical properties of Pb isotopes in silver coinage

175 The case of Athens well illustrates the geometry of the problem. Lead isotopes were determined for 112 silver coins dated from the Late Archaic period (*Wappenmünzen*, late 6th c. BCE) through to the Hellenistic period (early 3rd c. BCE). Discontinuities in the history of bullion supply and provenance, notably for coins minted from distinct masses of silver, can be handled in the multidimensional space of Pb isotope compositions. In order to assess the number of bullion sources and identify potential trends in the three-dimensional $^{206}\text{Pb}/^{204}\text{Pb}$ — $^{207}\text{Pb}/^{204}\text{Pb}$ — $^{208}\text{Pb}/^{204}\text{Pb}$ space, we first determined the PCA scores [c_1 , c_2 , c_3] of each datum
180 from the data set considered. Given that isotopic ratios are of similar range, PCA can be calculated on the variance matrix after centering.

185 The first component scores along the first axis c_1 typically account for 97–99% of the variance, which indicates that, in three-dimensional space, the variability of Pb isotopes is dominated by a linear array (Fig. 2). The projection of the c_1 values onto each plane of the three rectangular plots of the three ratios $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, and $^{208}\text{Pb}/^{204}\text{Pb}$ defines an array which is oblique with respect to both of the trends of radiogenic ingrowth and mass-dependent fractionation. The distribution of component c_1 is strongly skewed, which brings to mind the that, in general, Pb isotopic data on ores and artifacts are not normally distributed (Baxter, 1999, Baxter and Gale, 1998). In contrast, the second component c_2 and the very small component c_3 are much more symmetrically distributed. The more symmetric aspect of the second component c_2 and its small contribution to the variance (2.2%) prove that no more than two end-members are involved in the mixture.

195 The histograms of the smaller components c_2 and c_3 strongly suggest that they are dominated by random fluctuations and correspond to statistical noise. In contrast, the large asymmetric component c_1 is definitely not consistent with a normal distribution and reflects mixing of two sources of silver with different Pb isotopic compositions sitting at each end of the linear array.

200 These are known as 'end-members'. In other words, the trend stretching along the c_1 axis is not controlled by random fluctuations but by the additive mixing of two contrasting masses of bullion with different Pb isotope compositions. The only accessible information on these end-members is that their c_1 values must plot outside of the range defined by the Pb isotope data. Whether each end-member was added to the mixture in one or multiple steps, e.g., by successive (re)melting episodes, is what the new model is trying to address. Not only might 205 these addition episodes have been multiple, they could also have occurred at different points in time, such as progressive enrichment of an old silver 'mix' by later addition of freshly mined silver.

210 *Figure 2*

Figure 3

215 The fraction of scores c_1 is maximum next to the upper end-member c_0^b and decreases exponentially away from it towards its lower end-member c_0^a (Fig. 3). We used the standard optimization technique (see Appendix) provided by Matlab to determine the cumulative density function (cdf) $F(r)$ of the reduced mixing variable $r_1 = (c_1 - c_0^a) / (c_0^b - c_0^a)$ defined on $[0,1]$ to adjust it to an exponential distribution. In a plot of $\log F(r)$ vs $\log r$ (Fig. 4), the data form a remarkable alignment corresponding to cdf $F_{R_1}(r_1) = r_1^\alpha$ indicating that the scores c_1 are distributed following a truncated power law with *positive* α exponent between the upper and 220 lower values c_0^a ($r_1 = 0$) and c_0^b ($r_1 = 1$) of the end-members. A more conventional power law with a *negative* α exponent and defined over $[0, \infty[$ is obtained by replacing the variable r_1 by the variable $r'_1 = (c_0^b - c_1) / (c_1 - c_0^a) = (1 - r_1) / r_1$, although at the cost of not explicitly using mixing proportions r_1 . Optimization by the Matlab numerical software returns the values of c_0^a , c_0^b , and α and their 95% confidence interval. The Pb isotope ratios corresponding to c_0^a and c_0^b 225 are back-calculated from the principal components. For clarity, subscript 1 will hereinafter be omitted from symbols r and c .

Figure 4

230 The significance of the power law

To chemists and geochemists, the variable r brings mixing processes to mind: each sample represents a mixture of two metal fractions with Pb isotope compositions c_0^a and c_0^b (as determined by PCA and which can be back-calculated as true isotope ratios) or, equivalently, 235 with reduced variable values $r=r_a=0$ and $r=r_b=1$. The simple theory of mixing calculations applies indifferently to actual Pb isotopic ratios and to component scores.

Given the overwhelming predominance of the first component variance and the remarkably asymmetric distribution of its scores, mixing can be considered binary. Let us assume that each 240 new issue is minted using fresh bullion extracted from the mine, here the mines of Laurion, and recycled silver, which can be derived from either 'rogue' sources or a nondescript mix of multiple sources with low $^{206}\text{Pb}/^{204}\text{Pb}$. All the calculations are made on the isotopes of Pb contained in coinage. We will assume that the Pb proportion (caveat: not the mass of silver) of fresh silver (b) in the mix at the first step is denoted by φ and the proportion of recycled Pb (a) 245 is $1-\varphi$. The value c_1 of the mix in the first issue is given by:

$$c_1 = (1 - \varphi)c_0^a + \varphi c_0^b \quad (1)$$

For simplicity we assume that from one issue to the next, the proportion φ does not change.
 250 The value c_2 of the mix in the second issue is:

$$\begin{aligned} c_2 &= (1 - \varphi_2)[(1 - \varphi_1)c_0^a + \varphi_1 c_0^b] + \varphi_2 c_0^b \\ &= (1 - \varphi)^2 c_0^a + 2\varphi c_0^b - \varphi^2 c_0^b \end{aligned} \quad (2)$$

255 where it was assumed that $\varphi_1 = \varphi_2 = \varphi$. In addition, the contributions of antepenultimate and prior issues are neglected, which is equivalent to assuming that products of more than 2 terms in φ and $1 - \varphi$ are small with respect to lower-degree terms. For the n -th issue, the equivalent equation therefore is:

$$260 \quad c_n = (1 - \varphi)c_{n-1} + \varphi c_0^b \quad (3)$$

This is a difference equation which has the general solution:

$$265 \quad \begin{aligned} c_n &= (1 - \varphi)^n c_0^a + \{1 - (1 - \varphi)^n\} c_0^b \\ &= c_0^b + (1 - \varphi)^n (c_0^a - c_0^b) \end{aligned} \quad (4)$$

or

$$\frac{c_0^b - c_n}{c_0^b - c_0^a} = 1 - r = (1 - \varphi)^n \quad (5)$$

which gives the dependence of the time-integrated mixing parameter r with respect to
 270 parameters φ and n . In order to estimate n from $F_R(r)$, let us now use the observation that the reduced, time-integrated mixing variable is distributed as a power-law cdf with exponent α :

$$F_R(r) = r^\alpha \quad (6)$$

275 which is equivalent to the following point density (or frequency) function $f_R(r)$ (pdf):

$$f_R(r) = \frac{dF_R(r)}{dr} = \alpha r^{\alpha-1} \quad (7)$$

280 The pdf of the mixing parameter φ is:

$$\begin{aligned} f_{\Phi,n}(\varphi) &= f_R[r(\varphi)] \left| \frac{dr}{d\varphi} \right| \\ &= \alpha n (1 - \varphi)^{n-1} [1 - (1 - \varphi)^n]^{\alpha-1} \\ &= d[1 - (1 - \varphi)^n]^\alpha / d\varphi \end{aligned} \quad (8)$$

285 which gives the following expression for the cdf:

$$F_{\Phi,n}(\varphi) = [1 - (1 - \varphi)^n]^\alpha \quad (9)$$

290 consistent with Eqns. 5 and 6. The assumption of negligible contributions from the earliest issues could be relieved in a numerical code, but at the expense of the clarity of the deep model structure and for little benefit.

295 The parameter α is the exponent of the power law distribution of the time-integrated proportion
 300 r of end-member b in the coinage of a given polis. The parameter φ is the proportion of end-
 305 member b in the coinage at each minting cycle. Different numbers n of mixing/recycling loops
 are consistent with a same value of the parameter α . Note that $F_{\Phi,1}(\varphi) = F_R(r)$.

Results

300

The calculation used for Athenian silver coins was extended to other data sets: Corinthia, Aegina, Thasos, Thrace (east of the Strymon river), Macedonia, and Ptolemaic Egypt. The data are provided as an Excel spreadsheet in the Supplemental Table T1. A conventional plot of $^{208}\text{Pb}/^{206}\text{Pb}$ as a function of $^{207}\text{Pb}/^{206}\text{Pb}$ is presented in Fig. 5 without the data on Ptolemaic coinage so as to preserve readability. The size of the files containing the coin photographs (2.8 Gb) exceeds the limit allowed by the journal but it can be requested from the authors and will be uploaded to a public database. These photographs are for the purpose of identification only.

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Set	n	a	$a (-)$	$a (+)$	c_a	c_b	$^{206}\text{Pb}/^{204}\text{Pb}_a$	$^{207}\text{Pb}/^{204}\text{Pb}_a$	$^{208}\text{Pb}/^{204}\text{Pb}_a$	$^{206}\text{Pb}/^{204}\text{Pb}_b$	$^{207}\text{Pb}/^{204}\text{Pb}_b$	$^{208}\text{Pb}/^{204}\text{Pb}_b$
Athens	112	3.15	3.09	3.21	-0.845	0.263	18.101	15.605	38.135	18.874	15.700	38.923
Corinth	56	4.88	4.74	5.02	-1.139	0.235	17.855	15.581	37.863	18.803	15.683	38.852
Aegina	18	2.91	2.57	3.26	-0.708	0.223	18.165	15.589	38.115	18.755	15.676	38.830
Thasos	38	2.24	2.01	2.48	-0.403	0.186	18.379	15.646	38.464	18.793	15.679	38.882
Thrace	50	2.81	2.72	2.91	-0.712	0.265	18.215	15.624	38.146	18.800	15.683	38.926
Macedonia	48	1.27	1.20	1.34	-0.464	0.356	18.308	15.630	38.358	18.870	15.691	38.951
Ptolemies	46	6.46	6.22	6.71	-0.996	0.159	18.027	15.593	37.954	18.748	15.675	38.852

310 *Table 1. Calculation output. n is the number of silver coins in each data set. Columns 3-5 list α*
values and their 95% confidence limits. The scores c_1 of the first PCA component are
distributed following a power law between the upper c_0^a ($r = 0$) (recycled bullion) and lower
 c_0^b ($r = 1$) (silver from the most productive mines, such as those of Laurion) end-member
 315 *values. The Pb isotope compositions listed in the last six columns correspond to those of the*
end-members a and b c_0^a and c_0^b .

Figure 5

320 In general, the alignments are excellent at high values of c_1 with increasing scatter at low
 values. The Pb isotope compositions of the high- $^{206}\text{Pb}/^{204}\text{Pb}$ end-members (b) form a rather
 tight group with Cenozoic (<65 Ma) apparent ages, typically Laurion and the Cyclades (Stos-
 Gale et al., 1996, Vaxevanopoulos et al., 2022) whereas the spread of low- $^{206}\text{Pb}/^{204}\text{Pb}$ end-
 members (a) is significantly larger and reflects Late Proterozoic to Late Paleozoic sources
 325 (~700 to 250 Ma), typically the Rhodopes, the Balkans, Sardinia, and the Sierra Morena
 (Vaxevanopoulos et al., 2022, Westner et al., 2023).

Discussion and concluding remarks

Inferences on provenances drawn from the Pb isotope compositions of end-members a and b will be laid out and discussed in Part 2. Here we focus on mixing only.

330

First, the strong isotopic evidence of mixing establishes the pervasive practice of remelting and the less frequent restriking without melting such as is the case with the Athenian *pi*-style owls called in and restruck in the wake of the Social War (357–355 BCE) (Bingen, 1969, de Callataÿ, 2018, Flament, 2007, Kroll, 2011). The present results show that restriking without remelting is a minor occurrence in the Greek numismatic record.

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The relatively small number of analyses obtained for each mint forced us, unfortunately, to consider the data over long periods. This limitation cannot be minimized, but, as an upside, the number of bullion sources identified by PCA is shown to be limited to two in most cases. The sources of bullion used by the various mints have therefore remained relatively stable. The set of Figures S3 nevertheless suggests that, although the sources remain stable, their relative contribution changed through time.

340

When two end-members account for most of the isotopic variability, additional end-members are drowned within the noise and do not manifest themselves in the data. The linearity of the cumulative density function in a log-log plot (Fig. 4) of the isotopic variations in the coinage of a particular *polis* or kingdom confirms the dominantly binary mixing and that the sources of bullion remained almost unchanged over the centuries, even if, as in the case of Athens where the mines of Laurion dominated the supply from the 5th to the beginning of the 3rd c. BCE, the relative proportions contributed by each end-member may have changed with time (Fig. S3).

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The model reflects the power-law distribution of the first component score c_1 : the Pb isotope compositions of most coins are close to the value of the geologically young, high- $^{206}\text{Pb}/^{204}\text{Pb}$ dominating end-member while the contribution of the geologically older, low- $^{206}\text{Pb}/^{204}\text{Pb}$ end-member is small. This explains that, although some samples with a larger fraction of the geologically old end-member may misdirect the search, the Pb isotopes of most coins will reveal, although with noise, the provenance of the young silver component.

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The steeper the slope α , the steeper the histogram of the first component c_1 (Fig. 6). Steep slopes, such as those observed for Corinth and Egypt, reveal the dominance of the geologically young, high- $^{206}\text{Pb}/^{204}\text{Pb}$ silver component in their silver coinage. Trade between Corinth and Athens, but also wider exchanges involving multiple partners, may have funneled high- $^{206}\text{Pb}/^{204}\text{Pb}$ bullion from Laurion into the mints of *poleis* lacking silver mines. The observation is similar for Ptolemaic Egypt. Multiple minting loops acting to rapidly recycle Athenian silver coinage may create the false impression that Laurion-like silver production was much larger than broad estimates suggest. The presence of Laurion-like silver and high α values confirm that money minted in Athens was widely used for foreign trade. In contrast, the low α value observed in Macedonian coinage appears to reflect a larger proportion of the geologically old, low- $^{206}\text{Pb}/^{204}\text{Pb}$ in coinage silver.

360

365

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Figure 6

Smaller proportions of variance accounted for by the first component are compensated for by larger proportions inferred for the second component. This is the case with the coinages of Thrace and the Ptolemies. The larger spread in the plane c_2 vs c_1 may indicate the presence of one or more additional recycled sources of bullion.

375

A major shift in Athenian silver supply is clearly visible when the proportion of high- $^{206}\text{Pb}/^{204}\text{Pb}$ bullion is plotted as a function of the age of minting (Fig. 7). The contrast is

380 particularly strong between the early coinage of the *Wappenmünzen* and the subsequent Owls:
the former contains a range of different sources and includes low-²⁰⁶Pb/²⁰⁴Pb bullion, whereas
the latter is dominated by high-²⁰⁶Pb/²⁰⁴Pb values consistent with a Laurion source. In contrast,
the late issues show a relatively uniform distribution, which may indicate that recycling
385 prevailed at the time of Macedonian conquest.

385 *Figure 7*

Evidence of recycling and mixing is a straightforward consequence of the simple theory laid
out above. Let us assume a value of $\alpha = 3$ and use Eqn. 8 with $n = 1 \dots 8$ recycling stages
390 (Fig. 8). The peak of φ moves, as expected, towards lower time-integrated r values as n
increases, but finally converge to a stable value. In other words, some data sets reflect a smaller
contribution of low-²⁰⁶Pb/²⁰⁴Pb silver input and higher proportions of recycled material. This
is the most likely explanation of the lower time-integrated r values in the late 4th c. BCE issues
of Athenian coinage. The Athenian mint started out with a large proportion of bullion with low
395 ²⁰⁶Pb/²⁰⁴Pb values, *i.e.* non-Laurion sources possibly from Thrace (+Troas) and Macedonia as
demonstrated in Albaredo et al, (submitted). By the start of the Classical period, the high-
²⁰⁶Pb/²⁰⁴Pb Laurion silver became the dominant source of bullion (>90%). Subsequently,
coinage minted in the second part of the 4th c. BCE is largely dominated by multiply recycled
silver. This coincides with a period during which the production of Athenian tetradrachms
400 seems to have dwindled (Kroll, 2011). Nevertheless, Kroll (2011) offers a new reading of
Xenophon's 355 BCE discussion of the Athenian economy. The production of the Laurion
mines may have dried up because entrepreneurs had become averse to the financial risks
associated with opening new mines (Xen. *Poroi* 4.28), but Xenophon (Xen. *Poroi* 4.7) also
warns that 'if a man finds himself with a huge amount of it, he takes as much pleasure in
405 burying the surplus as in using it', *i.e.*, hoarding silver by weight becomes an attractive financial
alternative to minting.

In Corinth, an influx of fresh, low-²⁰⁶Pb/²⁰⁴Pb bullion only becomes apparent in the mid-4th c.
BCE both from the high α value and the evolution of mixing with minting age (Table 1, Figs.
410 S2 and S3).

The significance of the r and φ values should not be mistaken: these variables refer to
proportions of Pb from the different sources, not to proportions of silver. In Davis et al. (2020),
Pb contents are distributed as a log-normal variable with a geometric mean of 0.22 (0.03–1.8
415 wt.%) at the 95% confidence level. We nevertheless suggest that the bullion fractions of Pb
inferred from isotopes echo similar trends for silver.

Figure 8

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Figure captions

495 *Figure 1. Simulation of the respective effects of mixing and random noise on the $^{206}\text{Pb}/^{204}\text{Pb}$ and $^{207}\text{Pb}/^{204}\text{Pb}$ relationships for 100 coins. For clarity's sake, the example is represented in the 2-dimensional space of $^{206}\text{Pb}/^{204}\text{Pb}$ and $^{207}\text{Pb}/^{204}\text{Pb}$ values. The mixing proportions of end-members (=sources) a and b (yellow pentagrams) are strongly skewed towards the younger end-member b . The variability of Pb isotope compositions can be explained by the combination of variable proportions of end-members a and b (left) and random noise (right) introduced by natural and analytical variability. In the case of noise-free mixing (left), variance is explained at 100% by mixing by the first principal component (grey-filled symbols), whereas random noise (black symbols to the right) accounts for a small fraction (0.2%) of the variability.*

500
505 *Figure 2. PCA scores c_1 , c_2 , and c_3 of ^{204}Pb -normalized isotope compositions for 112 Athenian silver coins (525-295 BCE). In spite of a long span of minting ages (see https://www.youtube.com/watch?v=eLb5QKJs_14), the data spread along the c_1 axis and form a mixing line between bullion sources a and b . This axis explains 97.7% of the variance.*

510 *Figure 3. Distribution of the three component scores obtained from PCA of Pb isotopic ratios measured in 112 Athenian silver coins. Note the skewed distribution of component c_1 , which contrasts with the much more symmetric, nearly normal distribution of component c_3 . Component c_2 appears somewhat intermediate: although a hidden end-member may be present, this component does not account for enough variance (note horizontal scale) and the histogram is not different enough from a normal distribution for an additional end-member to be identified. Histogram skewness of c_1 is strong evidence of mixing, whereas more symmetric distributions of c_3 , and to a large extent c_2 , are suggestive of random noise.*

520 *Figure 4. Fit of the cumulated density function of the first reduced component r_1 by a power law for 112 silver coins from Athens. The fit for >90% of the main population is excellent. The slope of the regression line is α . The stronger noise around the straight line at low values of c_1 may result from variable proportions of other components with low- $^{206}\text{Pb}/^{204}\text{Pb}$ lead in a small number of coins (rogue samples).*

525 *Figure 5. Conventional plot of $^{208}\text{Pb}/^{206}\text{Pb}$ vs $^{207}\text{Pb}/^{206}\text{Pb}$ for six of the seven data sets considered in this work. In order to preserve readability, Ptolemaic coinage has not been included. Note that Thasos samples also appear in the Thrace set.*

530 *Figure 6. Log-log plots of the cumulated density function $F_R(r)$ for all the data sets. The strong linearity of these plots is suggestive of the binary character of source mixing.*

535 *Figure 7. Variation of the time-integrated proportion r of end-member b (high $^{206}\text{Pb}/^{204}\text{Pb}$, presumably from Laurion) in the principal component 1 (97.7% of the variance) in 112 Athenian silver coins as a function of time of minting. Horizontal bars indicate the range of minting dates associated with each coin. The Wappenmünzen (early coinage from the late 6th c.) contain a prominent fraction of low- $^{206}\text{Pb}/^{204}\text{Pb}$ bullion from Macedonia and Thrace. This fraction is definitely smaller in Classical coins (5th c. BCE), which reflects the large productivity of high- $^{206}\text{Pb}/^{204}\text{Pb}$ silver from the Laurion mines or the quick recycling of earlier productions. The latest issues show no strong grouping and reflect multiply recycled Pb.*

540

Figure 8. Different numbers n of recycling steps are consistent with a same value of the slope α . Point density function (pdf) of the mixing variable ϕ for successive recycling steps ($n=1\dots 8$) as a function of the reduced mixing variable $r = (c_1 - c_0^a) / (c_0^b - c_0^a)$. Note the larger proportion of the low- $^{206}\text{Pb}/^{204}\text{Pb}$ end-member for $\alpha = 2$ with respect to the case $\alpha = 5$. The maximum of $f_\phi(\phi)$ moves from $r=1$ for the first issue and converge towards smaller values when n increases. Slope values of $\alpha=2$ and $\alpha=5$ are assumed. Multiply recycled silver shows that most coins appear to contain 80–90% recycled lead.

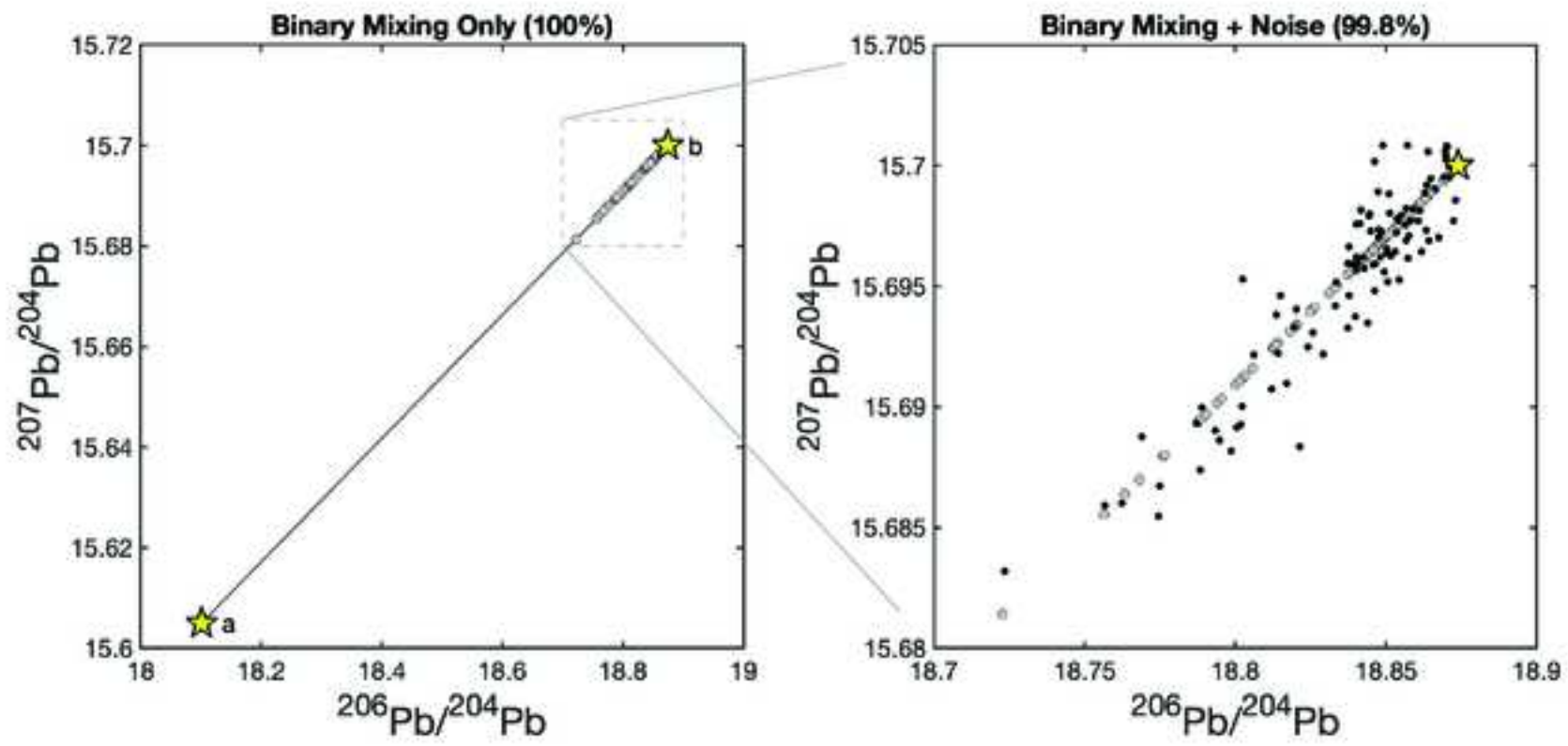
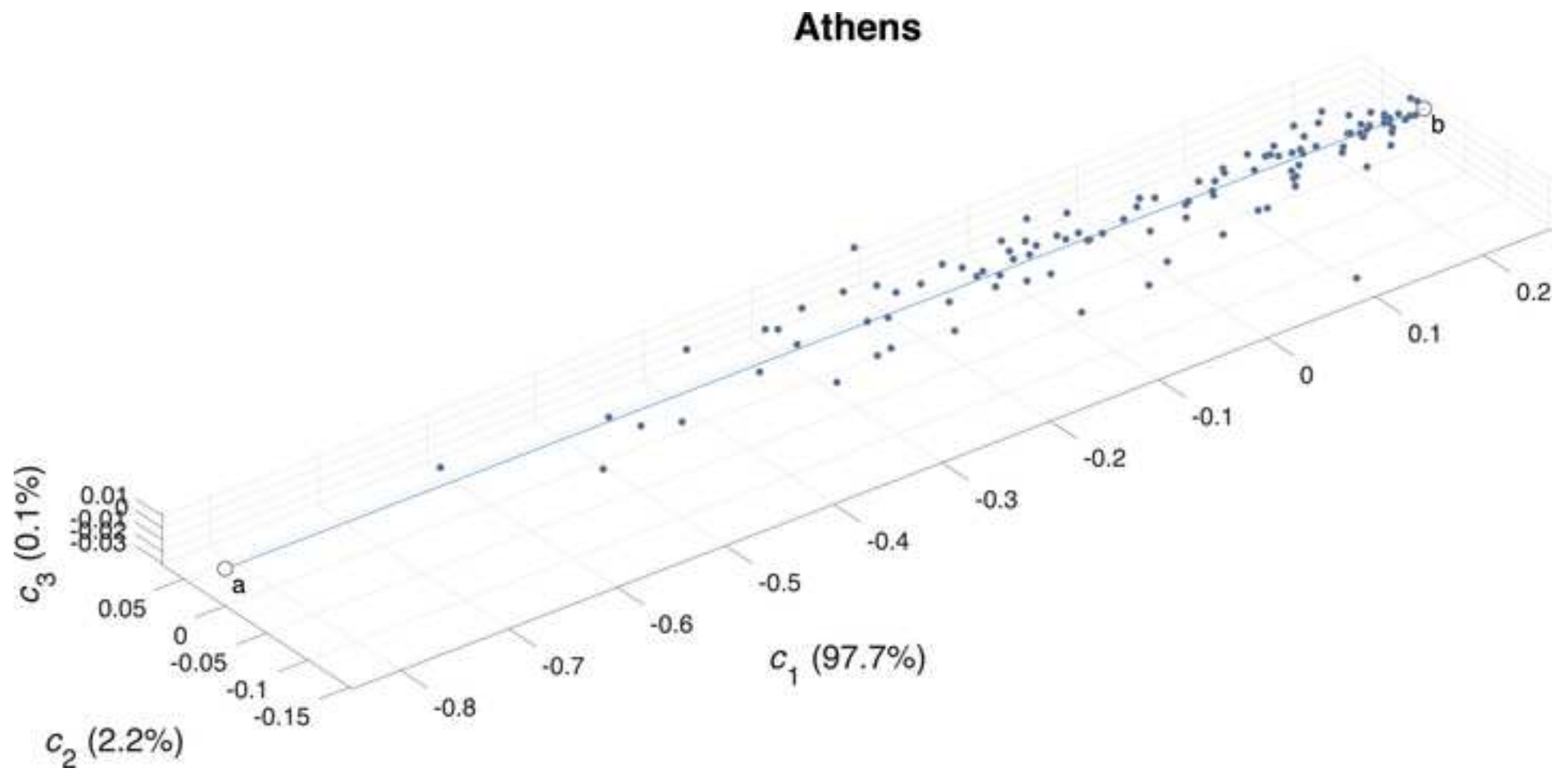
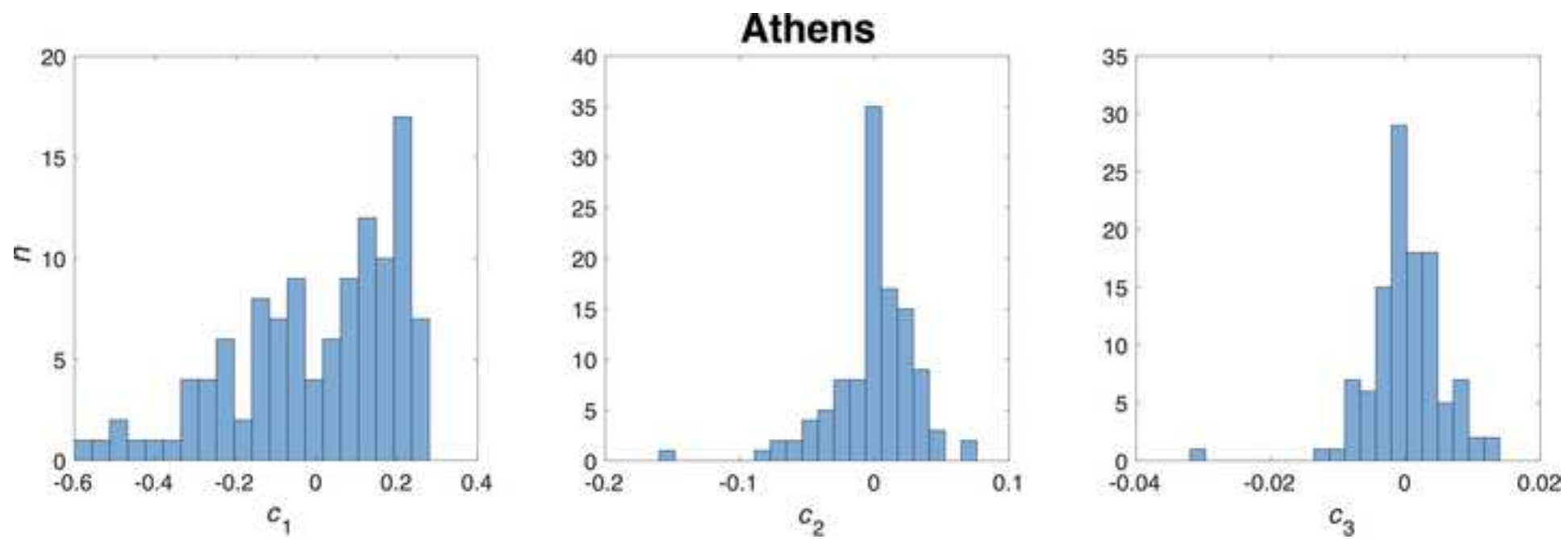


Figure 2





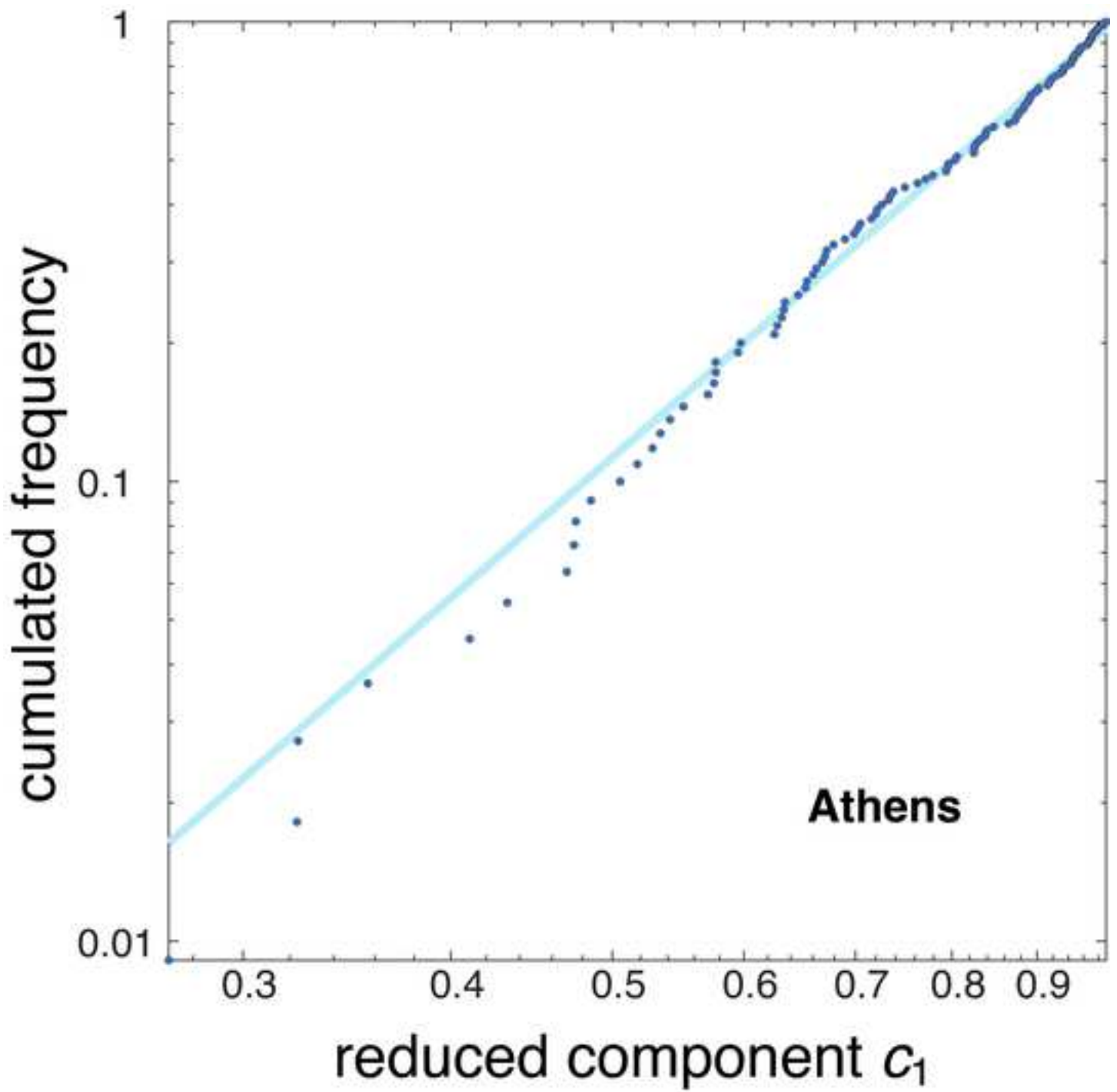


Figure 5

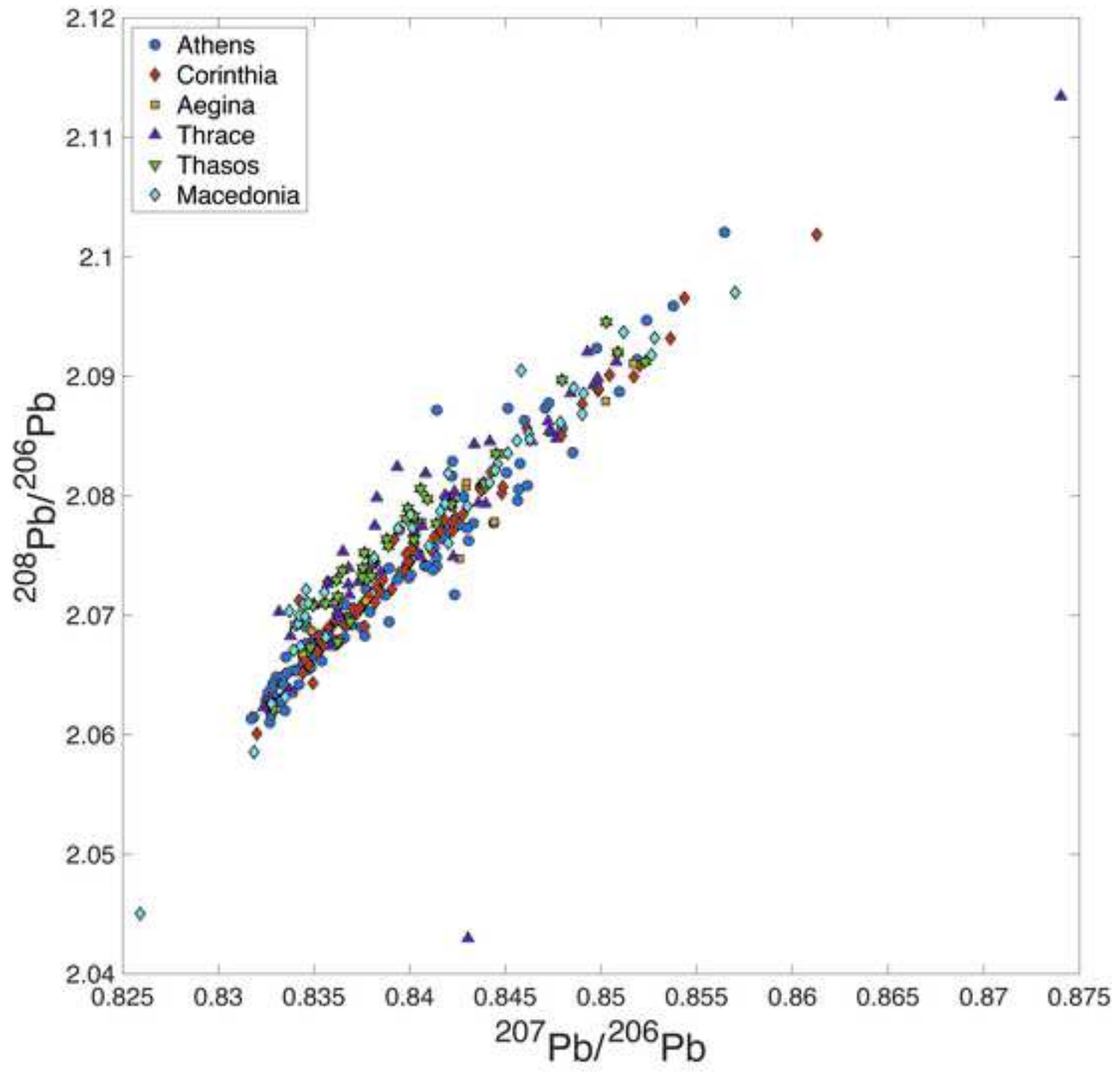
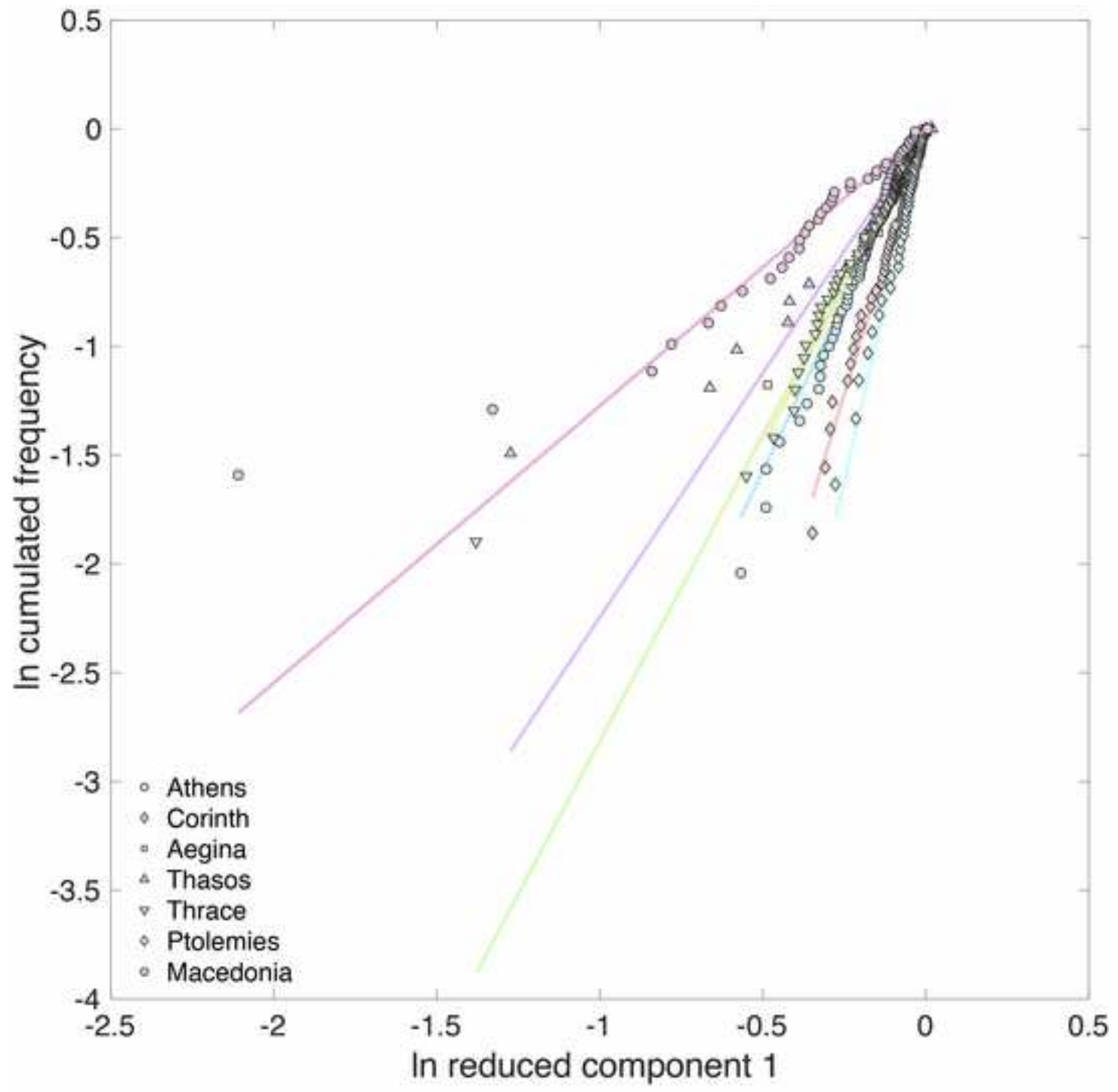


Figure 6



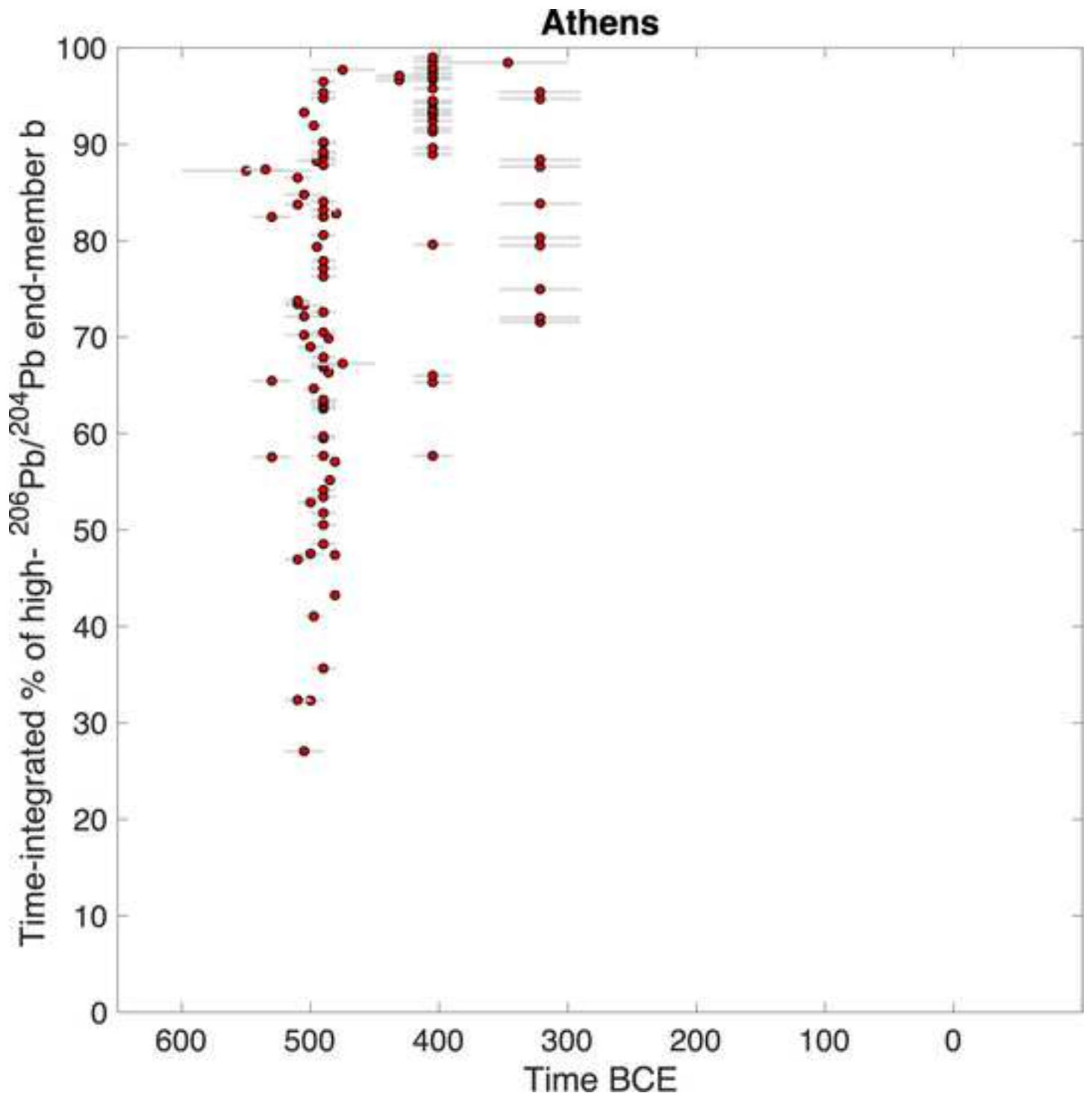
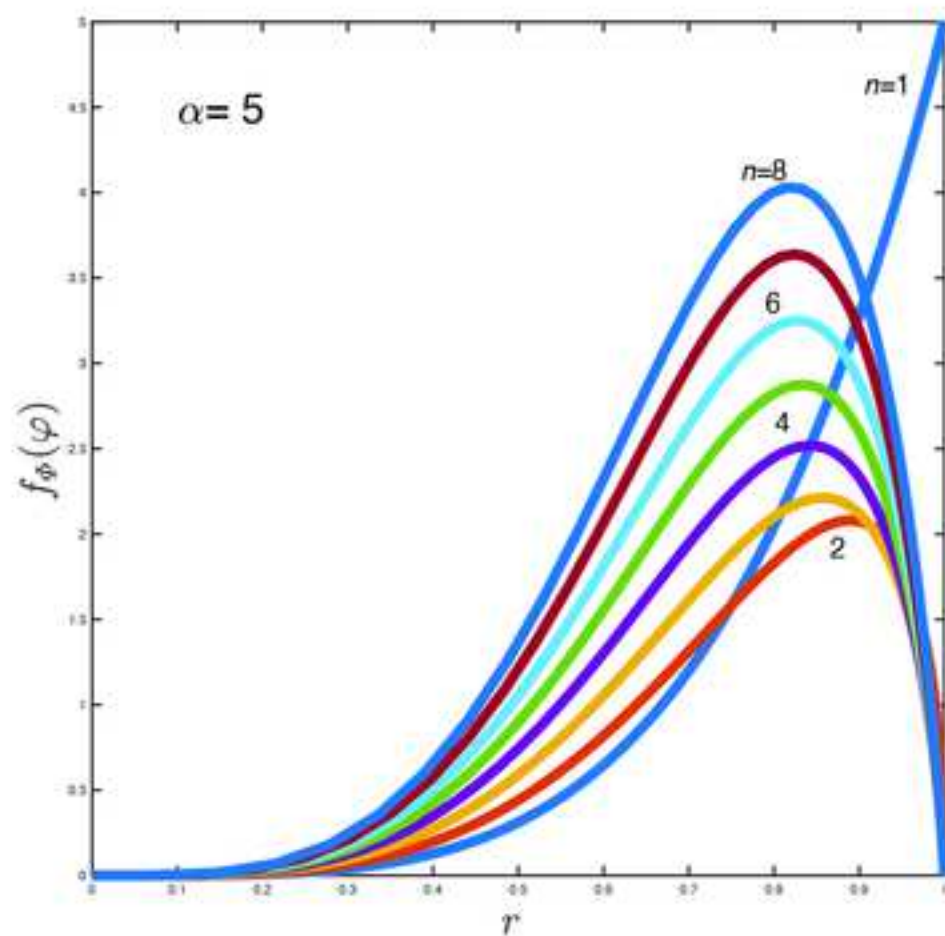
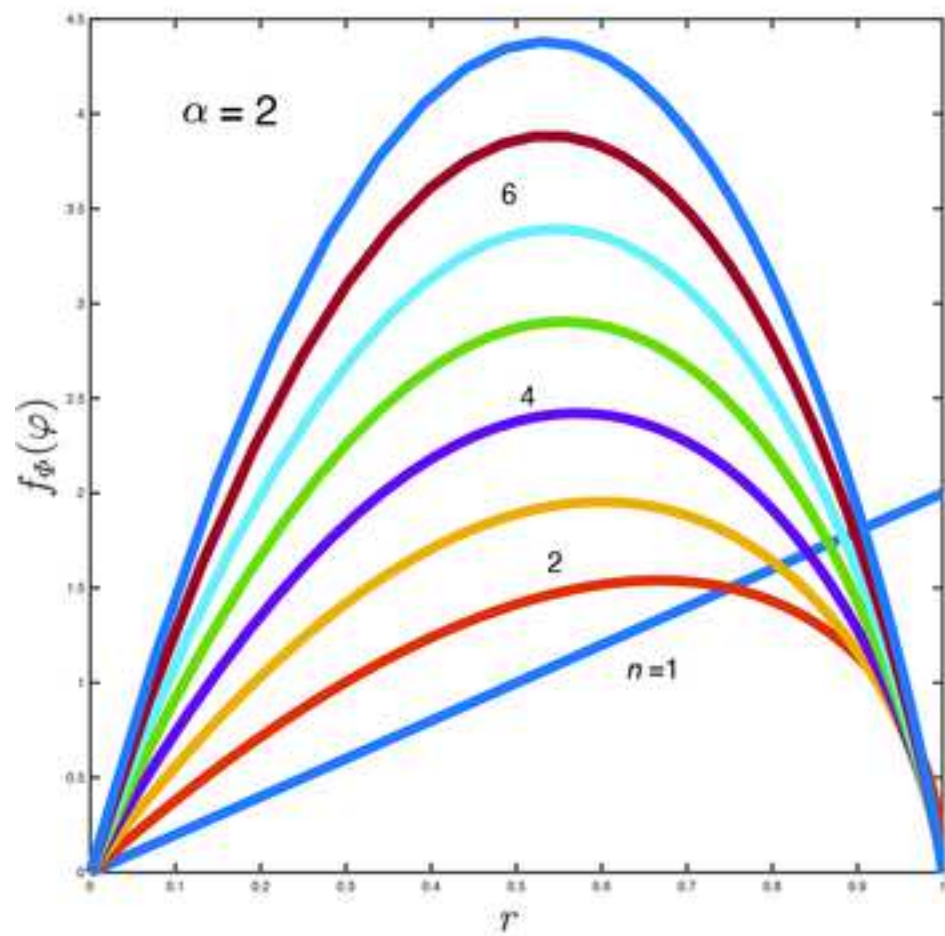
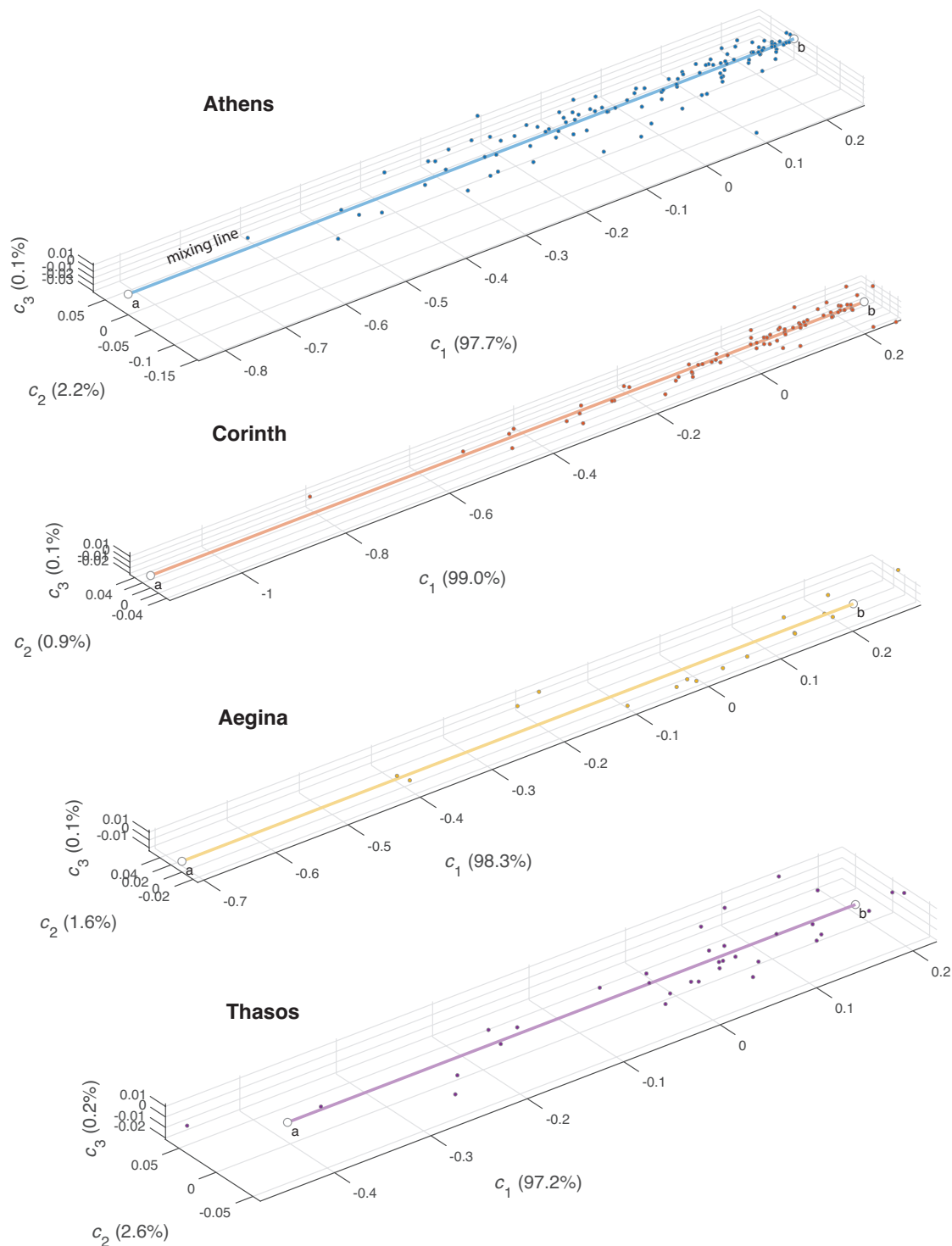


Figure 8



Supplemental material
Principal component analysis



5 *Figure S1. Scores c_1 , c_2 , and c_3 obtained by PCA of ^{204}Pb -normalized isotope compositions for the seven data sets used in the present study. The data spread along the c_1 axis, which accounts for most of the variability. They form a mixing line between bullion sources low- $^{206}\text{Pb}/^{204}\text{Pb}$ end-member a and the high- $^{206}\text{Pb}/^{204}\text{Pb}$ end-member b. The coordinates of the large open circles are taken from Table 1 and are calculated from the fits of Figure 4.*

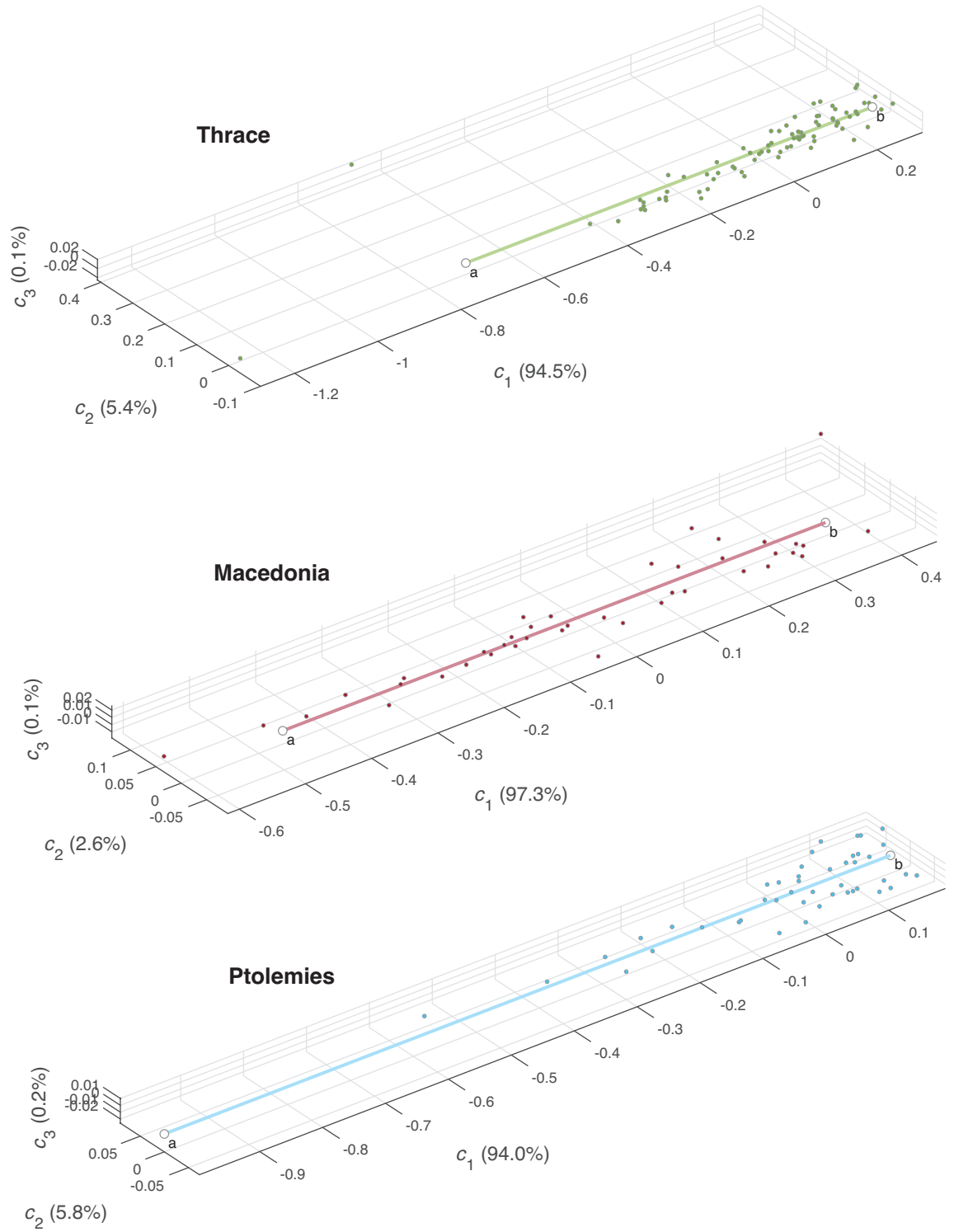


Figure S1 (continued)

Histograms of the component scores

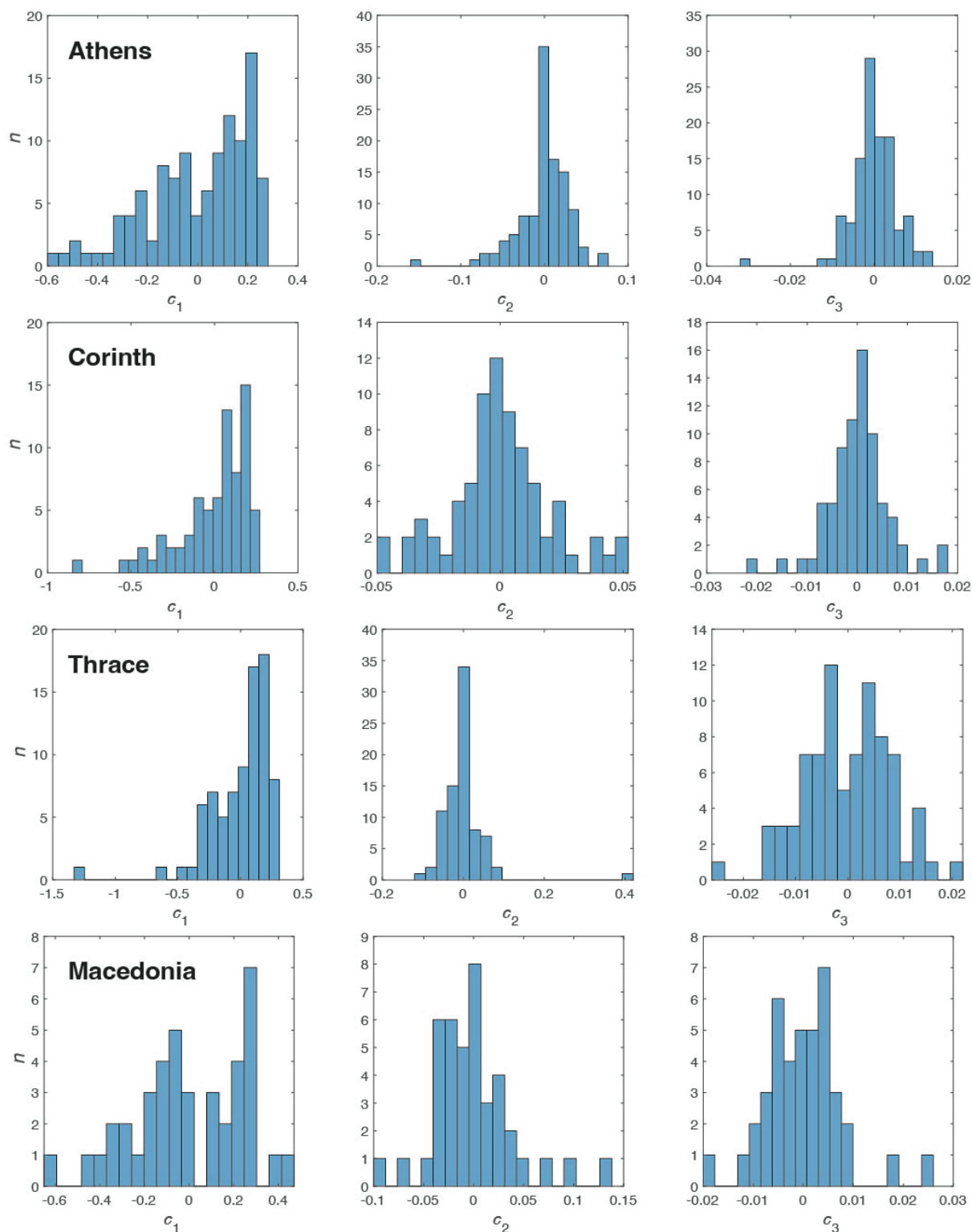
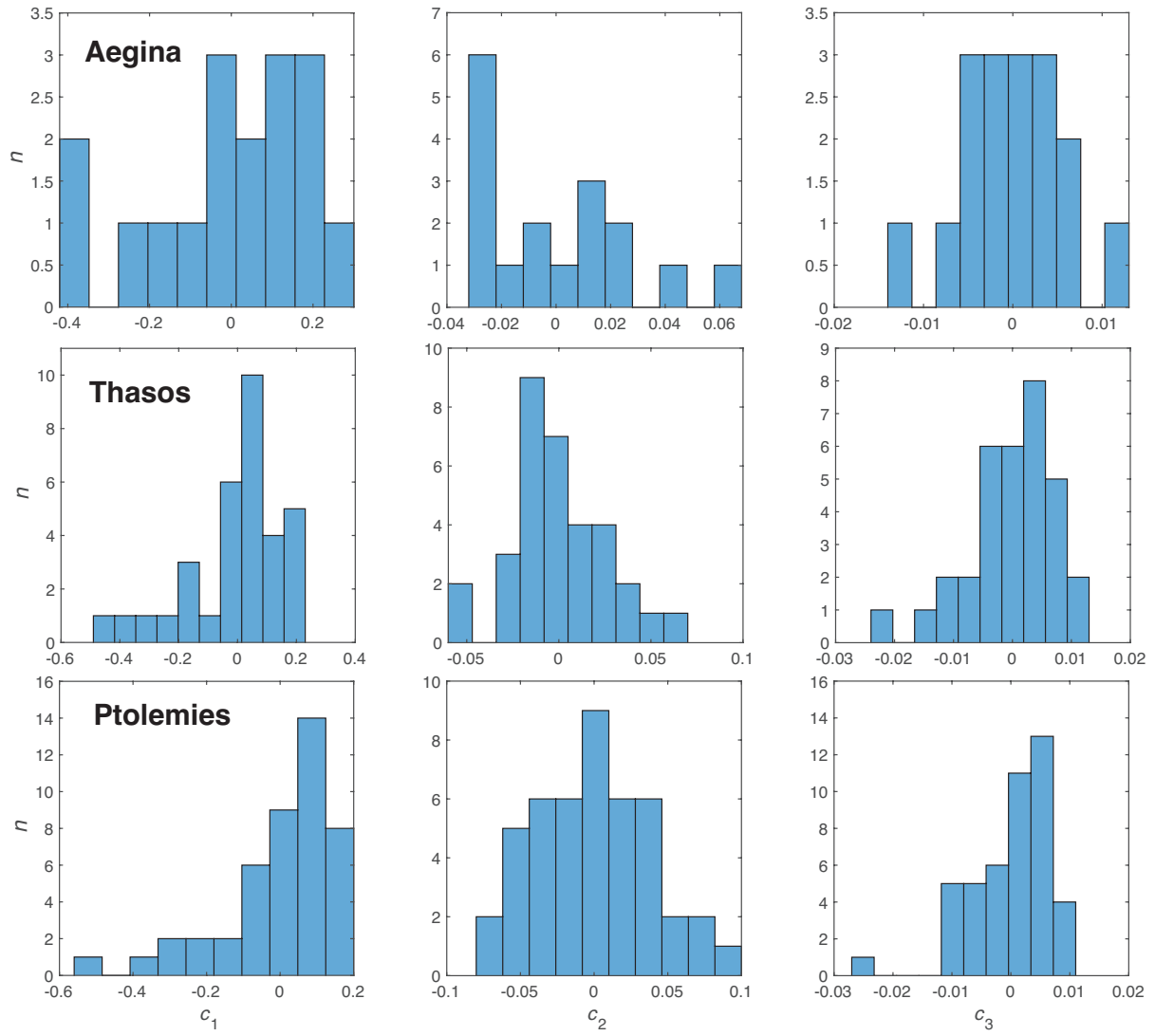
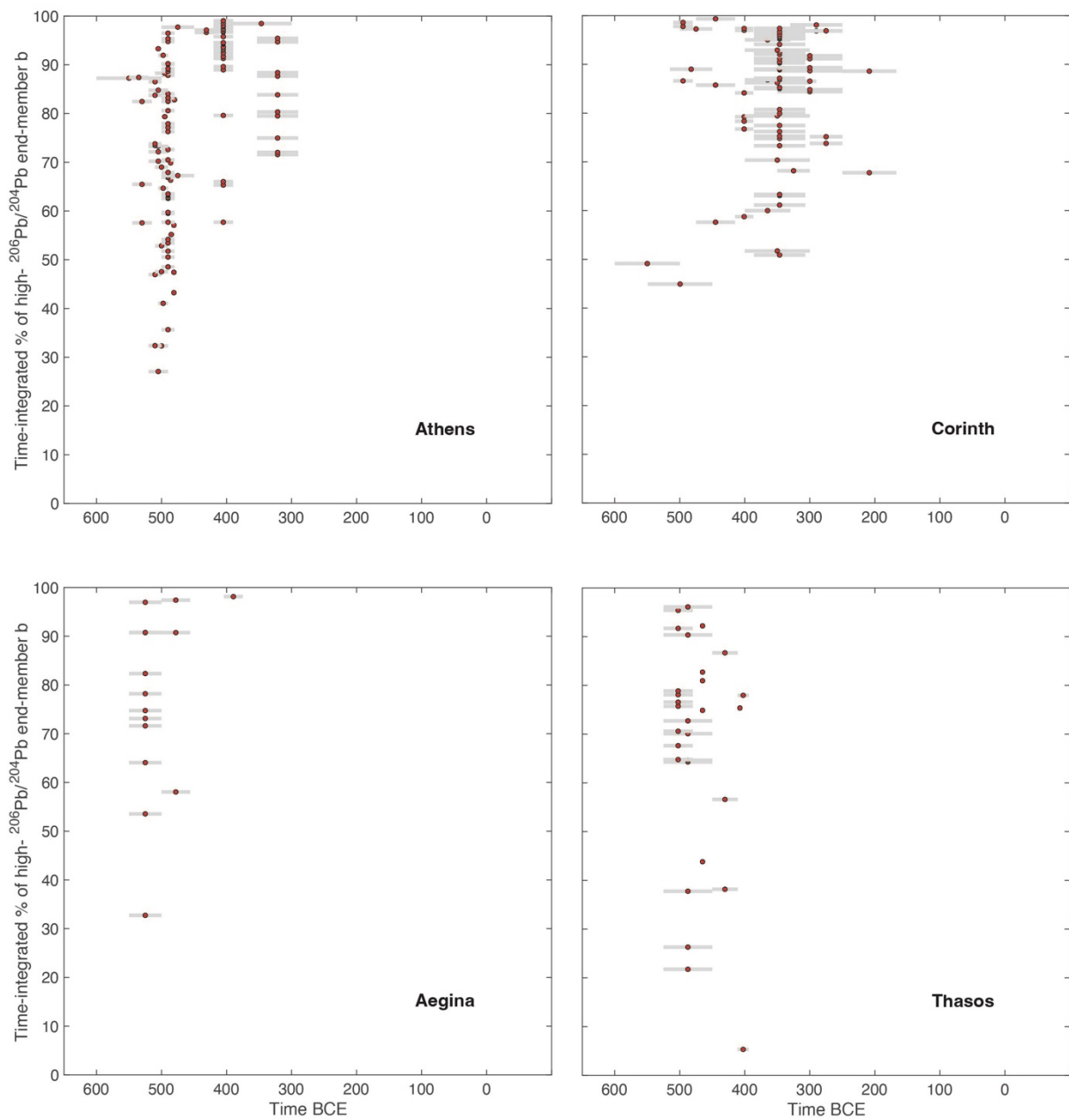


Figure S2



25 Figure S2 (continued)



30

Figure S3. Variation of the time-integrated proportion r of bullion end-member b (high $^{206}\text{Pb}/^{204}\text{Pb}$) in the principal component 1 (97.7% of the variance) in the coins from the seven data sets as a function of time of minting. Horizontal bars indicate the range of minting dates associated with each coin. The Archaic coins (late 6th and early 5th c.) contain a prominent fraction of low- $^{206}\text{Pb}/^{204}\text{Pb}$ bullion from Macedonia and Thrace. This fraction is strongly reduced in Classical coins (5th c.), which reflects the large productivity of high- $^{206}\text{Pb}/^{204}\text{Pb}$ silver from the Laurion mines or the quick recycling of earlier productions. The latest issues show no strong grouping and reflect multiply recycled Pb.

35

40

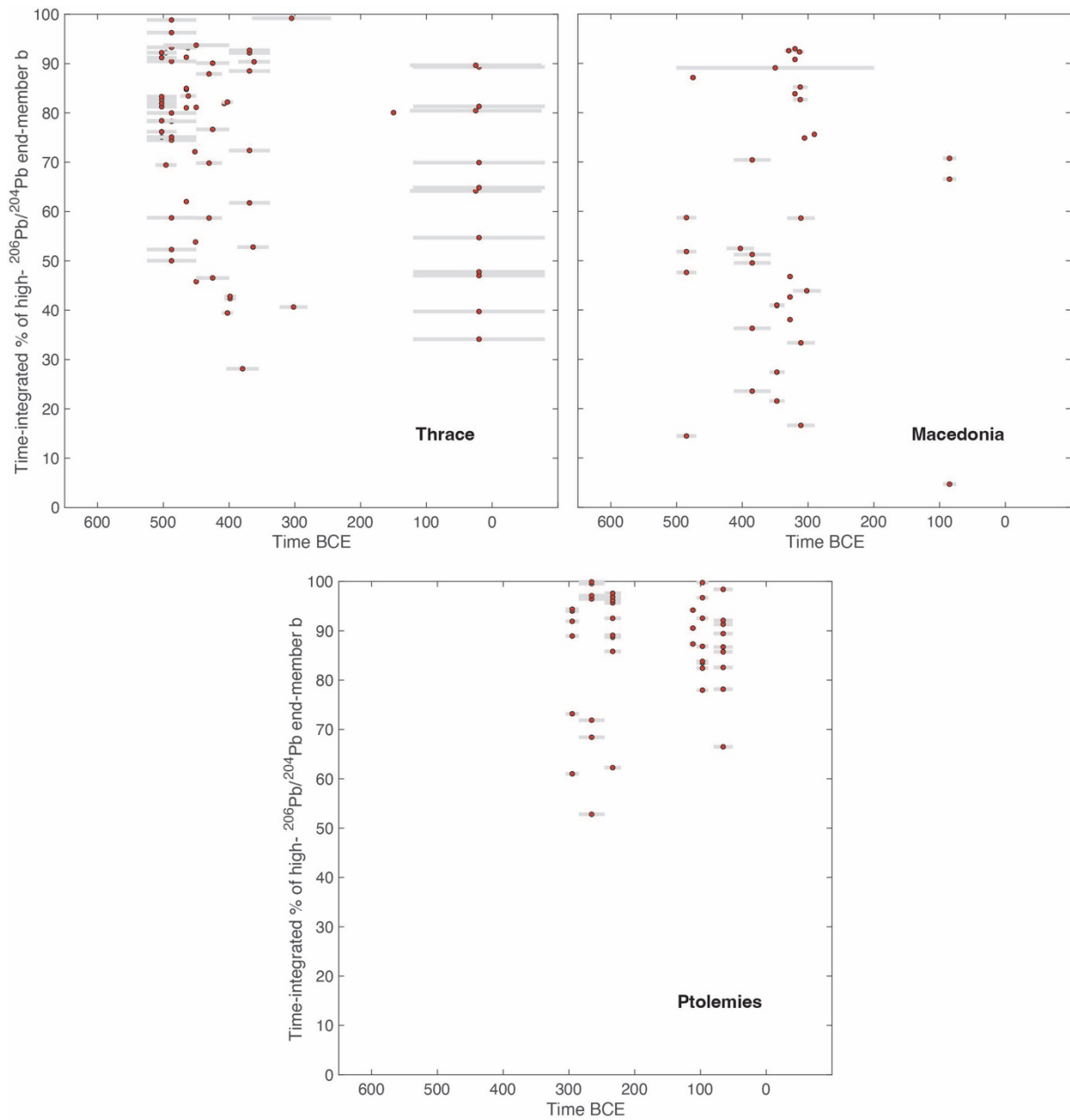


Figure S3 (continued)

Lab code #	Weight (g)	Photo Obv - I	Photo Rev - I	Museum coll Inventory num	Mint
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I081	3.89	DSC01828	DSC01829	Irsrael, The I: Samaria Envi	Athens
I114	6.74	DSC01826	DSC01827	Irsrael, The I: Samaria Envi	Athens
I012	16.97	DSC01625	DSC01626	Irsrael, The I: 101001 Horb	Athens
I020	17.08	DSC01659	DSC01660	Irsrael, The I: 153929 Khirt	Athens
I028	17.03	DSC01667	DSC01668	Irsrael, The I: 153933 Khirt	Athens
I032	17.01	DSC01534	DSC01535	Irsrael, The I: 51362 Lachis	Athens
I038	16.95	DSC01623	DSC01624	Irsrael, The I: 85121 Mrzpe	Athens
I068	17.1	DSC01665	DSC01666	Irsrael, The I: 153932 Khirt	Athens
I069	17.04	DSC01627	DSC01628	Irsrael, The I: 101002 Horb	Athens
Gr1					Athens
I011	15.21	DSC01530	DSC01531	Irsrael, The I: 51360 Samal	Athens
I014	15.86	DSC01621	DSC01622	Irsrael, The I: 83440 Horba	Athens
I017	16.33	DSC01575	DSC01576	Irsrael, The I: 81279 Tel Mi	Athens

					Athens
I018	16.16	DSC01572	DSC01573	Irsrael, The I: 81278 Tel Mi	
					Athens
I019	15.18	DSC01615	DSC01616	Irsrael, The I: 78976 Horba	
					Athens
I023	16.02	DSC01570	DSC01571	Irsrael, The I: 81277 Tel Mi	
					Athens
I024	16.24	DSC01558	DSC01559	Irsrael, The I: 8599 Dalton	
					Athens
I025	1.96	DSC01613	DSC01614	Irsrael, The I: 72253 Tel Ze	
					Athens
I026	16.63	DSC01568	DSC01569	Irsrael, The I: 81276 Tel Mi	
					Athens
I033	16.16	DSC01579	DSC01580	Irsrael, The I: 81281 Tel Mi	
					Athens
I034	16.19	DSC01581	DSC01582	Irsrael, The I: 81283 Tel Mi	
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I037	16.57	DSC01566	DSC01567	Irsrael, The I: 81275 Tel Mi	
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I039	17.71	DSC01528	DSC01529	Irsrael, The I: 51357 Sama	
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I042	17.09	DSC01661	DSC01662	Irsrael, The I: 153930 Khirk	
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					Athens
I052	16.72	DSC01597	DSC01598	Irsrael, The I: 64573 Khirbe	
					Athens
I053	14.78	DSC01532	DSC01533	Irsrael, The I: 51361 Sama	
					Athens
I056	16.76	DSC01577	DSC01578	Irsrael, The I: 81280 Tel Mi	

					Athens
I059	16.25	DSC01599	DSC01600	Irsrael, The I: 72576 'Athlit	
					Athens
I071	16.9	DSC01556	DSC01557	Irsrael, The I: 8598 Dalton	
					Athens
I072	3.48	DSC01655	DSC01656	Irsrael, The I: 153927 Khirt	
					Athens
I031	16.22			Irsrael, The I: 81274 Tel Mi	
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G014	17.04			Athens, Num Gil 2 Attica	
					Athens
G078	17.01			Athens, Num Gil 3 Attica	
					Athens
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					Athens
G045	17.2	DSC01321	DSC01322	Athens, Num Empedokles	

					Athens
G049	16.79	DSC01307	DSC01308	Athens, Num Empedokles	
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					Athens
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					Athens
G091	17.13	DSC01022	DSC01023	Athens, Num Empedokles	

					Athens
G092	16.84	DSC01016	DSC01017	Athens, Num Empedokles	
					Athens
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					Athens
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					Athens
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					Athens
G096	17.12	DSC01038	DSC01039	Athens, Num Empedokles	
					Athens
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					Athens
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					Athens
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					Athens
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					Athens
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					Athens
G111	15.97	DSC01032	DSC01033	Athens, Num Empedokles	
					Athens
G114	17.09	DSC01315	DSC01316	Athens, Num Empedokles	

					Athens
G115	16.47	DSC01345	DSC01346	Athens, Num Saroglou 801	
					Athens
G117	16.84	DSC01018	DSC01019	Athens, Num Empedokles	
					Athens
G120	17.18	DSC01020	DSC01021	Athens, Num Empedokles	
					Athens
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					Athens
G082	0.97	DSC01319	DSC01320	Athens, Num Empedokles	
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					Athens
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					Athens
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					Athens
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					Athens
G012	4.2	DSC01284	DSC01283	Athens, Num Empedokles	

					Athens
G019	3.81	DSC01295	DSC01296	Athens, Num Empedokles	
					Athens
G030	7.4	DSC01293	DSC01294	Athens, Num Empedokles	
					Athens
G112	3.88	DSC01365	DSC01366	Athens, Num Saroglou 802	
					Athens
G101	8.45	DSC01297	DSC01298	Athens, Num Empedokles	
					Athens
G028	4.26	DSC01299	DSC01300	Athens, Num Empedokles	
					Athens
G047	3.51	DSC01367	DSC01368	Athens, Num Saroglou 802	
					Athens
G065	8.25	DSC01285	DSC01286	Athens, Num Empedokles	
					Athens
G110	8.1	DSC01287	DSC01288	Athens, Num Empedokles	
					Athens
G116	8.48	DSC01289	DSC01290	Athens, Num Empedokles	
					Athens
G051	8.5	DSC01086	DSC01087	Athens, Num RN 1983 Em	
					Athens
G048	16.76	DSC01084	DSC01085	Athens, Num RN 1983 Em	
					Athens
G058	3.72	DSC01088	DSC01089	Athens, Num Cheldrauch 1	
					Athens
G016	3.92	DSC01090	DSC01091	Athens, Num 2544 ? ΔΣ 54	
					Athens
I041	4.88	DSC01619	DSC01620	Irsrael, The I: 79218 Tell el	
					Athens
I010	16.59	DSC01526	DSC01527	Irsrael, The I: 51356 Sama	
					Athens
G055	17.1	DSC01381	DSC01382	Athens, Num 1891-2, I 45 :	

Athens

G073

17.07 DSC01383 DSC01386 Athens, Num 1902-1908 IE

Mint - Nomisma.org	Area (sub- area)	Mint - Latitud	Mint - Longituity 1 (king, satr	Chronology	Denominatio
http://nomisma.org/id/athens	Attica	37.9756	23.722	480	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-290	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-290	Tetradrachm
http://nomisma.org/id/athens	Attica	31.400804	35.067326	353-290	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	353-295	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	393-300	
http://nomisma.org/id/athens	Attica	37.9756	23.722	420-390	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	420-390	Tetradrachm
http://nomisma.org/id/athens	Attica	37.9756	23.722	420-390	Tetradrachm

http://nomisma.org/id/atticahens	Attica	37.9756	23.722	420-390	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	420-390	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	420-390	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	420-390	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	449-413	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	449-413	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	449-413	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	482-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	482-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	482-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	490-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	490-482	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	490-482	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-450	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-450	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-480	Tetradrachm

http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-480	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-480	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-490	trihemiobol
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	505-490	Hemidrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	505-490	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	505-490	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	510-480	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	510-490	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	510-490	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	510-490	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	510-490	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	510-500	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-490	Didrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-490	drachm

http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-490	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-490	Didrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-490	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-500	Didrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-500	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-500	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-500	Didrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-500	Didrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	520-500	Didrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	545-515	
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	545-515	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	545-515	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	545-515	drachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	550-520	
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-482	Tetradrachm
http://nomisma.org/id/atticahens	Attica	37.9756	23.722	500-480	Tetradrachm

<http://nomisma.org/id/attica-hens>

37.9756 23.722

500-480

Tetradrachm

Weight (g)	Obverse desc	Reverse desc	Reference	1 206Pb/204Pt 2s	207Pb/204Pt
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16.74	Athena	Owl	Sear 1846	18.7437045	0.0007	15.6871805
8.34				18.6056905	0.000606	15.6701746
3.89				18.7786676	0.000798	15.6853527
6.74				18.7090234	0.000454	15.6726841
16.97	Head	Owl		18.6504754	0.000838	15.6747163
17.08	Head	Owl		18.7170707	0.000996	15.6860483
17.03	Head	Owl		18.8302522	0.001094	15.6938845
17.01	Head	Owl		18.7216168	0.001164	15.6796032
16.95	Head	Owl		18.8036564	0.001224	15.679744
17.1	Head	Owl		18.8380679	0.000514	15.6993062
17.04	Head	Owl		18.6806113	0.00063	15.6795604
			Desaulty 200	18.858		15.701
15.21		Owl		18.5898098	0.000682	15.6676264
15.86	Head	Owl		18.8676087	0.001538	15.710406
16.33	Head	Owl		18.8499349	0.000866	15.7019199

16.16 Head	Owl	18.8261499	0.000908	15.6919865
15.18 Head	Owl	18.7967663	0.001166	15.6877378
16.02 Head	Owl	18.848841	0.000812	15.6970819
16.24 Head	Owl	18.8460683	0.00063	15.6957178
1.96	Owl	18.8387048	0.001006	15.6897314
16.63 Head	Owl	18.8556288	0.0008	15.6980323
16.16 Head	Owl	18.8559081	0.000694	15.7034553
16.19 Head	Owl	18.8278039	0.001224	15.6948347
16.57 Head	Owl	18.8597697	0.000478	15.7004468
17.71	Owl	18.7944411	0.000732	15.6821601
17.09 Head	Owl	18.6788532	0.000786	15.6801291
16.12 Head	Owl	18.840909	0.000492	15.7034227
16.99 Head	Owl	18.6007568	0.000664	15.668071
16.72	Owl	18.8066834	0.000996	15.6959374
14.78	Owl	18.8098776	0.001114	15.6912402
16.76 Head	Owl	18.8251346	0.000894	15.6991137

16.25	Owl		18.6141162	0.000846	15.6704441
16.9 Head	Owl		18.8221367	0.00071	15.6995165
3.48	Owl		18.7940258	0.000648	15.6983214
16.22			18.7848739	0.000906	15.6779492
17.1			18.8407824	0.000686	15.6947388
17.04			18.855491	0.000616	15.6978157
17.01			18.8511307	0.000706	15.6967656
16.86 Athena	Owl	Sear 1845	18.4645459	0.000696	15.6571182
16.71 Athena	Owl	Sear 1844	18.4213726	0.00058	15.6538433
17.09 Athena	Owl	Sear 1845	18.5705796	0.000812	15.6563599
16.09 Athena	Owl	Sear 1842	18.5264241	0.000712	15.6558208
16.79 Athena	Owl	Sear 1843	18.6382615	0.00091	15.6798129
16.33 Athena	Owl	Sear 1842	18.6298829	0.000636	15.6751961
17.15 Athena	Owl		18.8670019	0.000666	15.6941671
16.1 Athena	Owl		18.6044355	0.000418	15.6681466
17.2 Athena	Owl		18.5466154	0.000788	15.6604628

16.79	Athena	Owl		18.6771803	0.001136	15.6648458
16.89	Athena	Owl		18.5129652	0.000714	15.6574792
17.4	Athena	Owl		18.6572829	0.000674	15.6710663
16.67	Athena	Owl		18.8443247	0.00066	15.6958248
16.95	Athena	Owl		18.8064078	0.00086	15.6884087
16.61	Athena	Owl		18.6329285	0.000802	15.6660431
16.88	Athena	Owl		18.7200542	0.000644	15.6769582
17.15	Athena	Owl		18.8017373	0.000774	15.6914037
17.78	Athena	Owl		18.5949227	0.000676	15.6673084
17.9	Athena	Owl		18.5014587	0.000668	15.6465668
17.11	Athena	Owl		18.6201754	0.00079	15.6727413
16.76	Athena	Owl		18.8017994	0.000668	15.6880561
16.34	Athena	Owl		18.7576217	0.000798	15.6873368
16.98	Athena	Owl	Sear 1839	18.5649113	0.00068	15.6561088
16.31	Athena	Owl		18.7923677	0.00066	15.6928793
17.13	Athena	Owl		18.7398239	0.000538	15.6809436

16.84	Athena	Owl		18.6109694	0.000678	15.6589409
16.14	Athena	Owl		18.681786	0.000508	15.6723532
16.89	Athena	Owl		18.7910948	0.000958	15.6874212
16.85	Athena	Owl	Sear 1839	18.5951476	0.001046	15.6624289
17.12	Athena	Owl		18.6379607	0.000616	15.6733257
14.34	Athena	Owl		18.3513484	0.000624	15.6422351
16.69	Athena	Owl		18.879258	0.000664	15.7021054
16.55	Athena	Owl		18.7941414	0.00073	15.6875064
17.3	Athena	Owl		18.4740275	0.000882	15.6523585
16.76	Athena	Owl		18.7289993	0.00067	15.6722321
16.85	Athena	Owl		18.5556675	0.000764	15.6599226
17.06	Athena	Owl	Sear 1839	18.5764021	0.000648	15.6597283
16.85	Athena	Owl		18.5168477	0.00052	15.6584953
17.29	Athena	Owl		18.5718615	0.000874	15.6690676
15.97	Athena	Owl		18.8439096	0.001512	15.7020055
17.09	Athena	Owl		18.7084131	0.001182	15.6760804

16.47	Athena	Owl		18.7529529	0.00097	15.6797807
16.84	Athena	Owl		18.8562207	0.00086	15.7002317
17.18	Athena	Owl		18.7134935	0.000704	15.6851527
4.09	Athena	Owl		18.6134853	0.00157	15.6578669
0.97	Janus	Athena		18.7332049	0.000472	15.6717875
2.25	Athena	Athena	Sear 1841	18.6013589	0.000556	15.6626238
16.64	Athena	Owl	Sear 1839	18.8406846	0.000682	15.6882931
16.82	Athena	Owl	Sear 1839	18.4447231	0.000562	15.6505602
3.92	Athena	Owl		18.7944458	0.000674	15.6874988
3.8	Horse	Incuse		18.4820813	0.000724	15.6557066
4.15	Athena	Owl		18.4944661	0.000718	15.648936
3.99	Athena	Owl		18.3543574	0.000738	15.6355443
4.19	Athena	Owl		18.6483039	0.001478	15.6654215
15.81		Owl		18.8437326	0.000494	15.691985
8.5	Wheel	Incuse	Sear 1829	18.6684774	0.000704	15.6723463
4.2	Wheel	Incuse	Sear 1829	18.6592482	0.000694	15.6706439

3.81	Wheel	Incuse	Sear 1829	18.2641503	0.000634	15.6423073
7.4	Wheel	Incuse	Sear 1829	18.678465	0.000864	15.669567
3.88	Wheel	Incuse	Sear 1829	18.772473	0.00112	15.6824128
8.45	Gorgon	Incuse	Sear 1834	18.6215743	0.001214	15.6830374
4.26	Horse	Incuse		18.7022371	0.000758	15.6658752
3.51	Horse	Incuse		18.6387164	0.000798	15.6827405
8.25	Horse	Incuse	Sear 1833	18.3273792	0.000676	15.6473728
8.1	Horse	Incuse		18.4220483	0.000954	15.6543723
8.48	Horse	Incuse	Sear 1833	18.7768314	0.000666	15.6824248
8.5	Gorgon	Incuse		18.7387137	0.00095	15.6780361
16.76	Gorgon	Lion		18.5454076	0.000748	15.6732119
3.72	Horse	Incuse		18.5119595	0.000864	15.6610268
3.92	Wheel	Incuse	Sear 1829	18.3221615	0.001218	15.5912507
4.88				18.7573439	0.000968	15.6851975
16.59		Owl		18.7560227	0.001098	15.6920966
17.1	Athena	Owl		18.836446	0.000822	15.6965992

17.07 Athena

Owl

18.8243

0.000666

15.6898637

2s	208Pb/204Pb 2s		207Pb/206Pb 2s		208Pb/206Pb 2s	
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0.000638	38.7843096	0.00202	0.83692927	0.00001022	2.06917105	0.0000356
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0.000532	38.7535399	0.001628	0.84222322	0.000007	2.08286684	0.0000256
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0.00082	38.8371374	0.00268	0.83527095	0.00001264	2.06815588	0.0000714
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0.00041	38.7684884	0.0015074	0.83770934	0.00000706	2.07223474	0.000023
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0.000836	38.7022209	0.00244	0.84043934	0.00001338	2.07510895	0.000058
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0.001196	38.8264756	0.00376	0.83807845	0.00001828	2.07442426	0.0000868
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0.001064	38.8836336	0.00322	0.83344369	0.00001548	2.06494672	0.0000812
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0.00122	38.7680135	0.00378	0.83749746	0.000033	2.07074466	0.0001286
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0.000996	38.8020243	0.00318	0.83388022	0.00001598	2.06356234	0.000061
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0.000518	38.8864496	0.001592	0.83339296	0.00000994	2.0642977	0.0000532
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0.000596	38.7249259	0.00186	0.83935345	0.0000099	2.0730439	0.0000486
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38.914

0.000802	38.6652356	0.00264	0.84282877	0.00001232	2.0799849	0.0000748
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0.00148	38.9123412	0.00296	0.83267109	0.00001608	2.06226644	0.0000628
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0.000884	38.9113434	0.00274	0.83300524	0.00001412	2.06429969	0.0000644
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0.000876	38.9045152	0.0025	0.83353496	0.00001488	2.06656876	0.000055
0.001164	38.8907239	0.00378	0.8346146	0.0000184	2.06912174	0.0001102
0.000578	38.8963847	0.001766	0.83280767	0.00000964	2.0636375	0.000032
0.00061	38.9031237	0.001736	0.83284796	0.00000942	2.06428839	0.000038
0.00109	38.8713294	0.00326	0.83284011	0.00001854	2.06335209	0.000087
0.00078	38.8994505	0.00236	0.83253198	0.00001242	2.06302351	0.000054
0.000676	38.9179205	0.00234	0.83280769	0.00001318	2.06402863	0.0000662
0.00102	38.8832405	0.00274	0.83359661	0.000012	2.0651829	0.0000458
0.000464	38.9053208	0.00141	0.83249288	0.00000804	2.06292293	0.0000358
0.000708	38.8411254	0.00208	0.83440435	0.00001194	2.06661286	0.0000546
0.000728	38.7987906	0.00238	0.8394614	0.00001568	2.07718844	0.0000694
0.000492	38.8503676	0.0042	0.83347692	0.00001258	2.06202556	0.0002
0.00062	38.5357135	0.00232	0.84232768	0.00001114	2.07170825	0.0000514
0.000976	38.8711508	0.00348	0.8345963	0.00001736	2.06688674	0.000097
0.000956	38.8510262	0.0026	0.83420618	0.0000155	2.06549127	0.0000678
0.000894	38.8811161	0.00264	0.83393566	0.00001766	2.06536323	0.000079

0.000726	38.6520034	0.00266	0.84185971	0.00001214	2.07647456	0.0000622
0.000524	38.8743919	0.001416	0.83409705	0.00000778	2.06539002	0.0000242
0.000584	38.8716617	0.001418	0.83527879	0.00000874	2.06830692	0.000026
0.000714	38.8407039	0.00202	0.83459028	0.00000936	2.06765726	0.0000318
0.000544	38.9033698	0.001518	0.83300807	0.0000095	2.06479695	0.0000308
0.000576	38.895958	0.00196	0.83253194	0.00000702	2.06279833	0.0000544
0.00061	38.8997767	0.001774	0.83266811	0.00000842	2.06357423	0.0000372
0.000666	38.5107532	0.00228	0.84796135	0.00000958	2.085692	0.0000552
0.00054	38.4884157	0.0015	0.84976655	0.00000798	2.08929809	0.0000494
0.00078	38.5571994	0.00238	0.84305244	0.00001192	2.07627066	0.0000512
0.00068	38.5708675	0.001898	0.84505442	0.00000954	2.08193588	0.0000432
0.000928	38.6870008	0.00218	0.8413031	0.00000968	2.07566331	0.000036
0.000584	38.6407224	0.00195	0.84141104	0.00000958	2.07414071	0.0000352
0.000718	38.8946097	0.00222	0.83182761	0.00001398	2.06148149	0.0000632
0.000532	38.6811295	0.001576	0.84217461	0.00000822	2.07915326	0.0000456
0.000676	38.5348631	0.0019	0.84438501	0.00001058	2.07773207	0.0000294

0.000914	38.6932632	0.0027	0.83871124	0.00001118	2.07166405	0.000033
0.000722	38.5569818	0.00206	0.84576163	0.00001236	2.08269465	0.0000642
0.000674	38.6791425	0.002	0.83994648	0.00001086	2.07312499	0.0000434
0.000692	38.8796935	0.00228	0.83292982	0.00001038	2.06321492	0.0000588
0.000852	38.8204359	0.00256	0.83420021	0.00001312	2.06422461	0.0000616
0.000798	38.6471991	0.00228	0.84077682	0.00000984	2.0741649	0.0000476
0.000638	38.7322722	0.00204	0.83744701	0.00001064	2.06908397	0.0000448
0.000754	38.8404453	0.001962	0.83457682	0.00001216	2.06582166	0.0000572
0.000596	38.6319057	0.001646	0.84254736	0.00001086	2.07752058	0.000046
0.000544	38.4932797	0.00155	0.84570093	0.00000694	2.08057192	0.0000252
0.000738	38.6629433	0.00228	0.84171564	0.00001382	2.07641324	0.0000626
0.000594	38.8425338	0.001746	0.83440133	0.00000964	2.06593465	0.0000356
0.00077	38.7897347	0.0025	0.83632627	0.00001068	2.06795553	0.0000554
0.00086	38.5722918	0.0026	0.84330887	0.00001358	2.07767075	0.0000636
0.000786	38.8351661	0.00278	0.83508145	0.00001426	2.06659817	0.0000794
0.000608	38.7836789	0.0021	0.83678648	0.0000112	2.06961304	0.0000672

0.000646	38.6155628	0.00202	0.84138736	0.00001114	2.07485284	0.0000474
0.000458	38.7451572	0.0012	0.83889022	0.00000794	2.07389845	0.0000242
0.001116	38.8160759	0.00362	0.83482406	0.0000175	2.06562685	0.000088
0.00123	38.6278856	0.00372	0.84224782	0.00001718	2.07724781	0.0000888
0.000594	38.6576508	0.001962	0.84093268	0.00001034	2.0741062	0.0000396
0.000732	38.4403716	0.00246	0.85236323	0.00001164	2.09464636	0.0000436
0.000744	38.9167443	0.00246	0.83171609	0.0000136	2.06130686	0.000064
0.000684	38.8254718	0.001878	0.83469636	0.00000952	2.06587783	0.0000318
0.000734	38.5696578	0.00236	0.8472691	0.00001052	2.08782641	0.000033
0.000618	38.7658332	0.001482	0.83679897	0.00000852	2.06989029	0.0000258
0.000692	38.6124257	0.00226	0.84396516	0.00001324	2.08089354	0.0000568
0.000534	38.5889103	0.001368	0.84298621	0.00000718	2.07735091	0.0000226
0.0005	38.5079494	0.00138	0.84562995	0.00000768	2.07961309	0.000024
0.000932	38.6439373	0.00284	0.84370196	0.00001394	2.08078791	0.000062
0.001522	38.8702955	0.00722	0.8332655	0.00001968	2.06278844	0.000254
0.001162	38.7317468	0.00382	0.8379101	0.00001968	2.0703666	0.0001052

0.00102	38.7718937	0.00306	0.83611906	0.0000161	2.06757725	0.0000796
0.00087	38.8851372	0.00316	0.8326194	0.00001488	2.0622108	0.0000908
0.000726	38.8201979	0.00234	0.83816516	0.00001406	2.07452545	0.000075
0.00136	38.6005755	0.0031	0.84121816	0.00001258	2.07378634	0.0000456
0.000416	38.7426222	0.001272	0.83657879	0.00000716	2.06811521	0.0000228
0.00064	38.6443492	0.00174	0.84203421	0.00000886	2.07752174	0.0000412
0.000544	38.8311261	0.00152	0.83267343	0.0000108	2.06103099	0.0000342
0.000596	38.431768	0.00156	0.84849321	0.00001104	2.08366077	0.0000416
0.000798	38.8194227	0.0025	0.83467814	0.00001136	2.06549913	0.0000554
0.000632	38.5784309	0.00179	0.84709026	0.0000103	2.08738913	0.0000366
0.000628	38.4843739	0.001644	0.84612953	0.00000836	2.08088781	0.000029
0.000658	38.3863721	0.00202	0.85187359	0.0000098	2.09142526	0.0000418
0.00129	38.6653185	0.00474	0.84004919	0.00001976	2.07335711	0.0000904
0.00041	38.84866	0.001386	0.83275002	0.00000842	2.0616333	0.000037
0.000698	38.7113582	0.00282	0.83950158	0.00001104	2.07357018	0.000069
0.00065	38.7031164	0.00252	0.83983274	0.00001132	2.07419189	0.000078

0.00057	38.3922332	0.001576	0.85645787	0.00001022	2.1020896	0.0000622
0.000726	38.6542747	0.00242	0.83893053	0.00000932	2.06945667	0.0000824
0.000976	38.7873021	0.00412	0.83538529	0.00001396	2.06615789	0.0001234
0.001052	38.7639047	0.00254	0.84220478	0.00001348	2.08176478	0.0000404
0.00086	38.6816287	0.00402	0.83764164	0.00001056	2.0681999	0.0001148
0.000752	38.9022993	0.00232	0.8414025	0.00000844	2.08715684	0.0000466
0.000704	38.4122216	0.00232	0.85377133	0.0000125	2.09589619	0.0000594
0.00094	38.5454805	0.00426	0.84977603	0.0000155	2.09246368	0.0001714
0.00074	38.8100835	0.00224	0.83520006	0.00001504	2.06692422	0.0000696
0.000926	38.784809	0.00294	0.83666328	0.00001388	2.06975227	0.0000652
0.0008	38.7103965	0.00336	0.84512673	0.00001654	2.08727457	0.0001236
0.00092	38.6215942	0.00272	0.84599678	0.00001072	2.08635054	0.0000668
0.000998	38.269787	0.0022	0.85093623	0.00000776	2.08869906	0.0000374
0.000684	38.8425071	0.00198	0.83622453	0.00001048	2.0707929	0.0000398
0.001226	38.8406445	0.00394	0.83664329	0.00001814	2.07082738	0.0001006
0.00081	38.8850034	0.00258	0.83330362	0.00001372	2.0643461	0.000064

0.000602 38.8405895 0.001612 0.83346973 0.0000083 2.06335266 0.0000278

T	mu	kappa
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119 9.88 3.89

188 9.84 3.95

89 9.87 3.89

116 9.83 3.90

164 9.85 3.90

136 9.88 3.92

68 9.89 3.88

120 9.86 3.89

60 9.84 3.86

73 9.91 3.88

151 9.86 3.89

61 9.91 3.88

195 9.84 3.92

73 9.95 3.88

69 9.92 3.89

67	9.88	3.90
81	9.87	3.91
60	9.90	3.88
60	9.89	3.88
53	9.87	3.87
57	9.90	3.88
68	9.92	3.89
72	9.89	3.89
59	9.91	3.88
71	9.85	3.88
153	9.87	3.93
79	9.93	3.86
188	9.84	3.84
89	9.90	3.89
78	9.88	3.88
82	9.91	3.89

182	9.84	3.90
85	9.91	3.89
103	9.91	3.90
70	9.84	3.89
62	9.89	3.89
57	9.90	3.88
58	9.90	3.88
267	9.82	3.92
293	9.82	3.93
187	9.80	3.87
219	9.80	3.91
182	9.87	3.90
180	9.86	3.88
41	9.89	3.87
185	9.84	3.92
213	9.82	3.88

125	9.81	3.88
232	9.81	3.91
151	9.84	3.88
61	9.90	3.87
75	9.87	3.87
160	9.82	3.88
116	9.85	3.87
84	9.89	3.88
190	9.83	3.90
220	9.77	3.88
182	9.85	3.90
77	9.87	3.88
109	9.88	3.88
191	9.80	3.88
94	9.89	3.88
109	9.86	3.89

162	9.80	3.88
136	9.84	3.90
84	9.87	3.87
181	9.82	3.89
170	9.85	3.89
323	9.79	3.95
48	9.91	3.87
82	9.87	3.88
251	9.80	3.94
100	9.83	3.88
205	9.81	3.91
190	9.81	3.88
231	9.82	3.88
211	9.85	3.92
74	9.92	3.87
123	9.85	3.88

97	9.85	3.87
61	9.91	3.87
137	9.88	3.92
158	9.79	3.87
96	9.82	3.87
177	9.81	3.90
49	9.87	3.85
270	9.80	3.89
82	9.87	3.87
252	9.81	3.94
230	9.78	3.88
308	9.76	3.92
147	9.82	3.88
54	9.88	3.86
146	9.84	3.89
149	9.83	3.89

387	9.81	3.98
133	9.83	3.86
88	9.86	3.87
201	9.89	3.95
108	9.81	3.85
188	9.89	4.01
350	9.82	3.95
294	9.82	3.96
85	9.86	3.88
105	9.85	3.89
238	9.87	3.97
240	9.83	3.94
247	9.60	3.86
105	9.87	3.91
119	9.90	3.91
69	9.90	3.88

64

9.88

3.87

Lab code #	Weight (g)	Photo Obv - Numk	Photo Rev - Number	Museum coll Inventory num
B149	8.4	IMG_2268	IMG_2269	Bruxelles, Bil Tray 192 : Ac
B150	8.24	IMG_2270	IMG_2271	Bruxelles, Bil Tray 192 : Ac
B151	8.57	IMG_2272	IMG_2273	Bruxelles, Bil Tray 193 : Ac
B152	8.57	IMG_2274	IMG_2275	Bruxelles, Bil Tray 193 : Na
B167	8.55	IMG_2305	IMG_2306	Bruxelles, Bil Tray 193 : Du
B168	8.39	IMG_2307	IMG_2308	Bruxelles, Bil Tray 193 : Ac
B169	8.57	IMG_2309	IMG_2310	Bruxelles, Bil Tray 193 : Na
B170	8.3	IMG_2311	IMG_2312	Bruxelles, Bil Tray 193 : Il.
B171	8.38	IMG_2313	IMG_2314	Bruxelles, Bil Tray 193 : Ac
B172	8.59	IMG_2315	IMG_2316	Bruxelles, Bil Tray 193 : Du
B173	8.49	IMG_2317	IMG_2318	Bruxelles, Bil Tray 193 : Ac
B174	8.54	IMG_2319	IMG_2320	Bruxelles, Bil Tray 194 : Il.
B175	8.39	IMG_2321	IMG_2322	Bruxelles, Bil Tray 194 : Il.
B176	8.45	IMG_2323	IMG_2324	Bruxelles, Bil Tray 194 : Ac
B177	8.43	IMG_2325	IMG_2326	Bruxelles, Bil Tray 194 : Il.
B178	8.38	IMG_2327	IMG_2328	Bruxelles, Bil Tray 194 : Il.

B179	8.6	IMG_2329	IMG_2330	Bruxelles, Bil Tray 194 : Ac
B180	8.61	IMG_2331	IMG_2332	Bruxelles, Bil Tray 194 : Hi
B181	8.49	IMG_2333	IMG_2334	Bruxelles, Bil Tray 194 : II.
B182	8.31	IMG_2335	IMG_2336	Bruxelles, Bil Tray 194 : II.
B183	8.42	IMG_2337	IMG_2338	Bruxelles, Bil Tray 194 : II.
B184	8.46	IMG_2339	IMG_2340	Bruxelles, Bil Tray 194 : Na
B185	8.37	IMG_2341	IMG_2342	Bruxelles, Bil Tray 194 : II.
B186	8.33	IMG_2343	IMG_2344	Bruxelles, Bil Tray 194 : II.
B187	8.45	IMG_2345	IMG_2346	Bruxelles, Bil Tray 194 : II.
B188	8.54	IMG_2347	IMG_2348	Bruxelles, Bil Tray 194 : II.
B189	8.55	IMG_2349	IMG_2350	Bruxelles, Bil Tray 194 : II.
B190	2.79	IMG_2351	IMG_2352	Bruxelles, Bil Tray 194 : Na
B191	3.65	IMG_2353	IMG_2354	Bruxelles, Bil Tray 194 : Na
B192	9.53	IMG_2358		Bruxelles, Bil Tray 170 : Du
B193	5.03	IMG_2360	IMG_2361	Bruxelles, Bil Tray 170 : Na
B194	8.25	IMG_2362	IMG_2363	Bruxelles, Bil Tray 170 : Ac

B195	8.15 IMG_2364	IMG_2365	Bruxelles, Bil Tray 170 : II.
B196	8.36 IMG_2366	IMG_2367	Bruxelles, Bil Tray 170 : II.
B197	8.27 IMG_2368	IMG_2369	Bruxelles, Bil Tray 170 : II.
B198	8.43 IMG_2370	IMG_2371	Bruxelles, Bil Tray 171 : II.
B199	8.17 IMG_2372	IMG_2373	Bruxelles, Bil Tray 171 : II.
B200	8.33 IMG_2374	IMG_2375	Bruxelles, Bil Tray 171 : II.
B201	8.42 IMG_2376	IMG_2377	Bruxelles, Bil Tray 171 : Ac
B202	8.25 IMG_2378	IMG_2379	Bruxelles, Bil Tray 171 : Ac
G004	8.37 DSC01423	DSC01424	Athens, Num 3907a
G031	8.01 DSC01417	DSC01418	Athens, Num 3905
G040	8.51 DSC01419	DSC01420	Athens, Num 3906
G071	8.37 DSC01421	DSC01422	Athens, Num 3906a
I030	2.95 DSC01617	DSC01618	Irsrael, The I: 79165 Beth I
P287	16.66 P285_OBV	P285_REV	
P325	0.62 P325_OBV	P325_REV	
P331	8.13 P331_OBV	P331_REV	

B203	8.08	IMG_2380	IMG_2381	Bruxelles, Bil Tray 171 : Na
B204	8.25	IMG_2382	IMG_2383	Bruxelles, Bil Tray 171 : Il.
B205	8.34	IMG_2384	IMG_2385	Bruxelles, Bil Tray 171 : Ac
B206	8.39	IMG_2386	IMG_2387	Bruxelles, Bil Tray 171 : Il.
B207	8.23	IMG_2388	IMG_2389	Bruxelles, Bil Tray 171 : Il.
B208	8.3	IMG_2390	IMG_2391	Bruxelles, Bil Tray 171 : Il.
B209	8.39	IMG_2392	IMG_2393	Bruxelles, Bil Tray 171 : Ac
B284	11.92	20211130_100358	20211130_100358	Bruxelles, Bil Tray 197 : Ac
B285	11.84	20211130_101038	20211130_101041	Bruxelles, Bil Tray 197 : Na
B286	12.24	20211130_101739	20211130_101746	Bruxelles, Bil Tray 197 : Du
B287	5.14	20211130_102558	20211130_102606	Bruxelles, Bil Tray 197 : Ac
B288	2.63	20211130_103318	20211130_103328	Bruxelles, Bil Tray 197 : FC

Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		350-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		350-300
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		350-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		350-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		350-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		350-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		300-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		300-250
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		510-480
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		510-480
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		510-480
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		510-480
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355	Alexander III the Great	310-290
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		500-450
Corinth	http://nomisma.org/id/co	Corinthia	37.9404	22.9355		340

Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	400-330
Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	400-330
Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	400-330
Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	300-250
Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	330-250
Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	330-250
Leucas	http://nomisma.org/id/Corinthia_rinth	37.9404	22.9355	167 and after
Sicyon	http://nomisma.org/id/Corinthia_rinth	37.980	22.723	400-300
Sicyon	http://nomisma.org/id/Corinthia_rinth	37.980	22.723	400-300
Sicyon	http://nomisma.org/id/Corinthia_rinth	37.980	22.723	400-300
Sicyon	http://nomisma.org/id/Corinthia_rinth	37.980	22.723	400-300

Denominatio	Weight (g)	Obverse desc	Reverse desc	Reference 1	206Pb/204Pb 2s
Stater	8.4			18.3003169	0.000968
Stater	8.24			18.2948575	0.000896
Stater	8.57			18.3919252	0.0007
Stater	8.57	Pegasus	Athena	18.8013739	0.00098
Stater	8.55			18.6724217	0.00065
Stater	8.39			18.7577473	0.00054
Stater	8.57			18.5455824	0.000514
Stater	8.3			18.8433444	0.000664
Stater	8.38			18.6962168	0.00063
Stater	8.59			18.5873669	0.000542
Stater	8.49			18.7012844	0.000498
Stater	8.54			18.7236605	0.000964
Stater	8.39			18.7444907	0.000748
Stater	8.45			18.3454224	0.000854
Stater	8.43			18.7800534	0.000672
Stater	8.38			18.4330697	0.000506

Stater	8.6		18.4337463	0.000962
Stater	8.61		18.4446339	0.001442
Stater	8.49		18.7340781	0.000504
Stater	8.31		18.7375827	0.001146
Stater	8.42		18.6185762	0.000812
Stater	8.46		18.5597654	0.00093
Stater	8.37		18.7139066	0.000582
Stater	8.33		18.7636693	0.000572
Stater	8.45		18.6980074	0.000896
Stater	8.54		18.705677	0.000716
Stater	8.55		18.7719651	0.000652
drachm	2.79	Aphrodite	18.5905884	0.00068
Trihemidra	3.65	Pegasus Chimera	18.7613924	0.000864
Stater	9.53		18.5155411	0.0009
Hemistater	5.03	Achelus Apollon Aktios	18.6900034	0.000662
Stater	8.25		18.718277	0.001044

Stater	8.15			18.7018667	0.00082
Stater	8.36			18.5147648	0.000904
Stater	8.27			18.6482955	0.000542
Stater	8.43			18.72034	0.000668
Stater	8.17			18.7247184	0.000624
Stater	8.33			18.6571011	0.000576
Stater	8.42			18.5514558	0.00091
Stater	8.25			18.5582207	0.000664
Stater	8.37	Pegasus	Athena	18.7776803	0.000526
Stater	8.01	Pegasus	Athena	18.6496576	0.000986
Stater	8.51	Pegasus	Athena	18.7541272	0.000788
Stater	8.37	Pegasus	Athena	18.7836808	0.000806
	2.95		Pegasus	18.6715643	0.00137
Tetradrachm	16.66	Herakles	Zeus	18.6720919	0.001402
Diobol	0.62			18.8090966	0.000446
Stater	8.13	Helmet	Pegasus	18.8439517	0.000568

Stater	8.08	Athena	18.421555	0.000956
Stater	8.25		18.7499451	0.000584
Stater	8.34		18.6652528	0.000724
Stater	8.39		18.7793166	0.00074
Stater	8.23		18.7749996	0.000758
Stater	8.3		18.7904746	0.000576
Didrachm	8.39		18.1163783	0.00083
Stater	11.92		18.6995157	0.000656
Stater	11.84		18.7706479	0.00081
Stater	12.24		18.3560456	0.00082
Drachm	5.14		18.4983626	0.000664
Triobol	2.63		18.6018499	0.000666

207Pb/204Pt 2s		208Pb/204Pt 2s		207Pb/206Pt 2s		208Pb/206Pt
15.6349192	0.000952	38.3675975	0.00266	0.85434448	0.00001288	2.09656886
15.616859	0.00093	38.2943968	0.00266	0.85362827	0.00001448	2.09322725
15.6412045	0.00072	38.4411556	0.001918	0.8504392	0.00000904	2.09013417
15.6939506	0.000992	38.8397987	0.00354	0.83471767	0.00001314	2.06588051
15.6674056	0.000638	38.6930047	0.001754	0.83906398	0.00001204	2.0722115
15.6764992	0.000482	38.8090651	0.00127	0.83572355	0.00000618	2.06895248
15.6488525	0.000446	38.5926414	0.001118	0.84380077	0.00000754	2.08097262
15.687905	0.000584	38.8604326	0.001476	0.83254469	0.00000706	2.06230905
15.6566795	0.000538	38.711822	0.001486	0.83742039	0.0000094	2.07054197
15.6550288	0.000478	38.6076006	0.001174	0.84223574	0.0000069	2.07707541
15.6691117	0.000432	38.7416698	0.00108	0.83786008	0.00000718	2.07162983
15.6757602	0.00078	38.7606796	0.001912	0.83721826	0.00000972	2.07014624
15.6837773	0.00067	38.7953002	0.001884	0.83672165	0.00000744	2.06974511
15.630372	0.000668	38.3584618	0.001884	0.85201167	0.00000912	2.09088303
15.6701522	0.000526	38.7844416	0.0013	0.83440664	0.00000764	2.06522012
15.6652737	0.000452	38.5037338	0.00113	0.84984513	0.00000672	2.08883564

15.6660974	0.00046	38.5070057	0.001894	0.84982468	0.00000678	2.08887799
15.6397535	0.0021	38.4579237	0.00634	0.84791704	0.0000612	2.0850293
15.6725111	0.000492	38.7676541	0.001124	0.836583	0.0000074	2.06937979
15.674686	0.001034	38.7721823	0.00258	0.83655635	0.00001102	2.06927788
15.6635078	0.000686	38.6629496	0.001804	0.84126043	0.0000089	2.07655062
15.6584	0.000814	38.6155606	0.00214	0.84366103	0.00000942	2.08055796
15.6718532	0.000526	38.7530003	0.0013	0.83744197	0.00000756	2.07078518
15.6722206	0.000526	38.808565	0.001296	0.83523433	0.00000782	2.06825511
15.676758	0.000834	38.7412026	0.0028	0.8384119	0.00001286	2.07193895
15.6797271	0.000598	38.7643335	0.001642	0.83823314	0.00000758	2.07233393
15.6803481	0.000496	38.818314	0.001306	0.83529679	0.00000992	2.06788656
15.6578591	0.000666	38.628008	0.00204	0.84223518	0.000009	2.07782703
15.6807431	0.000842	38.8051743	0.00244	0.83580943	0.00001232	2.06830138
15.6420098	0.000728	38.5164273	0.00358	0.84481665	0.00001134	2.08021045
15.6731285	0.000616	38.7435733	0.001786	0.83858159	0.00001072	2.07297279
15.661367	0.001058	38.7312371	0.00294	0.83668929	0.00001552	2.06919705

15.6756724	0.00076	38.7332649	0.00234	0.83817371	0.00001182	2.07105569
15.6424265	0.000838	38.5247203	0.00248	0.8448725	0.00001138	2.08071725
15.6659598	0.00061	38.7043191	0.001526	0.84005308	0.00000976	2.0754562
15.6757143	0.000606	38.7629524	0.001958	0.83736733	0.0000084	2.070625
15.6735947	0.000776	38.7707053	0.00298	0.83703922	0.000019	2.07051981
15.670295	0.000564	38.7030373	0.001786	0.83990692	0.00000926	2.0744532
15.6526369	0.000842	38.5957721	0.00262	0.8437318	0.0000109	2.08046522
15.6613803	0.000538	38.6143343	0.001522	0.84390798	0.0000082	2.08074191
15.6901913	0.0005	38.8331184	0.001988	0.83555993	0.00000786	2.06798308
15.6738933	0.000862	38.7442477	0.00282	0.84043286	0.00001346	2.07749787
15.6727434	0.000778	38.8730528	0.00226	0.8356844	0.00001132	2.07277057
15.6696748	0.000942	38.9054617	0.00316	0.83423382	0.00001774	2.07124482
15.6690032	0.001424	38.7693785	0.00474	0.83919281	0.00001884	2.07637788
15.6792055	0.001266	38.721071	0.0033	0.83970625	0.00001946	2.07375619
15.6661077	0.0004	38.7954044	0.001172	0.83289801	0.00000586	2.06258547
15.678279	0.000498	38.8203734	0.00169	0.83199906	0.00000794	2.06007153

15.6399988	0.00091	38.4583579	0.00266	0.84901042	0.0000113	2.08765251
15.6799983	0.000568	38.8081947	0.00143	0.83626666	0.00000636	2.06977165
15.6751378	0.000758	38.7330867	0.00224	0.83979664	0.0000107	2.07513843
15.6835049	0.000668	38.8150938	0.001872	0.83515146	0.00000926	2.06692097
15.6865456	0.000706	38.818398	0.00232	0.83550413	0.0000123	2.06759212
15.6808674	0.000532	38.8274755	0.001762	0.83450619	0.00000754	2.06633127
15.6030371	0.00084	38.0781892	0.00354	0.86127402	0.00001436	2.10184369
15.6635554	0.000508	38.6903858	0.001268	0.83764553	0.00000916	2.06899644
15.6722957	0.000794	38.7487529	0.00366	0.83494275	0.00001162	2.06425454
15.6339765	0.00056	38.3638829	0.001728	0.85169441	0.00000872	2.08998006
15.6518159	0.000582	38.5811779	0.00159	0.84612743	0.00000808	2.08565194
15.6593099	0.00065	38.6543477	0.00222	0.84180555	0.00000856	2.07799548

2s	T	mu	kappa
0.000043	347	9.77	3.94
0.0000506	317	9.70	3.90
0.0000286	291	9.78	3.92
0.000082	89	9.90	3.88
0.0000528	133	9.82	3.88
0.0000152	87	9.84	3.89
0.0000208	191	9.77	3.90
0.0000193	46	9.87	3.86
0.0000208	94	9.77	3.87
0.00001444	172	9.79	3.89
0.00001668	115	9.82	3.89
0.00001696	111	9.84	3.88
0.0000212	112	9.87	3.89
0.0000236	305	9.74	3.91
0.00001894	58	9.81	3.86
0.00001112	306	9.86	3.94

0.00001592	307	9.87	3.94
0.0001518	249	9.76	3.90
0.00001364	97	9.83	3.88
0.0000254	99	9.83	3.88
0.0000224	166	9.81	3.90
0.0000436	199	9.81	3.91
0.0000212	111	9.83	3.88
0.00001892	75	9.82	3.88
0.0000662	132	9.85	3.89
0.0000214	132	9.86	3.90
0.0000258	84	9.85	3.88
0.0000462	175	9.80	3.90
0.0000804	93	9.85	3.88
0.0001368	201	9.75	3.88
0.0000632	131	9.84	3.90
0.000066	87	9.79	3.87

0.0000526	127	9.85	3.88
0.0000574	202	9.75	3.89
0.00004	148	9.82	3.90
0.0000438	114	9.84	3.89
0.0001006	106	9.83	3.89
0.0000424	150	9.83	3.90
0.0000602	194	9.79	3.90
0.0000212	206	9.82	3.91
0.0000586	100	9.89	3.89
0.0000664	163	9.85	3.92
0.0000554	83	9.82	3.92
0.000082	55	9.81	3.92
0.000108	137	9.83	3.92
0.0000514	156	9.86	3.90
0.0000408	28	9.79	3.84
0.0000548	27	9.83	3.84

0.0000442	267	9.77	3.91
0.00001796	100	9.85	3.89
0.0000542	153	9.85	3.91
0.000039	85	9.86	3.88
0.0000858	94	9.87	3.88
0.0000278	72	9.85	3.88
0.0001338	424	9.69	3.90
0.0000248	105	9.80	3.86
0.000151	70	9.82	3.85
0.000032	304	9.76	3.90
0.00001926	232	9.79	3.93
0.0000682	170	9.80	3.90

Lab code #	Weight (g)	Photo Obv - I	Photo Rev - I	Museum coll Inventory num	Mint
B145	12.21	IMG_2260	IMG_2261	Bruxelles, Bil Tray 191 : Na	Aegina
					Aegina
B146	12.07	IMG_2262	IMG_2263	Bruxelles, Bil Tray 191 : Na	
					Aegina
B147	11.94	IMG_2264	IMG_2265	Bruxelles, Bil Tray 191 : Ac	
					Aegina
B148	11.91	IMG_2266	IMG_2267	Bruxelles, Bil Tray 191 : Ac	
B305	11.86	20211130_1	20211130_1	Bruxelles, Bil Tray 192 : Na	Aegina
B306	12.35	20211130_1	20211130_1	Bruxelles, Bil Tray 192 : FC	Aegina
B307	11.85	20211130_1	20211130_1	Bruxelles, Bil Tray 192 : Na	Aegina
					Aegina
G001	11.67	DSC01433	DSC01434	Athens, Num	3223
					Aegina
G002	11.95	DSC01437	DSC01438	Athens, Num	3225
					Aegina
G003	11.42	DSC01445	DSC01446	Athens, Num 1911-1912, M	
					Aegina
G007	12.17	DSC01429	DSC01430	Athens, Num	3221
					Aegina
G010	11.57	DSC01443	DSC01444	Athens, Num ΕΖ! = 1913-1	
					Aegina
G050	11.73	DSC01431	DSC01432	Athens, Num	3222
					Aegina
G052	11.73	DSC01435	DSC01436	Athens, Num	3224
					Aegina
G053	12.13	DSC01439	DSC01440	Athens, Num	3226
					Aegina
G054	12.21	DSC01427	DSC01428	Athens, Num Π242	
					Aegina
G067	11.35	DSC01441	DSC01442	Athens, Num ΕΖ! = 1913-1	
					Aegina
P327	1.03	P327_OBV	P327_REV		

Mint - Nomisma.org	Area (sub- area)	Mint - Latitud	Mint - Longituty 1 (king, satr	Chronology	Denominatio
http://nomisma.org/id/ae	Aegina	37.75	23.4333	6th c.	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	6th c.	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	6th c.	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	6th c.	Stater
	Aegina	37.75	23.43	500-456	Stater
	Aegina	37.75	23.43		Stater
	Aegina	37.75	23.43		404-375
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	5th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	Late 6th	Stater
http://nomisma.org/id/aegina_aegina	Aegina	37.75	23.4333	525-500	Obol

Weight (g)	Obverse desc	Reverse desc	Reference 1	206Pb/204Pb	2s	207Pb/204Pb
12.21	Tortoise			18.5684883	0.000758	15.6524174
12.07	Tortoise			18.3647833	0.000588	15.6144263
11.94				18.3439304	0.000736	15.6230384
11.91				18.5146648	0.001198	15.6341305
11.86				18.7559336	0.001	15.6587649
12.35				18.553269	0.000538	15.6329899
11.85				18.7621409	0.00081	15.679412
11.67	Turtle	Union Jack	Sear 1849	18.521624	0.000522	15.6482307
11.95	Turtle	Union Jack	Sear 1849	18.6044945	0.000708	15.6625782
11.42	Turtle	Union Jack	Sear 1849	18.7375342	0.000754	15.6668515
12.17	Turtle	Union Jack	Sear 1849	18.5766611	0.000604	15.6590249
11.57	Turtle	Union Jack	Sear 1849	18.6955829	0.000722	15.6643882
11.73	Turtle	Union Jack	Sear 1849	18.8096312	0.00093	15.6945265
11.73	Turtle	Union Jack	Sear 1849	18.6337974	0.000876	15.6638898
12.13	Turtle	Union Jack	Sear 1849	18.6960524	0.000722	15.6648162
12.21	Turtle	Union Jack	Sear 1849	18.7110514	0.000726	15.6740864
11.35	Turtle	Union Jack	Sear 1849	18.5886172	0.001124	15.651327
1.03	Turtle	Incuse		18.6983014	0.000882	15.6575122

2s	208Pb/204Pb 2s		207Pb/206Pb 2s		208Pb/206Pb 2s	
0.000808	38.6428808	0.0026	0.84295925	0.00001666	2.081136	0.0000796
0.000684	38.3441943	0.00214	0.85022585	0.00001296	2.08793949	0.000061
0.000746	38.3579895	0.00226	0.85166875	0.00001224	2.09103152	0.0000604
0.001196	38.4704275	0.0031	0.84442157	0.00001856	2.07786095	0.0000738
0.00082	38.7999673	0.00334	0.83488266	0.0000099	2.06861743	0.000116
0.000488	38.4931669	0.001126	0.84261232	0.0000083	2.07475559	0.0000272
0.000754	38.8010337	0.001882	0.83569159	0.00001158	2.06803105	0.0000312
0.000436	38.5904777	0.001134	0.84485189	0.00000668	2.08350852	0.0000256
0.000608	38.6917646	0.00166	0.8418426	0.00000684	2.07961057	0.0000242
0.000668	38.8087554	0.00252	0.83611183	0.00000888	2.07111129	0.0000688
0.000566	38.6535817	0.001662	0.84294725	0.00000786	2.08072214	0.0000584
0.000654	38.7685771	0.00362	0.8378709	0.00001032	2.07365672	0.0001428
0.000836	38.8753872	0.0023	0.8343849	0.00001118	2.06677808	0.0000482
0.000784	38.7175972	0.00214	0.84062026	0.00001002	2.07780681	0.0000352
0.000636	38.76787	0.00208	0.83788237	0.00001096	2.07357556	0.0000458
0.000732	38.7543369	0.001874	0.8376966	0.00001146	2.0712267	0.0000364
0.00116	38.6643306	0.0034	0.84197184	0.00001506	2.0799236	0.0000638
0.000808	38.8045611	0.00214	0.83737124	0.00001166	2.07529366	0.0000454

T	mu	kappa
181	9.78	3.92
260	9.68	3.88
292	9.72	3.90
186	9.72	3.85
54	9.77	3.88
155	9.71	3.84
90	9.85	3.88
208	9.78	3.92
174	9.81	3.92
84	9.80	3.90
188	9.81	3.92
110	9.80	3.90
84	9.90	3.89
155	9.81	3.92
110	9.80	3.90
117	9.84	3.89
164	9.77	3.91
94	9.78	3.92

Lab code #	Weight (g)	Photo Obv - I	Photo Rev - I	Museum coll Inventory num	Mint
B238	9.7	IMG_2455	IMG_2456	Bruxelles, Bil Tray 125 : Nε	Thasos
B239	9.77	IMG_2460	IMG_2461	Bruxelles, Bil Tray 125 : Nε	Thasos
B240	9.4	IMG_2464	IMG_2465	Bruxelles, Bil Tray 125 : Nε	Thasos
B241	9.63	IMG_2466	IMG_2467	Bruxelles, Bil Tray 125 : Nε	Thasos
B242	9.43	IMG_2468	IMG_2469	Bruxelles, Bil Tray 125 : Nε	Thasos
B243	9.69	IMG_2470	IMG_2471	Bruxelles, Bil Tray 125 : Nε	Thasos
B244	9.62	IMG_2472	IMG_2473	Bruxelles, Bil Tray 125 : Nε	Thasos
B245	9.68	IMG_2475		Bruxelles, Bil Tray 125 : Nε	Thasos
B246	9.37	IMG_2477	IMG_2478	Bruxelles, Bil Tray 125 : Dε	Thasos
B247	8.99	IMG_2479	IMG_2480	Bruxelles, Bil Tray 126 : Nε	Thasos
B248	3.86	IMG_2481	IMG_2482	Bruxelles, Bil Tray 126 : Ac	Thasos
B249	3.5	IMG_2483	IMG_2484	Bruxelles, Bil Tray 126 : Gi	Thasos
B250	4.48	IMG_2485		Bruxelles, Bil Tray 126 : FC	Thasos
B251	8.78	IMG_2487	IMG_2488	Bruxelles, Bil Tray 126 : Nε	Thasos
B252	8.68	IMG_2489	IMG_2490	Bruxelles, Bil Tray 126 : Nε	Thasos
B253	3.65	IMG_2491	IMG_2492	Bruxelles, Bil Tray 126 : Ac	Thasos
B254	12.66	IMG_2493		Bruxelles, Bil Tray 126 : Il.	Thasos
B255	3.61	IMG_2495		Bruxelles, Bil Tray 126 : FC	Thasos
B256	16.84	IMG_2497	IMG_2498	Bruxelles, Bil Tray 128 : FC	Thasos
B257	16.81	IMG_2499	IMG_2500	Bruxelles, Bil Tray 128 : Ac	Thasos
B258	16.71	IMG_2501		Bruxelles, Bil Tray 128 : Ac	Thasos
B259	16.81	IMG_2503	IMG_2504	Bruxelles, Bil Tray 128 : Ac	Thasos
B260	16.78	IMG_2505		Bruxelles, Bil Tray 128 : Il.	Thasos
G008	8.45	DSC01415	DSC01416	Athens, Num 1160	Thasos
G009	7.8	DSC01413	DSC01414	Athens, Num 1158a	Thasos
G015	8.85	DSC01411	DSC01412	Athens, Num 1158	Thasos
G021	7.9	DSC01399	DSC01400	Athens, Num 1892-93 KΘ!	Thasos
G022	8.4	DSC01409	DSC01410	Athens, Num 1157B	Thasos
G023	8.05			Athens, Num 1057 = ΔΣ 72	Thasos
G032	3.54			Athens, Num Gil 10 Thrace	Thasos
G041	3.8	DSC01407	DSC01408	Athens, Num AE 71	Thasos
G046	3.95	DSC01403	DSC01404	Athens, Num 1153a	Thasos
G056	3.7	DSC01405	DSC01406	Athens, Num 1153b	Thasos
G064	9.56	DSC01401	DSC01402	Athens, Num 1902-1908 IF	Thasos
G080	3.95	DSC01397	DSC01398	Athens, Num General Coll	Thasos
P310	0.39	P310_OBV	P310_REV		Thasos
P316	0.78	P316_OBV	P316_REV		Thasos
P317	0.88	P317_OBV	P317_REV		Thasos

Mint - Nomisma.org	Area (sub- area)	Mint - Latitud	Mint - Longituity 1 (king, satr	Chronology	Denominatio
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	480 and earli	Stater
http://nomis	Thrace	40.6833	24.65	465	Stater
http://nomis	Thrace	40.6833	24.65	465	Stater
http://nomis	Thrace	40.6833	24.65	465	drachm
http://nomis	Thrace	40.6833	24.65	465	drachm
http://nomis	Thrace	40.6833	24.65	465	drachm
http://nomis	Thrace	40.6833	24.65	450-411	Stater
http://nomis	Thrace	40.6833	24.65	450-411	Stater
http://nomis	Thrace	40.6833	24.65	450-411	drachm
http://nomis	Thrace	40.6833	24.65	411-394	Tetradrachm
http://nomis	Thrace	40.6833	24.65	411-394	drachm
http://nomis	Thrace	40.6833	24.65	148 and afte	Tetradrachm
http://nomis	Thrace	40.6833	24.65	148 and afte	Tetradrachm
http://nomis	Thrace	40.6833	24.65	148 and afte	Tetradrachm
http://nomis	Thrace	40.6833	24.65	148 and afte	Tetradrachm
http://nomis	Thrace	40.6833	24.65	148 and afte	Tetradrachm
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	520-490	drachm
http://nomis	Thrace	40.6833	24.65	525-450	drachm
http://nomis	Thrace	40.6833	24.65	525-450	drachm
http://nomis	Thrace	40.6833	24.65	525-450	drachm
http://nomis	Thrace	40.6833	24.65	525-450	Stater
http://nomis	Thrace	40.6833	24.65	525-450	drachm
http://nomis	Thrace	40.6833	24.65	411-404	hemiobol
http://nomis	Thrace	40.6833	24.65	404-355	trihemiobol
http://nomis	Thrace	40.6833	24.65	525-480	Diobol

Weight (g)	Obverse desc	Reverse desc	Reference 1	206Pb/204Pb	2s	207Pb/204Pb
9.7	Satyr			18.6370847	0.000812	15.653375
9.77	Satyr			18.6951804	0.000872	15.6669361
9.4	Satyr			18.7087211	0.001078	15.6730298
9.63	Satyr			18.6799485	0.00161	15.6445001
9.43	Satyr			18.7007244	0.000634	15.6713106
9.69	Satyr			18.8225563	0.000524	15.6765304
9.62	Satyr			18.6684444	0.000752	15.6589107
9.68	Satyr			18.7052232	0.0007	15.6663869
9.37				18.5785346	0.000666	15.6461174
8.99	Satyr			18.7531288	0.000634	15.6818973
3.86				18.7593118	0.000548	15.6750487
3.5				18.7032154	0.00084	15.6662742
4.48	Satyr			18.6830613	0.000778	15.6728025
8.78	Satyr			18.740979	0.000812	15.6718455
8.68				18.5521971	0.000888	15.6559263
3.65				18.6223255	0.00079	15.6687886
12.66				18.3980005	0.000894	15.6542006
3.61				18.7300119	0.000672	15.674855
16.84				18.4089477	0.00088	15.6475776
16.01				18.6216274	0.000642	15.6683601
16.71				18.2464722	0.001296	15.6149848
16.81				18.4566555	0.001	15.6414731
16.78				18.6660762	0.000664	15.6694979
8.45	Satyr/nymph	Incuse		18.4682065	0.000904	15.6602248
7.8	Satyr/nymph	Incuse		18.4267025	0.000712	15.6675815
8.85	Satyr/nymph	Incuse		18.5363714	0.000604	15.6540425
7.9	Satyr/nymph	Incuse		18.6513186	0.00078	15.6710125
8.4	Satyr/nymph	Incuse		18.6564402	0.000594	15.6676588
8.05	Satyr/nymph	Incuse		18.7921487	0.000622	15.687817
3.54				18.8090449	0.000734	15.6872386
3.8	Satyr/nymph	Incuse		18.8015179	0.000766	15.6907657
3.95	Satyr/nymph	Incuse		18.6619059	0.000752	15.6800793
3.7	Satyr/nymph	Incuse		18.7375059	0.000712	15.6734337
9.56	Satyr/nymph	Incuse		18.7819923	0.000718	15.6817667
3.95	Satyr/nymph	Incuse		18.6316207	0.000536	15.6676304
0.39	Satyr	Dolphins		18.6551269	0.00071	15.6806654
0.78	Satyr	Krater		18.3546046	0.00061	15.6436738
0.88	Satyr	Incuse		18.7459716	0.000762	15.674812

2s	208Pb/204Pb 2s	207Pb/206Pb 2s	208Pb/206Pb 2s	208Pb/206Pb 2s	208Pb/206Pb 2s	208Pb/206Pb 2s
0.000814	38.745626	0.00208	0.83989259	0.00000902	2.0789317	0.000036
0.00066	38.7848819	0.00218	0.83803247	0.00000984	2.07458718	0.0000718
0.001038	38.7836567	0.00266	0.83771788	0.0000123	2.07292745	0.0000586
0.001818	38.7275783	0.00678	0.83752635	0.000003	2.07325605	0.0001938
0.00055	38.7720702	0.001534	0.83801451	0.00000662	2.07327442	0.0000436
0.00046	38.8143707	0.001624	0.83287058	0.00000788	2.06209468	0.0000382
0.000766	38.7624202	0.00214	0.83878433	0.00000996	2.076301	0.0000454
0.000626	38.7940611	0.001632	0.84045851	0.00000892	2.07396094	0.000028
0.00058	38.6301714	0.00252	0.8421802	0.00001	2.07927789	0.0000986
0.00062	38.7774786	0.00294	0.83622611	0.00000962	2.06781168	0.0001108
0.0006	38.8506609	0.00228	0.83558621	0.00000772	2.07100328	0.0000826
0.00084	38.8134961	0.00262	0.83762005	0.00001228	2.07524144	0.000078
0.00058	38.7824651	0.00238	0.83888082	0.00000846	2.075775	0.000039
0.000762	38.8231748	0.00282	0.83623358	0.0000102	2.07156192	0.0000854
0.000694	38.6085348	0.001916	0.84389336	0.00001018	2.08103467	0.000049
0.000648	38.6911297	0.001934	0.84139894	0.00000892	2.07765962	0.00003
0.000768	38.4885931	0.00208	0.85086098	0.00000938	2.09197234	0.0000268
0.000636	38.7613819	0.00264	0.83688803	0.000012	2.06943226	0.000089
0.000814	38.4739568	0.00222	0.84999317	0.00000996	2.08996214	0.0000348
0.000592	38.6875525	0.00153	0.84140764	0.00000996	2.07754767	0.000042
0.00123	38.1905485	0.00372	0.85577288	0.00001258	2.09296778	0.0000468
0.000892	38.5253287	0.00246	0.84746784	0.00001182	2.08735901	0.0000506
0.000754	38.7340568	0.00216	0.83946953	0.0000117	2.07510789	0.0000328
0.000804	38.5928468	0.00246	0.84797055	0.00000842	2.08976859	0.0000536
0.000688	38.5956222	0.00302	0.8497484	0.00001266	2.09325342	0.000106
0.000566	38.6209913	0.001912	0.8444883	0.00000728	2.08349901	0.0000352
0.000752	38.7261449	0.00356	0.84020653	0.00000982	2.07623267	0.0001148
0.000564	38.7694249	0.00189	0.83978871	0.00001158	2.07805313	0.0000614
0.00055	38.8494434	0.00191	0.83481962	0.00000806	2.06735156	0.0000548
0.000644	38.9195215	0.001864	0.83402882	0.0000089	2.06918148	0.000042
0.00066	38.910213	0.001736	0.8345507	0.00000926	2.0695109	0.000023
0.000628	38.7849443	0.00187	0.84023426	0.00000902	2.07829308	0.0000396
0.000618	38.8569239	0.00178	0.8364727	0.00000954	2.0737625	0.0000344
0.000686	38.8941453	0.001864	0.83493842	0.00000936	2.070822	0.0000372
0.00068	38.7487821	0.00196	0.84092286	0.0000117	2.07966464	0.0000558
0.000754	38.8135493	0.0025	0.84053272	0.00001832	2.08056131	0.0000738
0.000602	38.3835785	0.001142	0.85229187	0.00000836	2.09111412	0.000027
0.000634	38.8596568	0.001902	0.83616936	0.0000089	2.07296542	0.0000402

T	mu	kappa
132	9.771	3.923
115	9.812	3.911
117	9.833	3.903
82	9.728	3.883
120	9.828	3.902
39	9.825	3.848
119	9.786	3.914
107	9.808	3.909
162	9.755	3.9
101	9.859	3.875
83	9.831	3.906
108	9.808	3.92
136	9.837	3.919
91	9.822	3.902
200	9.799	3.909
173	9.834	3.91
311	9.826	3.947
105	9.836	3.879
290	9.798	3.93
173	9.833	3.909
350	9.707	3.875
243	9.763	3.923
142	9.828	3.904
271	9.834	3.957
315	9.873	3.989
208	9.795	3.925
156	9.837	3.91
145	9.823	3.928
84	9.874	3.889
70	9.869	3.913
83	9.884	3.914
165	9.87	3.937
97	9.829	3.922
80	9.853	3.915
164	9.828	3.934
172	9.874	3.956
323	9.795	3.916
93	9.833	3.919

Lab code #	Weight (g)	Photo Obv - I	Photo Rev - I	Museum coll	Inventory num	Mint
B024	16.91	DSC00936	DSC00937	Bruxelles, Bil Tray 129		Sestos
B028	15.13	DSC00944	DSC00945	Bruxelles, Bil Tray 129		Byzantium
B029	15.42	DSC00946	DSC00947	Bruxelles, Bil Tray 129		Byzantium
B030	13.47	DSC00948	DSC00949	Bruxelles, Bil Tray 129		Byzantium
B031	29.71	DSC00950	DSC00951	Bruxelles, Bil Tray 119		Abdera
B032	14.84	DSC00952	DSC00953	Bruxelles, Bil Tray 119		Abdera
B033	15.03	DSC00954	DSC00955	Bruxelles, Bil Tray 119		Abdera
B034	14.88	DSC00956	DSC00957	Bruxelles, Bil Tray 119		Abdera
B035	14.81	DSC00958	DSC00959	Bruxelles, Bil Tray 119		Abdera
B036	16.5	DSC00960	DSC00961	Bruxelles, Bil Tray 119		Aenus
B051	16.85	IMG_1048	IMG_1049	Bruxelles, Bil Tray 118		Mesembria
B052	16.58	IMG_1050	IMG_1051	Bruxelles, Bil Tray 118		Mesembria
B053	16.45	IMG_1052	IMG_1053	Bruxelles, Bil Tray 118		Mesembria

				Odessus
B054	16.5	IMG_1054	IMG_1055	Bruxelles, Bil Tray 118 : Ac
				Odessus
B055	16.45	IMG_1056	IMG_1057	Bruxelles, Bil Tray 118 : Na
				Odessus
B056	15.19	IMG_1058	IMG_1059	Bruxelles, Bil Tray 118 : 20
				Odessus
B057	16.17	IMG_1060	IMG_1061	Bruxelles, Bil Tray 118 : Il.8
				Mesembria
B058	16.16	IMG_1062	IMG_1063	Bruxelles, Bil Tray 118 : M
				Odessus
B071	15.11	IMG_1093	IMG_1094	Bruxelles, Bil Tray 119 : Il.8
				Odessus
B072	16.33	IMG_1095	IMG_1096	Bruxelles, Bil Tray 119 : Na
				Abdera
B225	14.17	IMG_2427	IMG_2428	Bruxelles, Bil Tray 119 : Du
				Abdera
B226	11.17	IMG_2429	IMG_2430	Bruxelles, Bil Tray 119 : Na
				Aenus
B227	15.47	IMG_2431	IMG_2432	Bruxelles, Bil Tray 120 : Du
				Aenus
B228	15.11	IMG_2433	IMG_2434	Bruxelles, Bil Tray 120 : Na
				Maroneia
B229	6.99	IMG_2435	IMG_2436	Bruxelles, Bil Tray 121 : Na
				Maroneia
B230	14.03	IMG_2437	IMG_2438	Bruxelles, Bil Tray 122 : Du
				Maroneia
B231	14.02	IMG_2439	IMG_2440	Bruxelles, Bil Tray 122 : Na
				Maroneia
B232	12.8	IMG_2441	IMG_2442	Bruxelles, Bil Tray 122 : Na

					Maroneia
B233	16.34	IMG_2443	IMG_2444	Bruxelles, Bil Tray 122 : Na	
					Maroneia
B234	17	IMG_2445	IMG_2446	Bruxelles, Bil Tray 122 : Na	
					Maroneia
B235	16.33	IMG_2447	IMG_2448	Bruxelles, Bil Tray 122 : Na	
					Maroneia
B236	14.14	IMG_2449	IMG_2450	Bruxelles, Bil Tray 122 : FG	
					Maroneia
B237	15.86	IMG_2451	IMG_2452	Bruxelles, Bil Tray 122 : FG	
					Istrus
Dr					
					Abdera
G026	2.06			Athens, Num Gil 9 Thrace	
					Istrus
Ob1					
					Istrus
Ob2					
					Istrus
Ob3					
					Abdera
P276	0.59	P276_OBV	P276_REV		
					Chersonesus
P280	2.07	P280_OBV	P280_REV		
					Byzantium
P289	2.41	P289_OBV	P289_REV		
					Chersonesus
P290	1.86	P290_OBV	P290_REV		

			Chersonesus
P307	2.32	P307_OBV P307_REV	
			Chersonesus
P308	2.31	P308_OBV P308_REV	
			Chersonesus
P314	2.2	P314_OBV P314_REV	
			Chersonesus
P318	2.13	P318_OBV P318_REV	
			Chersonesus
P320	2.26	P320_OBV P320_REV	
			Apollonia Pontica
pont1			
			Apollonia Pontica
Pont2			
			Apollonia Pontica
Pont3			

Mint - Nomisma.org	Area (sub- area)	Mint - Latitud	Mint - Longituity 1 (king, satr	Chronology	Denominatio
http://nomisma.org/id/sestus	Thrace	40.2167	26.3833	Lysimachus 323-281	Tetradrachm
http://nomisma.org/id/byzantium	Thrace	41.0139	28.9556	Lysimachus 125-75	Tetradrachm
http://nomisma.org/id/byzantium	Thrace	41.0139	28.9556	Lysimachus 125-75	Tetradrachm
http://nomisma.org/id/byzantium	Thrace	41.0139	28.9556	Lysimachus 125-75	Tetradrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507	512-480	octodrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507	512-480	Tetradrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507	450	Tetradrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507	451	Tetradrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507	452	Tetradrachm
http://nomisma.org/id/aenus	Thrace	40.7333	26.0667	474-450	Tetradrachm
http://nomisma.org/id/mesebria	Thrace	42.658435	27.731161	Mithridates VI 150	Tetradrachm
http://nomisma.org/id/mesebria	Thrace	42.658435	27.731161	Mithridates VI 120-80	Tetradrachm
http://nomisma.org/id/mesebria	Thrace	42.658435	27.731161	Mithridates VI 120-80	Tetradrachm

http://nomisma.org/id/odessus	Thrace	43.207917	27.915083	Mithridates VI	120-80	Tetradrachm
http://nomisma.org/id/odessus	Thrace	43.207917	27.915083	Mithridates VI	120-80	Tetradrachm
http://nomisma.org/id/odessus	Thrace	43.207917	27.915083	Mithridates VI	c. 120-80	Tetradrachm
http://nomisma.org/id/odessus	Thrace	43.207917	27.915083	Mithridates VI	120-80	Tetradrachm
http://nomisma.org/id/mesembria	Thrace	42.658435	27.731161	Mithridates VI	120-80	Tetradrachm
http://nomisma.org/id/odessus	Thrace	43.207917	27.915083	Mithridates VI	120-80	Tetradrachm
http://nomisma.org/id/odessus	Thrace	43.207917	27.915083	Mithridates VI	120-80	Tetradrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507		450	Tetradrachm
http://nomisma.org/id/abdera_thrace	Thrace	40.9814	24.9507	Philip II	347 and after	Tetradrachm
http://nomisma.org/id/aenus	Thrace	40.7333	26.0667		405-357	Tetradrachm
http://nomisma.org/id/aenus	Thrace	40.7333	26.0667		405-357	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667		480 and earlier	Didrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667		450-400	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667		450-400	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667		450-400	Tetradrachm

http://nomisma.org/id/maroneia	Thrace	40.9	25.516667	407-390	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667	407-390	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667	148 and after	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667	148 and after	Tetradrachm
http://nomisma.org/id/maroneia	Thrace	40.9	25.516667	148 and after	Tetradrachm
http://nomisma.org/id/istrus	Thrace			V-III BC	
http://nomisma.org/id/abdera_thracedera_thrace	Thrace	40.9814	24.9507	365-245	drachm
http://nomisma.org/id/istrus	Thrace			V-III BC	
http://nomisma.org/id/istrus	Thrace			V-III BC	
http://nomisma.org/id/istrus	Thrace			V-III BC	
http://nomisma.org/id/abdera_thracedera_thrace	Thrace	40.9814	24.9507	475-450	Obol
http://nomisma.org/id/cheronesus_thraceronesus_thrace	Thrace	44.611472	33.492		Hemidrachm
http://nomisma.org/id/byzantium	Thrace	41.0139	28.9556	387-340	Amisos
http://nomisma.org/id/cheronesus_thraceronesus_thrace	Thrace	44.611472	33.492	386-338	Hemidrachm

http://nomisma.org/id/cheronesus_thrace	Thrace	44.611472	33.492	400-338	Hemidrachm
http://nomisma.org/id/cheronesus_thrace	Thrace	44.611472	33.492	400-338	Hemidrachm
http://nomisma.org/id/cheronesus_thrace	Thrace	44.611472	33.492	400-338	Hemidrachm
http://nomisma.org/id/cheronesus_thrace	Thrace	44.611472	33.492	400-338	Hemidrachm
http://nomisma.org/id/cheronesus_thrace	Thrace	44.611472	33.492	400-338	Hemidrachm
http://nomisma.org/id/apollonia_pontica	Thrace			V BC	
http://nomisma.org/id/apollonia_pontica	Thrace			V BC	
http://nomisma.org/id/apollonia_pontica	Thrace			V BC	

Weight (g)	Obverse desc	Reverse desc	Reference 1	206Pb/204Pb	2s	207Pb/204Pb
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16.91	Alexander	Athena		18.4210317	0.000634	15.650398
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15.13	Alexander	Athena		18.5529539	0.000622	15.6620187
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15.42	Alexander	Athena		18.7090288	0.000554	15.6813251
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13.47	Alexander	Athena		18.6405111	0.000486	15.6733252
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29.71	Griffin	Incuse	Sear 1335	18.6051913	0.000524	15.6625197
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14.84	Griffin	Incuse	Sear 1336	18.7638452	0.000708	15.667409
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15.03	Griffin	Incuse	Sear 1336	18.6944953	0.000592	15.6658472
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14.88	Griffin	Incuse	Sear 1336	18.5720014	0.000496	15.6425394
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14.81	Griffin	Incuse	Sear 1336	18.637145	0.0007	15.6594305
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16.5	Head	Goat	Sear 1562	18.7134469	0.000746	15.6691468
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16.85	Alexander	Zeus		18.7348803	0.00056	15.6597873
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16.58	Alexander	Zeus		18.7348914	0.000488	15.6601276
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16.45	Alexander	Zeus		18.4133513	0.000968	15.6478669
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16.5	Alexander	Zeus	18.5463524	0.000584	15.6523753
16.45	Alexander	Zeus	18.468315	0.000954	15.6469329
15.19	Alexander	Zeus	18.4766085	0.000822	15.6549052
16.17	Alexander	Zeus	18.3806381	0.00163	15.6379286
16.16	Alexander	Zeus	18.6410817	0.000738	15.6688063
15.11	Alexander	Zeus	18.5577354	0.00075	15.6509768
16.33	Alexander	Zeus	18.6752455	0.000846	15.6749089
14.17			18.4476331	0.00097	15.6511709
11.17	Griffon	Apollo	17.8440815	0.001142	15.5961749
15.47			18.5278348	0.000734	15.6611781
15.11	Hermes		18.3675566	0.001048	15.6391503
6.99	Horse		18.5843458	0.000886	15.6541787
14.03			18.7754194	0.000626	15.6744606
14.02	Horse		18.4773134	0.001132	15.6387007
12.8			18.679126	0.001026	15.6621795

16.34	Dionysus		18.4575038	0.000704	15.64572
17	Dionysus	Wheat	18.4565615	0.000622	15.640934
16.33	Dionysus	you Dionysus	18.696381	0.00147	15.6689978
14.14			18.5664096	0.000598	15.6522196
15.86			18.5881055	0.0008	15.6554724
		Desaulty 200	18.772		15.684
2.06		Sear 1341	18.7641852	0.000624	15.6963248
		Desaulty 200	18.767		15.684
		Desaulty 200	18.823		15.694
		Desaulty 200	18.861		15.699
0.59	Griffin	Sear 1338	18.7476329	0.00052	15.6878835
2.07	Lion		18.7371936	0.000854	15.6800875
2.41	Bull	Incuse	18.4547296	0.000722	15.6733514
1.86	Lion	Incuse	18.7445251	0.000664	15.6850242

2.32	Lion	Incuse	18.8135446	0.000754	15.685504
2.31	Lion	Incuse	18.7670918	0.000634	15.6934814
2.2	Lion	Incuse	18.5759718	0.000736	15.6704471
2.13	Lion	Incuse	18.6348901	0.001194	15.6651037
2.26	Lion	Incuse	18.7542985	0.000612	15.6841626

Desaulty 200	18.852	15.697
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Desaulty 200	18.711	15.685
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Desaulty 200	18.821	15.681
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2s	208Pb/204Pb 2s	207Pb/206Pb 2s	208Pb/206Pb 2s
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0.000648	38.4863887	0.001622	0.84960785	0.00000972	2.08926636	0.0000254
0.000538	38.6746002	0.001528	0.84418489	0.00000786	2.08457636	0.0000292
0.000504	38.8678664	0.00168	0.83816685	0.00000914	2.0775056	0.000048
0.00043	38.8072338	0.001152	0.84081001	0.0000088	2.08188235	0.0000308
0.000474	38.6996761	0.00145	0.8418387	0.00000836	2.08007246	0.0000346
0.000662	38.8590733	0.00183	0.83493261	0.0000077	2.07092385	0.0000498
0.000502	38.7754635	0.00164	0.83799731	0.00000838	2.07418804	0.0000332
0.000488	38.5351006	0.001392	0.84583461	0.0000072	2.0837006	0.000033
0.000696	38.7089367	0.00204	0.84022729	0.00001022	2.07700998	0.000047
0.000764	38.7892863	0.00232	0.83728934	0.00001062	2.07277901	0.0000642
0.000478	38.7326431	0.00222	0.83586037	0.00000952	2.06741181	0.0000872
0.000412	38.7480088	0.001214	0.83586486	0.00000898	2.06819261	0.0000274
0.000732	38.4812073	0.001954	0.84980779	0.0000202	2.08986707	0.0000268

0.000544	38.5643232	0.001192	0.84395823	0.00000688	2.07933539	0.0000222
0.000802	38.5291742	0.00212	0.84722933	0.00001316	2.08624382	0.000027
0.000704	38.531517	0.001904	0.8472904	0.00001622	2.08545261	0.0000432
0.001342	38.4378575	0.00318	0.85078584	0.0000278	2.09124382	0.0000418
0.000682	38.6784224	0.0022	0.84056023	0.00001012	2.07489214	0.0000564
0.000626	38.6801459	0.001632	0.84336251	0.00000858	2.08429547	0.000024
0.000736	38.8896028	0.00314	0.83934526	0.00001158	2.08235428	0.0000898
0.001042	38.5294783	0.00236	0.84841473	0.00000874	2.08850833	0.000033
0.001086	37.7122897	0.0029	0.87403905	0.00001478	2.11345047	0.00005
0.00069	38.5977261	0.0028	0.84528056	0.00000794	2.08320794	0.0001066
0.00098	38.4019134	0.00456	0.85145709	0.00001452	2.09080691	0.0001136
0.000842	38.66145	0.00284	0.84233871	0.0000121	2.08029614	0.0000548
0.000522	38.8238138	0.00174	0.8348539	0.00001058	2.0677803	0.0000462
0.00098	38.5172116	0.00282	0.84637329	0.00001214	2.08453846	0.0000456
0.001036	38.7326061	0.00316	0.83848526	0.0000135	2.07363198	0.0000652

0.000616 38.4802599 0.0028 0.8476483 0.00000928 2.08476254 0.0000944

0.000636 38.4868669 0.001818 0.8474529 0.00001012 2.08529474 0.0000416

0.001152 38.7908444 0.00478 0.83812813 0.0000222 2.07482294 0.0001258

0.000538 37.9306748 0.00151 0.84304282 0.00000926 2.08154769 0.0000272

0.000834 38.6580852 0.00248 0.84223253 0.0000155 2.07977171 0.0000738

38.876

0.000638 38.9419844 0.001894 0.83648878 0.00000906 2.07532089 0.0000342

38.897

38.931

38.897

0.000486 38.8819543 0.00139 0.83678899 0.00001024 2.07394916 0.000041

0.000772 38.8178762 0.002 0.83683069 0.00001278 2.07167966 0.0000392

0.000638 38.6081739 0.00208 0.84928034 0.00000928 2.09205412 0.0000474

0.000546 38.8495297 0.00183 0.83678483 0.0000097 2.07261831 0.000037

0.000788 38.8263758 0.0026 0.8337272 0.00001258 2.06374026 0.0000628

0.000658 38.8542747 0.00242 0.83620622 0.0000112 2.07027024 0.000057

0.000788 38.627041 0.0028 0.84356813 0.00001388 2.07933937 0.0000608

0.001042 38.7132943 0.00294 0.84063128 0.00001376 2.0774553 0.0000638

0.000684 38.8195827 0.001734 0.83630365 0.00001512 2.0699305 0.0000442

38.894

38.916

38.965

T	mu	kappa
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287 9.81 3.93

211 9.82 3.95

133 9.87 3.95

168 9.85 3.96

174 9.81 3.92

65 9.80 3.90

114 9.81 3.91

159 9.74 3.85

144 9.80 3.91

106 9.82 3.90

71 9.78 3.86

72 9.78 3.86

288 9.80 3.93

198	9.79	3.89
245	9.78	3.92
254	9.81	3.92
293	9.77	3.93
159	9.83	3.89
187	9.78	3.94
146	9.85	3.98
269	9.80	3.94
613	9.74	3.87
228	9.82	3.92
305	9.77	3.92
173	9.79	3.92
70	9.83	3.88
223	9.75	3.90
118	9.80	3.89

251	9.78	3.90
242	9.76	3.90
118	9.82	3.91
182	9.78	3.55
173	9.79	3.91
92	9.86	3.91
121	9.91	3.96
95	9.86	3.93
73	9.89	3.91
55	9.90	3.87
117	9.88	3.93
110	9.86	3.91
305	9.89	3.98
114	9.87	3.92

64	9.86	3.86
114	9.90	3.91
210	9.85	3.91
157	9.82	3.91
105	9.87	3.90
58	9.90	3.88
139	9.88	3.97
49	9.84	3.93

Alex2

Alex3

						Amphipolis
B005	28.96	DSC00895	DSC00896	Bruxelles, Bil Tray 138 :	Næ	
B006	27.55	DSC00900	DSC00901	Bruxelles, Bil Tray 139 :	Naster 1012	
B007	27.67	DSC00902	DSC00903	Bruxelles, Bil Tray 139 :	Naster 1013	
B008	13.33	DSC00904	DSC00905	Bruxelles, Bil Tray 139 :	Naster 1014	
B009	10.26	DSC00906	DSC00907	Bruxelles, Bil Tray 139 :	Naster 1017	
B010	2.1	DSC00908	DSC00909	Bruxelles, Bil Tray 139 :	Naster 1018	
B011	8.72	DSC00910	DSC00911	Bruxelles, Bil Tray 139 :	Naster 1021	
B012	9.87	DSC00912	DSC00913	Bruxelles, Bil Tray 139 :	Naster 1025	

						Uranopolis
B026	17.13	DSC00940	DSC00941	Bruxelles, Bil Tray 129 :	co	

						Pella
B037	14.47	DSC00962	DSC00963	Bruxelles, Bil Tray 140 :	Næ	

						Amphipolis
B038	14.39	DSC00968	DSC00969	Bruxelles, Bil Tray 140 :	Næ	

						Pella
B039	14.29	DSC00970	DSC00971	Bruxelles, Bil Tray 140 :	Næ	

						Amphipolis
B040	14.46	DSC00972	DSC00973	Bruxelles, Bil Tray 140 :	Næ	

						Pella
B041	14.46	DSC00974	DSC00975	Bruxelles, Bil Tray 140 :	Næ	

						Amphipolis
B042	17.11	DSC00976	DSC00977	Bruxelles, Bil Tray 142 :	ac	

						Amphipolis
B043	17.07	DSC00978	DSC00979	Bruxelles, Bil Tray 142 :	Næ	

						Pella
B044	17.2	DSC00980	DSC00981	Bruxelles, Bil Tray 142 :	Næ	

				Pella
B045	16.64	DSC00982	DSC00983	Bruxelles, Bil Tray 131 : Na
				Pella
B046	16.69	DSC00984	DSC00985	Bruxelles, Bil Tray 131 : co
				Pella
B047	16.78	DSC00986	DSC00987	Bruxelles, Bil Tray 131 : CN
				Uranopolis
B059	17.23	IMG_1064	IMG_1065	Bruxelles, Bil Tray 143 : Na
B060	17.03	IMG_1066	IMG_1067	Bruxelles, Bil Tray 143 : Acq. 1912
B061	17.02	IMG_1068	IMG_1069	Bruxelles, Bil Tray 143 : Naster 1067
				Acanthus
B273	16.89	IMG_2536		Bruxelles, Bil Tray 131 : Il.
				Acanthus
B274	17.07	IMG_2537	IMG_2538	Bruxelles, Bil Tray 131 : Na
				Acanthus
B275	16.9	IMG_2540		Bruxelles, Bil Tray 131 : Na
				Acanthus
B276	16.47	IMG_2542		Bruxelles, Bil Tray 131 : Du
				Acanthus
B277	14.38	IMG_2543	IMG_2544	Bruxelles, Bil Tray 131 : Du
				Acanthus
B278	14.17	IMG_2545	IMG_2546	Bruxelles, Bil Tray 131 : Na
				Amhipolis
B279	12.43	IMG_2547	IMG_2548	Bruxelles, Bil Tray 132 : Ga
				Amhipolis
B280	14.19	IMG_2549	IMG_2550	Bruxelles, Bil Tray 132 : Na
				Amhipolis
B281	14.23	IMG_2551	IMG_2552	Bruxelles, Bil Tray 132 : Na

				Amhipolis
B282	3.62	IMG_2553	IMG_2554	Bruxelles, Bil Tray 132 : Na
				Amhipolis
B283	14.17	IMG_2555	IMG_2556	Bruxelles, Bil Tray 132 : Na
G076	28.98	DSC01389	DSC01390	Athens, Num BE 647/1996/76 0b, 5.12
Hemi2				
				Terone
P285	1.26	P285_OBV	P285_REV	
P333		P333_OBV	P333_REV	
P335		P335_OBV	P335_REV	
P338		P338_OBV	P338_REV	
P339	4.22	P339_OBV	P339_REV	
P340	16.902	P340_OBV	P340_REV	
P341	4.117	P341_OBV	P341_REV	
P362	4.28	P362_OBV	P362_REV	
P363	4.16	P363_OBV	P363_REV	
P364	4.23	P364_OBV	P364_REV	

http://nomisma.org/id/pe lla_macedon	Macedonia	40.7629	22.5193	Aesillas	95-75	Tetradrachm
http://nomisma.org/id/pe lla_macedon	Macedonia	40.7629	22.5193	Aesillas	95-75	Tetradrachm
http://nomisma.org/id/pe lla_macedon	Macedonia	40.7629	22.5193	Aesillas	95-75	Tetradrachm
http://nomisma.org/id/ur anopolis	Macedonia	40.3333	23.9833	Alexander III the Great	332-290	Tetradrachm
	Macedonia			Alexander III the Great	332-290	Tetradrachm
	Macedonia			Alexander III the Great	332-290	Tetradrachm
http://nomisma.org/id/ac anthus	Macedonia	40.390833	23.886111		500-470	Tetradrachm
http://nomisma.org/id/ac anthus	Macedonia	40.390833	23.886111		500-470	Tetradrachm
http://nomisma.org/id/ac anthus	Macedonia	40.390833	23.886111		500-470	Tetradrachm
http://nomisma.org/id/ac anthus	Macedonia	40.390833	23.886111		500-470	Tetradrachm
http://nomisma.org/id/ac anthus	Macedonia	40.390833	23.886111		424-382	Tetradrachm
http://nomisma.org/id/ac anthus	Macedonia	40.390833	23.886111		424-382	Tetradrachm
http://nomisma.org/id/a mphilis	Macedonia	40.8183	23.84		413-357	Tetradrachm
http://nomisma.org/id/a mphilis	Macedonia	40.8183	23.84		413-357	Tetradrachm
http://nomisma.org/id/a mphilis	Macedonia	40.8183	23.84		413-357	Tetradrachm

http://nomisma.org/id/amphipolis	Macedonia	40.8183	23.84	413-357	drachm
http://nomisma.org/id/amphipolis	Macedonia	40.8183	23.84	413-357	Tetradrachm
	Macedonia	40.7629	22.5193	480-470	octodrachm
	Macedonia			V-III BC	
http://nomisma.org/id/terone	Macedonia	39.988376	23.89978		tetrobol
	Macedonia			Antigonus I Monophtalmus c. 310-301 AC	drachm
	Macedonia			Philipp III Arrhidaeus c.323-317 AC	drachm
	Macedonia			Démétrius poliorcetes c. 291-290 AC	drachm
	Macedonia			Antigonus I Monophtalmus c.323-301 BC	drachm
	Macedonia			Philipp III Arrhidaeus c. 323-317 BC	tetradrachm
	Macedonia			Antigonus I Monophtalmus c.323-301 BC	drachm
	Macedonia			Antigonus I Monophtalmus c. 320-306	drachm
	Macedonia			Philipp III Arrhidaeus . 322-319/8 BC	drachm
	Macedonia			Philipp III Arrhidaeus	drachm

Weight (g)	Obverse desc	Reverse desc	Reference 1	206Pb/204Pt 2s		207Pb/204Pt
			Desaulty 200	18.824		15.71
			Desaulty 200	18.804		15.677
28.96	Griffin	Incuse	Sear 1323	19.0349131	0.000528	15.7209972
27.55	Horse rider	Incuse		18.7898594	0.000604	15.6690197
27.67	Horse rider	Incuse		18.664998	0.000554	15.6706201
13.33	Horse rider	Incuse		18.6708686	0.000454	15.6712574
10.26	Head	Horse		18.4464462	0.000728	15.6555834
2.1	Helmet	Horse		18.6582302	0.000586	15.6645835
8.72	Head	Horse		18.5168826	0.000432	15.6549109
9.87	Horse rider	Lion		18.6437908	0.000594	15.6577725
17.13	Alexander	Athena		18.5461705	0.00082	15.663684
14.47	Head	Horse rider		18.2275029	0.000476	15.6209887
14.39	Head	Horse rider	Sear 1385	18.4461586	0.000498	15.6528708
14.29	Head	Horse rider		18.5234759	0.000778	15.6634538
14.46	Head	Horse rider	Sear 1385	18.4274333	0.000634	15.646284
14.46	Head	Horse rider		18.5385491	0.00049	15.6551102
17.11	Alexander	Zeus	Sear 1385	18.5510894	0.000616	15.6601711
17.07	Alexander	Zeus	Sear 1385	18.5788472	0.000564	15.6619478
17.2	Alexander	Zeus		18.5192459	0.000688	15.6508929

16.64	Head		18.6793015	0.000596	15.6791322
16.69	Head		18.3368015	0.000542	15.6374665
16.78	Head		18.6565845	0.000652	15.6721558
17.23	Alexander	Zeus	18.6059729	0.000494	15.6662944
17.03	Alexander	Zeus	18.3780274	0.000638	15.6428498
17.02	Alexander	Zeus	18.4916979	0.00073	15.6480269
16.89			18.6347404	0.000724	15.6554063
17.07	Lion		18.4119736	0.001454	15.6319321
16.9			18.6008555	0.000514	15.6621466
16.47			18.6183128	0.000704	15.6579723
14.38			18.3254533	0.000696	15.6248358
14.17	Lion		18.6028503	0.000574	15.6562171
12.43			18.5194759	0.000762	15.6640697
14.19	Apollon		18.5053536	0.001224	15.6604933
14.23	Apollon		18.5944816	0.00119	15.6535426

3.62	Apollon		18.4497665	0.000696	15.6430313
14.17	Apollon		18.6935636	0.000598	15.6676406
28.98	Horseman ar Incuse; Alexander		18.7800325	0.000874	15.6710036
		Desaulty 200	18.811		15.687
1.26	Incuse		18.7579142	0.000742	15.6727681
			18.7831404	0.000492	15.6555284
			18.7929319	0.000928	15.6861724
			18.754211	0.000542	15.6711216
4.22			18.7852778	0.00068	15.6723183
16.902			18.8449729	0.000896	15.6762527
4.117			18.8247409	0.001246	15.6766678
4.28			18.8091632	0.001836	15.6900256
4.16		Price (1991)	18.8072542	0.000582	15.6896625
4.23		Price (1979)	18.7927754	0.000648	15.682855

2s	208Pb/204Pb 2s	207Pb/206Pb 2s	208Pb/206Pb 2s
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39.006

38.931

0.000448	38.9268583	0.001436	0.82589629	0.00000772	2.04499746	0.0000502
0.000542	38.8831442	0.00234	0.83391	0.00000866	2.06933126	0.000072
0.000452	38.8019543	0.001366	0.83957727	0.00000736	2.07886251	0.00001868
0.000474	38.7440576	0.001272	0.83933268	0.00000818	2.07510469	0.0000232
0.000782	38.5543666	0.00244	0.84870258	0.00001234	2.09005966	0.000056
0.00051	38.7482949	0.001292	0.83955668	0.00000626	2.07673098	0.00001844
0.000426	38.6195672	0.001086	0.84544335	0.0000085	2.085644	0.0000332
0.000546	38.5533439	0.001402	0.83983005	0.00000888	2.06791722	0.0000332

0.000776	38.625564	0.0024	0.84458434	0.00000826	2.08267969	0.0000438
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0.0004	38.2233347	0.001156	0.85699924	0.00000776	2.0970192	0.0000278
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0.000384	38.5346198	0.001032	0.84855852	0.00000726	2.0890398	0.0000272
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0.000654	38.6143661	0.001714	0.84560931	0.00000974	2.08463183	0.000027
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0.000572	38.4868607	0.001458	0.84908043	0.00000816	2.08857027	0.0000268
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0.000454	38.5999112	0.001278	0.84445145	0.00000728	2.08213457	0.00001908
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0.000534	38.6070669	0.00141	0.84415624	0.00000702	2.08111859	0.0000228
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0.00049	38.6275808	0.00126	0.84298438	0.00000766	2.079047	0.0000266
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0.00051	38.5862663	0.001546	0.84510617	0.00000812	2.08359133	0.0000232
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0.000496	38.8017888	0.00118	0.839382	0.00000778	2.07724749	0.0000224
0.000388	38.3828668	0.001048	0.85278913	0.00000718	2.09320445	0.0000256
0.000594	38.7764092	0.001542	0.84002263	0.00000814	2.07836919	0.000024
0.000452	38.7355417	0.001142	0.84199255	0.00000752	2.0818325	0.0000214
0.000546	38.478086	0.00145	0.85116531	0.0000074	2.09370314	0.0000262
0.000672	38.5593377	0.00177	0.84621155	0.00001062	2.08520459	0.0000324
0.000652	38.7105533	0.001684	0.8401288	0.00000794	2.07735202	0.0000214
0.001842	38.4227832	0.00528	0.84906539	0.00001572	2.08691697	0.0000866
0.00049	38.616166	0.001412	0.8420124	0.0000064	2.07604921	0.0000284
0.00063	38.6478549	0.001834	0.84100283	0.00000944	2.07585607	0.0000378
0.000618	38.3330603	0.001618	0.85264055	0.00000706	2.0918407	0.0000246
0.000546	38.6698177	0.00147	0.841616	0.00000658	2.07871322	0.0000226
0.000794	38.7146992	0.00302	0.84580244	0.0000123	2.09047067	0.0000892
0.001068	38.5784735	0.00262	0.84626054	0.00001186	2.0846997	0.0000436
0.001466	38.6642253	0.00398	0.84187825	0.00001828	2.0793517	0.000095

0.00072	38.4887903	0.0027	0.84786967	0.0000163	2.08614707	0.0000736
0.000542	38.7859219	0.001808	0.8381384	0.00000688	2.07481803	0.0000572
0.000832	38.8926266	0.00266	0.83447979	0.00001216	2.07094374	0.0000518
	38.884					
0.000646	38.8653398	0.001636	0.83552355	0.0000079	2.07194819	0.0000193
0.000442	38.7526949	0.00137	0.83349021	0.00000626	2.06313345	0.0000486
0.001034	38.9204449	0.00308	0.83465095	0.00001314	2.07099914	0.0000534
0.000502	38.7868181	0.00103	0.83560038	0.00000672	2.06823189	0.000061
0.000796	38.8370005	0.00268	0.83428986	0.0000172	2.06743066	0.0000714
0.000828	38.7934904	0.005	0.83185194	0.00001216	2.0584881	0.0001984
0.001338	38.8279984	0.00522	0.83277902	0.00001776	2.06261991	0.0001484
0.00202	38.9220808	0.0092	0.8341813	0.0000346	2.0692793	0.0003
0.000532	38.9310337	0.00258	0.8342358	0.0000084	2.06996689	0.0000976
0.00058	38.8995552	0.00202	0.83449485	0.0000146	2.06994028	0.0000842

T	mu	kappa
104	9.95	3.95
54	9.83	3.92
-30	9.96	3.79
49	9.80	3.90
145	9.83	3.94
142	9.83	3.91
278	9.82	3.95
138	9.81	3.92
224	9.80	3.94
136	9.79	3.82
220	9.83	3.92
375	9.74	3.91
273	9.81	3.94
236	9.83	3.93
274	9.79	3.92
209	9.80	3.91
209	9.82	3.91
192	9.82	3.90
215	9.79	3.92

151	9.86	3.93
325	9.77	3.93
154	9.84	3.93
180	9.83	3.94
304	9.79	3.95
230	9.78	3.92
138	9.78	3.91
258	9.74	3.90
176	9.81	3.88
155	9.79	3.89
309	9.73	3.90
163	9.79	3.91
240	9.84	3.99
244	9.83	3.93
164	9.78	3.91

252	9.77	3.91
118	9.82	3.91
60	9.81	3.91
69	9.87	3.89
80	9.82	3.91
27	9.75	3.84
80	9.87	3.92
79	9.82	3.88
59	9.82	3.88
22	9.82	3.82
38	9.83	3.85
76	9.88	3.92
77	9.88	3.92
74	9.86	3.91

Lab code #	Weight (g)	Photo Obv -	Photo Rev -	Museum coll	Inventory num	Mint
B322	13.64	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	Nε Alexandria	
B323	14.12	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	Il.! Alexandria	
B324	12.55	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	20 Alexandria	
B325	14.28	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	FG Alexandria	
B326	14.05	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	Il.! Alexandria	
B327	14.27	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	Il.! Alexandria	
B328	14.15	20211201_0!	20211201_0!	Bruxelles, Bil Tray 336 :	Il.! Alexandria	
B329	14.21	20211201_1!	20211201_1!	Bruxelles, Bil Tray 336 :	FG Alexandria	
B330	13.96	20211201_1!	20211201_1!	Bruxelles, Bil Tray 336 :	20 Tyre	
B331	13.49	20211201_1!	20211201_1!	Bruxelles, Bil Tray 336 :	Il.! Tyre	
B332	14.23	20211201_1!	20211201_1!	Bruxelles, Bil Tray 336 :	Il.! Tyre	
B333	13.84	20211201_1!	20211201_1!	Bruxelles, Bil Tray 336 :	FG Tyre	
B334	14.18	20211201_1!	20211201_1!	Bruxelles, Bil Tray 336 :	Il.! Sidon	
B335	13.91	20211201_1!	20211201_1!	Bruxelles, Bil Tray 337 :	Il.! Sidon	
B336	14.09	20211201_1!	20211201_1!	Bruxelles, Bil Tray 337 :	Nε Sidon	
B337	14.06	20211201_1!	20211201_1!	Bruxelles, Bil Tray 337 :	Il.! Sidon	
B338	13.13	20211201_1!	20211201_1!	Bruxelles, Bil Tray 337 :	Il.52399 Svoronc	
B339	14.23	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	du Chastel 296 :	
B340	13.48	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52412 Svoronc	
B341	14.13	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52413 Svoronc	
B342	13.87	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52407 Svoronc	
B343	14.04	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52408 Svoronc	
B344	14.02	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	FG Svoronos 15	
B345	13.46	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52410 Svoronc	
B346	14.31	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52411 Svoronc	
B347	13.97	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Acq. In 1908 Svc	
B348	13.44	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52414 Svoronc	
B349	13.29	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52417 Svoronc	
B350	12.86	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52415 Svoronc	
B351	13.84	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52416 Svoronc	
B352	13.93	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	FG Svoronos 17	
B353	12.43	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	2005=501 BMC	
B354	13.93	20211201_1!	20211201_1!	Bruxelles, Bil Tray 340 :	Il.52419 Svoronc	
B355	11.89	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Il.52420 Svoronc	
B356	14.15	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	FG Svoronos 16	
B357	10.13	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Nε Paphos	
B358	14.39	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	2005-502 BMC	
B359	13.12	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Il.75077 Svoronc	
B360	13.75	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	FG Svoronos 18	
B361	13.53	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	2000-2104 188	
B362	12.76	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Il.52418 189	
B363	13.23	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Gift Saville Lum	
B364	13.86	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Il.52421 202	
B365	13.94	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	Il.52422 Svoronc	
B366	12.76	20211201_1!	20211201_1!	Bruxelles, Bil Tray 341 :	FG Svoronos 18	

Mint - Nomisma.org	Area (sub- area)	Mint - Latitud	Mint - Longituty 1 (king, satr	Chronology	Denominatio	
	Egypt	31.201	29.91	Ptolemy I	305-285	Tetradrachm
	Egypt	31.201	29.91	Ptolemy I	305-285	Tetradrachm
	Egypt	31.201	29.91	Ptolemy I	305-285	Tetradrachm
	Egypt	31.201	29.91	Ptolemy I	305-285	Tetradrachm
	Egypt	31.201	29.91	Ptolemy I	305-285	Tetradrachm
	Egypt	31.201	29.91	Ptolemy I	305-285	Tetradrachm
	Egypt	31.201	29.91	Ptolemy II	285-246	Tetradrachm
	Egypt	31.201	29.91	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.274	35.195	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.274	35.195	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.274	35.195	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.274	35.195	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.560	35.375	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.560	35.375	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.560	35.375	Ptolemy II	285-246	Tetradrachm
	Phoenicia	33.560	35.375	Ptolemy II	285-246	Tetradrachm
ς 1110				Ptolemy III	246-221	Tetradrachm
1489Le				Ptolemy VIII	246-221	Tetradrachm
ς 1584				Ptolemy VIII	246-221	Tetradrachm
ς 1595				Ptolemy VIII	246-221	Tetradrachm
ς 1438				Ptolemy VIII	246-221	Tetradrachm
ς 1445				Ptolemy VIII	246-221	Tetradrachm
13				Ptolemy VIII	246-221	Tetradrachm
ς 1514				Ptolemy VIII	246-221	Tetradrachm
ς 1524				Ptolemy VIII	246-221	Tetradrachm
ronos 1660				Ptolemy IX	117-106	Tetradrachm
ς 1663				Ptolemy IX	117-106	Tetradrachm
ς 1671				Ptolemy IX	117-106	Tetradrachm
ς 1668				Ptolemy X	106=88	Tetradrachm
ς 1669				Ptolemy X	106-88	Tetradrachm
28				Ptolemy X	106-88	Tetradrachm
2-119-29				Ptolemy X	106-88	Tetradrachm
ς 1676				Ptolemy X	106-88	Tetradrachm
ς 1678				Ptolemy X	106-88	Tetradrachm
81				Ptolemy X	106-88	Tetradrachm
				Ptolemy X	106-88	Tetradrachm
9				Ptolemy XII	80-51	Tetradrachm
ς 1818				Ptolemy XII	80-51	Tetradrachm
23 K				Ptolemy XII	80-51	Tetradrachm
				Ptolemy XII	80-51	Tetradrachm
ley Svoronos 1827Lb.				Ptolemy XII	80-51	Tetradrachm
				Ptolemy XII	80-51	Tetradrachm
ς 1836				Ptolemy XII	80-51	Tetradrachm
39Lß				Ptolemy XII	80-51	Tetradrachm

Weight (g)	Obverse desc	Reverse desc	Reference 1	206Pb/204Pb	2s	207Pb/204Pb
13.64				18.686537	0.00118	15.6679886
14.12				18.7609873	0.00067	15.6626657
12.55				18.5440595	0.000648	15.6637496
14.28				18.4701154	0.000994	15.6509052
14.05				18.6925471	0.000732	15.6788563
14.27				18.7130053	0.000954	15.6787411
14.15				18.5679971	0.000792	15.646907
14.21				18.3316349	0.000606	15.6218277
13.96				18.8122334	0.001136	15.6758474
13.49				18.7638255	0.000602	15.6804138
14.23				18.7994427	0.001006	15.6698873
13.84				18.7038101	0.00077	15.6629663
14.18				18.7876218	0.000902	15.6773737
13.91				18.5532333	0.000728	15.6351978
14.09				18.4083807	0.000918	15.6431283
14.06				18.793376	0.000662	15.6604085
13.13				18.6784784	0.000846	15.6570271
14.23				18.6821921	0.000694	15.6639368
13.48				18.7403362	0.000612	15.6771611
14.13				18.7365848	0.000568	15.6767306
13.87				18.6668365	0.000712	15.66487
14.04				18.7232141	0.000652	15.6746124
14.02				18.6664657	0.000922	15.65899
13.46				18.7356836	0.000882	15.6766013
14.31				18.4598701	0.000632	15.6381785
13.97				18.7121093	0.000866	15.6680066
13.44				18.6554408	0.000932	15.6736783
13.29				18.6680151	0.000542	15.6549859
12.86				18.6862014	0.000916	15.6606988
13.84				18.6131005	0.000638	15.6693542
13.93				18.5942095	0.00076	15.6364633
12.43				18.7006125	0.000866	15.6761783
13.93				18.5750776	0.000874	15.6581111
11.89				18.6253665	0.00061	15.6657185
14.15				18.5719967	0.000786	15.6680482
10.13				18.6850228	0.00053	15.6636921
14.39				18.6522214	0.000964	15.6705859
13.12				18.6175763	0.00065	15.6707104
13.75				18.6409413	0.001252	15.6724072
13.53				18.6520393	0.000728	15.6774492
12.76				18.620596	0.000616	15.6676738
13.23				18.69253	0.000928	15.681212
13.86				18.6767161	0.000608	15.6625169
13.94				18.4972701	0.000626	15.6499198
12.76				18.5759598	0.000886	15.6602416

2s	208Pb/204Pb 2s	207Pb/206Pb 2s	208Pb/206Pb 2s	208Pb/206Pb 2s	208Pb/206Pb 2s	208Pb/206Pb 2s
0.001054	38.737501	0.00442	0.83847937	0.00001476	2.07302472	0.0001478
0.00063	38.7534643	0.00222	0.83485356	0.00001008	2.06562173	0.0000682
0.000578	38.6183144	0.00153	0.84467965	0.00000868	2.08252862	0.0000366
0.000884	38.4982041	0.00244	0.84736419	0.00001	2.08431465	0.0000408
0.000674	38.7759798	0.001782	0.83877484	0.00000952	2.07439207	0.0000226
0.000718	38.7959006	0.00228	0.83788149	0.00001	2.0732253	0.0000492
0.00062	38.581357	0.001796	0.84269018	0.0000107	2.07786881	0.0000364
0.000566	38.2745607	0.001448	0.85218638	0.00000768	2.08792022	0.000026
0.0009	38.8405359	0.00384	0.83328031	0.0000096	2.06466343	0.0001156
0.00051	38.8420487	0.001428	0.83566848	0.00000726	2.07007116	0.000036
0.000838	38.8096386	0.00244	0.83352547	0.00000938	2.06439666	0.0000524
0.000648	38.8455237	0.00206	0.83738961	0.00000838	2.07687701	0.0000538
0.000744	38.8132501	0.00216	0.83445792	0.0000093	2.06592956	0.0000598
0.000622	38.5429188	0.001606	0.84271557	0.0000117	2.07743614	0.0000468
0.000764	38.4266189	0.00212	0.84978436	0.00000886	2.08744495	0.000049
0.000616	38.7640849	0.001462	0.83330423	0.00001084	2.0626297	0.0000382
0.00078	38.6987414	0.00236	0.83824208	0.00001064	2.07181345	0.000049
0.000604	38.7380697	0.001658	0.83843675	0.00000866	2.07355661	0.0000468
0.000454	38.8108415	0.00168	0.83655774	0.00000794	2.07098182	0.0000342
0.000514	38.8252304	0.001458	0.83668714	0.00000734	2.07217128	0.0000292
0.00058	38.8069356	0.001436	0.83918231	0.00001202	2.07890995	0.0000294
0.00057	38.8073339	0.00214	0.83717618	0.00000738	2.07266774	0.0000616
0.000856	38.7565975	0.00294	0.83887065	0.00000968	2.07626831	0.0000768
0.000742	38.8045591	0.00236	0.83673007	0.00000984	2.07117404	0.0000752
0.0005	38.5261892	0.001344	0.84713416	0.00000786	2.08697357	0.0000258
0.000836	38.7407491	0.00274	0.83731852	0.00000978	2.07030743	0.0000688
0.000852	38.8398337	0.00238	0.84015907	0.00001094	2.08192114	0.0000482
0.000474	38.7295788	0.001536	0.83859892	0.00000732	2.07462056	0.000045
0.000798	38.7920494	0.00246	0.83809676	0.00000952	2.07599046	0.000056
0.000522	38.7652016	0.001604	0.84185477	0.00000752	2.0826326	0.0000474
0.000636	38.7176318	0.00234	0.84092689	0.00000852	2.08224985	0.00006
0.00073	38.8861053	0.00234	0.83828127	0.00000976	2.07937552	0.00005
0.000754	38.6649573	0.00294	0.84295992	0.00001078	2.08157266	0.0000882
0.000562	38.7106335	0.0022	0.84109815	0.00000924	2.07839036	0.0000508
0.000686	38.7486746	0.00294	0.84362807	0.00000872	2.08638654	0.000077
0.000452	38.8543834	0.001258	0.83829436	0.00000844	2.07942132	0.0000238
0.000872	38.8000639	0.00224	0.8401438	0.00000914	2.08019414	0.0000438
0.000682	38.7448107	0.001764	0.84171063	0.0000092	2.08111623	0.0000418
0.001182	38.7810135	0.00416	0.84074236	0.0000101	2.08038088	0.0000974
0.00061	38.8114829	0.00165	0.84051435	0.00000858	2.08076987	0.0000398
0.000458	38.6958699	0.0013	0.84141042	0.00000802	2.07812553	0.0000236
0.000776	38.8719508	0.00244	0.83890467	0.00000872	2.07957427	0.0000524
0.000514	38.7129381	0.001396	0.83860479	0.000007	2.07273328	0.0000218
0.000586	38.557772	0.00314	0.84606578	0.00000972	2.08454163	0.0000644
0.00075	38.6669803	0.0022	0.84303372	0.00000854	2.08154093	0.000052

T	mu	kappa
124	9.82	3.89
58	9.78	3.85
221	9.83	3.92
251	9.80	3.90
140	9.86	3.91
125	9.85	3.91
171	9.76	3.88
299	9.71	3.87
46	9.82	3.87
91	9.85	3.90
43	9.80	3.86
101	9.80	3.93
67	9.84	3.87
159	9.72	3.87
282	9.78	3.90
29	9.77	3.84
108	9.78	3.87
119	9.80	3.89
102	9.84	3.90
104	9.84	3.91
132	9.81	3.94
109	9.84	3.91
121	9.79	3.91
104	9.84	3.90
235	9.75	3.92
105	9.81	3.88
158	9.85	3.97
112	9.77	3.90
110	9.79	3.92
181	9.84	3.96
131	9.71	3.93
129	9.85	3.96
187	9.80	3.92
165	9.82	3.92
209	9.84	3.97
116	9.80	3.95
154	9.84	3.95
180	9.84	3.94
166	9.84	3.95
168	9.86	3.96
172	9.83	3.91
145	9.87	3.96
120	9.80	3.88
229	9.79	3.92
191	9.81	3.93