Highly significant statistical results for the location of Plato's *Island of Atlas* in the Souss Plain in today's South Morocco

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ABSTRACT

In the 4th century B.C., in his *Timaeus* and *Critias* dialogues, Plato described a large state which he called *Atlantis Nesos*, the *Island of Atlas*. In the first century BC, in his *Bibliotheca historica*, Diodorus Siculus described the history and culture of North Africa and in particular the history of the *Atlantoi people.* Both the *Island of Atlas* and the settlement area of the *Atlantoi* have not yet been localized with certainty.

This paper discusses results of formal analyses of Plato's, Diodorus Siculus' and Maximus of Tyre's accounts. By means of a *geographical hierarchical constraint satisfaction* (GHCS) approach in combination with statistical analyses, a variety of geographically relevant criteria from the antique texts are used to infer the most probable locations of Plato's *Island of Atlas,* Diodorus Siculus' settlement area of the *Atlantoi* and Maximus of Tyre's settlement area of the *Hesperian Lybians.* Surprisingly, in all cases this turns out to be the Souss Pain in today's South-West Morocco. Global (large scale), regional (mid scale) and local (small scale) geographic and geologic attributes of the Souss Plain can be matched to the descriptions of Plato and Diodorus Siculus. Cultural and linguistic correlations can also be established. Moreover, a statistical evaluation of the distribution of criteria in the search area produces a highly significant result with regard to the assumption that the Souss Plain is Plato's Island of Atlas. Maximum of Tyre's account provides evidence of mega tsunamis in this area.

The location of the *Tritonis marsh*, and therefore the settlement area of the *Atlantoi*, was already deduced by Etienne Felix Berlioux (1884) from Diodorus Siculus' account to be within the region south of the High Atlas, which coincides with the results of the GHCS analyses on Diodorus Siculus' as well as Plato's account.

GHCS is a new formal method for text source analysis. The implementation of GHCS as an *inference engine* can be used to obtain information from a *knowledge base* (on geography, geology, climate, natural resources, etc.) for the purpose of inferring scientifically reasoned localization hypotheses. This *expert system* may also be used for comparative studies regarding alternative Atlantis localization hypotheses or for localizing/verifying other places described in ancient historical or mythological texts (e.g. Homer's Iliad and Troy, which may actually be somewhere other than the generally accepted location).

1. INTRODUCTION

In today's information science heuristic methods are often used to obtain feasible solutions to a specific problem with the minimum of effort. Therefore, these methods are mostly used when starting with a large number of potentially correct solutions (a large solution domain), out of which should be filtered those which represent a genuine solution or those which include a genuine or acceptable solution. The Atlantis Enigma, in other words, 'Did Plato's Atlantis exist, and if so, where ?' is a classic example of this type of problem, because on one hand, a diffuse range of information needs to be evaluated, while on the other hand, an enormous geographical area needs to be searched because, theoretically, Atlantis could be anywhere in the world. The problem of the Atlantis Enigma therefore consists firstly of the fragmentary and potentially distorted description (possibly by being passed down through generations) i.e. diffuse information, which does not make it clear how we can make the connection between known locations of the ancient world and the Island of Atlas. Secondly, the large number of potentially correct solutions (the large solution domain) is problematic.

All of today's well-known Atlantis localization hypotheses are based either on places where there are settlement traces of historically documented cultures (e.g. Santorini: Minoan culture, Malta: Megalithic culture, Troy: Trojan culture etc.) or on places where there is little or no archaeological evidence. Up to now however, none of these hypotheses have been examined in the light of all the criteria relevant to Atlantis. More often than not it has been shown that only a few criteria apply to the individual localization site. At any rate, more than 50 criteria from Plato's Dialogues that would satisfy the requirements of this site can be deduced. This lack of agreement has led to today's scientific consensus that Plato's Atlantis was purely fictional. Some scholars concede that at best, Plato composed the story out of various historically referenced fragments.

The number of Atlantis localizations to which only very few of the relevant criteria apply indicates that there shouldn't be any place in the world that actually meets all or at least many of the criteria. The question 'Is there anywhere in the world that meets all the criteria?' can even be rejected immediately. The combination of the criteria 'submerged in the sea', 'island' and 'continental size' alone can be considered impossible, according to contemporary scientific and geological knowledge. Today the bathymetry of all the oceans is known, and we know that there is no 'sunken continent'. Without exception, all the existing localization hypotheses have to come to terms with this anomaly.

The appropriate question we need to ask in order to get to the bottom of this 2,300-year-old mystery therefore should not be 'Is there anywhere in the world that fulfils all Atlantis relevant criteria?' but rather 'Where in the world fulfils the most Atlantis relevant criteria?' Only when this place is found, and a mathematical examination shows that the number of matching criteria deviates far above the expected mean, can we consider the question of how the three problematic criteria of 'sunken', 'island' and 'continental size' could be interpreted.

Plato's accounts of the whereabouts of the Island of Atlas are very vague: he describes it as lying 'somewhere beyond the Pillars of Hercules' for example. His descriptions of the Island of Atlas itself are very detailed however, and Plato gives us many of Atlantis relevant criteria that we can use when examining a candidate for Atlantis. In other words, he has given us the key to solving the problem. Of course, it would be extremely time consuming to examine every single place in the world to see how many of these Atlantis criteria apply. A heuristic method then, like the g*eographical hierarchical constraint satisfaction* (GHCS) method described here and which allows us to filter out the most plausible places, seems to be the right choice here.

2. GEOGRAPHICAL HIERARCHICAL CONSTRAINT SATISFACTION

The search for a site which has been mentioned in an ancient source can be described as a real world *constraint satisfaction problem* (CSP) as follows:

- The problem: where was the site located?
- The constraints: the multiplicity of criteria which a geographical area must satisfy in order to qualify as the site.
- A large domain of possible solutions: in general – anywhere on Earth.
- Only one valid solution: either the site never existed or it is located at a specific place on Earth. If the latter is the case, that should be archaeologically verifiable.

Because of the enormous effort which would be needed to test which place on Earth satisfies all given criteria, the criteria were divided into three hierarchically structured categories so that later they can be evaluated step by step. Examples of criteria that should apply to Plato's Atlantis:

- Global: *all the criteria which describe attributes on a global scale (e.g. proximity to the ocean; proximity to a very large, high mountain range etc.)*
- Regional: *all the criteria which describe attributes on a regional scale (e.g. the capital city was located on a large plain/plateau; red/black/white stone was used for building in the region etc.)*
- Local: *all the criteria which describe attributes on a local scale (e.g. the capital city was located on a hill; the capital city was located within a ring-shaped structure; there were hot and cold springs on the central mountain etc.)*

Using this method of classifying the criteria, the number of potential locations can be narrowed down in this first step, by calculating the *hypothesis support values (HSV)* on the basis of the global criteria. The most promising results from this first level are then examined against the regional and local criteria. The result of the GHCS is also statistically examined, by calculating the deviation from the expected mean of the number of criteria which apply to the location. This establishes whether the location is statistically relevant or not in relation to all named criteria.

1.1. Hypothesis Support Value (HSV)

Let's assume that we are searching for an ancient town (or region, country, etc.), which is described in a historical or mythological source. We can then derive a set C of geological, geographical, archaeological, biological, cultural etc. criteria from this source that a site should meet to qualify as a possible location. With this set of criteria (1)

$$\textit{Set of Criteria} \quad C = \{\gamma_1, \dots, \gamma_n\} \tag{1}$$

and a search area (2), which is represented by a 2-dimensional matrix

$$\textit{Search Area} \quad A = \begin{bmatrix} a_{1,1} & a_{1,2} & \cdots & a_{1,x} \\ a_{2,1} & a_{2,2} & \cdots & a_{2,x} \\ \vdots & \vdots & \ddots & \vdots \\ a_{y,1} & a_{y,2} & \cdots & a_{y,x} \end{bmatrix} \tag{2}$$

we can compute a *hypothesis support value* (*HSV*) (3) for each subarea $a_{m,n}$:

$$\textit{Hypothesis Support Value}: \quad h(m,n) = \frac{1}{|C|} \sum_{\gamma \in C} \left(w(\gamma) \cdot t(\gamma, m, n) \right) \tag{3}$$

Whereby $t(\gamma,m,n)$ is a test function (4), which tests if a criterion γ applies to subarea $a_{m,n}$ (e.g. by querying a knowledge-base or the results of an in situ investigation):

$$Test: \quad t(\gamma, m, n) = \begin{cases} 1 & \text{if } \gamma \text{ applies to } a_{\mathrm{m,n}} \\ 0 & \text{otherwise} \end{cases} \tag{4}$$

and $w(\gamma)$ is a weighting function (5), which weighs each criteria γ inversely proportional to its frequency of occurrence within the search area.

$$Weighting: \quad w(\gamma) = \frac{1}{\sum_x \sum_y t(\gamma, x, y)} \tag{5}$$

Therefore, a criterion which is frequently distributed in the search area, is low weighted; accordingly a criterion which can only be found in some subareas is high weighted.

1.2. Binomial Distribution of Criteria

The probability that a criterion applies to a subarea (6) is deduced directly from the distribution of the criterion across the entire search area.

$$Criteria\ Probability: \quad p(\gamma) = \frac{\sum_x \sum_y t(\gamma, x, y)}{xy} \tag{6}$$

Using the individual probabilities of all the criteria, the binomial distribution (7) calculates that any subarea meets all criteria (or a subset thereof):

$$P(k) = \sum_{\alpha \in M} \prod_{i=1}^{n} P_i^{\alpha_i} (1 - P_i)^{1-\alpha_i} \tag{7}$$

in which:

$$M := \left\{ \alpha \in \{0,1\}^n; \quad \sum_{i=1}^{n} \alpha_i = k \right\} \tag{8}$$

is the set of all permutations for which it holds that k criteria are met and n-k criteria are not met.

2. APPLYING GHCS TO PLATO

At the 2005 International Atlantis Conference in Milos (Greece) 24 criteria which a location should meet in order to be considered as a serious candidate for Atlantis, were derived from Plato's Dialogues. These criteria were developed by the participating Atlantis experts and incorporated into the conference proceedings (Kontaratos, 2007). Some of these criteria include 'Atlantis was an island', 'Atlantis' capital city was located on a mountain', 'The mountain was 50 stadia away from the ocean', 'There were hot and cold springs on the mountain' and 'There was red-black-white rock in Atlantis'. In addition to these 24 criteria, several essential geographical criteria, which may also apply to Atlantis, can be derived from Plato's Dialogues. Thus Atlantis' main plain was in close proximity to an ocean, which implies that the entire island was in close proximity to an ocean (ocean proximity criterion). This plain may also have been surrounded by several very high mountains (high

mountains criterion), buildings were constructed with red-black-white stone (multicoloured architecture criterion) etc. Over 50 of these essential criteria in total can be derived from Plato's dialogues (Huebner, 2010, 2011), which applied and should, at least partially, still apply to the Island of Atlas. When the GHCS method is applied to all Plato's criteria that are relevant to Atlantis, a probability map illustrating the possible location of Atlantis can be calculated .

2.1. Search Area

According to the criterion „*Atlantis should be located within a reasonable range from Athens*“, which was declared as a condition at the International Atlantis Conference 2005 in Athens, an adequate map or search area for Atlantis should cover Europe and parts of Africa and Asia, but not the Americas, Antarctica etc. The map which is used in this approach covers an area of about a 5,000 km radius around Athens and is divided into 25*25 = 625 subareas. Therefore, each subarea covers 400*400 km^2.

2.2. Global Criteria

When the global criteria $G01_{plato}$ - $G08_{plato}$ in (2) are marked on the map, the following distribution of criteria results:

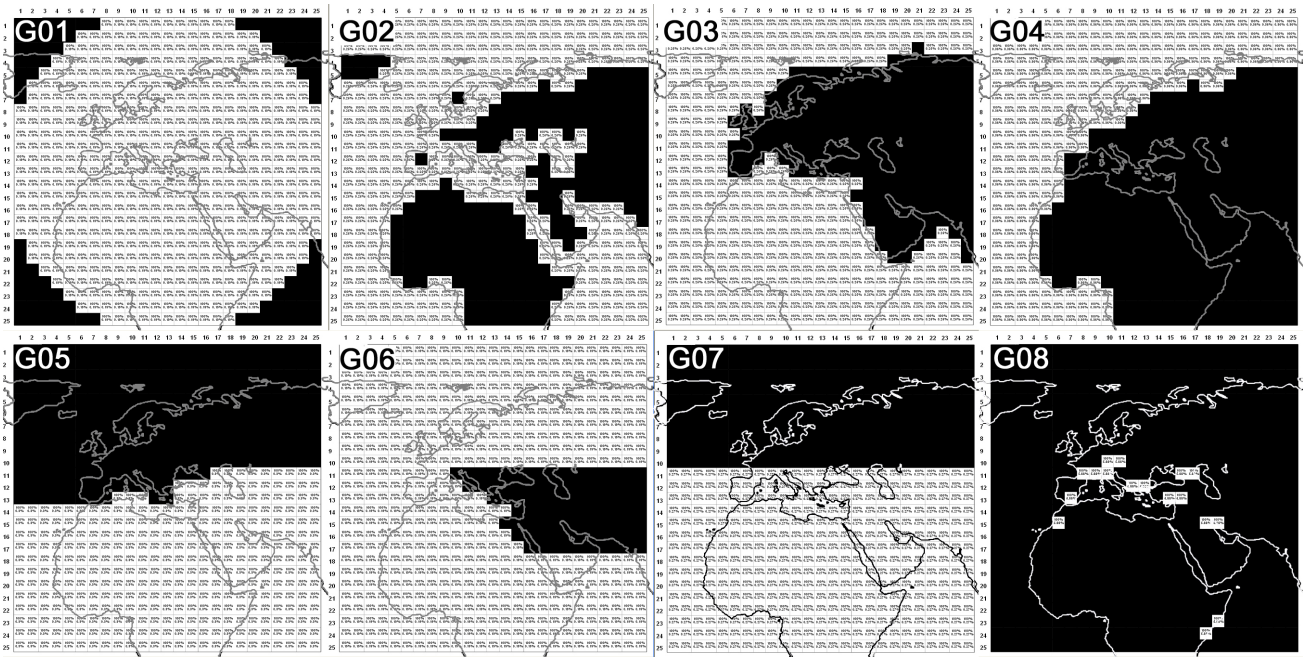

Figure 1. *Distribution of criteria: white = the criterion applies to the subarea, black = the criterion does not apply.* G01: *Distance to Athens less than 5000 km.* This criterion applies to approx. 85% of all subareas (p=0.85). Note: if we can not find Atlantis here, we can enlarge this radius. G02: *Atlantis should be located close to a sea or an ocean.* This criterion applies to approx. 63% of all subareas. G03: *Atlantis should not be located in Ancient Asia or Europe.* This criterion applies to approx. 64% of all subareas. G04: *Atlantis should be located close to a sea/ocean, which is large in relation to the Mediterranean and connected to the Mediterranean by a strait.* This criterion applies to approx. 44% of all subareas. G05: *Atlantis should be located where elephants lived.* This criterion applies to approx. 53% of all subareas. G06: *Atlantis should be located west of Tyrrhenia and Egypt.* This criterion applies to approx. 85% of all subareas. G07: *Atlantis should be located in an area with Mediterranean/subtropical or tropical flora.* This criterion applies to approx. 60% of all subareas. G08: *Atlantis' main plain should be located close to and south of high mountains.* This criterion applies only to approx. 3% of all subareas (p=0.027). Therefore, it is a high weighted global criterion.

Calculating the HSV for each subarea $a_{m,n}$ produces a probability map which shows which subarea or subareas contain the largest number of relevant attributes and where Atlantis is most likely to be

found.

The combination of the global criteria *G01-G07* show that the most likely location for Plato's Island of Atlas is somewhere on or off the west coast of Africa (white fields). Only here do all seven of these global criteria apply (Fig. 2).

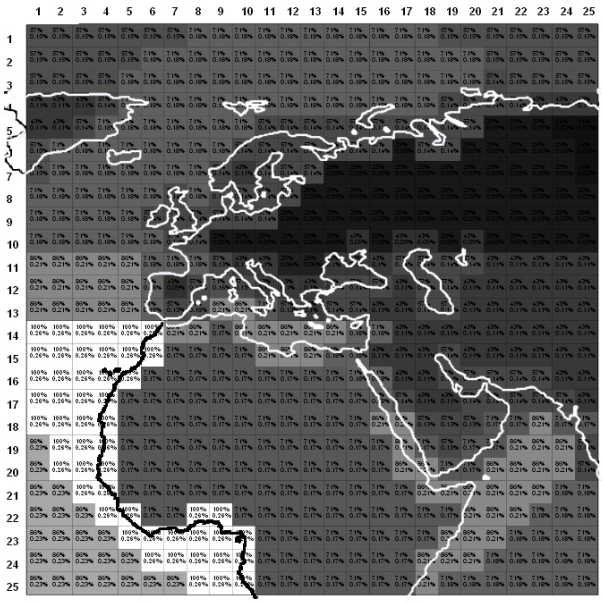

Figure 2. *G01-G07*

When the high weighted criterion '*G08 Atlantis' main plain should be located close to and south of high mountains'* is added, the only subarea to which all the global criteria apply is $a_{6,15}$ (Fig. 3) (here the High Atlas meets the Atlantic, while to the south lies the Souss Plain). The *HSV* for $a_{6,15}$ amounts to ca. 0.98%. The probability that all global criteria can be found combined by chance within a specific subarea according to (7) is already approx. 1 in a thousand $P_{Type\ I\ Error} \approx 0.00082$.

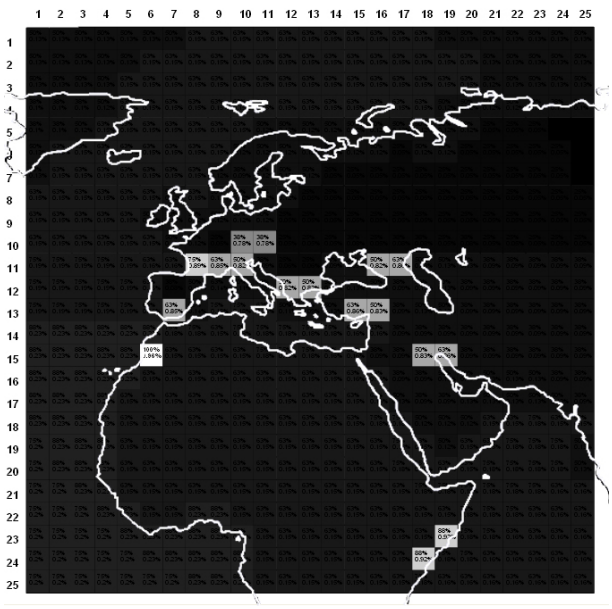

Figure 3. *G01-G08*

2.3. Regional and Local Criteria and In Situ Investigations

The probabilities of all regional and local criteria can't be computed while we don't have a knowledge-base that provides us with corresponding information for all subareas. In terms of *hierarchical constraint satisfaction* we proceed and test subarea $a_{6,15}$ based on in situ examinations (several expeditions to the Souss Plain in South Morocco in 2007-2011) where all criteria were investigated and most of them found to be true ($t(\gamma, a_{6,15}) = 1$ in (3)).

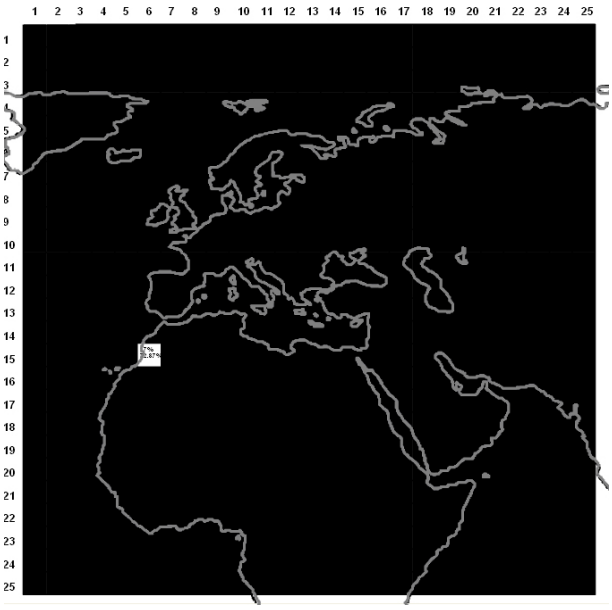

Figure 4. All global, regional and local criteria

The in situ examinations have shown that at least 44 out of 51 of the criteria described by Plato apply to the subarea $a_{6,15}$ (86%) (Huebner, 2010, 2011). Also included here are some criteria that are rare or even unique worldwide. One of the most interesting discoveries is surely that of an annular geomorphological structure (*Tagragra*) with a central mountain that corresponds very precisely in dimensions and in distance from the sea to the details given by Plato. It is also astonishing that a previously undiscovered large mesolithic/neolithic settlement was found inside this structure. Other prominent local criteria provided by Plato also apply – for example there are springs on the central mountain and the buildings (now in ruins) are built from red/black/white stone etc. After evaluating the global, regional and local criteria the *HSV* for $a_{6,15}$ amounts to 72.87%. All the other subareas have fallen to well below 0.2% (represented on the map with black) (Fig.4).

2.4. Binomial Distribution - Plato

If we want to compute a binomial distribution that tells us how probable it is to find 44 of 51 criteria within a subarea ($P(44)$), we need to make assumptions about the probability of each criterion. Today we know that South Morocco has geomorphological features that are very rare. For example we found docks which were cut into red, white and black bedrock near Cape Ghir. We think this feature, which was indeed described by Plato, is unique in the whole world (probability of 1/625=0.0016 within the search area). But since we don't want to support our South Morocco test results arbitrarily, we assume that all attributes described by Plato are occurring frequently and therefore have a high probability. We know that approx. 50% of all subareas cover land in our search area (and 50% cover sea). Since nearly all criteria described by Plato are related to land, we assume a 50% probability for criteria which we think are more common and a 25% probability for criteria which we think are rare.

For example we assume the probability of 0.25 instead of 0.0016 for the dock criteria and p = 0.5 for the criteria 'Smooth plain encircled by mountains' (to be on the safe side). We estimate that most 0.5 criteria have a smaller probability than 0.5 and most 0.25 criteria have a smaller probability than 0.25 in reality.

According to this assumption, the probability of finding all 51 criteria by chance within a specific subarea is: $5.94*10^{-25}$. The probability that 44 of 51 criteria apply to a specific subarea is: $2.79*10^{-12}$. The deviation from the expected mean of 19.75 therefore amounts to 7σ. The null-hypothesis (H_0) for each subarea is: 'The Island of Atlas *is not* located within this subarea'. Therefore, if we reject the null-hypothesis for subarea $a_{6,15}$ and accept the alternative hypothesis 'The Island of Atlas *is* located within this subarea', we have the extremely low probability of $P_{Type\ I\ Error} \leq 2.79*10^{-12}$ that rejecting the null-hypothesis was a wrong decision.

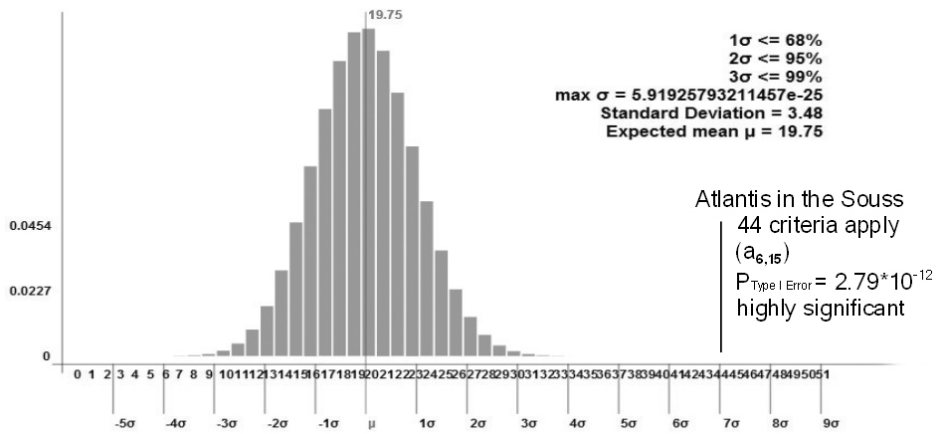

Figure 5. Binomial Distribution – Note: this graphic is computed using the standard equation for binomial distribution based on an averaged probability for all criteria. This is because the computation of the binomial distribution with the equation (7) would take several years on a standard computer, due to a very high number of permutations. Anyway, the expected mean would be nearly the same, the standard deviation little less and the significance level for P(44) even higher. Note also: we did a best-case assumption for the null-hypothesis „Atlantis *is not* located in $a_{6,15}$ ". If we make more realistic estimations for all regional and local probabilities, we get a false positive result for the case that all criteria apply to one subarea that is much less than $P_{Type\ I\ Error} \leq 10^{-50}$.

3. APPLYING GHCS TO DIODORUS SICULUS

In addition to Plato's account, we can also analyse other sources like Diodorus Siculus' account of the settlement area of the *Atlanteans* (*Atlantoi)* and the *Libyan Amazons*. From Diodorus Siculus we know that the Atlanteans lived on the western parts of Libya (Africa) at the shore $G01_{diodorus}$ close to the Atlas mountain range $G02_{diodorus}$. Just these two criteria point us to precisely the same subarea $a_{6,15}$, similar to the result of the analysis of Plato's account. Additionally, Diodorus Siculus' Atlanteans must have lived south of the Atlas mountain range, because their settlement area was also close to ancient Ethiopia $G03_{diodorus}$, which was also located south of the High Atlas. This correlates with Plato's account (south of high mountains $G08_{plato}$ and protected from the north wind). The location of the *Tritonis* marsh, and therefore the settlement area of the *Atlantoi*, was already deduced by Etienne Felix Berlioux (Berlioux, 1884) from Diodorus Siculus' account to be within the region south of the High Atlas, which coincides with the results of the GHCS analyses on Diodorus Siculus' as well as with Plato's account.

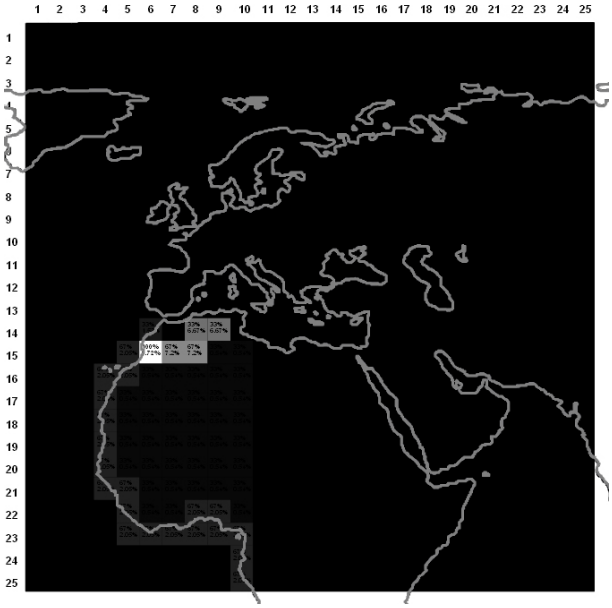

Figure 6. Diodorus Siculus: The HSV has a maximum in $a_{6,15}$ = 8,72%, $P_{Type\ I\ Error}$ = 0.0000279

4. APPLYING GHCS TO MAXIMUS OF TYRE

The analysis of Maximus of Tyre's *Disertationes*, in which he describes the settlement area of the *Hesperian Lybians,* also points us precisely to subarea $a_{6,15.}$ Maximus of Tyre doesn't mention the *Atlanteans*, but he gives us other interesting information about this area. In a similar way to Diodorus Siculus, Maximus of Tyre describes the settlement area of the Hesperian Lybians as situated in the western parts of Libya (Africa) at the Atlantic shore $G01_{tyre}$,close to the Atlas mountain range $G02_{tyre}$ and precisely '*where Atlas opens to the sea like theatres to the air*' $G03_{tyre}$. Without doubt, here he is describing the so-called Souss Plain (which is situated in $a_{6,15}$), because it is the only location where the Atlas meets the Atlantic and 'opens to the sea' (i.e. is split into High Atlas and Anti Atlas, which surround the coastal Souss Plain). Therefore $G03_{tyre}$ is a high weighted criteria.

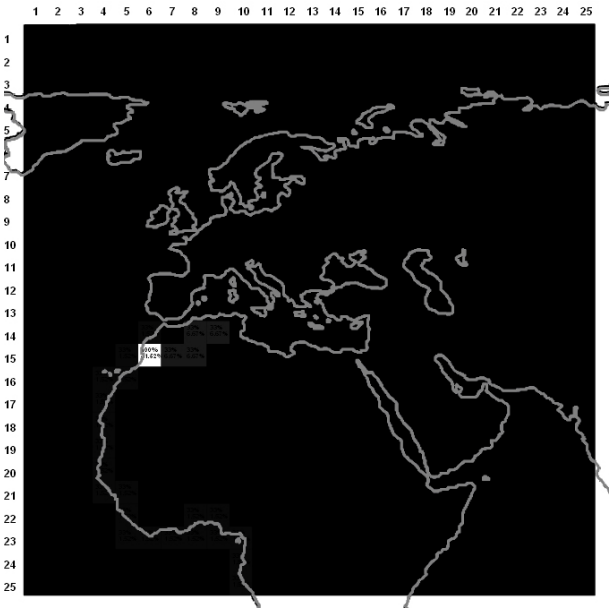

Figure 7. Maximus of Tyre: The HSV has a maximum in $a_{6,15}$ = 41.52%, $P_{Type\ I\ Error}$ = $4.5*10^{-7}$

From Maximus of Tyre's account (*Disertationes, viii. 57)* we can deduce at least two interesting details about this area: there once was a peninsula (or the region was called peninsula) and there is evidence for tsunamis (or even mega tsunamis). The literal translation, from the Greek original, of the passage referring to tsunamis: '*The wonder at this place: the overflowing ocean floods the coast, and on the other [side of the coast] it flows into the plain and the waves [of the ocean] even rise up over the Atlas itself. You may also see the water rising by itself like a wall [...]*". Note: Also Diodorus Siculus wrote about a town within this region, which was named *Cherronesos* (*Peninsula*) after its shape. Today there is no peninsula in this region.

5. COMPARSION SOUSS VS. SANTORINI

If we compare the number of all criteria that apply to Santorini [23] with all that apply to the Souss [44] we notice that Santorini does not have a significant amount of Atlantis-relevant attributes. Only slightly more than 19.75, which is the expected mean, criteria apply**.** Therefore, Santorini is most probably not Plato's *Island of Atlas*.

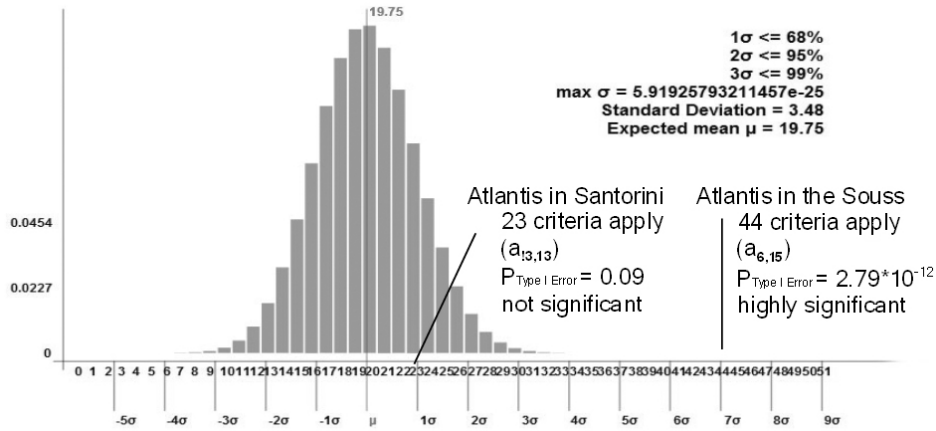

Figure 8. Binomial Distribution Souss vs. Santorini – Note: there are probably fewer than 23 criteria that apply to Santorini, e.g. we don't know if there is evidence for elephants or horses in prehistoric times or if there once were docks cut into red, white and black bedrock, etc. But for now we assume that these criteria apply (to be on the safe side).

6. ADDITIONAL EVIDENCE

Thanks to ancient sources we know that Cape Ghir was formerly known as Cape Heracles. Ptolemy recorded the existence of the Island of Hera, Cerne or Autolala off the coast of the Souss Plain, as well as the city of Autolala on the mainland. Diodorus Siculus provides evidence of a city which was named *Cherronesos* (peninsula) after its shape, as well as a holy city, which may also have been named after its shape, *Mene,* (Greek for 'moon') and which could also refer to a city within an annular structure. Maximus of Tyre also speaks of a peninsula inhabited by the Hesperian Lybians as well as of tsunamis.

In addition, current investigations into the Turbidite system of the West African coast indicate the occurrences of mega-tsunamis on the West African coast in ancient times (Krastel, 2010).

7. CONCLUSION

The Souss plain is surrounded by the *High Atlas*, the *Anti-Atlas* and the *Atlantic Ocean* (*Atlantis Thalassa*, the *Sea of Atlas*). Because of its isolated position, and the fact that it is enclosed by mountains and a sea both named after *Atlas*, this plain could well be called *Island of Atlas*, particularly be-

cause the term *island* has multiple denotations in Afroasiatic languages like Tamazight, Arabic and Ancient Egyptian, but also in Greek.

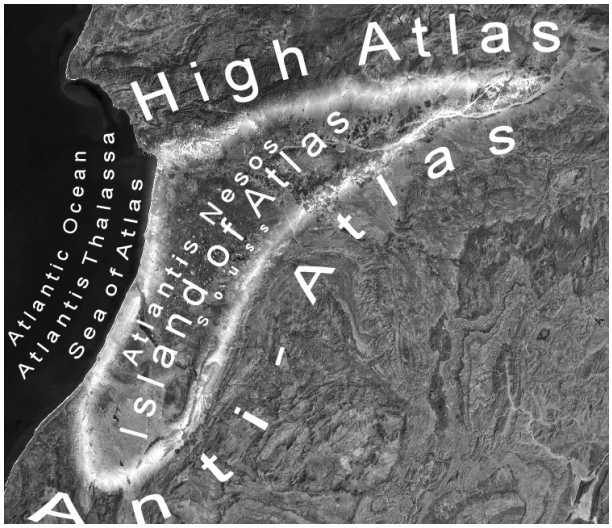

Figure 9. The Souss plain is surrounded by the *High Atlas*, the *Anti-Atlas* and the *Atlantic Ocean* (*Atlantis Thalassa*, the *Sea of Atlas*). Therefore, it is an island within Atlas.

Two remarkable archaeological sites were discovered on and next to the Souss-Massa plain. The main site is situated in a large annular geomorphological structure in the north-western part of the plain. This structure fits the dimensions and the circular shape of Plato's capital of Atlantis and is covered with hundreds of prehistoric ruins made out of red, white and black stone. The presence of dried up sources (probably some of them hot, which is indicated by Travertine sediments) on top of the central hill, substantial landscaping at the site and a vast number of prehistoric artefacts support the author's localization hypothesis. The second archaeological site is another unique geomorphological structure close to Cape Ghir, which corresponds to Plato's description of roofed-over docks cut into red, white and black bedrock. Many findings of prehistoric artefacts in this particular area indicate the importance of this site in prehistoric times (Huebner et al. 2010, 2011).

Using the distribution of criteria in the search area (a 5000 km radius around Athens), a mean of 19.75 criteria is calculated, which should apply to an area 400*400 km^2 in size. 44 of 51 of Plato's criteria apply to the Souss, giving a highly significant deviation (>7σ) from the expected mean. The Souss Plain covers an area of ca. 90*40 km^2, that is essentially smaller than 400*400 km^{2,} meaning that the criteria density is even more significant. The probability of a Type 1 Error with regard to the null-hypothesis 'Plato's Island of Atlas is not the Souss' is $P_{Type\ 1\ Error} \leq 2.79*10^{-12}$. This highly significant result shows that Plato's report is based on actual geographical evidence and that the Souss must be the Island of Atlas or rather the heartland of this island. If you assume that Plato's Atlanteans and Diodorus Siculus' Atlantoi are the same people, the probability of a Type 1 Error is $P_{Type\ I\ Error} \leq 7.78*10^{-17}$.

Interestingly, 3 of the 7 criteria, which do not apply to the Souss, refer to canals on the plain mentioned by Plato. Perhaps in this case soil liquefaction, probably also mentioned by Plato (criterion T25d_geol1 '*the shoal mud which the island created as it settled down*'), could be the reason that these attributes are no longer in existence.

The above-mentioned problematic criteria 'sunken', 'island' and 'continental size' do indeed seem to apply to the Souss, because there are both historical sources as well as current research findings which make the existence of mega-tsunamis in this area of the pre-ancient world very probable. The

Souss was probably called an island in the figurative sense, like many other places in Africa which are also not islands in the traditional sense. The Maghreb for example has been called the Island of the West (*Djesirat el Maghreb*) by Arabic geographers and merchants since at least the Middle Ages. In addition, before the 6th century the word *nesos* was used not only to denote islands (in the modern sense of the meaning) but also peninsulas, areas located near to an ocean or rivers, rivers themselves, cities, capes and even areas inland, insofar as they were associated with springs, lakes or rivers (Papamarinopoulos, 2011). The Souss was mostly likely the heartland of an early state system (Plato mentions several kings), that extended over parts of Africa, Europa and possibly even America (criterion T24e_geog7).

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