Spatio-Temporal Data Mining of Major European River and Mountain Names Reveals their Near Eastern and African Origins

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Abstract. This paper presents a spatio-temporal data mining regarding the origin of the names of the 218 longest European rivers. The study shows that 35.2 percent of these river names originate in the Near East and Southern Caucasus. The study also investigates the origin of European mountain names. It is shown that at least 26 mountain names originate from Africa.

Keywords: Data Mining, Etymology, Mountain, River, Spatio-Temporal.

1   Introduction

Archeology reveals three main expansions of human populations into Europe. The first of these expansions is an expansion from North Africa that was likely prompted by the desertification of the Sahara. The second expansion took place as is a Neolithic agricultural expansion from Anatolia or perhaps even from Mesopotamia. The population of this expansion is often called the group of Early European Farmers (EEF). The third expansion is a Bronze Age nomadic expansion from the Eurasian Steppe areas. The third expansion is commonly associated with the expansion of Proto-Indo-European (PIE) language speaking populations [1]. These expansions and other examples of the spread of human populations can be studied today using various archaeogenetics methods [2-4]. However, neither archeology nor archaeogenetics can identify the languages of the early North Africans and the EEFs. The goal of this research is to identify the languages of these groups based on the old European river and mountain names that may derive from those languages.

The approach we take is to analyze ancient river and mountain names. Many of these topological names are presumed to have survived for millennia, that is, they reflect a pre-Indo-European era [5]. Therefore, these topological names can be associated with the native Ice Age Europeans, the early North Africans of the first expansion mentioned above, or the Neolithic EEFs.

This paper is organized as follows. Section 2 describes the data sources. Section 3 presents the results of data mining for the origin of the European river and mountain names. Section 4 discusses the linguistic implications of the data mining. The data

mining implies ancient cross-continental linguistic connections between Africa and Europe. Finally, Section 5 presents some conclusions and ideas for future work.

2   Data Sources

2.1   River Names

Herodotus wrote extensively about the places he visited around 500 BCE. Strabo's work *Geographia* contains a wealth of river names that existed in the first century and was known to the ancient Greeks and Romans.

In a recent study of the degree of preservation of European river names, Carsten Peust [6] considered all European rivers exceeding 250 km that flow into the Atlantic, the Mediterranean Sea, the Black Sea or the Baltic Sea. He disregarded rivers that flow into the Arctic Sea and the Caspian Sea because supposedly the ancient Greek and Roman writers, such as Herodotus and Strabo, could not have known about those rivers. In this way, he obtained a total of 210 river names. Peust's goal was to find the degree that the names recorded by classical writers and used by modern populations match. He found a very high preservation rate, meaning that many river names seem to persist in Europe. Although Peust's study shows that many river names may be ancient, going back to the Neolithic or earlier, his study did not reveal the origin of these river names, which is the goal of our study.

We used his list with the addition of eight river names that we thought may be of ancient, non-PIE origin. Therefore, we used a total of 218 river names in our study. In particular, we added the following river names:

1. Aragón, this is a significant river flowing through the Basque region of Spain.

2. Arga, this is a significant river in Spain. The similar sounding Aragón river strengthens the proposition that this is an ancient river name.

3. Arnus, which just barely missed the arbitrary 250 km cut. It was the main Etruscan river.

4. Kama, which is a major river flowing into the Volga. This river flowed through the Finno-Ugric homeland according to the most widely-accepted theory of the origin of Finno-Ugric peoples.

5. Rioni, which flows into the Black Sea and is the longest river in Georgia. It seems that this barely missed Peust's criteria because Georgia is counted as a non-European state.

6. Salla, to whose length one may add the narrow and shallow lake Balaton (72 km in length) that can be considered a continuation of the Salla river. With that addition, it also just barely misses the arbitrary 250 km cut.

7. Saravus, which just barely missed the arbitrary 250 km cut.

8. Volga, which is the major river flowing into the Caspian Sea.

As a separate list, we created a list of ancient Near-Eastern river names. We placed into this list ancient Hattic river names from Anatolia because the Hattic people are assumed to have been indigenous to Anatolia before the arrival of PIE groups. We also added some Syrian, Caucasian and Mesopotamian river names.

2.2 Mountain Names

As the possible derivatives list, we considered all European mountain names from Herodotus, Strabo, and Pliny. We also considered all modern mountain names from the Carpathian Basin, and area where many migrants passed through over the millennia, including the EEFs.

For the possible sources list, it seemed unwarranted to restrict attention only to the Fertile Crescent, which has few mountains, or to Anatolia, which is mostly a high plateau. Instead, we extended our search for mountain names to Africa. Since Africa is a huge continent with many mountains, hills and promontories, to cut down the search space, we considered what locations an ancient migrant population slowly migrating from North Africa into Europe would go through. Presumably, this ancient mountain-name-giver population would also name the mountains that it found along the way. This consideration of possibilities greatly cut down the search place, as explained below.

Migrants from North Africa into the Iberian Peninsula likely followed the path of the Strait of Gibraltar. In ancient times the North African side of the Strait of Gibraltar was called the Abile Mountain, which is recorded by Strabo.

Migrants from North Africa to the Italian Peninsula would have to pass the island of Sicily, where the largest mountain is called Nebrode Mountain, which is also recorded by Strabo. Although technically Sicily is part of Europe, this name could have been given to the mountain by one of the earliest African migrant groups that passed through the island.

Finally, migrants from North Africa could follow the Nile River and then move along the Eastern Mediterranean seashore into Anatolia and then Greece. On this way, they could have seen the Abydos Mountain, which was already recorded in predynastic Egypt [7]. At the foot of this mountain is a city and a famous sanctuary.

Therefore, the possible sources list consisted of the following mountain names: Abile, Nebrode, and Abydos.

2.3 Congruent Sound Groups (CSGs)

First, we group some consonants together because they may change relatively easily from one to another. For these groups, we used the International Phonetic Alphabet's phonetic symbols and categorizations. The congruent sound groups (CSGs) are the following:

1. /b/, /p/, /m/ and /n/ – Here /b/ and /p/ is a voiced/voiceless plosive bilabial pair. These can change to /m/, which is a nasal bilabial sound. The /m/ can change to /n/, which is another nasal sound.

2. /d/, /t/ and /θ/ – Here /d/ and /t/ is a voiced/voiceless plosive dental/alveolar pair. The /θ/ is an aspiration of the /t/ sound.

3. /f/, /v/ and /w/ – Here /f/ and /v/ is a voiceless/voiced fricative labiodental pair. The /v/ and /w/ exchange is also common.

4. /g/, /k/ and /h/ – Here /g/ and /k/ is a voiced/voiceless plosive velar pair. The /k/ can change to /h/. For example, in reconstructed Proto-Finno-Ugric words with a word initial /k/ followed by a deep vowel the /k/ regularly changes to an /h/.

5. /l/ and /r/ – These alveolar sounds can commonly change into each other. Some ancient scripts, for example Mycenaean Linear B, did not even distinguish between these two sounds.

6. /s/, /z/, /ʃ/ and /ʒ/ – These fricative veolar sounds can be commonly exchanged.

2.4   River Name Groups (RNGs)

River names can have a beginning of the form $V_1C_1V_2C_2$ where C_1 and C_2 are (not necessarily distinct) consonants and V_1 and V_2 are (not necessarily distinct) vowels or the empty string. We divided into separate groups all river names according to C_1 and C_2. Table gives examples of Pre-Indo-European river names for each group for which we could find an appropriate match.

Table 1. River name groups identified according to the first two consonants in the river name. The first consonant is in the row and the second consonant is in the column. Where we could find, we give a Pre-Indo-European river name. The legend of the superscripts is: As = Assyrian, Can = Canaanite, Cau = Caucasian, Ha = Hattic.

	b, p, m n	d, t, θ	f , v, w	g, k, h	l, r	s, z, ʃ, ʒ
b, p, m n					*Mar*aššantiya[Ha]	
d, t, θ	A*don*is[Can]					
f , v, w						
g, k, h	*Kum*melmalya[Ha]				*Hul*aya[Ha]	
l, r	A*ran*tu[As]			A*rax*es[Cau]		
s, z, ʃ, ʒ	*Šam*ura[Ha]				*Šar*iya[Ha]	

2.5   Mountain Name Groups (MNGs)

The first consonant C_1 in each mountain name has to be /b/, /p/, /m/, or /n/. The second consonant C_2 has to be a /d/, /t/ or /θ/ in the Abydos group, or an /l/ in the Abile group. Finally, in the Ne-brode group (where Ne is ignored) the C_2 has to be an /l/ or an /r/ and the third consonant C_3 has to be /d/, /t/ or /θ/. Table 2 gives a summary of these three cases.

Table 2. River name groups identified according to the first two consonants in the river name. The first consonant is in the row and the second consonant is in the column. Where we could find, we give a Pre-Indo-European river name.

	$C_2 = d, t, θ$	$C_2 = l$	$C_2 = l, r$ and $C_3 = d, t, θ$
b, p, m n	A**byd**os[Egypt]	A**bil**e[Morocco]	Ne-**brod**e[Sicily]
other			

3   Analysis of the Spread of River and Mountain Names

3.1   Analysis of the Spread of River Names

Fig. 1 shows the river names that fit the Adonis group. Altogether nine out of the 218 river names fit into this group.

Rank	Ancient Name	Modern Name	km
	A**don**is (Canaanite)		
1	**Dan**uvius (Latin)	**Don**au (Germ.), **Dun**aj (Slovak), **Dun**a (Hung.), etc.	2860
3	**Tan**ais (Greek)	**Don** (Russ.)	1950
91	**Tib**eris (Latin)	**Tev**ere (Ital.)	410
98	**Ton**zos (Greek)	Tu**n**ca (Turk.)	390
113	**Tib**iskos (Greek)	Te**m**es (Hung.), **Tim**iş (Roman.)	360
125	**Tam**esa (Latin)	**Tham**es (English)	350
168		**Dun**ajec (Pol., Slovak)	290
188	**Tan**arus (Latin)	**Tan**aro (Ital.)	280
189		**Tom**es (Span.)	280

Fig. 1. Peust's river names that fit the Adonis River name group.

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Rank	Ancient Name	Modern Name	km
	*Hul*aya (Hattic)		
36	*Hie*rasos (Greek), *Ger*asus (Lat.)	Sirét (Roman.), Seret (Ukrain.)	710
40	*Gar*umna (Latin)	*Gar*onne (French)	650
45		*Gl*omma (Norweg.)	600
72		*Gál*áseatnu (Sami), *Kal*ixälven (Swedish)	450
133		*Kör*ös (Hung.), *Cri*ş (Roman.)	330
148		*Kal*itvá (Russ.)	310
154		*Xor*ól (Russ., Ukrain.)	310
155	*Hal*iakmōn (Greek)	A*l*iákmonas (Greek)	300
158	*Gr*anouas (Greek)	*Hr*on (Slovak), *Gar*am (Hung.)	300
160	*Col*apis (Latin)	*Kol*pa (Sloven.), *Ku*pa (Croat.)	300
170		*Hor*nád (Slovak), *Her*nád (Hung.)	290
	*Kumm*elmalya (Hattic)		
		*Kam*a (Russia)	1,805
19	(*H*)i*b*erus (Latin)	E*br*o (Span.)	910
46		*Kem*ijoki (Finnland)	550
101	*Kan*entelos (Greek)	Charente (France)	380
110	Singilis (Latin)	*Gen*il (Span.)	360
208	Panysos (Greek)	*Kám*čija (Bulgar.)	250
	*Mar*aššantiya (Hattic)		
2	*Bor*ysthenēs (Greek)	Dnepr (Russ.), Dnipró (Ukrain.)	2290
15	*Par*thiscus (Latin)	Tisza (Hung.), Tisa (Serb.), Týsa (Ukrain.)	960
16	*Py*retos (Greek)	*Pr*ut (Rom., Ukrain.)	950
29	*Mar*isos (Greek)	*Mar*os (Hung.), *Mur*eş (Rom.)	770
30		*Pr*ypeć (Polish), *Pr*íp'at' (Russ.), *Pr*ýp'jat' (Ukrain.)	770
44		*Ber*eziná (Russ.), *B'ar*ézina (Beloruss.)	610
54	E*br*os (Greek)	*Mar*íca (Bulg.)	510
56		*Ne*ris (Lithuanian)	510
58	*Mar*gos (Greek)	*Mò*rava (Serb)	490
62		*Na*rew (Polish), *Nár*aŭ (Beloruss)	480
74		*Mur*a (Croat, Hung. Slove.), *Mur* (Germ.)	450
120	*Mar*us (Latin)	*Mar*ch (German), *Mor*ava (Czech/Slovak)	350
142		*Pil*ica (Polish)	320
150		*Mul*de (Germ.)	310
166		*Bâr*lád (Roma.)	290
176		*Úbor*t' (Russ., Ukrain.)	290
179		I*bar* (Serb.)	280
185		*Pl*'ússa (Russ.)	280
194		*Pol*á (Russ.)	270

Fig. 2. Peust's river names that fit the Hulaya, Kummelmalya and Maraššantiya river name groups.

Fig. 2 shows the river names that fit the Hulaya, Kummelmalya and Maraššantiya river name groups. Fig. 3 shows the river names that fit the Šamura, Šariya, and Arantu and Araxes river name groups.

Rank	Ancient Name	Modern Name	km
	Šamura (Hattic)		
13	*Savus* (Latin)	*Sáva* (Croat; Serb), *Sava* (Sloven.)	990
79		*San* (Pol.), *S'an* (Ukrain.)	440
93	*Samus* (Latin)	*Szamos* (Hung.), *Sómeş* (Roman.)	400
97	*Sēnos* (Greek)	*Shannon* (Engl.), an t*Siannain* (Irish)	390
124	*Sabrina* (Latin)	*Severn* (Engl.), Hafren (Welsh)	350
143		*Samára* (Russ., Ukrain.)	320
151	A*sam*us (Latin)	O*sem* (Bulgar.)	310
175		*Sava*lá (Russ.)	290
187		*Suun*ujoki (Finn.), *Súna* (Russ.)	280
204	*Samara* (Latin)	*Somme* (French)	260
	Šariya, Zuliya (Hattic)		
27		*Sal* (Russ.)	800
75		*Sl*uč' (Russ.), *Sl*uč (Ukrain.)	450
88	*Sal*as (Greek)	*Saale* (German)	410
112		*Súla* (Russ.), *Sulá* (Ukrain.)	360
132		*Zsil* (Hung.), *Jiu* (Rom.)	330
152		*Sarthe* (French)	310
159	I*sara* (Greek)	I*sar* (German)	300
	Saravus (Latin)	*Sarre* (French), *Saar* (German)	246
	Salla (Latin)	*Zala* (Hung.)	139
	Arantu (Assyrian)	**Orontes (Greek), Asi (Arabic, Turkish)**	
5	*Rhenus* (Latin)	*Rhein* (Germ.), *Rhin* (French), *Rijn* (Dutch)	1230
7	Al*bis* (Latin)	E*lbe*	1090
92		*Ljungan* (Swed.) < *Lungan	400
	Phasis (Greek)	*Rioni* (Georgia)	333
173		*Łyna* (Pol.), A*lna* (Lith.), *Láwa* (Russ.), A*lle* (Germ.)	290
182		*Leine* (Germ.)	280
186	Ar*rabo* (Latin)	*Raab* (Germ.), *Rába* (Hung.)	280
	Ar*nus* (Latin)	Ar*no* (Italy)	241
	Araxes (Caucasian)	**Arax (Armen., Georgian), Araz (Azer.)**	**1,072**
116		Á*rge*ş (Roman.)	350
119		*Lúga* (Russ.), *Laugaz* (Votik)	350
178	Ar*gi*anēs (Greek)	E*rg*enes (Turk.)	280
		Arga (Spain)	145
		A*rag*ón (Spain)	129

Fig. 3. Peust's river names that fit the Šamura, Šariya, Arantu nd Araxes river name groups.

In Table 3 shows the number of river names from our list of 218 rivers that belong to each RNG that is associated with a Near Eastern river name.

Table 3. The number of river names that fall within each river name group.

	b, p, m n	d, t, θ	f , v, w	g, k, h	l, r	s, z, ʃ, ʒ
b, p, m n					19	
d, t, θ	9					
f , v, w						
g, k, h	6				11	
l, r	8			5		
s, z, ʃ, ʒ	10				9	
total	33			5	39	

Table 3 shows that 77 European major river names out of 218, that is, 35.3 %, could be traced to the Near East and the Caucasus. That is an unexpectedly high number given that some European river names could also derive from the native Ice Age hunter-gatherers, the early North Africans, or from the Bronze Age Proto-Indo-Europeans. Therefore, this is a strong linguistic support to the thesis that a large number of European river names go back go the agricultural expansion that started c. 7000 BC.

It is also interesting that the distribution of the river names is not random. There is a clear preference for the second consonant to be either in the first group (*b*, *p*, *m* and *n*) or the fifth group (*l* and *r*). Moreover, all of these names are associated with the Near East, and a remarkably large number with the Hattic names. Hence the mentioned preference probably reflects an essential characteristic of the Hattic language, who may have been the earliest agriculturalists in Anatolia. They apparently spread over the entire European continent and left their marks in all the places that was the main route of expansion, including present day Bulgaria, Romania, Serbia, Croatia, Slovenia, Hungary, Slovakia, Poland, Lithuania, Ukraine, Russia, Austria, Germany, Netherlands, Norway, Sweden, Finland, England, Ireland, France, Italy and Spain.

When the second syllable was in the fourth group (*g, k* and *h*), which was associated with the Araxes River in the Caucasus, then the distribution of the names was more selective. The five names in this group can be divided into a one subgroup, which starts with a vowel and the first consonant is an *r*, while the second subgroup starts with an *l* and contains the name of only one river near St. Petersburg, Russia.

The first subgroup apparently had a maritime expansion from the Caucasus to the historical Thrace (approximately present day southern Romania, Bulgaria and Northern Greece) then it may have reached the Argolis plain in Greece, and then reached northern Italy, where there is an Orco River, which is a tributary of the Po River, then reached southern France, where there is an Ariège River, which is a tributary of the Garonne River, and finally it reached northern Spain. The Loire River, which originates in southern France, also has the Arroux River as a tributary. It is possible that

this group of people called the entire Po the Orco and the entire Loire the Arroux, but these latter names survive today only as the names of tributaries.

The second subgroup probably had a separate, unrelated development because of the combination of the geographic and the subtler linguistic differences. The only route connecting the Caucasus with the northeast of Russia would be via the Volga River. The ancient name of Volga was the Scythian Rā, which has /r/ as the first consonant but has no second consonant. Therefore, whether this indicates an expansion from the Caucasus or not cannot be decided by this study.

Record	Ancient Name	Modern Name
Strabo	A**bil**e (Morocco)	
Strabo	Am-**pel**os (Samos I., Greece)	
Strabo	Or**bel**os (Thracian)	
Strabo	**Pel**ion (Thessaly, Greece)	
Strabo	**Phol**oe. (West Greece)	***Pol**oe
		Bilo (Hu/Croat.)
		Béli (Hu/Rom.)
Strabo	Ne**brod**e (Sicily)	
Strabo	**Bert**iscos (Thessaly, Greece)	
Strabo	**Parth**enion (Athens, Greece)	
Strabo	**Plat**amodes prom. (Greece)	
Strabo	Ty**phrest**os (Thessaly, Greece)	*Ty-**prett**os
pre-Dynastic	A**byd**os (Egypt)	
Pliny	Car-**pat** (Central Europe)	
Strabo	E**mod**os (India)	
Strabo	Hy-**mett**os (Athens, Greece)	
Strabo	Hy-**pat**on (Greece)	
Strabo	Idu-**bed**a (Iberia)	
Strabo	Lyka-**bett**os (Athens, Greece)	
Strabo	Oros-**ped**a (Iberia)	
Strabo	**Ped**alion prom. (Cyprus)	
Strabo	**Pt**oon (Greece)	
Strabo	**Pyd**na (Greece)	
Strabo	Sar-**ped**on prom. (Cilicia)	
		Bada-csony (Hung.)
		Bodoki (Hung., Roman.)
		Buda (Hung. city and hills)
		Buda-hunga (Burundi)
		Fátra (Hung., Slovak) < ***Pát**ra
		Madaras (Hung., Slovak)
		Pádis plateau (Hung., Roman.)
		Págyes prom. (Hung., Roman.) < * **Pád**es

Fig. 4. Mountain names that fit the three mountain name groups.

3.2   Analysis of the Spread of Mountain Names

Fig. 4 shows the list of mountain names that were found to fit well with the three source names. Naturally, the list contains a large number of Greek mountain names because that area was the most familiar to Strabo. Although the study of Asian mountain name was not the goal of this study, we also added to the Abydos list in Fig. 4 the famous Emodos Mountain, which today is called the Himalayas Mountain, the Sarpedon promontory in Cilicia, which is in southern Turkey, and the Pedalion promontory on Cyprus. It is possible that some of the ancient African migrants instead of following the Eastern Mediterranean coast followed a different route into India, probably going around the Arabian Peninsula. The Burundi mountain name Buda suggests that the expansion of the population that gave these mountain names started from around Lake Victoria, which is a source of the Nile River.

In summary, we found 6 European mountain names in the first group, 5 European mountain names in the second group (including Nebrode), and 15 mountain names in the third group. Therefore, we found a total of 26 mountain names that seem to derive from African sources. We also found a Burundian mountain name supporting the hypothesis of a mountain name giving population expansion along the Nile River.

4   Discussion of the Linguistic Implications

4.1   River Name Etymologies

The Araxes river name group (especially its first subgroup) recalls the *Argonauts* in Greek mythology. These mythical heroes made a journey to the land of the Colchis, which is present day Georgia. This myth may reflect some knowledge about the expansion of this first subgroup from the Caucasus to Greece. There are some linguistic theories that connect the Kartvelian languages, which includes Georgian, to the Basques [8]. If the connection is valid, then the maritime expansion of this group may be the explanation for the linguistic connection.

The etymology of the Arantu river is unknown. It may be a Hurrian name in origin. The Arnus is the main Etruscan river. There are some indications of Etruscan-Hurrian language relationships.

The word Maraššantiya may be related to puro[Finnish] (creek) and folyó[Hungarian] (river). Another surprising finding is that the Hattic river names all end in –ya. This could be related to jó[Hungarian] (river), which is the last syllable of many Hungarian river names.

4.2   Mountain Name Etymologies

It already struck us that the three mountain name groups Abile, Nebrode, and Abydos may be cognates. That is, they may all derive from some common root, some African word of truly ancient origin that may be Proto-Word for many languages in the world.

For example, Abydos and Bile may be related because a /d/ to /l/ change is not unusual. Hence *Abydo > *Abilo > Abile is a possible development. In addition, the insertion or deletion of an /r/ is also possible. Moreover, Nebrode could be a compo-

site word consisting of Ne + Abrode. We also could have with an /r/ omission the following development: *Abrode > *Abode > Abydo. Therefore, it is not impossible that one ancient North African population split and migrated on separate route into Europe. During this migration, the original word for "mountain" became slightly modified.

To further investigate this possibility, we searched for possible cognate words in various African, Eurasian languages. Table 4 lists the words that we could identify as possible cognates. Note that the Somali word buurta, which means "hill" could be close to the proto-word we look for. Our guess is that the proto-word was *aburda. The Somali language is a distinct branch of the Afro-Asiatic languages, but the proto-word *aburda likely pre-dates the beginning of Proto-Afro-Asiatic because it is also related to Sumerian bàd, which means "wall." The Sumerian wall is clearly cognate because walls are made of rocks and bricks. The proto-word is also related to the Filipino bato, which means "rock."

It is also surprising that the Carpathian Mountains now can be given a Sumerian etymology. In Sumerian kur means "mountain" and combines with bàd, it means mountaintop [9]. Previously, no satisfying etymology was given for the name Carpat, which was already recorded by Pliny.

Table 4. Some words that are cognates of various mountain name groups.

Group		Definition	Source
A*bil*e	*p*el*l*a[Greek]	stone, rock	[10]
A*bil*e	*p*aa*l*u[Finnish]	pile	[13]
A*byd*os	a*p*a*t*a[Yoruba]	rock	[13]
A*byd*os	*b*a*t*o[Filipino]	rock	[13]
A*byd*os	*b*à*d*[Sumerian]	wall	[9]
*C*ar-pat	*k*u*r*-bad[Sumerian]	mountaintop	[14]
A*byd*os	*b*u*d*a[Hungarian]	sharp picket.	[11]
A*byd*os	*p*a*t*i[Mansi]	go down to the river from a mountain	[12]
A*byd*os	*b*u*d*jā[Proto-Albanian]	lip, end, edge, bank, stitch, rock	[10]
A*byd*os	*p*y*t*na[Greek]	stone, hill rock	[10]
A*byd*os	*p*e*t*ra[Greek]	stone, rock	[10]
Ne-*bro*de	*b*la*t*[Maltese]	rock	[13]
Ne-*bro*de	*b*uu*rt*a[Somalian]	hill	[13]

Previous research of the author [15-19] using phylogenetic and spatio-temporal data mining methods [20-21] has revealed a close language connections between Minoan, Hattic and Hungarian. This result seemed to contradict previous theories about the origin of the Hungarian people and language. However, Fig. 5 suggests an explanation for the relationships. The white circles in Fig. 5 show the geographic locations that may provide refuge areas against any nomadic invasion from the great Eurasia Steppe areas. It can be assumed that in general the nomadic invaders, be they Bronze

Age Proto-Indo-Europeans [1] or later groups, would have preferred the relatively flat areas north of the Carpathian Mountains than to go through the Carpathians with their horses. They would also avoid the northern forest areas, which may be a refuge area other Uralic people. Similarly the Caucasus Mountains, Apennine Mountains and the Pyrenees Mountains may have provided some refuge for the Caucasian, the Etruscan and the Basque populations, respectively.

However, while all the white circles are shielded from an invasion from the Eurasian Steppe, they fare differently from an invasion from Anatolia. The Basque and the Etruscan areas would be still shielded, but most of the Carpathian Basin would be exposed to a southern invasion along the Danube River. It is possible perhaps that the relatively mountainous areas of Transylvania would have some protections, but that protection would be much weaker than the protection provided by the Carpathian Mountains against an eastern invasion. That means that a Hattic expansion could have influenced the population and culture of the Carpathian Basin, but the Proto-Indo-European invasion could have only a minimal impact.

Fig. 5. This figure shows two main expansions of human populations into Europe: (1) an agricultural expansion from Anatolia (dashed yellow lines) and (2) a nomadic expansion from the Eurasian steppe areas solid red lines). The white circles indicate possible language refugee areas.

Fig. 5 also suggests that the Proto-Indo-Europeans may have come to Europe from two directions. The first direction would have been from the Eurasian Steppe and the second via Anatolia. The second direction is a rougher terrain, which would have greatly slowed down the speed of the Proto-Indo-European advance. Moreover, in the Aegean Sea islands, as well as Sicily and Sardinia, the earlier populations would have

avoided an immediate invasion and could have their culture survive longer than on the mainland of Europe. This seems to be especially the case in the Cyclades and in Crete. The island of Crete was the seat of the Minoan civilization. The Minoan civilization seems related to the Hattic civilization, but survived much longer. Hattusa, the center of Hattic civilization, fell to the Hittites around 1700 BCE. However, the Mycenaean Greeks only captured Crete around 1450 BCE. According to many historians, the Mycenaean conquest would have been further delayed if the eruption of a volcano on the island of Santorini would not have already weakened by that time the Minoan civilization.

5   Conclusions and Further Work

Our spatio-temporal data mining study considered the geographic distribution of river and mountain names over a period of several millennia. We found evidence of an African origin of many mountain names in Europe, and even in Asia. Our hypothesis is that these mountain names were brought into Europe when the Sahara dried up and hunting-gathering North Africans were seeking a better climate. This gradual desertification may have started at the end of the Ice Age. Hence probably these mountain names could go back to the Ice Age.

We also found evidence of a Near Eastern or Caucasian origin of many river names. Apparently the EEFs either did not know the names of the rivers, or they found it very important to call the rivers certain names. On the other EEFs seem to have been less interested in the mountains and were willing to accept for them the local names that the hunter-gatherers already gave them.

One interesting question that remains is whether these river and mountain names extend to Australia and the Americas. If the river and mountain names have cognates in these continents, then that fact would imply an even earlier origin of these names, going back perhaps to the very earliest human proto-language.

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