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GIS Analysis and Digital Reconstruction of Ptolemy's India beyond the Ganges, Serike and Sinae

Keywords: Claudius Ptolemy, ancient geography, GIS analysis, historical cartography, georeferencing

Summary
In this paper, we use GIS analysis to produce a new digital reconstruction of the ancient India beyond the Ganges, Serike and Sinae, three peripheral regions from Claudius Ptolemy's classical *Geography*, a seminal work that provides coordinates of more than 6,300 places once known to the celebrated scientist of antiquity. We discuss practical implications of Ptolemy's criticism of a contemporary round mappa mundi, along with other relevant evidence, to advance a novel hypothesis that Sinae, where Ptolemy placed "fish-eating Aethiopians", actually belonged in Africa, instead of Asia. Our new Ptolemaic maps represent an attempt to rectify the ancient error and achieve clean separation of Sinae (Guinea) from its two Asian "neighbors". Multiple new identifications of Ptolemaic places are proposed. The results presented in the paper open up new potential avenues of exploration for archaeologists and contribute to improvement of understanding of cartographic heritage, the ancients' travels, and the state of geographical knowledge of remote regions of East Asia and West Africa in the time of Claudius Ptolemy.

Introduction

Claudius Ptolemy, a prominent Hellenic scholar and, arguably, the greatest African scientist of all time, is believed to have worked in Alexandria, Egypt, in the 2nd century AD. In his seminal *Geography* (Stückelberger & Grasshoff, 2006), the classic author provided the earliest known set of coordinates (latitudes and longitudes) of 6300+ ancient objects — cities, villages, markets, mountains, capes, bays, harbors, lakes, river mouths and sources, etc. — along with useful descriptions, names of the tribes that populated *oikouménē* (the 'known world', also spelled *ecumene*), and detailed instructions on how to draw maps in three different projections. Unfortunately, due to many source distortions and errors made during data compilation, along with mistakes caused by wrong opinions on the shape of the continents and the size of the Earth, Ptolemy's coordinates require additional georeferencing (conversion to a modern projection) before the objects can be visualized in a manner convenient for viewing by modern historians of cartography, geographers, archaeologists, hydrologists, and all people interested in learning how the modern civilization grew from its ancient roots. Thankfully, the many known Ptolemaic objects can serve as reference points that can help us place and identify previously unknown objects.
In this paper, we present new results of our multi-year research of *Geography*, extending the scope of our study to the remote regions that Ptolemy called India beyond the Ganges, Serike and Sinae. Our prior works dealt with Ptolemy's West Africa (Gusev et al. 2005), Taprobane and India before the Ganges (Abshire et al. 2016, 13–34), Arabia (Abshire et al. 2016, 133–154), the so-called Fertile Crescent including the provinces of Judaea Palestina, Syria, Mesopotamia, and Babylonia (Abshire et al. 2017, 152–167), Britain and Ireland (Abshire et al. 2017). A detailed review of other scientific literature related to the analysis of Ptolemy's data on India beyond the Ganges, Serike and Sinae is provided in the next section of the paper.
While Ptolemy's catalog is extensive and detailed, its interpretation and visualization still pose serious challenges. A big part of the problem are the great distortions of the actual shape of the inhabited world known to the early geographers of antiquity. Practical implications of Ptolemy's criticism of a contemporary round mappa mundi, along with other relevant evidence, will be discussed in the third section of the paper. We will propose and advocate a new hypothesis placing Ptolemy's Sinae almost entirely in West

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Africa, with one important exception of Thinae metropolis. This hypothesis will establish the need to reconsider our earlier findings in West Africa and substantially rework the reconstruction presented early on in (Gusev et al. 2005).

Given that we need reference points to place the rest of the objects, the necessary first step when dealing with India beyond the Ganges, Serike and Sinae is for us to identify and georeference as many locations as possible. We illuminate this painstaking process in the fourth section of the article. We will take into account that Ptolemy's work and the work of his main predecessor, Marinos of Tyre, were compilations, so the catalog contains a few duplicates.

The second step of the process is approximate placement of the points that could not be directly identified and georeferenced, conclusively or tentatively. We found that triangulation and flocking, the numerical methods for approximate point placement introduced in (Abshire et al. 2016, 13–34) and improved in (Abshire et al. 2016, 133–154), are too difficult and impractical to use in the area where distortions are so atrocious. The relatively primitive manual technique involving joint selection and movement of groups of points in ArcGIS sufficed to ensure ostensibly sensible precision of placement of the unknown objects. No detailed precision analysis was performed.

Figures 1-4 provide a visual representation of the results we achieved for Ptolemy's India beyond the Ganges, Serike and Sinae. ESRI's ArcGIS was used to make the maps. We draw conclusions and outline the future research directions in the final section of the paper.

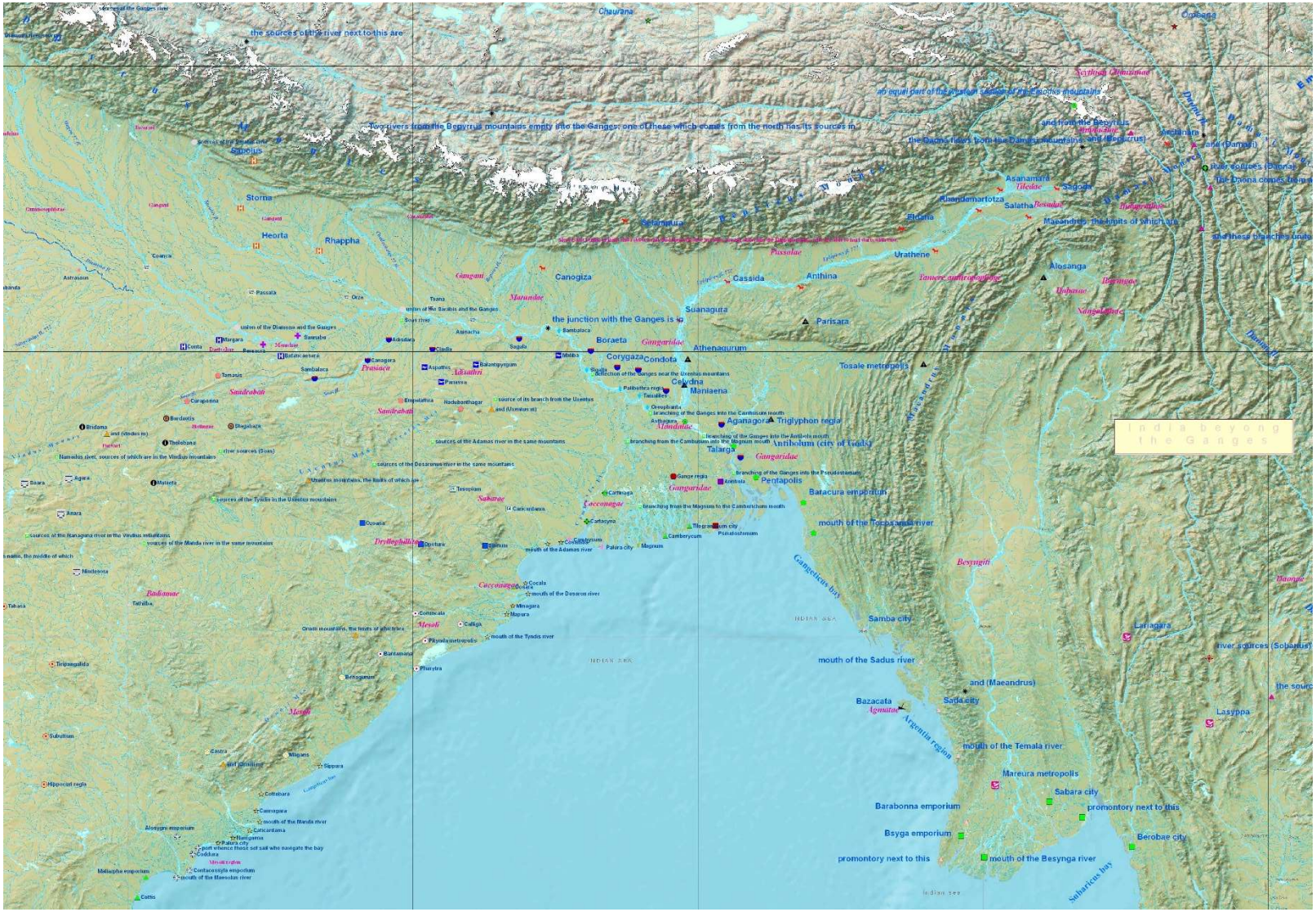

Figure 1: The West part of Ptolemy's India beyond the Ganges.

Figure 2: The East part of Ptolemy's India beyond the Ganges.

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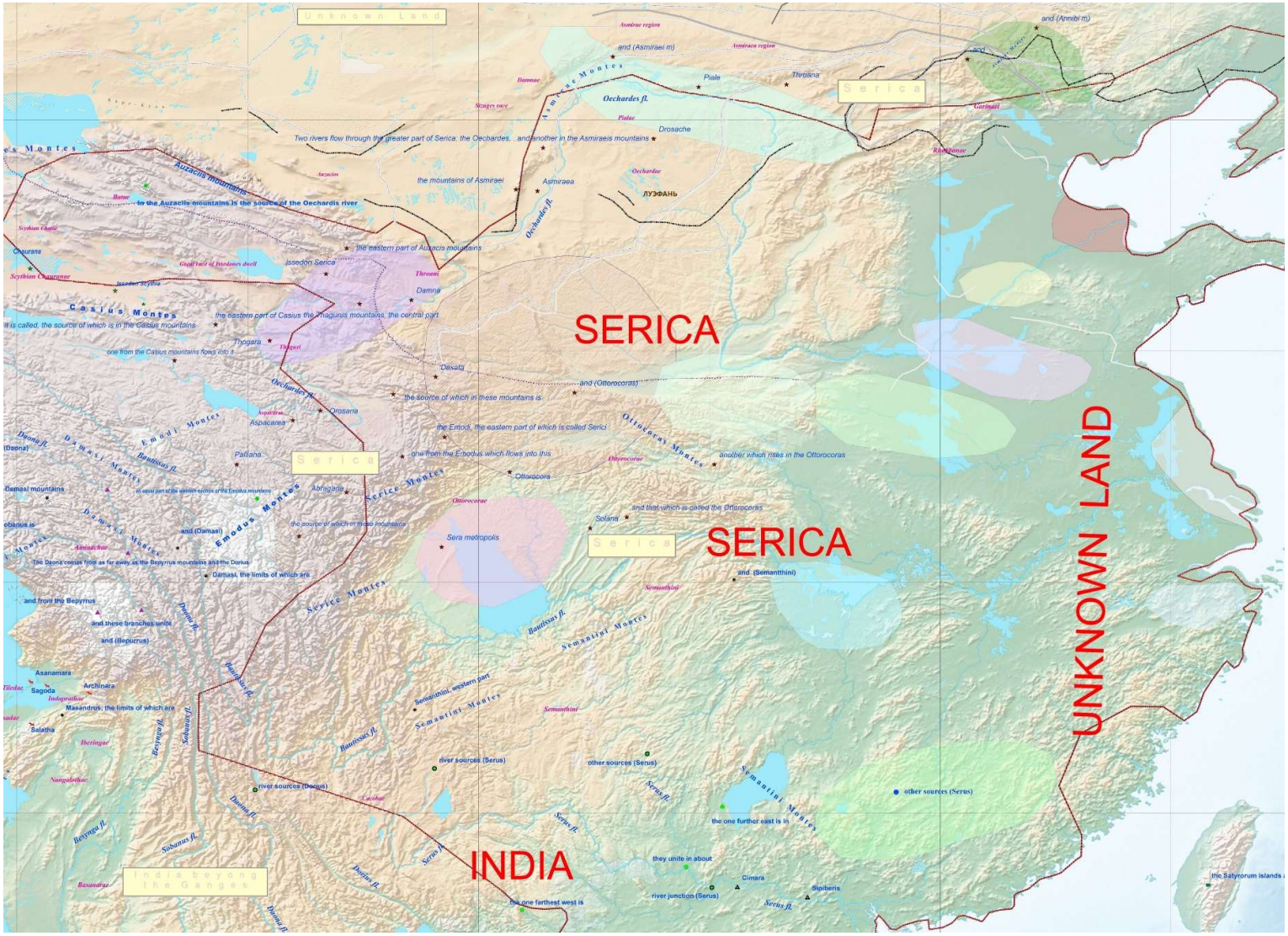

Figure 3: Ptolemy's Serike, the 'land of silk' (China).

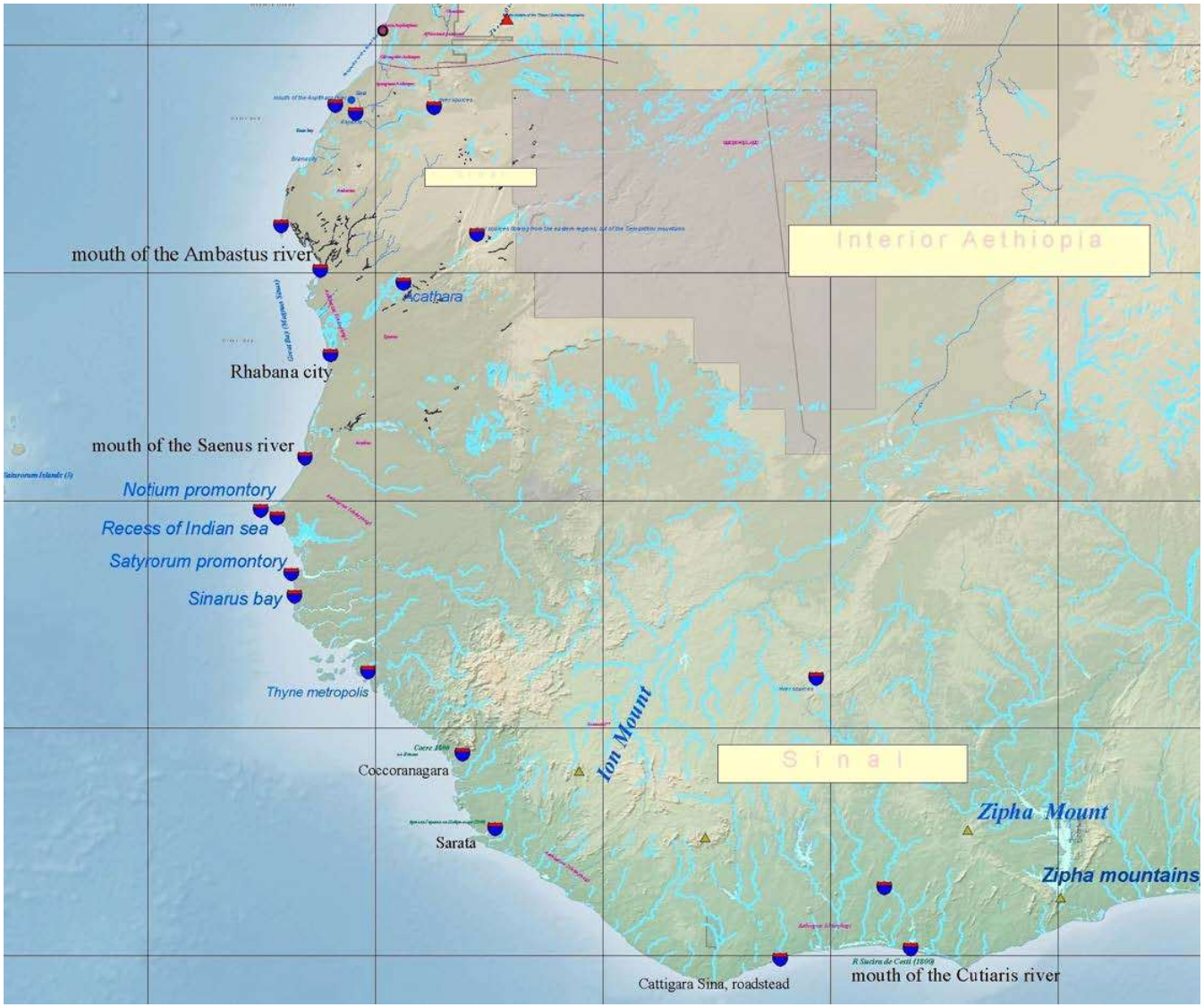

Figure 4: Ptolemy's Sinae (Guinea) in West Africa.

Literature Review

Stückelberger and Grasshoff (2006) provided the best available complete translation of Ptolemy's *Geography* into a modern European language (German). During the preparation of this translation, a comprehensive comparison of several surviving Greek manuscripts of *Geography* was completed. An authoritative Greek version of the original text is included, printed conveniently side-by-side with its German translation. In our works, we have made extensive use of the electronic database of coordinates accompanying the monograph and adopted its object ID system. Stückelberger and Grasshoff occasionally suggest modern names for the Ptolemy objects. For example, they propose Hanoi as the probable modern counterpart to Ptolemy's mysterious Cattigara, the final point of his itinerary on the coast of Sinae. However, we have observed that a few of their identifications in the remote regions have their roots in the notes found in a significantly older translation of *Geography* by Müller (1883-1901).
Unfortunately, the only complete English translation by E. L. Stevenson (Ptolemy 1991) has long been known to be of poor quality (Diller 1935). Nevertheless, we have occasionally used this flawed source in order to come up with appropriate translations of the German place names into English. Diller (2009) made a high quality English translation of Ptolemy's Book 8.
Berggren and Jones (2000) produced an annotated English translation of the theoretical chapters of *Geography*. This partial translation proved especially useful when we worked on the next section of the paper, the one devoted to the discussion of Ptolemy's criticism of a round mappa mundi and its implications, along with other relevant evidence including GIS analysis of the data.
McCrindle (1927) provided a sound partial English translation of *Geography* covering all of India and several regions placed nearby, including Serike and Sinae. McCrindle's detailed comments have served us as an excellent source for point identification. The modern atlases by Talbert (2000) and Åhlfeldt (2017) reach the West part of India beyond the Ganges. The reader should have in mind that the spellings of ancient names preferred by the latter two resources often deviate from those found in Ptolemy's *Geography*.
In addition to the modern publications, we used such classic sources as (d'Anville and Horlsey 1791) and (Bunbury 1879).
Among the publications that do not address Ptolemy's data for India beyond the Ganges, Serike and Sinae, yet provide additional insights into Ptolemy's achievements, we must mention an outstanding modern catalog by Tsorlini (2011) that covers Ptolemy's Mediterranean and Black Sea region. It also offers an original methodology for derivation of modern coordinates. Many references to other works related to the numerical analysis of ancient maps are provided in the literature reviews included in our earlier papers referenced in the introduction.

Ptolemy's Placement of India beyond the Ganges, Serike and Sinae

Ptolemy and a Round Mappa Mundi

Even though the earliest extant round *mappa mundi* showing Asia, Europe, and Africa surrounded by the Ocean is the Anglo-Saxon Cotton world map dated by the first half of the 11th century AD, the concept hearkens back to such ancient scholar names as Anaximander, Hecataeus of Miletus, and Eratosthenes, all of whom were Ptolemy's predecessors. In *Res Gestae Divi Augusti* (Cooley 2009) reproduced on the walls of the ancient Monumentum Ancyranum temple in Ankara, Emperor Augustus refers to the whole world using forms of *orbis terrarum* twice, where the Latin word *orbis* means a 'circle', 'ring', or 'disc'. The second occurrence corresponds to the word *οἰκουμένῃ* in the Greek translation inscribed beside the Latin text. An ancient statue of Augustus holding a scepter and an orb believed to symbolize the world is dated by the first half of the 1st century AD.
While the oldest surviving Greek manuscripts of *Geography* are dated by the late 13th century AD, the tradition of the round *mappa mundi* survived until the middle of the 15th century when the massive Fra Mauro map was made. In Book 8 of *Geography*, Claudius Ptolemy subjected contemporary samples of a

round *mappa mundi* to scathing, yet only partially justified criticism. The translated quote below is from (Diller 2009).

8.1.2. Now that we have seen what rendering of the whole ecumene in a single map would be suitable, the next thing is to set out the summary outlines to be if we divide it into several maps in order to put in the actual data in full and in scale for clarity. For in a single drawing where we must keep the proportion of the parts of the ecumene to each other it is necessary for some of the parts to be crowded because of the wealth of the data being shown and for others to be wasted for lack of data to be shown. 8.1.3. To evade this most were forced by the maps themselves, but not by the matter, to distort the sizes and shapes of the countries extensively. Thus those who allotted the greatest part of the map to Europe in both longitude and latitude for the wealth of data being shown, and the least part in longitude to Asia and in latitude to Libya for the contrary. For this reason they turned the Indian ocean beyond Taprobane northward as the map prevented their extending it eastward while they had nothing to put in against Scythia lying to the north, and they turned the western ocean eastward as the map prevented their extending it southward while here too the depth of interior Libya and of India did not have anything to be put in to continue the western coast. In this way, the notion of the whole earth surrounded by ocean began from errors in drawing and ended in unproved doctrine.

In essence, Ptolemy refuses to believe that the Atlantic ("western") Ocean is connected to the Indian Ocean, which he calls the "Indian sea" (Ptolemy 1991) or the "Sea of India" (Berggren and Jones 2000), at the southernmost point of Africa. This position directly contradicts the Periplus of the Erythraean Sea (Schoff 1912), which states the following.

And these markets of Azania are the very last of the continent that stretches down on the right hand from Berenice; for beyond these places the unexplored ocean curves around toward the west, and running along by the regions to the south of Aethiopia and Libya and Africa, it mingles with the western sea.

Ferrar (2010a) pointed out that the second half of Chapter 17 of Book 1 of *Geography* is a resume of the Periplus of the Erythraean Sea. Ptolemy apparently attributed that anonymous work, quite sensibly, to "the merchants who have crossed from Arabia Felix to Arōmata and Azania and Rhapta." Instead of letting the Atlantic Ocean join the Indian Ocean, Ptolemy mistakenly connected East Asia to East Africa by incorrectly describing the "Indian sea" as closed by land on the south and likening its shape to that of the Mediterranean Sea. In doing so, he contradicted what should have been common knowledge since the time of Herodotus (Marincola and A. de Sélincourt 1996), who famously reported on the first circumnavigation of Africa by the Phoenicians.

Libya is washed on all sides by the sea except where it joins Asia, as was first demonstrated, so far as our knowledge goes, by the Egyptian king Necho, who ...sent out a fleet manned by a Phoenician crew with orders to sail west about and return to Egypt and the Mediterranean by way of the Straits of Gibraltar. ...These men made a statement, which I do not myself believe, though others may, to the effect that as they sailed on a westerly course round the southern end of Libya, they had the sun on their right - to northward of them.

Even though Herodotus himself expressed disbelief, Ptolemy the Astronomer should have recognized why this account had to be true. Alas, Ptolemy's works show no signs of familiarity with the work of Herodotus.

There used to be a disagreement among geographers on whether Ptolemy's Taprobane was Ceylon (the modern Sri Lanka) or Sumatra. On the one hand, the presence of such Ptolemaic place names as Anurogrammon (the modern Anuradhapura), Kalandadrua (Colombo, believed to have been renamed by the Portuguese from the Sinhalese *Kolon thota*, or *Kola-amba-thota*) and Nagadiba (Nagadeepa), along with the overall shape of the island, indicates that the main land mass of Taprobane is Sri Lanka (Abshire et al. 2016, 13–34). On the other hand, Ptolemy mentions (Book 7, Chapter 4) that the Island of Taprobane was formerly called the Island of Symondi. The latter name is similar to Sumatra. Either interpretation

forces us to conclude that, contrary to Ptolemy's faulty argument, the Ocean does turn northward after Taprobane to form either the Bay of Bengal (after Sri Lanka), or the Gulf of Thailand, formerly the Gulf of Siam (after Sumatra).

Suetonius Tranquillus claimed that Emperor Augustus applied himself energetically to Greek studies and excelled in them, yet could not speak Greek fluently (Thomson 1889). We can conclude that if not Augustus himself, then his contemporary Greek translator identified *orbis terrarum* (the 'whole world') and *oikouménē* (the 'known world'). That would have the longitudinal extent of Asia, Europe and Africa reckoned to be near 360°, or 24 hours in the early 1st century AD, placing the Eastern part of India beyond the Ganges dangerously near the West African coast.

Ptolemy's predecessor and the most important source, Marinos of Tyre (c. AD 70-130) clearly differentiated the whole earth from the *oikouménē*, whose longitudinal extent he calculated to be 15 hours (225°). Ptolemy reduced this number even further by presenting an argument "clearly designed to obtain by hook or by crook a longitude for Kattigara just slightly short of the preconceived figure of 180° for the breadth of the *oikouménē*..." (Berggren and Jones 2000). Ptolemy may have conveniently chosen 12 hours (180°), having recognized that, unlike a whole sphere, half of a sphere naturally projects onto a disc. Ferrar (2010) diligently dissected Ptolemy's contrived argument and the accompanying calculations. Ferrar (2010a) then argued that Ptolemy made up a new capital for "China" (Sinae), Thinae metropolis, spelled Thyne in (Ptolemy 1991) and corrected to Sinai by Stückelberger and Grasshoff (2006). Ferrar further observed that Ptolemy placed Thinae at the geometric distance obtained from the location by Marinos of "The capital of the Seres."

However, Thinae is not made up! In Chapter 15 of Book 1, Ptolemy argued that the positions of the individual cities in Marinos' exposition "call for correction in many places where, because of the copiousness and detail of his compilations, [Marinos] gives them positions in different passages that conflict with one another or are illogical." In this particular case, Ptolemy lifted Thinae from the Periplus of the Erythraean Sea, which relays the following.

And just opposite this river [Ganges] *there is an island in the ocean, the last part of the inhabited world toward the cast, under the rising sun itself; it is called Chryse* ['Golden' – i.e., Sumatra, from Suwarnadwipa, the 'golden island' in Sanskrit]*; and it has the best tortoise-shell of all the places on the Erythraean Sea. After this region under the very north, the sea outside ending in a land called This, there is a very great inland city called Thinae, from which raw silk and silk yarn and silk cloth are brought on foot through Bactria to Barygaza* [Bharuch]*, and are also exported to Damirica by way of the river Ganges.*

We can now safely conclude that the land of This is identical to Ptolemy's Serike, the 'land of silk', i.e. China, and Thinae metropolis corresponds to its capital, Xi'an. Yet we are prepared to argue in the next subsection that the rest of Sinae belongs in West Africa.

The Great Bay and Fish-Eating Aethiopians in West Africa and East Asia

In Book 4, Chapter 6, Ptolemy (Stückelberger and Grasshoff 2006) informs us that Interior Libya is "bounded on the south by Interior Aethiopia, where the Agisymba region lies, along the border, which extends from the just mentioned reference point [51°15' E 3°10' S] to the corner of the Gulf of the Outer Sea [Atlantic], called the Hesperian and the Great Bay; its location is at 14°[E] 4°[N]." The following quote from Book 4, Chapter 8, establishes the location where the fish-eating Aethiopians lived.

The Great Bay of the Western Ocean is inhabited by the fish-eating Aethiopians, commonly called Hesperian Aethiopians, and further to the east by the Athaca Aethiopians.

Remarkably, we also find the Great Bay and fish-eating Aethiopians… in Ptolemy's East Asia. We cross-checked the following translations of German versions of two text fragments from Book 7, Chapter 3 ("Location of Sinae") found in (Stückelberger and Grasshoff 2006) against (McCrindle 1927) and (Ptolemy 1991). Here is what they say.

The land of Sinae is bounded on the north by the aforementioned part of Serike, on the east and south by unknown land, on the west by India beyond of the Ganges along the borderline defined as far as the Great Bay and by the Great Bay itself, and the parts immediately adjacent thereto: the so-called Bay of Wild Beasts and the part of Sinae where the fish-eating Aethiopians live.
...
And around the Bay of Sinae 178° [E] 2°20' S dwell the fish-eating Aethiopians.

The reader might suppose that, perhaps, there were two Great bays. This is not the case. Indeed, in Book 7, Chapter 5, Ptolemy provides the following list of remarkable gulfs.

Of the most notable gulfs the first and the largest is the Gangetic, the second is the Persian gulf, the third is that one which is called the Great gulf, the fourth is the Arabian, the fifth the Ethiopian, the sixth the Pontic, the seventh is the Aegean sea, the eighth is the Maeotis, the ninth the Adriatic sea, the tenth the Propontis.

The translation above is from (Ptolemy 1991), but we crosschecked it against (Stückelberger and Grasshoff 2006). The latter states clearly in German, "der Grosse Golf der dritte," i.e., the Great Bay (μέγας κόλπος) is the third largest. Ptolemy must have copied this list, along with the other lists found in that chapter, from Marinos of Tyre, who, in his turn, had copied from an unknown predecessor who mistakenly believed the complete longitudinal breadth of the world to be already known. As part of our GIS analysis, we plotted Ptolemy's data in ArcGIS so that the graph's 0° and 180° longitudes joined. The result is shown in Figure 5 below.
The dark gray points show the part of the West coast of Africa that was erroneously moved to East Asia, beginning with the mouth of the river Aspithara (170°[E] 16°[N]). Indeed, another important source on early cartography, Tabula Peutingeriana (Levi and Levi 1978), shows the mouth of the Ganges and Sera Maior, but no Sinae. However, it is still possible to suspect that a predecessor had mixed together information about two Great bays (the Gulf of Tonkin and the Gulf of Guinea). This possibility will be addressed in the next section of the paper devoted to the complicated task of identification of points from Ptolemy's India beyond the Ganges, Serike and Sinae in East Asia or West Africa.

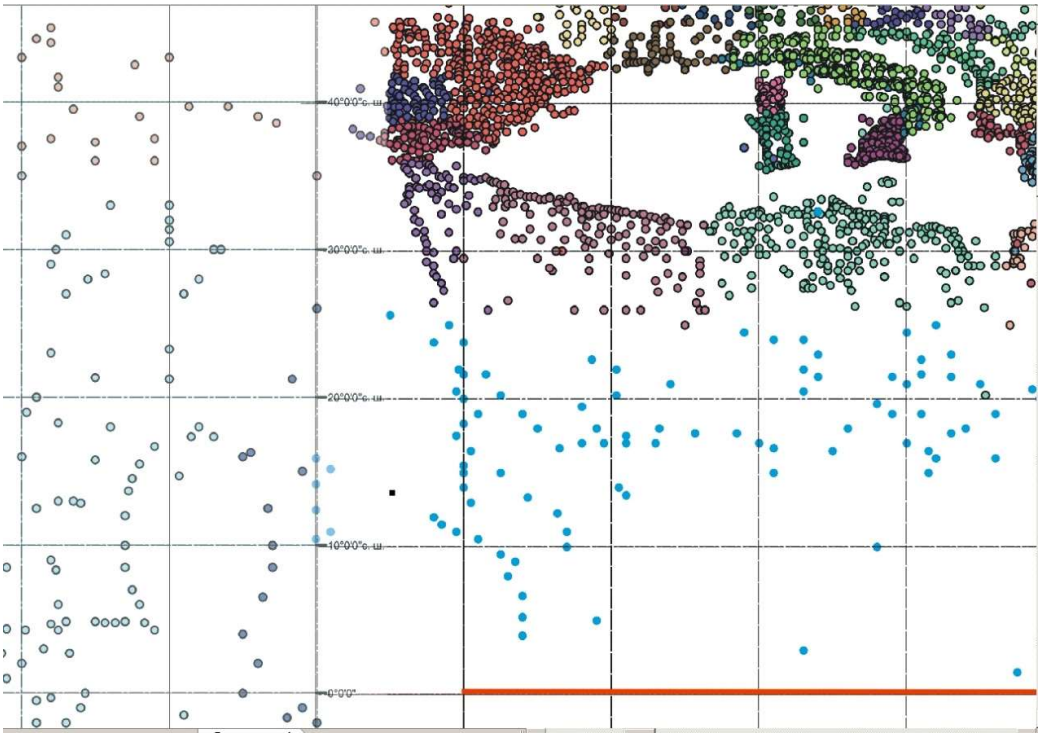

Figure 5: GIS analysis of Ptolemy's East Asia and West Africa.

Point Identification

We continued to apply the point classification introduced in our paper on Ptolemy's Arabia (Abshire et al. 2016, 133–154) and divide all Ptolemy points into four categories: *known* points, *tentatively identified* points, *unknown* points, and *duplicates*.

Identification of Known Points

McCrindle (1927) identified Ptolemy's Samarade along the coastline of India beyond the Ganges by pointing out that Samarat was the Buddhist classical name of the city known to the Westerners under the name Ligor. The present day name of this Thai city is Nakhon Si Thammarat. The Perimulic Bay where the city is located is therefore identified as the Gulf of Thailand, and the city of Samarinda on the island of Borneo is ruled out.

The next identifiable object along the coastline going east is the mouth of the Sobanos river (Maenam Tha Chin, or, less likely, Maenam Chao Phraya). The name is derived from the Sanskrit word Suvarna ('golden'). By following either of the rivers upstream, one can reach the Thai city of Suphan Buri (Ptol. Sipiberis), the name of which is believed to be derived from Suvarnabhumi, the 'golden kindgom', the 'Golden Land' of Ptolemy in India beyond the Ganges. (The 'Silver Land', or Argyros in Greek, is a mere corruption of the name Arakan.)

McCrindle quotes an argument by Yule that Ptolemy's Zabai is the seaport called Ṣanf or Chanf by the Arabs, part of the ancient state of Champâ. McCrindle then identifies Zabai as the modern Kampot in Cambodia. The Great Cape where the Great Bay begins is, therefore, Cape Cà Mau (Mũi Cà Mau) in Vietnam.

In the Great Bay, the mouth of Daona river is that of the Mỹ Tho river, one of the distributaries of Mekong. The mouth itself is called Cửa Đại. After that, nothing along the coast can be positively identified. The mouth of the Seros river is the last coastal object still in Asia. If this was meant to be the river flowing through the Sera/Thinae metropolis, then that must be the Yellow River. If this is the first major river in Serike reached after the Gulf of Tonkin, then that is likely the Pearl River, also known as Zhujiang river, former Canton River. The interior town of Rhingiberi that Ptolemy placed relatively close to the mouth of the Dorias river (the Red River?) corresponds to the modern Ratchaburi in Thailand, misplaced along with Sipiberis and a duplicate of Pagrasa (Paprasa).

When dealing with Sinae, we take Ptolemy's Saenos river (Stückelberger and Grasshoff renamed it Sinos) to correspond to the modern Senegal River in West Africa. We cannot discuss all identifications of the known objects due to the size limitation imposed on this paper. The tables of modern coordinates for known locations in Ptolemy's India beyond the Ganges, Serike and Sinae are located in Appendix A at the end of the article.

Identification of Duplicates

The table of likely duplicates in India beyond the Ganges, Serike and Sinae is placed in Appendix B at the end of the article.

Tentative Identification

The tentative identifications proposed are too numerous to list and discuss all of them here. Berggren and Jones (2000) point out that it is not clear if some Alexandros who had written that "sailing across" from Zabai to Cattigara would take "some days", which Marinos of Tyre took to mean "many days", was reporting his own travels or those of another. We believe that the estimate was not based on any travel data and tentatively identify Cattigara as Calabar in Nigeria by reading Καλλίβαρα instead of Καττίγαρα. We also believe that Ptolemy's Cape Hesperu Keras (13°[E] 8°[N]) in the Interior Libya and the Southern Cape, or Notium promontory (175°[E] 4°[N]) correspond to the Horn of the West and the Horn of the South of the Periplus of Hanno (Schoff 1972).

Conclusions and Future Work

We extended our study of Ptolemy's *Geography* to India beyond the Ganges, Serike and Sinae. A novel interpretation of the data was proposed, placing Ptolemy's Sinae in West Africa (Guinea). This result demonstrated the power of GIS analysis and helped improve our understanding of historical cartographic heritage, the ancients' travels, and the state of geographical knowledge of remote regions of East Asia and West Africa. In the nearest future, we intend to rework our initial digital reconstruction of Ptolemy's West Africa to take into account the new finds.

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Appendix A. Tables of Known Points

Table 1. Modern coordinates for known locations in India beyond the Ganges.

Ptolemy ID	*Ptolemy Name*	*Modern Name*	*Ptol. Lat.*	*Ptol. Lon.*	*Mod. Lat.*	*Mod. Lon.*
7.02.02.04	Pentapolis	Chittagong	18.00	150.00	22.3384	91.8316
7.02.02.05	Katabeda R. mouth	Kutubdia Channel	17.00	151.33	21.8500	91.9147
7.02.02.06	Barakura	Bharua Khali	16.00	152.50	21.5023	92.0232
7.02.03.03	Sados R. mouth	Sandoway R.	12.50	153.50	18.5450	94.2536
7.02.03.04	Sada	Thandwe	11.33	154.33	18.4654	94.3656
7.02.03.06	Temala R. mouth	Thē Chaung	10.00	157.50	16.2837	94.2382
7.02.03.07	Tamala	Thama	9.00	157.50	16.2603	94.2360
7.02.03.08	Cape following Tamala	Round Cape	8.00	157.67	16.2618	94.2264
7.02.04.04	Besynga R. mouth	Pathein (Bassein) R.	9.00	162.00	15.9734	94.3527
7.02.04.05	Besynga	Pathein (Bassein)	8.42	162.33	16.7792	94.7321
7.02.04.07	Cape following Berobai	Baragua Point	4.67	159.00	15.7171	95.3167
7.02.05.05	Sabana	Singapore	-3.00	160.00	1.2893	103.8499
7.02.05.06	Palanda R. mouth	Sungai Pelentong	-2.00	161.00	1.4944	103.7982
7.02.05.07	Cape Maleu Kolon	Tanjung Kelok	-2.00	163.00	1.3638	104.2722
7.02.05.09	Kolipolis	Kota Bharu (of Kelantan)	0.00	164.33	6.1332	102.2384
7.02.06.02	Samarade	Nakhon Si Thammarat	4.83	163.00	8.4332	99.9666
7.02.06.06	Akadra	Chanthaburi	4.83	167.00	12.6112	102.1039
7.02.06.07	Zabai	Kampot	4.75	168.33	10.6101	104.1814
7.02.07.02	Great Cape	Mũi Cà Mau	4.25	169.00	8.6369	104.7261
7.02.07.06	Daona R. mouth	Sông Mỹ Tho	10.00	167.00	10.1935	106.7402
7.02.13.06	Heorta	Ayodhya	34.00	138.50	26.7990	82.2047
7.02.14.04	Boraita	Bardah	29.00	142.33	25.8088	82.8525
7.02.14.08	Aganagora	Agradwip	22.50	146.50	23.5954	88.2558
7.02.22.03	Kanogiza	Kannauj	32.00	143.00	27.0552	79.9188
7.02.22.04	Kassida	Varanasi	31.50	146.00	25.3165	83.0103
7.02.22.08	Urathenai	Inwa	31.33	170.00	21.8546	95.9761
7.02.22.10	Sagoda	Ayodhya	29.33	155.33	26.7990	82.2047
7.02.23.01	Rhandamarkotta	Inwa	28.00	172.00	21.8546	95.9761
7.02.23.06	Alosanga	Elenga (former Ellasing)	24.25	152.00	24.3387	89.9219
7.02.23.14	Sipiberis	Suphan Buri	21.25	170.00	14.4741	100.1222
7.02.23.15	Triglyphon (Trilingon)	Udaipur, Tripura	18.00	154.00	23.5333	91.4833
7.02.24.02	Rhingiberi	Ratchaburi	18.00	166.00	13.5367	99.8170
7.02.24.04	Tomara (Tamara)	Tamarâṭ	18.00	172.00	20.3913	-15.9036
7.02.24.06	Mareura	Bharua Khali	12.50	158.00	21.5023	92.0232
7.02.24.08	Bareuaora	Bharua Khali	12.83	164.00	21.5023	92.0232
7.02.25.02	Balonca	Phuket (former Thalang)	4.67	162.00	7.8793	98.3926
7.02.25.04	Tharra	Tharrawaddy (Tharyarwady)	1.67	162.00	17.6507	95.7862
7.02.25.05	Palanda	Pelentong	-1.50	161.00	1.5244	103.8240
7.02.29.04	Iabadiu I. (west end)	Java, Tanjung Layar	-8.50	167.00	-6.7555	105.2182
7.02.29.05	Iabadiu I. (SE end)	Java, Tanjung Bantenan	-8.00	169.00	-8.7653	114.5641

Table 2. Modern coordinates for known locations in Serike.

Ptolemy ID	*Ptolemy Name*	*Modern Name*	*Ptol. Lat.*	*Ptol. Lon.*	*Mod. Lat.*	*Mod. Lon.*
6.16.08.07	Sera metropolis	Xi'an	38.58	177.25	34.3815	109.2539