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Georeferencing Napoleonic Cartography to reconstruct Ancient Egypt landscapes: methods in comparison and the case of the island of *iw-rd* in the 16th *nomos* of Upper Egypt

The Egyptian landscape over the millennia has been affected by geomorphological and urban changes that have also involved the hydrological scenery, with the consequent transformation of areas around watercourses. This paper aims to highlight the possibilities derived from the consultation of Napoleonic cartography for the study of the Egyptian landscape through GIS platforms, providing an innovative methodology for its georeferencing. The strengths of this resource, joined to the traditional research methods, will be illustrated through the case of the ancient island of iw-rd located in the 16th nomos of Upper Egypt.

Introduction

This paper was conceived in the context of the *PAThs* project, an ERC Advanced Grant (2015) directed by Paola Buzi and hosted at Sapienza University of Rome, whose main purpose is to explore the processes of production, copying, usage, dissemination, and storage of Coptic literary texts in relation to the geographical contexts of origin of both the texts and their related writing supports (https://atlas.paths-erc.eu). One of the strong points of this project is its multidisciplinary approach that also involves digital humanities. In this perspective *PAThs* also takes advantage of the Laboratorio di Cartografia Storica of Sapienza University of Rome, coordinated by Julian Bogdani, which focuses on the elaboration of cartographic documentation on Egypt using GIS-based methodologies (Buzi *et al* 2017; Bogdani 2017, 59-69; Bogdani 2018, 200-210; Bogdani 2019).

It should be emphasized how in recent years several studies have utilised the comparison between historical and contemporary cartography to improve the understanding of landscapes of the past. Combining this methodology with the study of the literary sources and the analysis of the archaeological evidence, it is possible to attempt to reconstruct landscapes even of very ancient periods (Graves 2017; Toonen *et al* 2017; Hillier *et al* 2007; Relats Montserrat 2017). As a matter of fact, historical maps provide – in some cases more than written sources – geographic

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and topographical information that is of fundamental importance for understanding the geography of the past (Rumsey and Williams 2002, 1; Cajthaml 2011; Boutoura and Livieratos 2006; Grosso 2010; Timár, Mészáros and Molnár 2014). This is the general context of this paper, the purpose of which is to offer a new perspective for the analysis of the Egyptian landscape by georeferencing, via a GIS platform, the *Carte topographique de l'Égypte*, drawn by Pierre Jacotin during the Napoleonic campaign in Egypt, with the purpose of highlighting its value as a historical and archaeological source.

The Napoleonic cartography

The *Carte topographique de l'Égypte* is part of the most famous *Description de l'Égypte*, an important editorial effort that concludes the French exploration of Egypt during the first phase of the colonial conquest. The series provides a thorough scientific description of Egypt at the beginning of the 19th century and is the result of the research conducted by more than 160 *savants* that followed the military expedition led by Napoleon Bonaparte. The 22 volumes where published between 1809 and 1818 where followed by a cartographic atlas of Egypt and Syria.

The *Carte topographique de l'Égypte* – the cartographic atlas – includes a three-sheet plate that shows the whole of Egypt on a scale of 1:1,000,000 meters, and 47 plates covering Egypt and Syria in a scale of 1:100,000 meters. Pierre Jacotin was appointed director of the topographical data collection, and elaboration processes, as well as publisher of the cartography. He was supported in this task by the famous astronomer Nicolas-Antoine Nouet, whose contribution was fundamental for the publication of the atlas (Godlewska 1988, 15-18). The editing of the 47 plates took place in Paris, several years after the repatriation of the French troops. Jacotin and his superiors decided to compile the cartography using the same projection that was adopted for the *Carte de l'Académie* (a cartography of France), published in its entirety in 1815 the family of astronomers and cartographers of Italian origin Cassini, in particular by Jean-Dominique and his father César-François (Gallois 1909, 307). Nouet's contribution in this first phase was fundamental as he adapted Cassini's projection to the Egyptian area by developing a spheroid based on the calculation of astronomically-measured control points, surveyed whenever possible, during the campaign in Egypt. The astronomer chose the centre of the pyramid of Gizeh as the *fulcrum* of his projection, the intersection point of the first meridian and first parallel (Jacotin 1824, 492; Godlewska 1988, 45). However, despite his good will, Jacotin informs us that more than once, during the drafting of the plates, he had to face cases of discrepant information between the topographical surveys and the control points calculated by Nouet. In these cases, the director at times preferred to use only the astronomical control points, in others he preferred to use only the information from the topographic surveys and in others he chose to use other astro-

nomically-observed control points that were distant from the area he was designing (Godlewska 1988, 82).

What is evident in this brief introduction is that the *Carte topographique de l'Égypte*, even though it can be considered a pioneering work for the time in which it was conceived, is deeply affected by sometimes very severe on-field difficulties that the surveyors encountered, most of the time determined by the ongoing armed conflict. For these reasons, the topographical information it supplies deserves additional investigations before it can be used in any scientific work. Finally, emphasis should be placed on two contributions that have provided fundamental information for this study. At first, Pierre Jacotin himself supplies us with a complete description of the events and processes that led to the actual drafting of the *Carte topographique de l'Égypte* and provides us with a precious description of the topographic survey process and of the several difficulties encountered on the field (Jacotin 1824). Secondly, Anne Godlewska ha conducted and published in 1988 a thorough and detailed study of this endeavour based on the close exam of several manuscripts and completed with a precious cartometric analysis of the maps (Godlewska 1988). Her generous help and support was fundamental for the launch of this study.

Georeferencing of Napoleonic Cartography: comparing methodologies

The following paragraphs deal with the methodologies used for georeferencing the Napoleonic cartography with the specific aim of making it a useful tool for archaeological research and a valid source for the historical study of the Egyptian landscape. Modern cartography, both satellite images and cartography produced in the 20th century by different institutions, mostly for military purposes, have provided a fundamental tool for this study. A most precious source of information are the maps published in 1941 by the Great Britain War Office and U.S. Army Map Service, a cartography that uses the same metric scale as the Napoleonic one and covers the whole of Egypt (fig. 1). It was conceived before the construction

Fig. 1: To the left the entire coverage of the 4085-Great Britain War Office-U.S. Army Map Service-1941 overlayed on a satellite image (Esri satellite), on the right a detail of the Delta area of the same cartography.

of the Aswan dam, and thus represents an Egyptian landscape much more similar to the one described by the Napoleonic plates than the one represented in the cartography of the second half of the 20th century. This cartography has already been georeferenced and published online (Fig. 1) by the Laboratorio di Cartografia Storica at Sapienza and is freely available as a WMS service (Bogdani 2018-19).

The results of the two different georeferencing methodologies will be considered, using as examples two distinct plates, the Minîeï-Antinoë (plate XIV) and the Rosette-Lac Burlos (plate XL). As a side note, the toponym variants used to identify the plates in this paper closely follow the ones reported in the *Carte topographique*.

The plate XIV shows an area of Middle Egypt bordered on the north by the city of Minya and on the south by that of el-Ashmunein (the ancient Hermopolis). The area on the map, densely urbanized and including a stretch of the Nile about 50 kilometres long, clearly exemplifies some common issues of georeferencing areas located near bends of the Nile – areas that have been interested by changes in the river's course after the construction of the Aswan dam – and areas highly affected by urbanization. The plate XL describes an area of the Egyptian Delta located west of Alexandria, near Rosetta. It depicts a territory that has radically changed over the last few centuries. At the time the plate was drawn, there were only a few cities in the area, and the various branches of the Delta of the Nile were very evident. Nowadays the landscape has been profoundly modified by urbanization and land-reclamation programmes, which have led to a very dense net of irrigation canals. Both areas in different ways were thus subject to significant urban and geomorphological changes during the last century.

The first georeferencing method involves the visual identification of common ground control points (GPC) of known coordinates; the second one considers the manual correction of the scale of the plates, the rotation to follow the original north and then their shift to accurately chosen ground control points. Finally, it should be emphasized that even if this paper deals with only two plates, the entire georeferenced atlas is being published as a WMS service within the *PATHs* project.

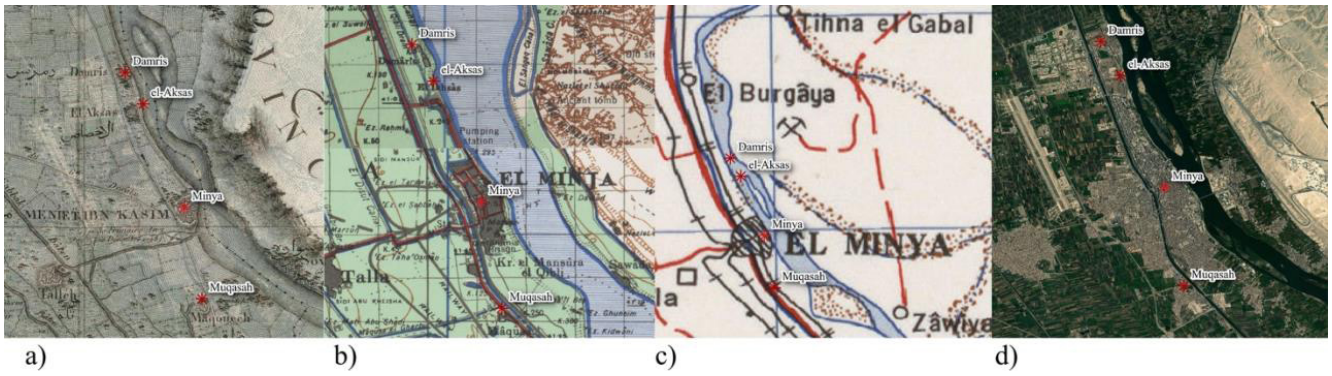
Georeferencing through visual identification of ground control points

The first attempt at georeferencing Napoleonic cartography is based on the visual observation of places – cities, villages or archaeological sites – available in plates XIV and XL, and currently identifiable on modern cartography and on freely available satellite imagery (Bing and Google satellite imagery are used as basemaps).

As already mentioned, the plates of the *Description de l'Égypte* were drafted on a scale of 1: 100,000 meters and therefore they do not provide punctual identifiable references to use as GPC. For this reason, we decided to carry out the georefe-

rencing by setting a scale of 1: 100,000 meters in the GIS project, the same used for the above-mentioned cartography. It should be considered that the decision to maintain a consistency of parameters during the georeferencing process between the GIS project and Jacotin's cartography was also influenced by the desire to preserve as much as possible the quality of information obtained from the *Description de l'Égypte.* At the same time, one must consider all factors – both anthropic and non-anthropic – that can potentially compromise the final result of the georeferencing operation, mainly related to the geomorphological changes of Egyptian landscape and its urbanization. In order to provide a practical example, the georeferencing through visual identification of ground control points has highlighted how, what were several villages in the Napoleonic cartography have now grown

Fig. 2: Examples of cartographic reproduction of the area surrounding the city of Minya: a) Carte topographique d'Égypte georeferenced and overlayed on a satellite image (Esri satellite), b) Great Britain War Office, U.S. Army Map Service 1941, c) Series 1404-Great Britain War Office and Air Ministry-1960, d) Esri Satellite.



and merged into a single city and there is no reliable way to use these centres as error-safe control points. The case of the city of Minya may be representative (fig. 2). This urban agglomeration over the centuries has swallowed up the villages of El Askàs and Damris, making it impossible to distinguish them within the present-day town using only satellite images.

Fig. 3: Location of the GCPs in both example plates

In order to georeference plates XIV and XL, the GCP were positioned in such a way as to uniformly cover the area represented on both maps (fig. 3). The result obtained from the transformation of plate XIV shows a remarkable correspondence between the historical cartography and the satellite image, with a gap of only 200-600 meters between places represented on them both. It must be noted, however, that this situation is not homogeneous, and in fact it radically changes in the south-west area of the map, between the village of Balansura and the end of the section defined by the Bahr Yussef. In this area a gap of about 2 kilometres between the places indicated in the satellite image and those in the georeferenced image is reported (fig. 4a). In an attempt to correct this transformation, additional GCP were placed in the area. The result obtained from this second pursuit showed important deformations in the map, a fact that allows us to hypothesize that most likely plate XIV itself had a series of inaccuracies probably due to calculation errors made during the drafting of the cartography (Godlewska 1988, 18-22).

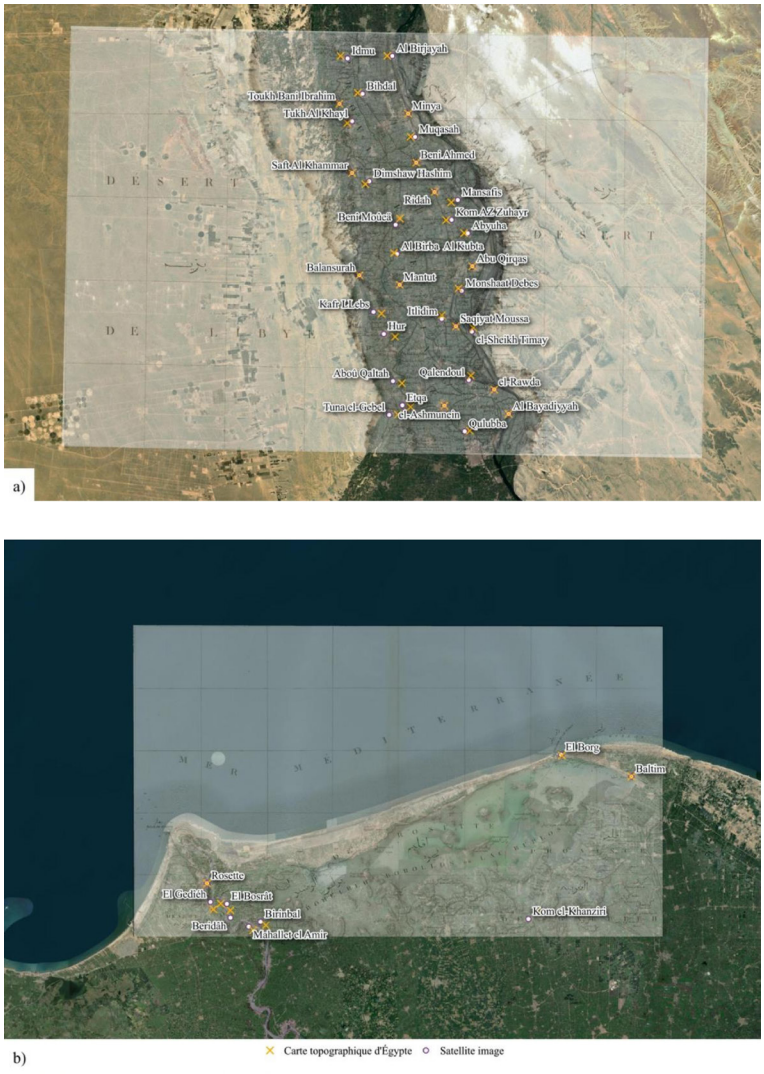


Fig. 4: a) The image shows the result of the georeferencing through visual recognition of control points of the XIV plate of the Carte topographique de l'Égypte overlayed on a satellite image (Esri satellite). It is evident that in the southern part of the map the margin of error increases significantly, especially near the Bahr Yussef. b) The image shows the result of the georeferencing through visual recognition of control points of the XL plate of the Carte topographique de l'Égypte overlayed on a satellite image (Esri satellite). Near the city of Rosetta, the margin of error between the cities is about 1.5 kilometers. In the Delta area, as the example of Kom el-Khanziri shows, the shift amounts to 3 kilometers.

Even though the GCP-based georeferencing process has produced satisfactory results for plate XIV, it was not as successful with plate XL. In fact, the landscape of the Egyptian Delta has undergone profound changes over the last centuries. One must consider that the georeferencing strategy adopted in this first phase is based exclusively on the comparison between historical and modern cartography, and for this reason any attempt at a geomorphological or toponymic comparison between the plates produced by Bonaparte's *savants* and modern satellite images is, ultimately, a very complex task.

Quite interesting is the result obtained from the georeferencing of plate XIV in relation to the area south of the vil-

lage of Balansura. The increase in topographical errors in this area, as suggested by the studies of Godlewska, seems to have originated in the drafting phase of the *Carte topographique de l'Égypte*. Considering that in recent years various studies on the Egyptian territory have been based on the comparison between historical cartography and satellite images, it is imperative to take into consideration these inaccuracies and discrepancies in order to avoid interpretative errors that could arise from the visual comparison of the images (fig. 4a). The case of plate XL is emblematic for reflecting on how this type of georeferencing, even though it may produce excellent results for some areas of Egypt – such as the area of Minîeï-Antinoë – it may nonetheless be ineffective for areas that have undergone changes of various nature over the last century or areas that were poorly surveyed by the French team. The georeferencing based on visual recognition of the control points of plate XL produced a deviation which reaches a maximum of 3 kilometres between the position of the cities in the georeferenced image and those in the satellite image area (fig. 4b). It should be noted that this gap might be reduced by increasing the amount of GCP, but the almost total discrepancy between the landscape of the Egyptian Delta of the 19th century and the present one makes the identification of equivalent points quite arduous, and leaves ground for a high degree of inaccuracy.

In conclusion, this first attempt must be considered not that effective for our purposes. A georeferencing operation of the *Carte topographique de l'Égypte* based on a visual comparison of control points can be misleading since it risks producing a high margin of error.

Manual georeferencing based on correcting the metric scale

The second approach is based on Anne Godlewska's studies, which pointed out a constant error in the linear unit of measurement, i.e. the meter used in the 19th century, and therefore also for the preparation of the *Carte topographique de l'Égypte.*

In fact, the coordinates assigned to each location in the published tables are correlated to their distance in kilometres from the pyramid of Gizeh, and since, as the scholar points out, the unit of measurement of the meter used at that time was still provisional, the positioning of these locations in the plates is altered. As a matter of fact, the studies of Anne Godlewska have calculated a deficit of 0.3 m every 100 meters, i.e. a loss of 0.3(3)% in linear measurements (Godlewska 1988, 44). On the basis of this information, considering that each plate covers an area of 80x50km, we should add 0.33% to each side and obtain a rectangle of 80264 x 50165 meters covering the represented area of each plate. The raster image was manually scaled to fit this rectangle by using the "Freehand raster georeferencer" plugin for QGIS (available at https://plugins.qgis.org/plugins/FreehandRasterGeoreferencer/), correcting thus the linear error caused by the non-standard metric unit. Furthermore,

this plugin allows us to easily improve the manual georeferencing through the insertion of two ground control points. It was chosen to use for each plate (and when available) the astronomically measured points calculated by Nouet, a list of which was edited by Jacotin (Jacotin 1824, 492). In theory, these point should be more reliable than other kinds of on-field measurements and less prone to error due to haste or difficult field conditions.

Fig. 5: a) The image shows how there is greater correspondence between the satellite image (Esri satellite) and the georeferenced maps in plate XIV using manual georeferencing based on metric scale correction. The shift between the satellite image and the historical cartography south of the village of Balansura along the course of the Bahr Yussef remains evident. b) The image shows how there is greater correspondence between the satellite image (Esri satellite) and the georeferenced maps in plate XL using manual georeferencing based on metric scale correction. The shift between the satellite image and the historical cartography decreases with this method also for the Delta area as demonstrated by the case of Kom el-Khanziri.

The astronomically measured control points of plate XIV were Antinoopolis and Minya. It is the same P. Jacotin who informs us that the calculations of Antinoopolis were wrong, so it was decided to use the location of el-Ashmunein, ancient Hermopolis, as a second control point (Jacotin 1824, 492, 520). For Plate XL the astronomically measured points used by P. Jacotin are the great Pyramid at Gizeh and the city of Rosette. Since the Great Pyramid lays outside the extent of the map, a second ground control point at el-Borg was used (Jacotin 1824, 492, 587-589).

The results obtained for plate XIV do not differ much from the data obtained in the first approach, but the obtained map is not distorted. As a matter of fact, in the upper half of the map the places visible in the satellite image and in the georeferenced image seem to line up well (fig. 5a). In any case, the before mentioned error located south of the village of Balansura is still persistent. It would seem reasonable, therefore, to definitively assume that this error is due to an inaccuracy in the calculations used to compile the plate during the editing phase (Godlewska 1988, 82; Jacotin 1824, 33). Furthermore, the result obtained for plate XL is interesting, since manual georeferencing allowed us to rotate and position the plate, adapting it

to the few places on it still visible in modern cartography with a very low margin of error (fig. 5b).

In conclusion, the freedom of action guaranteed by manual georeferencing combined with the correct scale setting of the image has allowed us to avoid deformations in the plates, and consequently allows us to observe Napoleonic cartography for what it is: a historical document that carries the errors of its time. The placement of only two control points is also relevant to the result, unlike the GCP georeferencing method, where many control points must be involved to ensure an efficient result. Well-measured points can be selected, and many attempts can be performed to find un-problematic areas of the map to use; on the contrary the first method incurs in the constant risk of placing at the same level of certainty accurately measured points with poorly measured ones or with clearly wrong points without having the possibility to tell one apart from the other. The second method is therefore a much more transparent and reliable one.

	Pros	*Cons*
GCP	- It is a simple procedure. - It does not require a profound knowledge of the original map or coordinate transformations.	- It is not able to highlight inaccuracies of the original maps. - It may give rise to misinterpretation due to the fact that these are not highlighted. - The map could be distorted.
Metric Scale Correction	- Provides metric scale accuracy. - It keeps the original proportions of the map. - The "freehand georeferencer" plug-in allows for the improvement of the georeference of the image by assigning two control points. - Promptly highlights cartographic errors attributable to the drafting phase of the map allowing a more objective view of the landscape to be obtained.	- It is a manual process that might introduce uncontrollable errors in the final result. - It does not correct the cartographic errors attributable to the editorial phase of the cartography showing sometimes not much correspondence between the satellite image and the georeferred one.

Tab. 1: A comparative summary of the two georeferencing approaches.

The use of the *Carte topographique de l'Égypte* as a source for archaeological research: the case study of the island of *iw-rd*

As already stressed, the Egyptian landscape has changed deeply over the millennia. The recent event that absolutely caused the greatest geomorphological changes

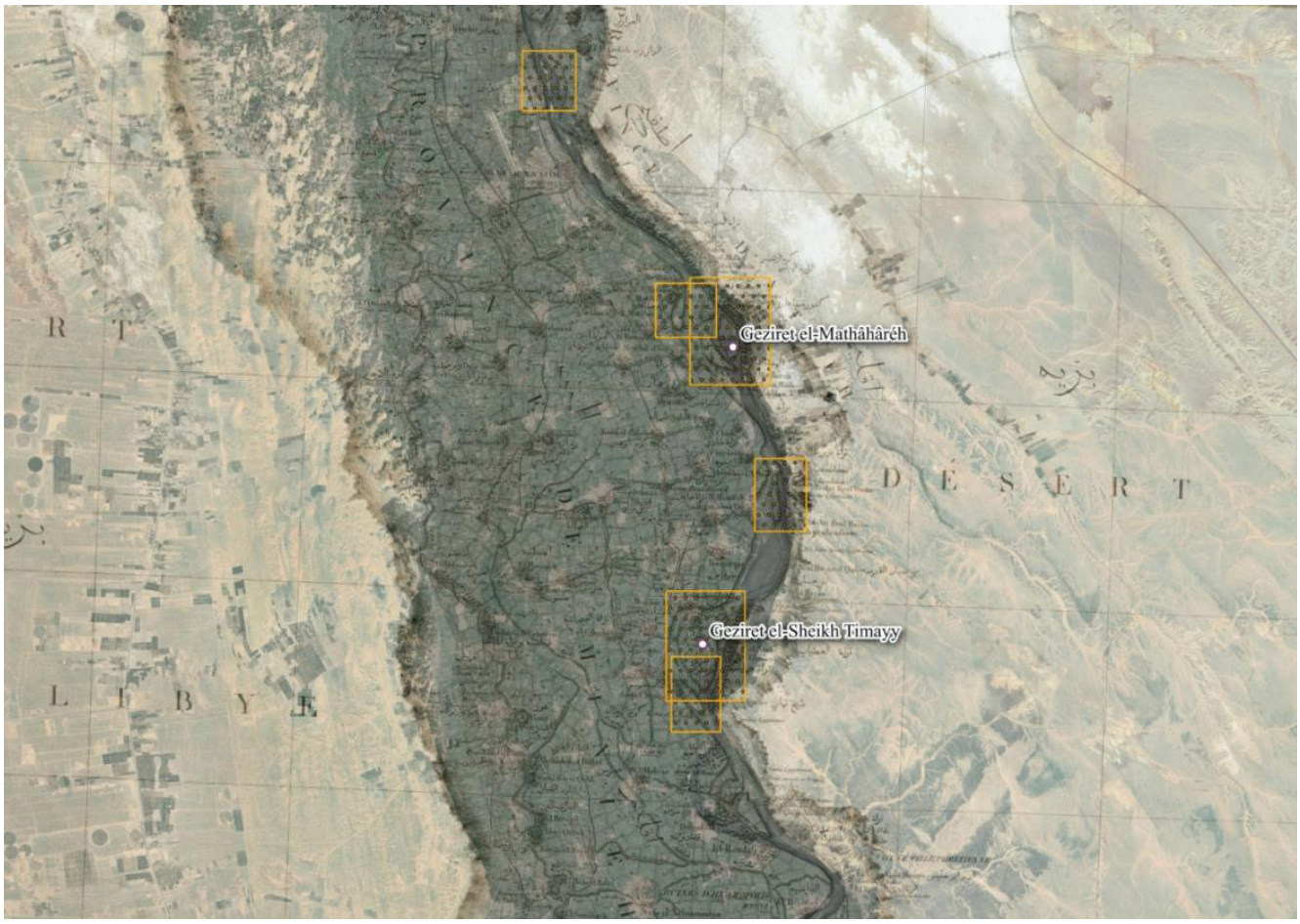


Fig. 6: Islands represented in the area of pertinence of the 16th nomos of Upper Egypt by the Carte topographique d'Égypte overlaid on the satellite image (Esri satellite).

was the construction of the great Aswan dam in the second half of the 20th century and the consequent land-reclamation programmes.

Considering how this engineering work radically changed the course of the Nile river and its many branches, the *Carte topographique de l'Égypte* is a particularly valuable document for the reconstruction of the ancient Egyptian landscape, especially when it is combined with literary sources and archaeological evidence. The case of the island of  *iw-rd* (Montet 1961, 161; Gautier 1925, 30, 47), according to the sources located in the 16th *nomos* of Upper Egypt, will be advanced as a highly representative one (Montet 1961, 158). This practical case allows us to concretely observe geomorphological phenomena that over the centuries have affected all islands positioned along the course of the Nile as a result of changes in the territory (Graves 2017, 310-311; Graham 2010; Burn 2014), and how carefully georeferenced historical cartography can be of assistance to this type of research.

According to the sources, the island of *iw-rd* in ancient times was in the 16th *nomos* of Upper Egypt, known during the Pharaonic period as  *mȝ-ḥḏ* (Montet 1961, 161). It was located on the western shore of the Nile, north of the 15th *nomos*,  *wnw*, and south of the 17th,  *inpw* (Baines and Málek 1980, 14). The analysis of

Fig. 7: In the image it is possible to observe the area of the island of Geziret el-Sheick Timay represented in the Napoleonic cartography overlaid on the satellite image (Esri satellite).

archaeological and philological sources has allowed us to establish that this area now corresponds to a vast portion of territory around today's Minya governorate, whose northern border is generally located south of Tihna el-Gebel (ancient Akoris), Fraser Tombs and El Hibeh, while the southern one is around el-Ashmunein (ancient Hermopolis), Tuna el-Gebel, Sheikh 'Ibada (ancient Antinoopolis), Deir Abu Hinnis and Deir el-Bersha (Graves 2017, 53-56). The borders of the *nomos* changed over time in relation to Egypt's political-administrative events, but a detailed review is far beyond the scope of this paper.

The toponym *iw-rd* is attested in the Pharaonic era, from the Old Kingdom to the Late Period, occasionally in association with the *nomos* of *mȝ-ḥḏ* (Montet 1961, 161; Gautier 1925, 30, 47). Our sources also inform us that the island in the Middle Kingdom was linked to the cult of Khnum, called "Lord of *iw-rd*", whereas in the New Kingdom the toponym is associated in various attestations to Amon "Lord of *iw-rd*" (Montet 1961, 158.). Georges Daressy in a publication of the early years of 1900 (cit. in Graves 2017, 203, n. 31) identified the possible location of *iw-rd* with the village of Beni Hasan el-Shuruq (fig. 7), whereas in 1961 Pierre Montet suggested that the island could correspond to one of the islands located south of Minya along the course of the Nile (Montet 1961, 161). Considering the area within the

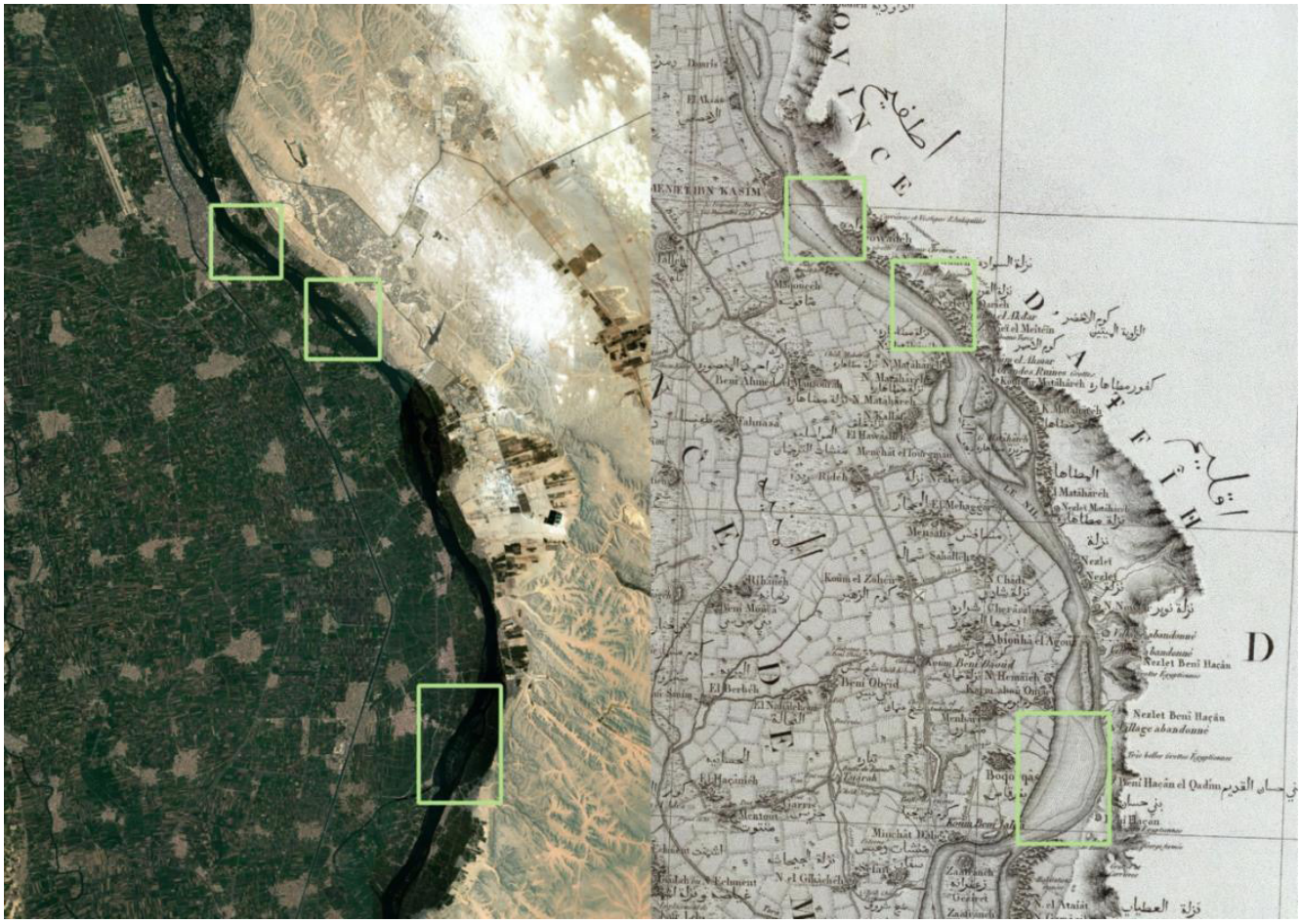


Fig.8: The image shows the islands present in the Esri satellite image (left), but which do not appear in the Carte topographique d'Égypte (right).

borders of this *nomos* and consulting the available cartography, the only islands of considerable size that can be taken into consideration are today's Geziret el-Sheick Timay (indicated in plate XIV as Geziret Zaafrâneh) and the one that is indicated in the *Carte topographique de l'Égypte* as Geziret Mathâhâréh. Furthermore, also the smaller and unnamed islands that are represented in the *Carte* can be taken into account (fig. 6). In this case, georeferenced historical cartography – particularly plate XIV – is very useful for concretely observing geomorphological changes in this territory. It should be noted, however, that during the georeferencing process described in paragraph § 4 it was noticed that this area in the plate contains serious inaccuracies that can be traced back to the editing phase of the cartography. Therefore, it is necessary to pay even more attention when comparing satellite images and the above-mentioned cartography.

Over the past two centuries, the island of Geziret el-Sheick Timay, positioned near the southern boundary of the 16th *nomos,* shifted westward, almost completely annexed to the mainland. The Napoleonic map features an inhabited centre, the village of Zaafrâneh, now located south of Monshat Dabes and no longer distinguishable in the satellite images from this village (see fig. 7 and fig. 9a).

The island of Geziret el-Mathâhâréh, which appears in the Napoleonic map as a set of smaller islands, may have separated before the Napoleonic cartography was drafted. This island, as shown by the Great Britain War Office-U.S. Army Map Service 1941 and the satellite images, has partly shifted towards the eastern bank of the Nile by the change in river flow, while the other part has sunk into the river. However, in the Napoleonic and in the 20th century cartography, there is no trace of villages within this area (fig. 9d).

Regarding the unnamed islands represented in the *Carte topographique de l'Égypte*, the first one is south of Geziret el-Sheick Timay, the second one is north of this village and south of the village of Nuwayr, the third is west of the island of Geziret el-Mathâhâréh, and the fourth is north of Minya and east of the village of Damris. It should be noted that satellite images show three other unnamed islands of which, however, there is no sign in the Napoleonic cartography, proving that most likely they are of recent formation (fig. 8). The first of these "anonymous" islands in satellite images is almost indistinguishable from the nearby Geziret el-Sheick Timay. Both islands have shifted towards the western bank of the Nile (fig. 9a). The second island, even though it appears in the Napoleonic cartography, is no longer visible in the modern one (fig. 9c). The third island, positioned close to the village of Nazlet el-Awam, according to the comparison between maps, appears to have shifted towards the eastern bank of the Nile, and in satellite images it is indistinguishable from the mainland (fig. 9e). Finally, the fourth island in the *Carte topographique de l'Égypte* is not represented in the 4085-Great Britain War Office-U.S. Army Map Service – 1941. In the same spot, the satellite images now show a much larger island than the one in the Napoleonic cartography. Once again, this appears to be a later formation than the island drawn in the aforementioned cartography (fig.9f).

As a result of these comparisons, it is now possible to narrow down the search for the island of *iw-rd* to the following areas: the entire area of today's Geziret el-Sheick Timay; the area south of Nuwayr; the area north of the village of Matahrah el-Sharquiyya; the area south of the village of Nazlet el-Awam; the area near Damris. In particular, the island of Geziret el-Sheick Timay appears from the Napoleonic cartography to be of considerable size (an area of about 5 square kilometres) and also it is located in a strategic position between two narrows of the bends of the Nile. This is, in my opinion, an element in favour of the fact that it could have been chosen as a place to settle. In addition, the fact that on the island there was an inhabited centre, although modern, is not to be ignored. In the Napoleonic cartography, the island is identified as Geziret Zaafrânéh, which in Arabic means the "Island of Saffron Flower" (Graves 2017, 145 n. 36). It is interesting to emphasise that the Egyptian toponym *iw-rd* can be translated as "Island of Plant(s)", which suggests a possible semantic connection between the two toponyms. In this area there are several *tells*, one of which is located in the village of Zaafrânéh (Graves

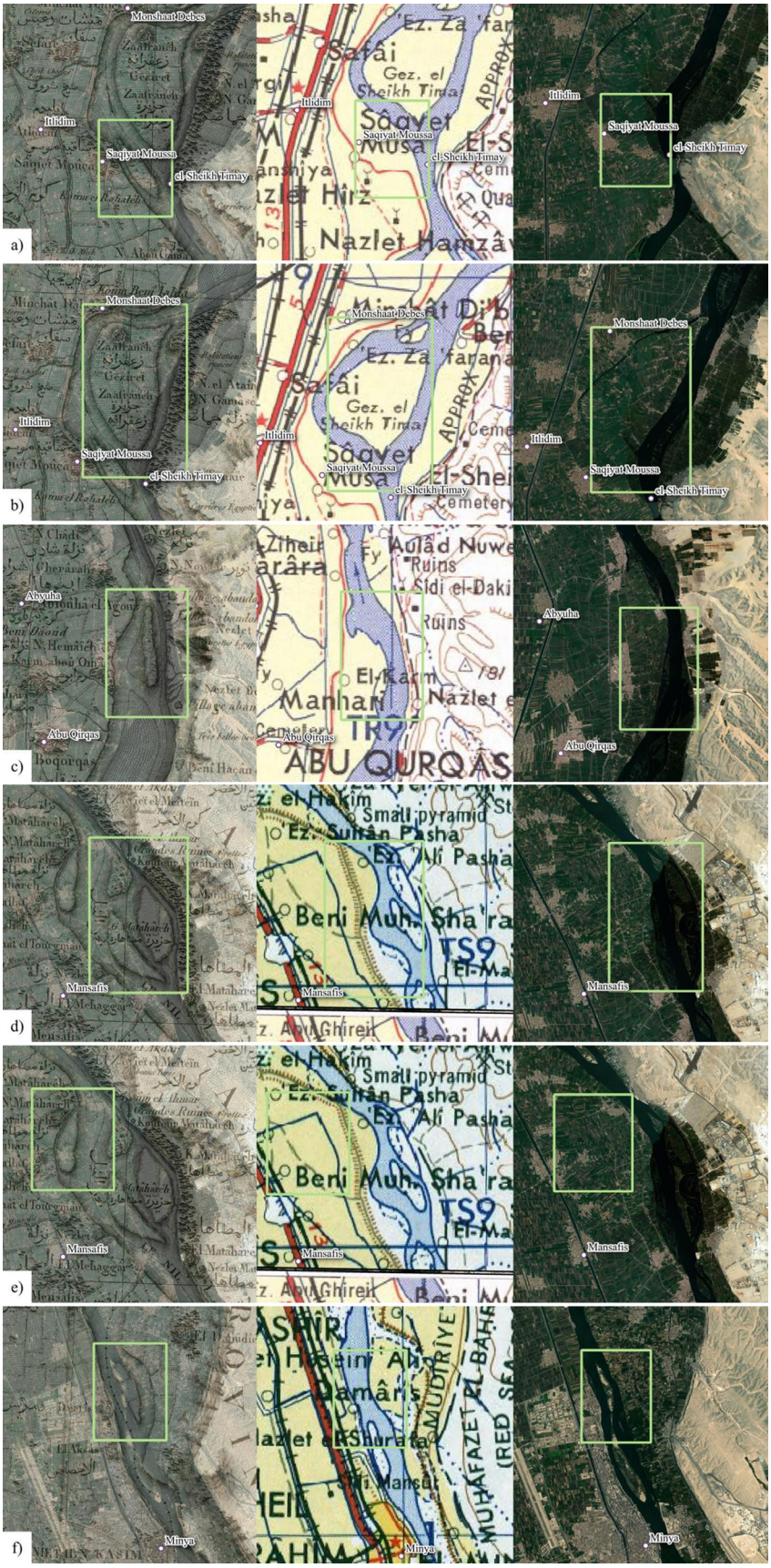


Fig. 9: Diachronic evolution of the geomorphology of the islands located in the 16th nomos of Upper Egypt. The maps shown are from the left: Carte topographique georeferenced and overlayed on a satellite image (Esri Satellite), 4085-Great Britain War Office-U.S. Army Map Service-1941 and Esri Satellite. a) Island located south of Gerizet el-Sheick Timai; b) Island of Gerizet el-Sheick Timay; c) Island located south of the village of Nuwayr; d) Island of Geziret el-Mathâhâréh; e) Island located north of Geziret el-Mathâhâréh; f) Island located north of Minya to the east of the village of Damris.

2017, 208), now part of the mainland, south of the village of Monshat Debes. Therefore, one can suppose that, among the various islands present in the territory of *mȝ-ḥḏ*, the island of Geziret el-Sheick Timay could correspond to what in the Pharaonic era was the ancient *iw-rd* (fig. 7).

In conclusion, the attentive use of historical cartography can partially fill the lack of information that typifies the historical sources. Furthermore, the area under examination has been neglected for a long time by the archaeological investigation, except for a few notable cases such as the capital of the *nomos*, Zawiet Sultan, and the well-known necropolis of Beni Hasan. Although the island of *iw-rd* is not widely mentioned in the written documentation, its identification in the same way as that of other smaller villages in the Egyptian territory could reveal some interesting aspects of Egyptian culture. In the absence of visible archaeological evidence suggesting the location of these centres, there is a need to be able to compare recent topographical sources with the most ancient ones. In the perspective of the most modern research conducted through the use of powerful GIS platforms, the possibility of using a georeferenced version of Napoleonic cartography turns out to be very helpful. The different approaches discussed in this paper for the georeferencing of the *Carte topographique* also make it very clear how different technical solutions can lead to sometimes rather divergent results. Unproblematic solutions do not exist, but a deep awareness of the related issues can certainly help the scholar in interpreting the data.

The complex case of the island of *iw-rd* has revealed that modern satellite images alone are scarcely helpful, while the comparison of different sources — the *Carte topographique de l'Égypte* being one of the most important — in a GIS-based environment might significantly increase the value of the underlying data.

Ultimately, it should be emphasised that the observation and study of georeferenced historical cartography represents a good starting point for identifying places of the past that are no longer accurately identifiable. However, as in the case here presented, field investigation is necessary in verifying the accuracy of the hypothesis formulated when applying this methodology.

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