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An Archaeological Survey North of the 6th Cataract: GIS study of Sabaloka East

1. Introduction

In assessing the development of archaeology in the last decades, the growing importance of the interplay between archaeological and other disciplines such as geology, geography, chemistry, amongst others, becomes apparent. Many of these are now elements of the permanent scientific toolkit of archaeology. During the last 10 years, many techniques such as satellite imagery evaluation and remote sensing, ground-penetrating radar and geophysical prospection, GIS and laser scanning were developed and used for archaeological site discoveries, explorations, and documentation.

In this study, GIS and remote sensing are used to explore an area located 100 km to the north of Khartoum in the Hajer El-Asal area on the east bank of the Nile (Fig. 1). The study aims at shedding more light on this region and its archaeological history. The survey, which was part of the author's MA-thesis successfully defended at Al-Neelain University, Khartoum, in 2017, focused on an area of 36 km^2 between the villages of El-Miseiktab and El-Amada along the east bank of the Nile. To record the archaeological sites, a specific recording form was used in accordance with the aims and purposes of the original MA-thesis which forms the basis of this paper.

2. Methodology

To gain a better understanding of the archaeology of the 6th Cataract region, an archaeological survey of the area was carried out between the villages of El-Miseiktab and El-Amada Village in parallel with building a GIS database. In addition, the history of research in the region was discussed. This was and is helpful to assess the role of the area in Sudanese prehistory. In order to select and explore an area within the concession of the Department of Archaeology and Tourism, Al-Neelain University, Khartoum, satellite imagery and Google Earth data were studied to detect a potential region for ground survey. Once the said area was chosen, the on-site documentation included mapping with GPS and a short description for each site as well as a detailed record in the survey form (Fig. 2).[1]

The Global Position System (GPS) is a means of precisely determining the location of a given point on earth in coordinates with the help of satellites that orbit the earth.[2] As one of the most important systems for locating points on earth, GPS was first only used by the US Ministry of Defence after its commissioning in 1978. After 1996, it became available for everyone and was used for different purposes such as navigating, surveying and measuring and many others.[3] There is, however, still an accuracy issue with a global average user range error of ≤ 7,80 m,[4] which can only be limited by using a differential GPS device.

A Geographic Information System (GIS) is a computer-based program for recording, mapping, analysing and displaying spatial data.[5] With the technology to integrate common database operations, statistical analyses and geographic operations can be offered. The database is also capable of storing a broad range of information about archaeological sites.[6]

After their discovery and description and the integration of the data into the GIS, all the sites in the study area were examined using a spatial suitability algorithm[7] to understand why those sites are located

1 Cf. on general survey methodology also King 1978, 17–26.

2 Upadhyay et al. 2014. The basic idea of GPS concerning positioning is that if the distances from a point on the earth (GPS receiver) to three GPS satellites are known along with the satellite location, then the location of the point can be determined. For further information see also El-Rabbany 2002.

3 Lachow 1995, 126–148.

4 See https://www.gps.gov/systems/gps/performance/accuracy/ (last accessed 25 June 2018).

5 Huisman 2009, 32.

6 Hritz 2014, 229–279.

7 'Spatial suitability' is one of the most important applications carried out by GIS. It depends on the analysis of spatial data for each location, for example proximity to and distance from natural phenomena such as rivers, mountains and valleys. The result is a calculation based on raster data with colour gradients that indicate the suitability of each specific zone. For further information see Malczewski 2004, 4–9.

there and not elsewhere. Such a GIS analysis depends on three conditions regarding the best location for both settlements or cemeteries: the distance from the (present) course of the Nile,[8] the distance from the mountains, and the distance from the wadis.

3. The Study Area

The study area is located between these four vertices given in WGS 1984 UTM format:

Point 1: N 1820225 E 480523
Point 2: N 1818908 E 482341
Point 3: N 1811825 E 475916
Point 4: N 1814270 E 474380

The study area lies on the east bank of the Nile, ca. 100 km north of Khartoum, close to the inlier complex of Jebel Sabaloka between the modern villages of El-Miseiktab in the south and El-Amada in the north, with the railway line and the main channel of the Nile roughly demarcating the western and eastern borders respectively (see Fig. 1).

4. Geography and Topography

The geographical nature of the 6th Cataract region contains basement rock formations consisting of Granite, Rhyolite, Schist and Quartz. Most of these rock types were formed during the Palaeozoic-Mesozoic age.[9] This rocky nature dominates the entire area around the Nile Cataract.[10] The most important natural features in the area between Gerri in the south up to Hajer Al-Asal in the north are the valleys coming from the Butana in the east and the Sabaloka complex as well as the river Nile, that limits the study area in the west.

The rocky nature and the valleys draining the Butana from east to west have played an important role in attracting animals and humans during the Late Holocene period. The valleys should be considered as non-permanent sources of water, but they stood in an important relationship with prehistoric sites. They offered suitable places for humans to build settlements nearby. The mountains and the Nile in the west acted as natural protection and provided good environments for hunting and gathering.

The extended modern islands in the flood plain represent an important part of the life of the people of the region working on their farms. Many vegetables such as onions, tomatoes and potatoes are cultivated, and fruits such as banana, grapefruit, orange, mango and guava are seasonally harvested and send to the markets in Khartoum and elsewhere. The most prominent examples of these islands are El-Abdalab and Marnat.

5. History of Fieldwork

The area of the 6th Cataract, generally also known under the term Sabaloka, is located within the administrative boundaries of the River Nile state north of Khartoum. It is one of the most important areas of historical heritage in Sudan. Its geographical location linking central and northern Sudan particularly characterises the area and turns it into an interface between regions and cultures that originated in northern Sudan and spread to the south since Prehistoric times down to the Islamic period and vice versa.[11]

Several archaeological projects were carried out in the region in the past, including a quick survey of the Butana by Fritz Hinze in 1958 and the works of the French Unit in 1978–79, led by Francis Geus, that resulted in the recording of nine archaeological sites between Gerri and Hajer Al-Asal, including settlement sites dating to the Neolithic period.[12]

In 2009, the Institute of Archaeology, Charles University Prague, and the Institute of Geology, Czech Academy of Sciences, undertook an archaeological survey around Jebel Rauwiyan at the southern end of Sabaloka, that aimed at uncovering settlement patterns as well as at understanding the geological nature of the region.[13] The study resulted in the registration of 30 new archaeological sites, including the discovery of an important Mesolithic occupation site.[14] Some of those archaeological sites were revisited within the salvage survey of NCAM in the flooding area of the proposed dam of Sabaloka.[15]

In 2009, the area between the Sabaloka ring complex in the south up to El-Wadi El-Saeed village in the north became the concession of the Department of Archaeology, Al-Neelain University, Khartoum.

8 The current location of the Nile is used in the GIS analysis only for easy digitisation. In fact, this is not the course of the Nile in the periods of existence of the archaeological sites mentioned and used in the analysis. The location of the sites and their distance from the modern Nile may be used as proxies for reconstructing the course of the Nile in the past.
9 Almond and Ahmed 1993, 6–17.
10 Whiteman 1971, 1–40.
11 Arkell 1949.
12 Geus 1984.
13 Sukova 2011; Varadzinova Sukova and Varadzin 2017.
14 Varadzin, Varadzinová and Pacina 2017.
15 Ali Mohmmed, Bakhiet and Salih 2014.

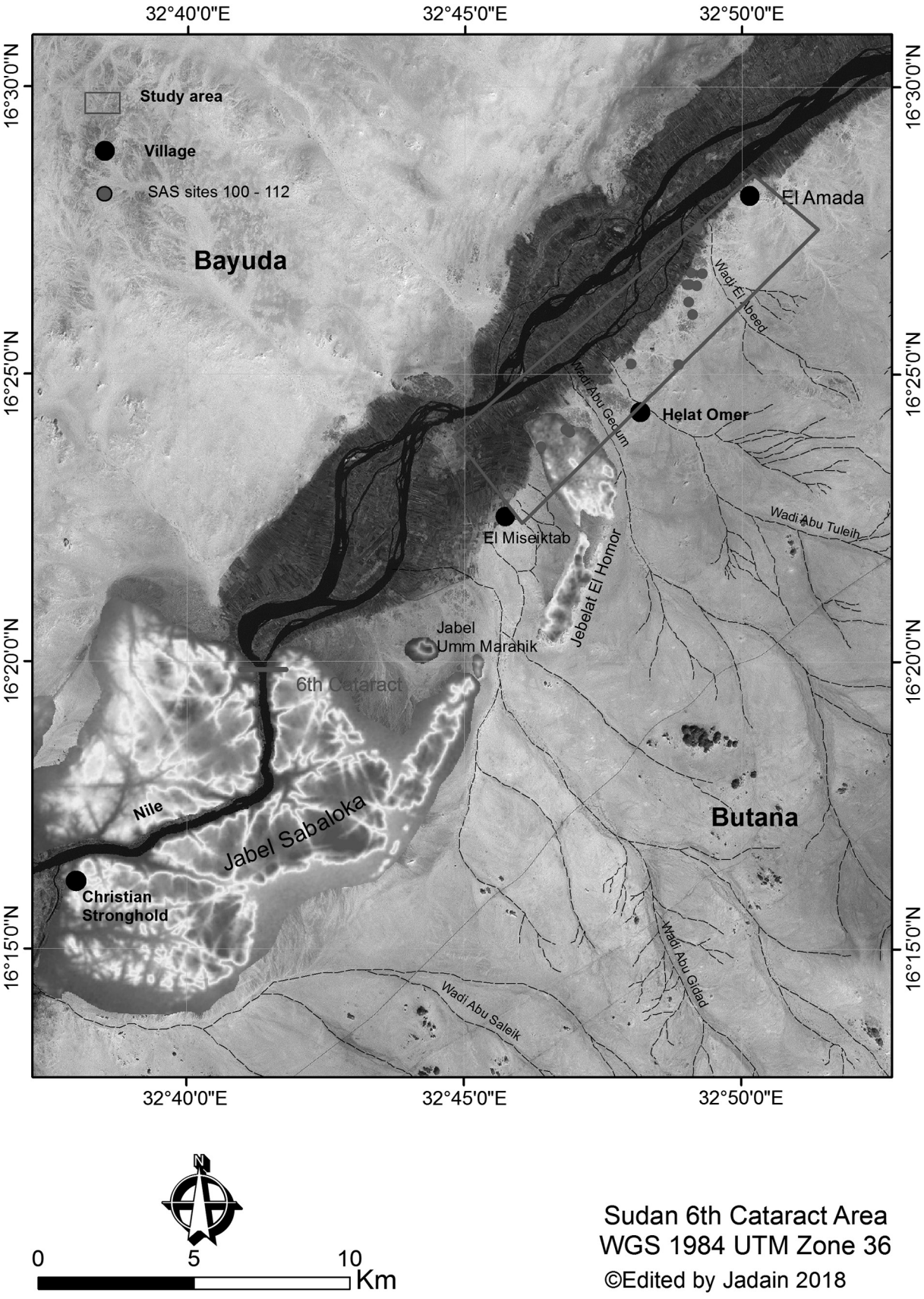
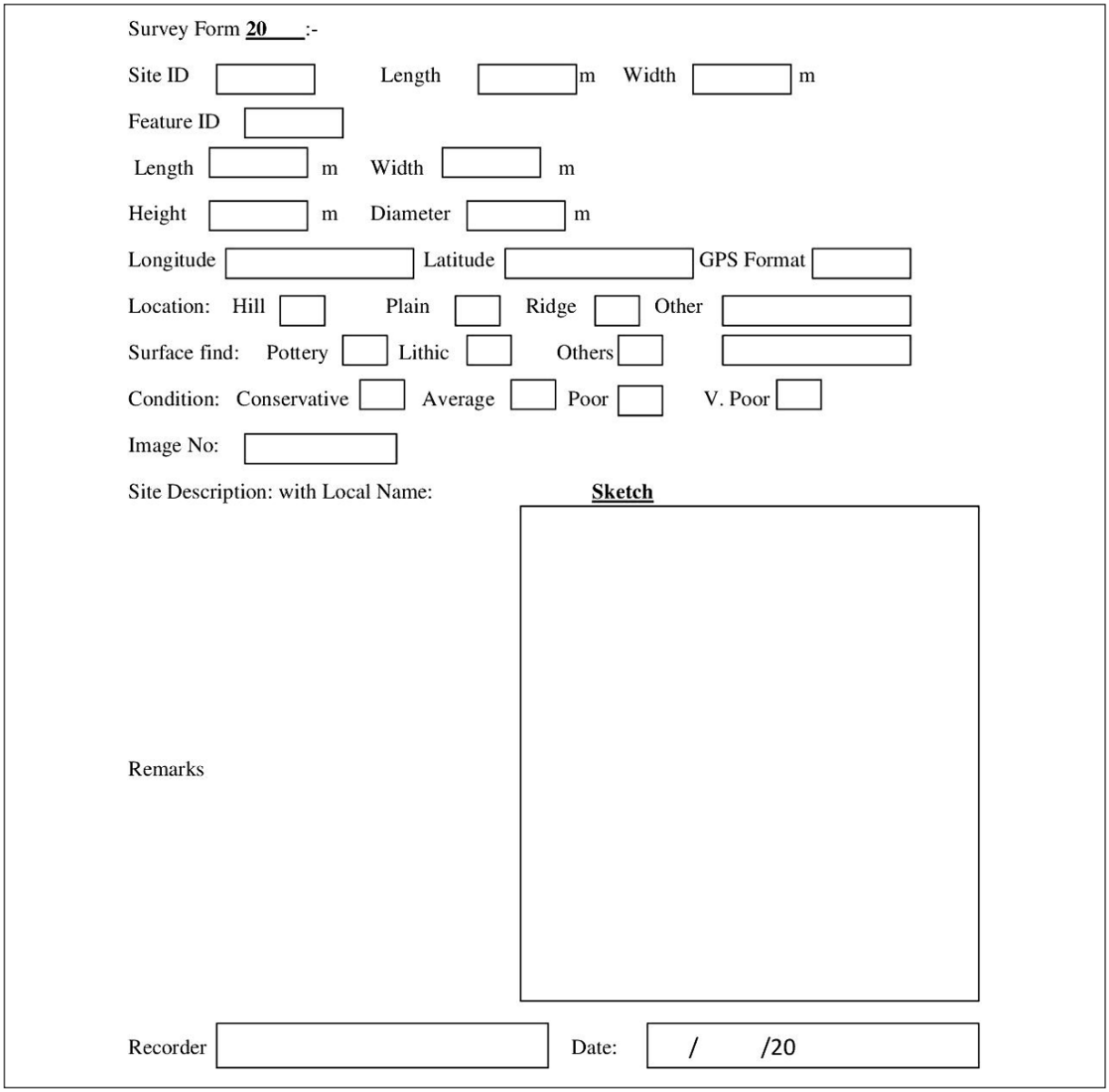


Fig. 1: Map of the study area (Author: Modather Jadain).


Survey Form 20 :-

Site ID Length m Width m

Feature ID

Length m Width m

Height m Diameter m

Longitude Latitude GPS Format

Location: Hill Plain Ridge Other

Surface find: Pottery Lithic Others

Condition: Conservative Average Poor V. Poor

Image No:

Site Description: with Local Name: Sketch

Remarks

Recorder Date: / /20

Fig. 2: The survey form.

The first season of archaeological fieldwork was carried out in 2013.[16] Some additional fieldwork was undertaken in the area, such as the archaeological survey between Hajer Al-Asal and Geili on the east bank of the Nile, conducted by the MA student Amjad Bashir Ali in 2013.[17] His work provides us with information about 27 further archaeological sites, including cemeteries and settlements.

6. Fieldwork

The fieldwork carried out by the author in 2016 aimed at exploring the archaeological sites in the area to gain a better understanding of the history of the area, and at testing the ability of GIS for field archaeology. To do so, a database for the archaeological sites in the area was created. Such a database could also be useful for comparative or any future studies on the area and it can serve many purposes in archaeological studies.

The survey covered an area of about 12 km in length and 3 km in width. The area was divided into three sectors. During the survey, all areas not occupied by modern inhabitants were covered.

To record the archaeological sites and to gather data for the database, the on-site recording was done with a specific survey form (see Fig. 2). The database, later filled with this data, contains information such as the Site ID, Local Name, GPS Location, Number of Features, Proposed Period and Description.

16 Nassr 2017.
17 Bashir Ali 2013.

6.1 Results of the archaeological survey

The survey allowed the recording of 13 new archaeological sites distributed between the wadis Abu Gidad and Abu Tulaih. Based on the structures or the material culture present, they can be dated to the Neolithic, Post-Meroitic and Islamic periods. Here follows a short description of each site arranged according to their site ID.

SAS_100

The site is situated on a small hill, that rises to a maximum of about 5 m above the surrounding area, close to El-Kandareya village. The site itself consists of six tumulus graves, with diameters of ca. 3–4 m and 0.5–1 m maximum height. The superstructures are made of medium-sized volcanic stones (Fig. 3).

SAS_101

This site is a large cemetery situated close to El-Zaragna village. There are two distinct types of burial structures: Islamic and mound graves. The mound graves have different shapes and sizes, their superstructures are made from stone mixed with gravel and sandy soil in the middle of the superstructure. Their diameters range between 3–4 m with a height of 0.5–1 m (Fig. 4). The cemetery was in use until quite recent times.

SAS_102

This site is situated about 1 km north of SAS_101. It contains several circular mound graves with diameters between 3–4 m, whose superstructures are made from the sandy soil in the surrounding covered with stones (Fig. 5).

SAS_103

This site is a small cemetery close to El-Zaragna village. It consists of mound graves with superstructures made of stone, whose diameter is around 4 m with a height of max. 1 m (Fig. 6).

SAS_104

This site is located on the plain next to Jebel Hajer Addaba. It is a cemetery consisting of large mound graves, whose diameters are more than 10 m with heights of 1 m. The superstructures are made from stone with a sand fill in the middle (Fig. 7).

SAS_105

This site consists of five small burial structures with diameters between 1–2 m, whose superstructures are made from medium-sized stones (Fig. 8).

SAS_106

This site, located on a small rocky plateau close to the Jebel Hajer El-Meleik, is a circular stone building with a diameter of 4 m. The highest part of the stone wall rises to 1.5 m (Fig. 9). The local people have considered it as the burial structure of a sheikh.

SAS_107

This site is situated to the south of the Jebel Hajer El-Meleik. It features several potential grinding spots on a black rock outcrop with a few pottery sherds scattered on the surface. The sherds were not collected (Fig. 10).

SAS_108

This site, located close to Hajer El-Asal village at the foot of the Jebel Hajer El-Asal, has the dimension of 700x50 m. Some pottery sherds and lithics have been collected from the surface (Fig. 11). There are also some human activity remains indicated by wavy line potsherds. A part of the site was destroyed by recent gold mining activities.

SAS_109

This site, situated on a rocky hill called Jebel Hommeid, contains about 23 mound graves in different sizes and shapes, with a minimum diameter of 5–7 m and a maximum diameter of 8–12 m; the height ranges between 0.5–1.2 m (Fig. 12) The graves of the site are very close to recent settlement, nevertheless, they are still preserved.

SAS_110

This site is located close to El-Maslha village on a rocky plateau not far from the river. It consists of 34 graves with diameters between 4.5–10 m, that rise to a height of 0.5–1.5 m. The superstructures were made from big black stones. Most of the graves are still in a good condition and well preserved (Fig. 13). Quite recently, however, three burials were clearly unearthed.

SAS_111

This site is a group of 32 mound grave structures, located to the west of SAS_110. Both sites are separated by a small modern road. The general preservation of the graves is quite good, except from two burials that were unearthed recently. In general, the diameters of the 1–1.5 m high tomb structures are between 5–10 m (Fig. 14) There are six larger graves that have the same general shape of their superstructure.

Fig. 3: Site SAS_100 (Foto: Abdalla El Noor 2016).

Fig. 4: Site SAS_101 (Foto: Abdalla El Noor 2016).

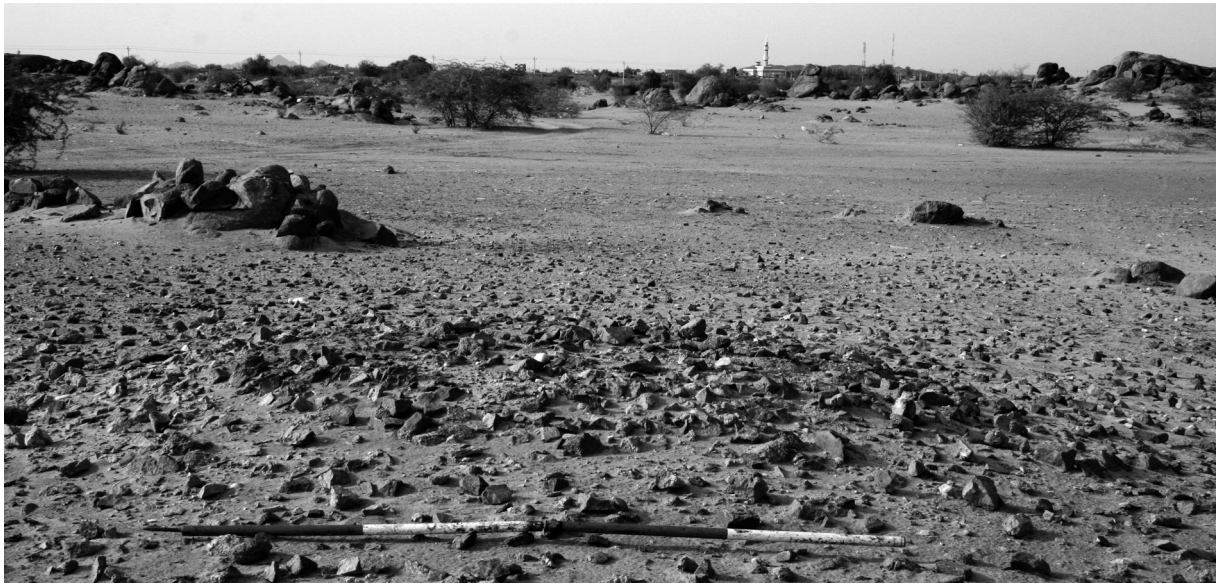


Fig. 5: Site SAS_102 (Foto: Abdalla El Noor 2016).

Fig. 6: Site SAS_103 (Foto: Abdalla El Noor 2016).

Fig. 7: Site SAS_104 (Foto: Abdalla El Noor 2016).

Fig. 8: Site SAS_105 (Foto: Abdalla El Noor 2016).

Fig. 9: SAS_106 (Foto: Abdalla El Noor 2016).

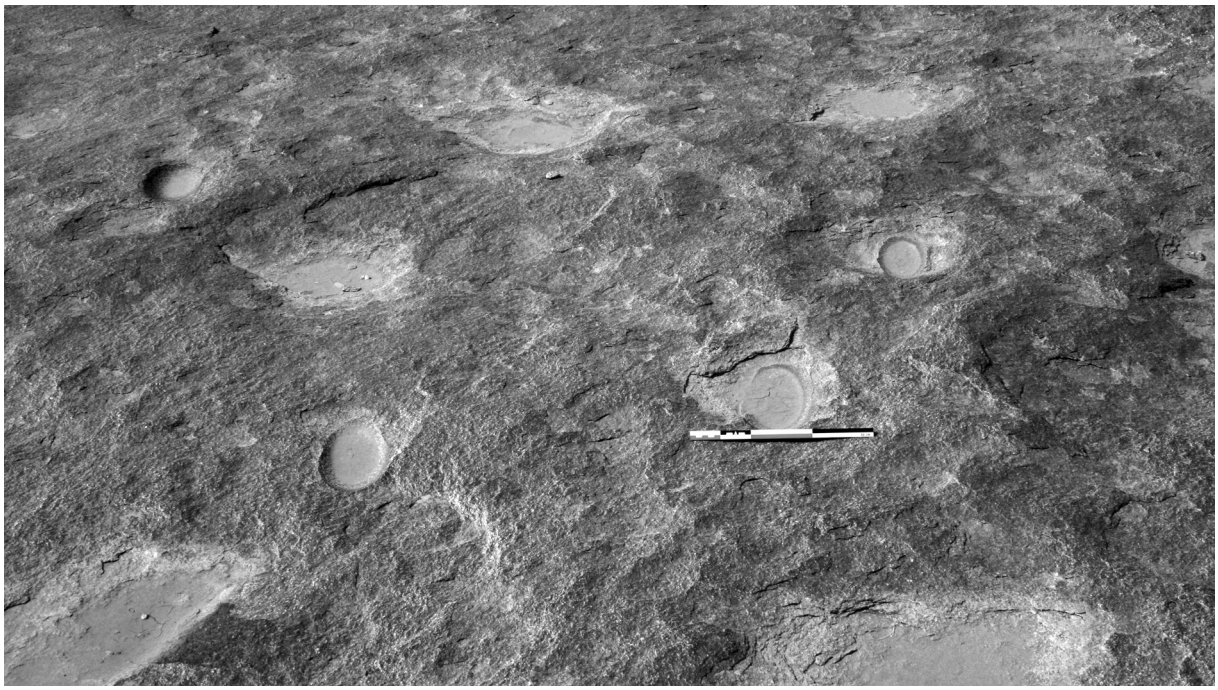


Fig. 10: Site SAS_107 (Foto: Modather Jadain 2016).

Fig. 11: Site SAS_108 (Foto: Modather Jadain 2016).

Fig. 12: Site SAS_109 (Foto: Modather Jadain 2016).

Fig. 13: Site SAS_110 (Foto: Modather Jadain 2016).

Fig. 14: Site SAS_111 (Foto: Modather Jadain 2016).

SAS_112:

This site is located on a hill rising about 4 m above the surrounding area close to El-Edayat village. It contains 27 circular graves with superstructures made of small- and large-sized volcanic black stones (Fig. 15). Most of the burials are still preserved.

7. Discussion

The archaeological survey of the study area north of Sabaloka could identify 13 archaeological sites, most of them cemeteries (Fig. 16). The tombs have a variety of forms and dimensions, while their superstructures are generally made from different locally available material (Fig. 17). The first impression based on the archaeological survey results is that the area was occupied during the Prehistoric, Post-Meroitic, Medieval and Islamic periods.

7.1 Prehistoric settlement

Evidence for prehistoric settlement was identified at site SAS_108, where several fragments of pottery decorated with zigzag and curved dotted lines were recovered from the surface. Such pottery is typical for the Neolithic period or the Shaheinab culture in central Sudan.[18] Comparable specimens were found all over the region in central Sudanese Neolithic sites such as El-Kadada, Site SP07 at Sabaloka, Kadero 1 and El-Geili.[19] The lithic gouges collected from the surface of SAS_108 are also valuable indicators for a Neolithic settlement typical for the so-called Shaheinab culture.

The five season of work of the Department of Archaeology, Al-Neelain University, Khartoum, at SP07 in the Sabaloka area provide us with a number of pottery styles comparable to the types from site SAS_108 (Fig. 18).[20] The lithic material, small flakes and microlithics mainly made from quartz, is also typical for Neolithic stone tools found at many other sites in the region (e.g. Sabaloka, El-Geili, Kadero 1, and Shaheinab[21]) (Fig. 19). The comparison of the material from site SAS_108 with that from other Neolithic sites in the region indicates an extended cultural horizon in central Sudan with a diversity of material on the one hand, but with a similarity of lifestyle on the other.

7.2 Post-Meroitic

Although the study area is in the greater neighbourhood of the centre of the Kushite kingdom at Meroe city, there is no clear evidence of Meroitic settlement in the whole area of the 6th Cataract.[22]

The basic information about the Post-Meroitic period in the region between Atbara and Khartoum derives from the works of the French Unit in Sudan at the cemeteries of El-Kadada and El-Ghaba[23]. The Post-Meroitic period is also clearly attested in the form of tombs recorded during the surveys conducted by NCAM and Al-Neelain University in the region.[24] Later, the survey by the present author revealed 11 cemetery sites consisting of circular graves in the study area (Figs. 20–21).

The tombs excavated by the Al-Neelain University Sabaloka project at SP04 have the shape of a circular mound. The superstructures consist of a stone circle and sand mixed with gravel. The burial chamber was formed by a side room cut in the sediment; the skeleton was always lying in contracted position. Long-necked 'beer jars' and other pots were placed close to the head of the skeleton as offerings. Sometimes, the offerings were also placed close to the legs of the dead (Fig. 22). The excavations at Umm

18 Arkell 1953.

19 The natural environment of the 6th Cataract made it a wanted region for Neolithic settlers in central Sudan which produced decorated pottery and (micro-)lithic material. This type of material culture extending along the Nile from north to the south of Khartoum has common characteristics, but the central region of Sudan has a more specific style of lithic industry, consisting of bifacial tools (celts and gouges) as local stone tool types dominating in the region. As the 6th Cataract region can be considered one of the most important sources of raw material (Rhyolite and Quartz) for such industries, access to and control of this resource might be good reasons for Neolithic groups to occupy and settle in the area. See Arkell 1953, 72. Arkell also mentions the decoration of zigzag and/or curved lines, that can be made with the serrated Aspatharia shells. See also Geus 1984, 72; Chlodnicki et al. 2011, 227; Caneva 1988, 84–86.

20 The archaeological work of Al-Neelain University in the area revealed evidence for the Neolithic period. The technology and typology of lithic materials from site SP07 provide good indicators for settlement during the Holocene; see Nassr 2016, 36–37.

21 Arkell 1953, 31–32; Geus 1984, 72.

22 The most visible historical remains in the area are the mound graves, which are widely distributed in the region.

23 Geus 1984.

24 In 2013, NCAM conducted salvage surveys in the area of the 6th Cataract that was supposed to be flooded by the water of a proposed dam. These surveys covered the eastern and western shores of the Nile and revealed the presence of a number of circular tumuli in the region. For further information see Ali Mohamed, Bakhiet and Salih 2014.

Fig. 15: Site SAS_112 (Foto: Modather Jadain 2016).

Site ID	E	N	Type	Date	Number of Features	Local name
SAS_100	480935	1818258	Cemetery	Post-Meroitic	6	El-Kandareya
SAS_101	480575	1818283	Cemetery	Post-Meroitic + Islamic	26	Hajer El-Meleik
SAS_102	478657	1815366	Cemetery	Post-Meroitic	11	El-Zaragna 1
SAS_103	480629	1816951	Cemetery	Post-Meroitic	5	El-Zaragna 2
SAS_104	480500	1817351	Cemetery	Post-Meroitic	7	El-Zaragna 3
SAS_105	480761	1817869	Cemetery	Post-Meroitic	3	Hajer Addaba 2
SAS_106	480524	1817906	Cemetery	Islamic	1	Burial of Sheikh Khalel
SAS_107	480448	1817907	Settlement	Unknown	23	Hajer El-Asal 2
SAS_108	480776	1819700	Settlement	Neolithic	0	Hajer El-Asal 1
SAS_109	480178	1815342	Cemetery	Unknown	54	Jebel Hommaid
SAS_110	476689	1813167	Cemetery	Post-Meroitic	25	El-Edayat
SAS_111	476559	1813257	Cemetery	Post-Meroitic	32	Hellt Omer
SAS_112	475759	1812702	Cemetery	Post-Meroitic	27	El-Maslha

Fig. 16: The general survey results.

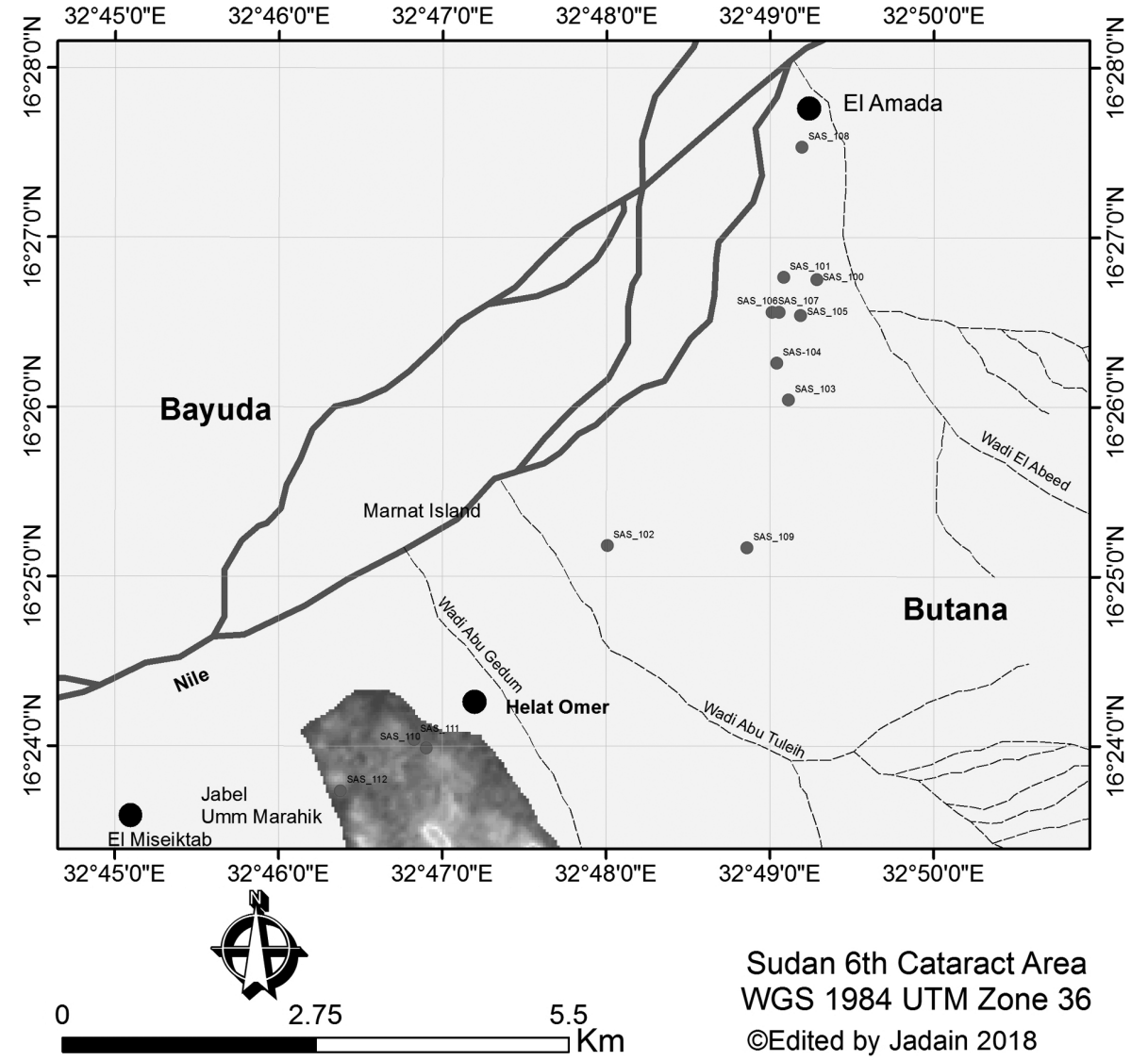


Fig. 17: Distribution map (Modather Jadain 2018).

Fig. 18: Sherd with zigzag decoration from Site SAS_108 (Foto: Modather Jadain 2016).

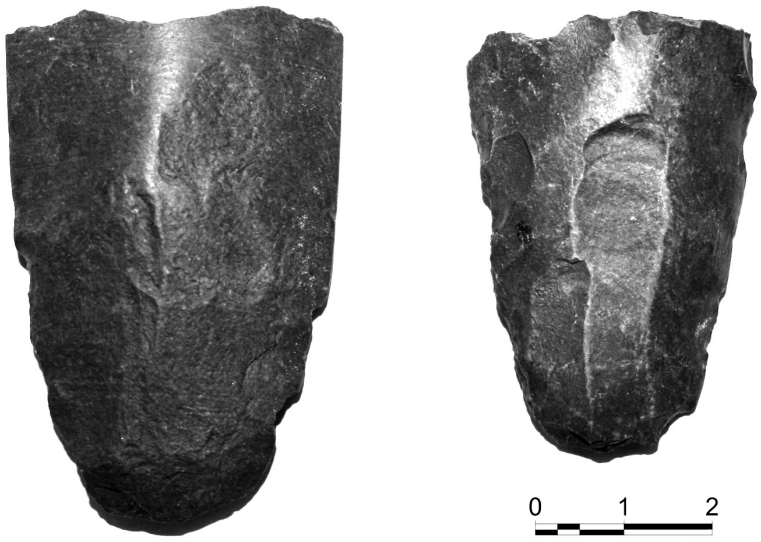


Fig. 19: So-called 'gouge' made from Rhyolite of the 6th Cataract from Site SAS_108 (Foto: Modather Jadain 2016).

Fig. 20: Grave from site SP04 (Foto: Modather Jadain 2016).

Fig. 21: Site SAS_112 seen from the north (Photo: Abdalla El Noor 2016).

Fig. 22: Burial chamber of a tomb at site SP04 (Foto: Ahmed H. Nassr 2016).

Marahik SP04[25] turned out the similarity between jars from the site and jars from Gabati, Ez-Zuma and Umm Gibier, for which dates in the late Meroitic and Post-Meroitic period have been proposed.[26]

7.3 Christian period

There are some burial structures that seem to be related to the Christian period in the area of Sabaloka. Some examples were found during Al-Neelain University excavations at the sites SP04 (grave no. 3) and SP29.[27] Archaeological work at site SP04 revealed a skeleton, buried in extended position, and oriented east-west, with the head in the west. This burial cut another tumulus that seems to be older (Fig. 23). The general shape of the burial looks, in the view of the author, similar to Christian burial style.

The only Christian settlement or building remains come from the south outside of the actual study area. It is a fortified building with a tower and stone walls at Gerri. It was built by one of the kings of Alwa (also known as Alodia) in the Middle Ages and later used by Abdullah Gamaa during his rule of the region after the end of the Alwa Christian kingdom.[28] It may have been the administrative or military centre of the region. The presence of such a structure underlines the importance of the region during both the Christian and the Early Islamic period. This is also the period to which several cemeteries found during the present author's survey can be assigned, so there is a cultural and chronological relationship (Fig. 24).

7.4 Islamic period

During the survey reported here, cemeteries with both circular and Islamic tombs were recorded. Evidence for an Islamic date of the structures was particularly found at the sites SAS_101 and SAS_106 (Fig. 25). The Department of Archeology of Al-Neelain University and the M.A.-student Amgad Basher also recorded several Islamic sites in the Sabaloka area. Most of them were cemeteries and qubbas.[29]

25 The sites SP04 and SP29 lie in the concession area of Al-Neelain University. Both sites consist of Post-Meroitic and Christian graves and provide a large body of data for comparative studies; see Nassr 2015 and 2017.

26 Edwards 1998, 191, No. <11701>; El-Tayeb 2010, 2–12.

27 For more information about grave no. 3: Nassr 2015, and about site SP29: Nassr 2018.

28 Chittick 1963.

29 Bashir Ali 2013.

Fig. 23: Christian burial at site SP04 (Foto: Ahmed H. Nassr 2015).

8. GIS and 'Spatial Suitability' analysis

In this paper, a 'Spatial Suitability' analysis is performed for the sites discovered during the survey. Before doing so, suitability shall be defined and the idea behind the use of this method in this study shall be clarified. The basic idea of a suitability analysis is to check several locational parameter of the respective site(s) with the following question in mind: "Why are these features or sites placed at this specific spot?" In archaeology, a geographical study area needs to be selected to reveal the existence of ancient features while asking about the location of these sites. Such an analysis can provide us with information that greatly help to understand the locational factors of any kind of archaeological feature.[30]

For example, settlement sites will usually be found close to water resources or areas close to the mountains. Here, water and mountains can be considered natural attractions for settlement in any location relative to the human need for these natural resources. In the case of cemetery sites, the suitable places for burial are usually placed in a distance from flood areas, which means that the flood areas and valleys are not preferred in the selection of cemetery locations, but that higher lying lands are the most suitable areas for burial. So, the idea of testing sites in the study area is justified to see whether they have been carefully selected or not.

All the archaeological sites that were recorded during the survey will be examined by means of a spatial suitability analysis. The aim is to understand the landscape and the distribution of the archaeological sites.[31] A Landsat 8 satellite image, downloaded from the USGS online archive,[32] was used to digitise the natural features such as mountains and both seasonal and permanent water sources in the study area, i.e. the Nile and the wadis. These phenomena represent the basic conditions adopted by the researcher in the process of analysing the data.

A spatial analysis in GIS provides us with models for the most suitable zones of the location of sites in the natural landscape (Fig. 26 & Colour fig. II). The digital elevation model (DEM) A shows the slopes in the study area which are between 1–10 degrees. The prevailing red colour indicates that the whole area appears flat and is slightly sloping towards the north and the Nile channel. On the other hand, the DEM B represents the distance of each site from the Nile divided into colour zones. Also, image C represents an assessment of the distances of the sites from the wadis. The colour gradient represents the spatial suitability of the archaeological site in relation to the existing wadis. And DEM D shows the suitability relationship of the sites to the closest mountains. The colour gradient has 10 different values starting with brown up to pink, which represents less proximity and suitability.

After processing the suitability of all the sites according to the four conditions discussed above, a combined GIS calculation of the previous models was performed (Fig. 27 & Colour fig. III). The values between 2.5–8.75 are represented as colour zones. One can observe that the sites concentrate in quite specific (colour) zones. Those are the areas with a higher range of suitability values between 5.25–7.25.

30 Liu 2014, 173.

31 Westcott and Brandon 2005, 37, 62.

32 https://earthexplorer.usgs.gov/

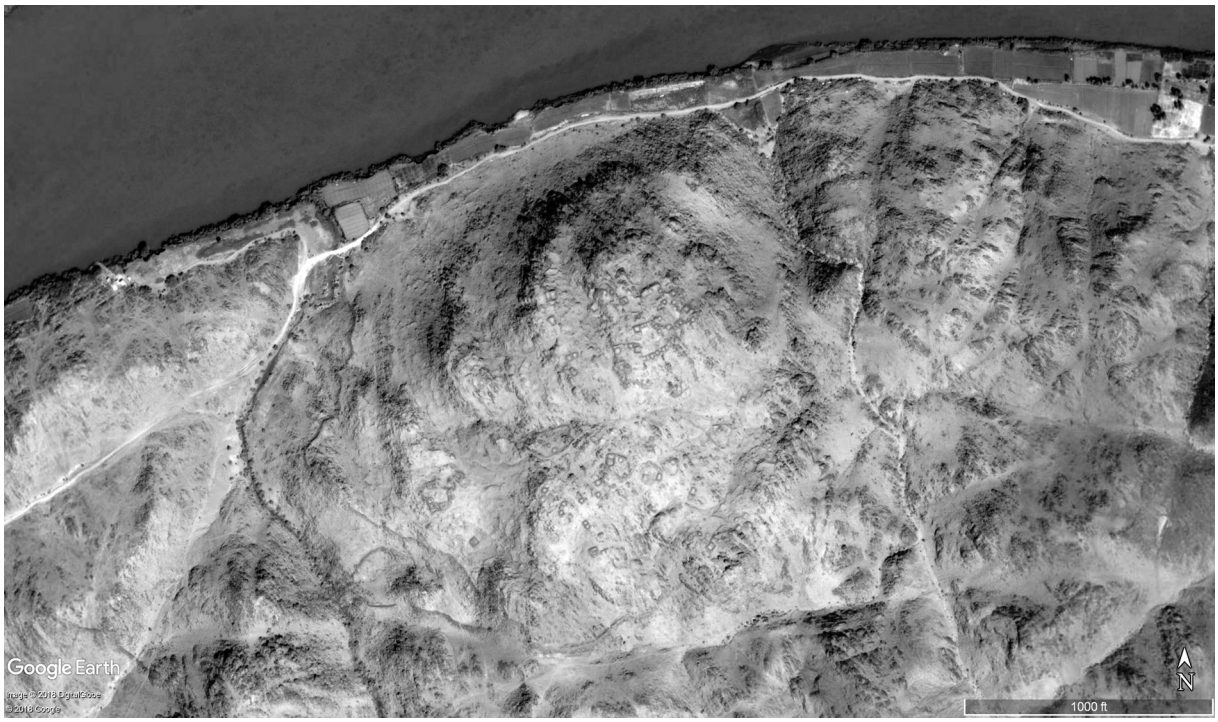


Fig. 24: The Christian stronghold at the 6th Cataract (Foto: Google Earth 2014).

Fig. 25: Islamic qubbas in the area (Foto: Ahmed H. Nassr 2015).

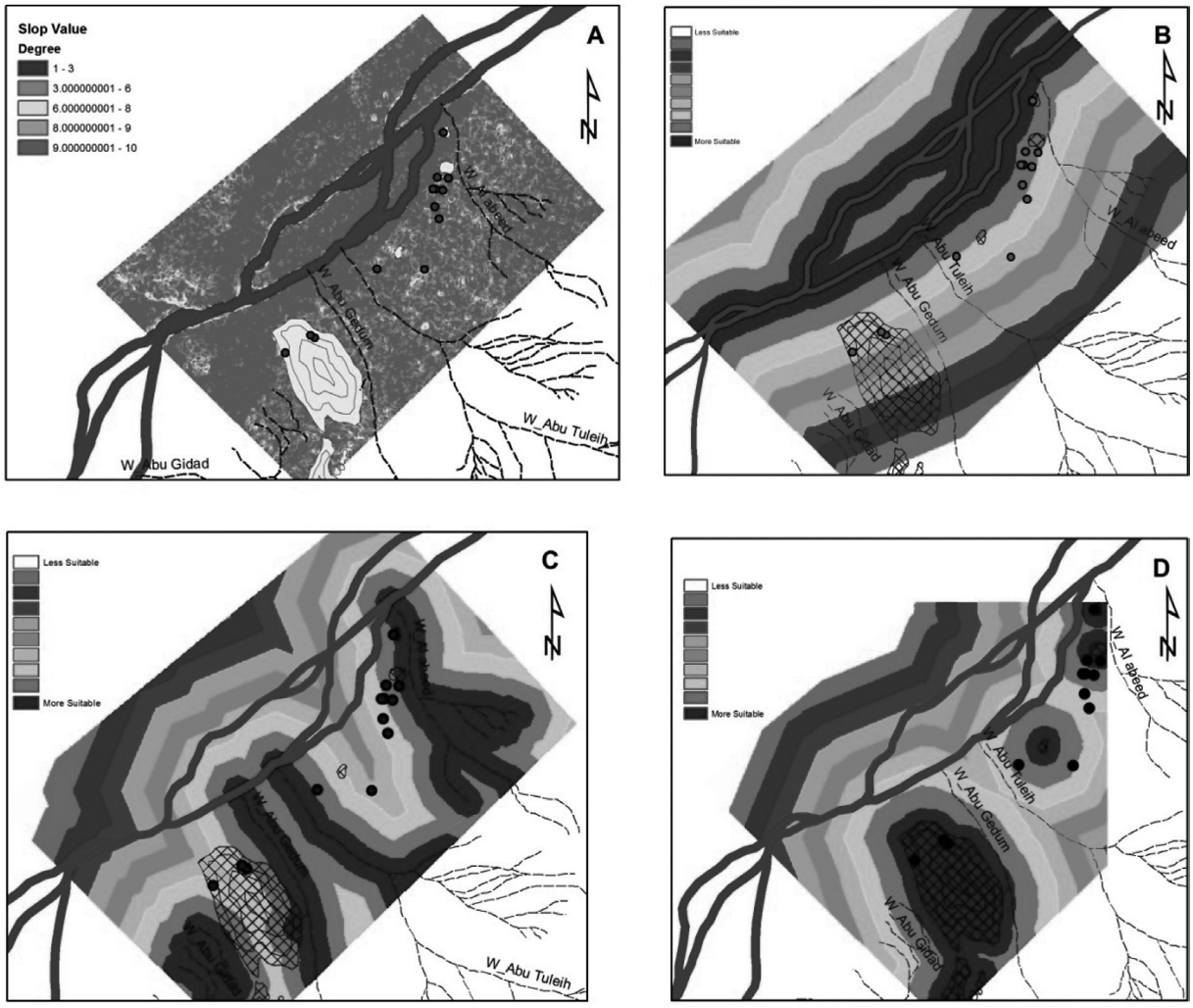


Fig. 26: Individual DEM A, B, C & D (Author: Modather Jadain 2016).

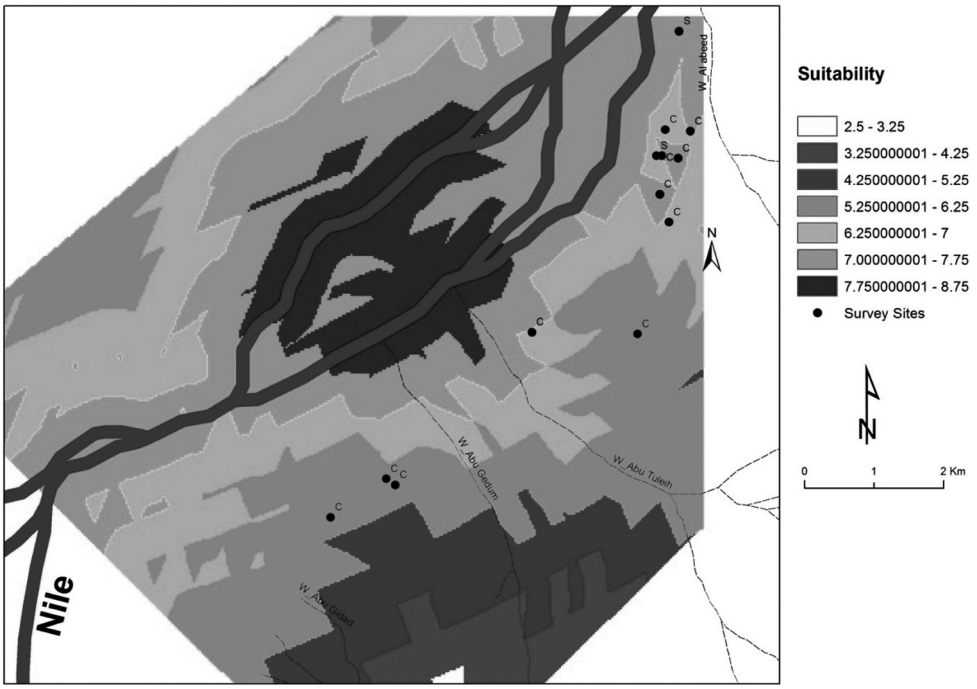


Fig. 27: Combined DEM (Modather Jadain 2016). The features labelled with the letter C are cemeteries, while the letter S indicates settlements.

This suggests that the location of the archaeological sites was carefully chosen by the ancient people, based on their needs and considerations.

There are, however, also some methodological considerations to be made regarding the DEM used in this analysis and its significance. The DEM shows the distribution and location of the archaeological sites within modern topography, it does not represent the ancient environment and landscape. While features such as mountains and wadis can be considered as very stationary topographical entities with only little potential for change, it is the Nile which is known to exhibit rather stark shifts in its flow over time. Since the calculations are based on the current topography, the location of the archaeological sites and, particularly, their distance to the current Nile may be used as proxies for understanding and reconstructing the course of the Nile or of one of his channels in the past.

9. Results

GIS provides powerful tools for archaeological survey and for building databases of archaeological sites including geographical references. Spatial analyses help to understand how the location of each site was chosen. Distribution maps of archaeological sites can also assist in visualising the ancient environment and landscape, while the information in the database offers wide options for comparative studies between the archaeological sites in the area and those in other regions of Sudan. The use of several modern methods greatly supports the detection and inventory of archaeological sites and aids in the interpretation and understanding of the regional history of the Sabaloka area.

The study area provides clear archaeological evidence belonging to different periods of the history of Sudan. The discoveries shed light on the relationship between the region of central Sudan and the surrounding areas during the Prehistoric, Meroitic, Medieval and Islamic periods. The similarity of the prehistoric material with other late prehistoric sites in central Sudan shows the chronological relationship between the sites and indicates a coherent cultural horizon in central Sudan for that period. The Christian stronghold at Jebel Sabaloka proves the role of the region and its importance during both Christian and Early Islamic times.

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Zusammenfassung

Dieser Artikel hat zwei Ziele: a) die Rolle der 6. Katarakt-Region während der antiken Geschichte des Sudans besser zu verstehen, und b) das Potenzial von Geographischen Informationssystemen (GIS) für archäologische Feldstudien im Sudan zu testen, was die Lokalisierung, das Erforschen, Vermessen und Dokumentieren alter Stätten beinhaltet. Der Survey, dessen Ergebnisse die materielle Basis dieses Beitrags bildet, wurde vom Autor mit dem Ziel durchgeführt, mit Hilfe eines GIS eine Datenbank zu erstellen und die Eignung räumlicher Parameter der kartierten archäologischen Stätten in einem abgegrenzten Untersuchungsgebiet zwischen den Dörfern El- Miseiktab und El-Amada, ca. 100 km nördlich von Khartum, zu prüfen. Neben einer Diskussion der archäologischen Reste hinsichtlich einer Chronologie und kultureller Zugehörigkeit zielt die Arbeit darauf ab, den aktuellen Zustand der untersuchten archäologischen Stätten zu bewerten und diese in eine Verbreitungskarte einzuordnen.