Sudan & Nubia

The Sudan Archaeological Research Society
Bulletin No. 19 *2015*

ASWAN
1st cataract
Middle Kingdom forts
Egypt
RED SEA
Wadi el- Allaqi
2nd cataract
Wadi Gabgaba
Seleima Oasis
Sai
3rd cataract
Sudan
ABU HAMED
Kurgus
Nile
El-Ga'ab Basin
Kawa
Jebel Barkal
4th cataract
5th cataract
el-Kurru
Dangeil
Debba-Dam survey
Berber
ED-DEBBA
Ganati
ATBARA
Wadi Howar
Meroe
Hamadab
Atbara
Muweis
Wad ben Naqa
Wadi el- Melik
6th cataract
Wadi Muqaddam
OMDURMAN
KHARTOUM
Wadi Muqaddam survey
KASSALA
Eritrea
Blue Nile
MODERN TOWNS
Ancient sites
WAD MEDANI
GEDAREF
White Nile
Jebel Moya
KOSTI
SENNAR
N
Ethiopia
0
250 km
South Sudan

SUDAN & NUBIA

The Sudan Archaeological Research Society — *Bulletin No. 19* — *2015*

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Front cover: QSAP Dam-Debba Archaeological Survey Project. Site DS7, Ganati: the re-erected columns in the church (photo: Fawzi Hassan Bakhiet).

Sudan & Nubia is a peer-reviewed journal

The Qatar-Sudan Archaeological Project – The Meroitic Town of Hamadab and the Palaeo-Environment of the Meroe Region

Pawel Wolf [1]

The 2015 season at Hamadab[2] involved excavations at the Meroitic settlement and investigations between the Wadi el-Hawad and Meroe City. The excavations focussed on Building H 3000 and areas around the town's temple (Figure 1). The trenches in the temple forecourt yielded information not only on the town's sacral installations, but also on the supply of water within the confines of the town, while those behind the temple added to our knowledge of the town's early occupation periods and its insufficient drainage system. A team from UCL-Qatar excavated within the iron slag heaps in the southern part of the settlement mound. The wider-scale investigations continued the archaeological reconnaissance survey east of the tarmac road and palaeo-environmental investigations including core drillings and geophysical soundings in various places such as at the *hafir* near the 'Sun Temple' M 250 (Figure 2).

The Meroitic Upper Town

The altar in the temple forecourt

Although the town's temple precinct is relatively small, it was apparently furnished with all necessary cult installations – but in a downsized manner. The excavations in its forecourt revealed a well-preserved freestanding altar that was oriented towards the temple's entrance[3] but slightly off its main axis (Plate 1, cf. Figure 1). With base, podium and a ramp it is comparable to various altars situated in front of other Meroitic temples such as at Naqa, el-Hassa, Kawa and in front of the 'Sun Temple' M 250 (Wolf *et al.* 2014, 106 n. 5). Based on the assumption that exactly half of it has been excavated, its podium, 1.88 x 1.45m in size, would have risen to a height of 750mm. It consists of a mud-brick core with a white plastered red-brick facing. A red-brick paved ramp was constructed abutting the podium on its western side. The base is formed by a 550mm high red-brick faced structure,

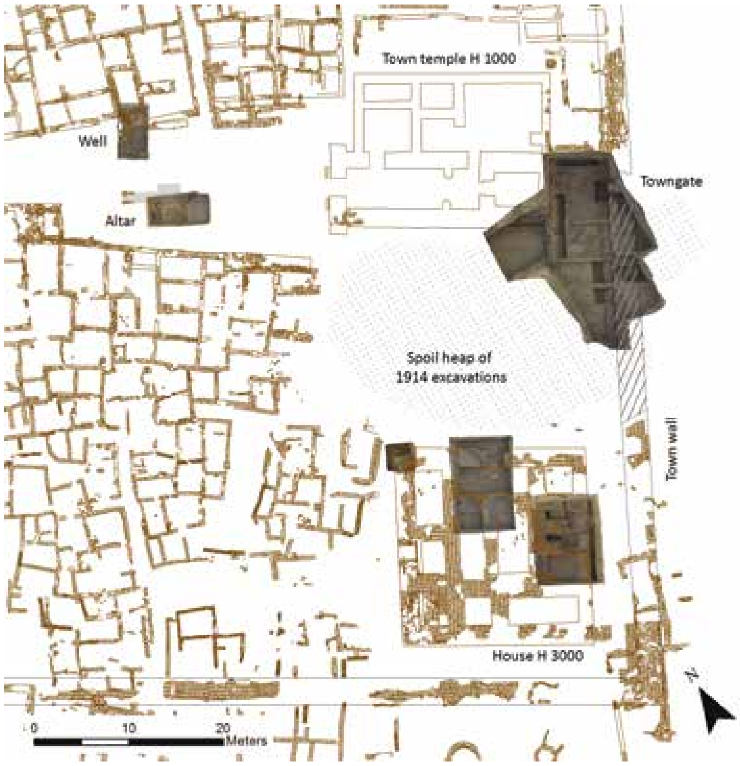

Figure 1. Key map of the south-eastern part of the Upper Town of Hamadab indicating the areas excavated during the 2015 season (N. Salamanek, G. Raab and P. Wolf, 2015).

2.45 x 2.04m in size, also covered with white plaster. The foundation beneath the base consists of a course of rowlock red bricks. A pavement of fired bricks and fragments thereof was roughly laid out to the east and west of the altar abutting the lower part of its base.

A trench section extended down to a depth of 5.7m below the present surface (Plate 2) revealed at its bottom aggraded silty to sandy material interspersed with calcretes, which is typical for natural levees (see below). It is covered by a sand dune[4] and by the town's occupation horizon D,[5] into the

[1] With contributions by Björn Briewig, Jane Humphris, Catharine Hof, Ann-Li Rodenwaldt, Ulrike Nowotnick, Ronny Schomacker, Thomas Scheibner, Vincent Eichmann, Saskia Büchner, Jacke Phillips, Gerald Raab, Michal Sip, Nicole Salamanek and Jochen Hallof.

[2] We would like to express our gratitude to the supporting institutions, in first instance the Qatar-Sudan Archaeological Project and the German Archaeological Institute, to our cooperative partners, especially the National Corporation for Antiquities and Museums, the University of Shendi, the UCL-Qatar and the Berlin Beuth University, and also to Eastern Atlas (geophysics, Berlin), Mohammed Abdelwahab (geophysics, University of Dongola, Wadi Halfa campus), Gerald Raab (crazyeye/Vienna), Stremke-Archaeology (airborne photogrammetry), Daniel Kelterbaum (coring, University of Cologne), Dorian Fuller and Gregory Thoma (palaeo-botanics, UCL). Special thanks go to all our team members, assistants and workmen during the season. Many thanks go also to Derek Welsby and Steve Matthews for proofreading and commenting on the manuscript. For previous reports, see Wolf *et al.* 2014 as well as the literature cited in Wolf and Nowotnick 2013 and in Wolf *et al.* 2014.

[3] The front end of the altar ramp was discovered in 2014 (Wolf *et al.* 2014, 106f and pl. 3).

[4] A charcoal sample from the dune was dated to 393-206 BC (2 sigma, 2245 ±30 BP; Poz-65804; HSP 14-469).

[5] A charcoal sample from this horizon was dated to 191-38 BC (2 sigma, 1995 ±30 BP; Poz-65803; HSP 14-470). Cf. also Wolf *et al.* 2014, 109f, pl. 7, fig. 5 and table 1.

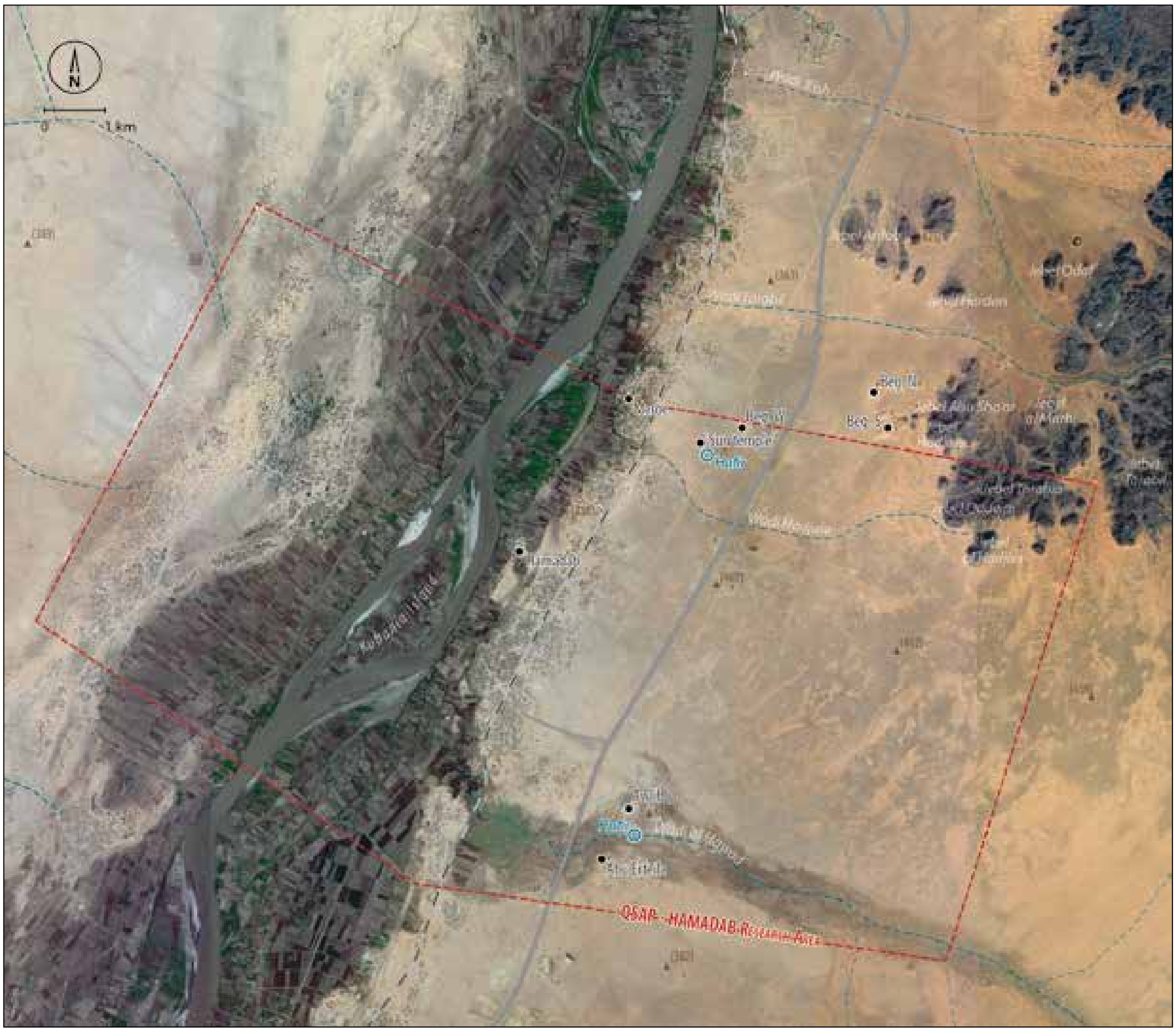

Figure 2. Satellite image of the Meroe region on which are marked the most important archaeological sites and the project's research area (compiled by N. Salamanek, 2015: background image: DigitalGlobe, acqu. date: 2.12.2014 (UTM Zone 36Q, WGS1984, source: GoogleEarth)).

Plate 1. View of the partially excavated altar in the forecourt of the town temple from the south east (photo: P. Wolf, 2015).

Plate 2. The western section of the trench with the altar (cf. Figure 10; photo: P. Wolf, 2015).

upper part of which the altar's foundation apparently was set at the end of occupation horizon D or at the beginning of horizon C. A *c.* 250mm thick construction layer,[6] which probably marks the construction of the Upper Town in horizon C, corresponds to the above mentioned red-brick pavement that abuts the plastered altar base. Reused bricks within the ramp's foundation indicate that white-plastered red-brick structures existed in this area already prior to its construction. Over time, the base and the ramp of the altar sanded up, leaving only the top layers of the base exposed above ground. During a repair of the podium,[7] the top of the base was also plastered, which is indicated by two layers of plaster preserved at the upper corner of the base. At the end of the town's occupation horizon C,[8] the ramp and the altar had completely sanded up. The sequence of subsequent street levels sealed the altar which had obviously fallen into disuse at the end of that occupation horizon. Much later, during horizon A in the late Meroitic period, a rough red-brick/sandstone structure of as yet unclear function was constructed perpendicular to the temple's axis in the area of the former altar.

The well in the temple forecourt

A few metres to the north of the altar we re-excavated a trench of 2014 in order to document the well, the upper preserved remains of which have been found at that time (cf. Figure 1 and Wolf *et al.* 2014, 107 with pl. 4). Since the excavation is not yet finished, we cannot determine the original depth of the well. The spoil from its original construction contained large quantities of calcretes indicating that it was dug through the calcrete-containing sediments below the settlement. Coring about 50m north of the settlement mound, at a similar distance to that of the well from the Nile's riverbed, produced large river pebbles at a depth of 3-4m. Such pebble deposits are usually perfect aquifers. It is probable that the well reached this aquifer and was about 4-5m deep. Its general construction resembles present-day wells in the region (Plates 3 and 4). The subterranean part of its shaft was lined with ferricrete rubble stones. Its curb, roughly 1.5m in diameter, was constructed of fired bricks set in mud mortar. Its top was covered by ferricrete slabs and sandstone blocks, some of which had 20-30mm deep grooves worn by the ropes during the lifting of water vessels. Post-holes and remains of calcified wood in the floor level next to the well curb testify to the presence of wooden hoisting devices. A triangular-shaped red-brick pavement or drain, to the east of the well's curb, is likely to be related to collecting and directing the water from the well (Plate 4).

The well was installed slightly later than the altar, but still during occupation horizon C. In layers relating to the earlier horizon D, we recovered next to the well a large plantation pit 1.7m in diameter (Plate 3, bottom right). While the section through the layers above the well shows that the spot was used as a cistern-like water source continuously until the town's latest periods (Plate 5),[9] its last reinforcement with stones and red-brick fragments as well as layers which indicate a backfilling of the original well correspond to the last repair-period of the altar. Hence, both structures were apparently abandoned at the end of the town's occupation horizon C. The correspondence of installation and abandonment of the well and the altar indicates that the well was originally related to the sacral installations of the town. After its abandonment, the forecourt was narrowed by an extension of the adjoining housing blocks suggesting that the centre of the town underwent a major transformation. It might be associated

Plate 3. View of the partially excavated well in the forecourt of the town temple from the south (photo: P. Wolf, 2015).

Plate 4. The partially excavated well (bottom) and the triangular-shaped pavement/drain (top left) (photos: P. Wolf and G. Raab, 2015).

[6] It could date, according to a charcoal sample, between 165-24 BC (2 sigma, 2045 ±30 BP; Poz-65805; HSP 14-475).

[7] The corresponding street layers were dated by a charcoal sample to 52 BC-AD 71 (2 sigma, 1995 ±30 BP; Poz-65802; HSP 14-472).

[8] Cf. Wolf *et al.* 2014, 109f, pl. 7, fig. 5 and table 1. The strata covering the altar were dated by a charcoal sample to AD 21-209 (2 sigma, 1910 ±30 BP; Poz-65801; HSP 14-474).

[9] Likely with a wooden construction to stabilise the later water pit.

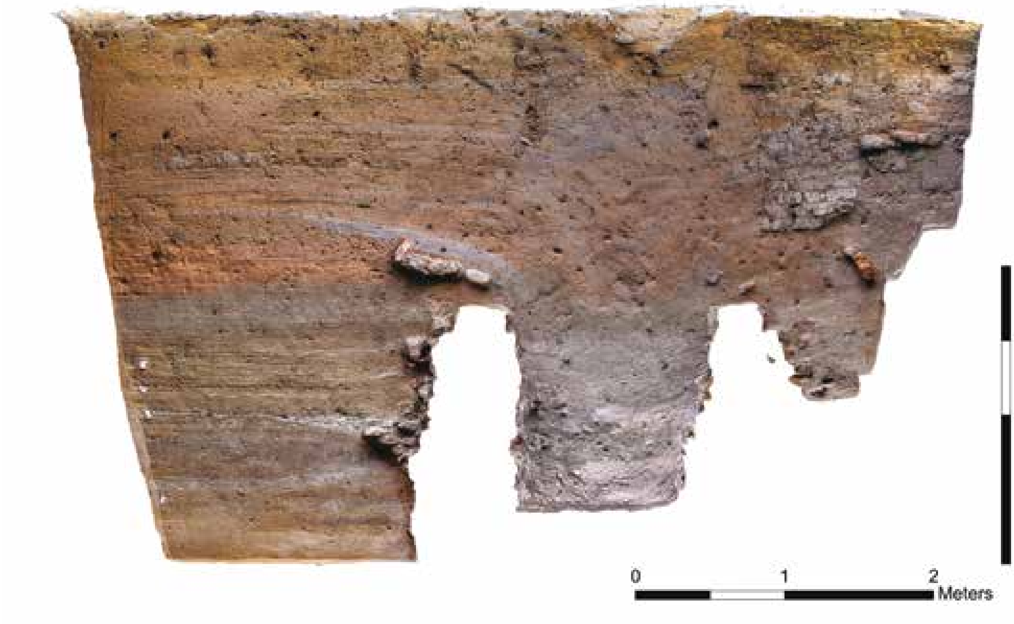

Plate 5. Western section of the trench cutting through the well (photo: G. Raab, 2015).

with the assumed spread of the settlement into its suburbs and a possibly related shift of its (sacral) centre beyond the confines of the Upper Town (Wolf *et al.* 2014, 110).

The quantity of pottery recovered in the layers around the well was generally low and the potsherds tended to be small and worn comprising mainly utilitarian or semi-fine wares but including some fine ware sherds. Remarkable finds are an almost complete miniature vessel of rectangular shape, probably a small incense burner, and a well-preserved scarab with a hieroglyphic inscription (Plate 6).[10] The bottom side of the scarab is divided by a centre line into two parts. The right half is dominated by the throne name of Thutmose III, *Mn-ḫpr-Rᶜ,* which is, however, not inscribed in a cartouche and therefore permits also the reading of the name of Amun written in cryptic form (cf. Hornung and Staehelin 1976, 61). Below the *ḫpr*-hieroglyph, traces of the hieroglyph are recognizable indicating the epitheton *mrj Ỉmn*, 'beloved of Amun'. The left half of the scarab is dominated by a highly stylized sign that perhaps resembles the hieroglyph *tj.t,* effigy/image', followed by what is probably the hieroglyph . Other characters below and above the hieroglyph *tj.t* cannot be identified. Thus, it remains unclear which god Thutmose III is reflecting – perhaps Amun, whose name may have been written at the bottom right. Other scarabs show, however, that the god's name was probably placed over the *tj.t* hieroglyph. However, the traces there are not identifiable. The entire text reads thus: *Mn-ḫpr-Rᶜ mrj Ỉmn tj.t n.t* [*Ỉmn*], 'Thutmose III, beloved of Amun, image of [Amun]'. The scarab is one of the 'better' copies of scarabs with the name of Thutmose III, since it contains two epithets next to the name of the king. Scarabs of Thutmose III continued to be made into the Late Period (see Grieshammer 1984, 971 and 975) and the present one joins a number of scarabs of the same type recovered from several tombs at the cemetery of Begrawiya West.[11]

Plate 6. Inscribed scarab recovered near the well (photo: M. Sip, 2015).

The area between the town temple and the eastern town gate

The fringes of the North Mound have suffered more severe erosion than the centre of the Upper Town. Therefore, we supposed that most of the structures dating to the later occupation horizons B and A are eroded in the outer quarters (Wolf *et al.* 2014, 105 and fig. 3). Assuming that most of the erosion took place during the last century, we expected some of these later structures to still be preserved under the spoil heap of John Garstang's excavations of 1914.[12] After having partially removed the spoil, we thus examined the area behind the temple more thoroughly (Figure 1). The excavation trenches indeed illustrated a heavy fluvial and aeolian erosion with thick relocated layers with a mixture of silt, sand, muddy fragments and ash. Apart from a carelessly laid wall of two preserved mud-brick courses,[13] nothing was attributable to the later occupation horizons, but also in the town's occupation horizon C the area behind and to the south of the temple was remarkably empty (Plate 7). Except for the town wall with its eastern gate, no substantial buildings existed here – in contrast to the situation north of the temple, where the mud-brick houses seem to abut the temple's side rooms. It is likely that the area south of the temple was reserved for sacral and administrative use. Alternatively, the (as yet undated) house structures in the north date to a later period.[14]

[10] The scarab and its inscription have been kindly analysed by J. Hallof.

[11] For example Dunham 1963, 41 fig. 27.h2; 42 fig. 28a; 45 fig. 30.g-h; 52f fig. 37f; 105 fig. 79.j; 303 fig. 179.7; 315 fig. 182.12.

[12] Garstang's sketch plan of the temple M 1000 shows remains marked as later structures covering the temple walls (Garstang *et al.* 1914-16, pl. VIII).

[13] Starting at the southern corner of the temple and running roughly south east, parallel to the town wall, being probably part of the later walls indicated on Garstang's temple plan (see last note).

[14] Their stratigraphic relation to the temple was not recorded during the excavations in 1914. The southern corner of the foundation of house H 1200 was re-excavated in 2009. It corresponds in its absolute level to a brick pavement in front of the temple's northern pylon. Stratigraphically, however, it postdates the pavement (cf. Wolf *et al.* 2009, 241f and Abb. 33).

Plate 7. Panoramic view of the trenches behind the town's temple – bottom: southern corner of the temple; left: north east-south west running town wall with the eastern gate and the walkway (photos: P. Wolf and G. Raab, 2015).

Access to the Upper Town was provided by two gates. The town's main gate was the 1.6m wide gate in the centre of the western town wall (Wolf *et al.* 2014, 108 and pl. 5). The second gate is situated in the eastern town wall exactly on the central axis of the main temple building, 5.55m behind its sanctuary. The originally 1.95m wide gate was furnished with sandstone jambs and a threshold of roughly hewn

Plate 8. Section along the eastern gate of the town - front: gate with sandstone jambs, threshold and red-brick foundations as well as gullies cutting down to the threshold, with later ferricrete threshold in the upper part; left and right: walkway and red-brick repairs of the wall (photo: P. Wolf, 2015).

sandstone slabs that rest on a red-brick foundation (Plate 8). An approximately 1.15m broad walkway, constructed in mud bricks with red-brick facing, starts next to the gate and runs along the inner face of the town wall towards its southern corner. Many parts of the 2.8m thick town wall show heavy water damage. Near the gate, it was repaired with a 1.15m thick red-brick wall, narrowing the gate to 1.45m. During a later period, the gate was furnished with a new threshold of ferricrete slabs, situated 1.2m above the original threshold. Part of the wall repair was apparently the installation of a *c.* 800mm wide water outlet within the town wall about 7.25m south of the gate. Its location above the walkway only makes sense if it was installed after the surrounding ground silted up to the height of the walkway.

The occupation floor between the temple and the town wall consisted throughout of levelled construction debris, which sloped down towards the gate and covered the sandy layers of occupation horizon D and the sand dune beneath the settlement. Many gullies filled with sand, gravel and pebbles cut through these debris layers and horizon D down to the sand of the dune. Even after the repairs of the town wall and the gate, similar gullies cutting down to the gate's original threshold testify to heavy water run-off. These observations illustrate the obvious problem of run-off drainage faced by the town from its very beginning until its late periods, when the more central parts of the Upper Town had sanded up. Apparently, no drainage management existed – rainwater running down the main street was probably just re-directed around the temple towards the town wall and drained originally through its gate and later through the above-mentioned water outlet as well. However, it apparently led to the destruction of the town wall and to the erosion of the later building structures in that area already during the lifetime of the town, since beside potsherds from occupation horizon C, many vessel forms dating to occupation horizons B and A were recovered in relatively deep contexts.

Building H 3000

Building H 3000 in the south-eastern quarter of the Upper Town, which replicates basic features of larger palace-like structures in the Lower and Middle Nile Valley (Wolf *et al.* 2014, 107-109, fig. 4 and pls 5 and 6), has been further investigated in its northern and western part (Figure 3). The alignment of its exterior red-brick facing and the orientation of several internal walls uncovered within these trenches now provide a more detailed picture of the building's ground plan. It is not perfectly square as previously supposed, but resembles a rhomboid with sides of approximately 20.7m with a deviation of 2-3° from the right angle. The walls of H 3000 are thus well lined up with the town walls in the south-eastern quarter of the Upper Town at a distance of 2.9m from it, which confirms that H 3000 was planned and constructed either together with, or after the completion of, the town's enclosure walls. Similar to the eastern town gateway, the lower red-brick courses of the building have suffered severe water damage.

Another important feature of H 3000 is a 1.75m wide second entrance to the ground floor of the building, situated in the middle of the northern façade. Similar to the building's western entrance, its jambs were faced with red bricks. Its

Figure 3. Plan of house H 3000 - black arrows mark the doorways; green: mud bricks; red: red bricks; blue: trenches of the 2015 season; scale 1:250 (drawn by C. Hof, 2015).

threshold was elevated by repairs to approximately 750mm above the outer floor level and accessible via a simple earthen lateral fill against the building's base. The doorway led into the large room 3005 (20.5m^2; 7.35 x 2.8m). The only access from this room into the interior of the building was an at least 1.35m wide doorway, which, however, was blocked by mud and red bricks. A semicircular structure constructed out of re-used moulded red bricks was set into the occupation floor of the room's north-western corner.

In the building's western part, we recognised the outlines of three smaller rooms. At 7.93m^2, the southernmost room 3009 is the largest. With its proportions and the lack of doorways it can be compared to room 3003 in the south of the building, making it a closed 'casemate' cell (Wolf *et al.* 2014, 108 and pl. 6). The neighbouring room 3008, the smallest one within this group, was heavily disturbed by later pits, the western one containing the skeleton of a donkey. The room may have originally been linked to the adjacent room 3007. A red-brick structure set into the eastern outer wall next to room 3007 may provide an indication of their function, if it is part of a water outlet.[15] A cautious suggestion could be that sanitary facilities had been installed above room 3007 and the room might have served as their substructure.

The pottery found in the building comprises a considerable number of well-preserved vessel forms including painted and stamp-decorated fine ware with typical Meroitic motifs as well as imported wares, such as handle fragments from amphorae. The assemblage is clearly different from what was recovered from the town's later occupation phases B and A. Objects like massive red-slipped pot stands, storage vessels, basins and vases as well as stone tools such as grinders, saddle querns and pounders, provide an important glimpse into the material culture of one of the earlier occupation phases at Hamadab.

Hamadab beyond the Upper Town and during the later periods

Research on the iron production at Hamadab[16]

A geophysical study carried out by the UCL-Qatar team indicated potential furnace structures in the two iron slag heaps H 700-800 that overlay suburban building remains at the southern edge of the North Mound.[17] Both heaps were, therefore, selected for detailed excavation by the UCL-Qatar team to explore these locations and to implement ambitious metallurgical debris processing procedures.[18] The metallurgical debris at slag heap H 800 was, on average towards the top of the mound, just 400mm thick. Below, a sandy layer of *c.* 500mm covered the suburban building remains. The metallurgical debris consisted of typical dumping episodes associated with iron production, being made up of a variety of slag types, ore processing debris, charcoal, technical and domestic ceramics. The strong dipole detected by the geophysics at the top of the heap was found to be the dense remains of furnace material, rather than an *in situ* furnace. The excavations at heap H 700 produced similar results. The haphazard, mixed nature of the furnace material supported the fact that this location was also a dump of furnace material rather than a furnace structure. Underlying the slag, building remains and pottery were located, suggesting that the room uncovered was a kitchen. It can be hypothesised, therefore, that the rooms at this location clearly predate the iron production waste. A connecting trench between both slag heaps revealed no obvious metallurgical or other pyro-technological installations, although the identification of door thresholds suggests that the excavation was low enough within the former settlement

[15] It is unlikely to be the remains of a staircase which cannot reasonably be expected in this place.

[16] Directed by Jane Humphris.

[17] For a plan of the settlement mound, see Wolf *et al.* 2014, 105, fig. 2.

[18] Designed to allow for statistical analysis of the debris.

structures that any such installation would have been visible.

The observations prove that the metallurgical remains of the both slag heaps clearly postdate the Meroitic settlement at these locations and that iron-production started just after the settlement had been eroded to a considerable degree. They support the radiocarbon dates derived from several of the slag heaps at Hamadab which attest that iron production took place here at the very end of, and subsequent to the end of, the kingdom (Humphris 2014; Wolf *et al.* 2014, 106). The building structures in this part of the suburbs were already abandoned before the 5th-6th century AD, while the iron smelters were presumably dwelling in structures that are no longer preserved.

Medieval and Islamic period pottery

Research started on the Islamic and Christian pottery recovered during previous seasons, which is particularly useful, as the pottery from this period has received very little attention in the Meroe region. It appears very likely that the South Mound was occupied during the Medieval period and there are indications that this was also the case at the North Mound. More certain is, according to the pottery analysis, the existence of a larger occupation at the North Mound between the 15th and the 19th centuries AD, to which the round structures on the eastern limits of the Upper Towns belong.[19] The pottery analyses thus indicate that the both settlement mounds of Hamadab were almost continuously occupied from the early Meroitic period until the 19th century AD.

Rescue excavation of a grave at the South Mound of Hamadab

Rescue excavations necessitated by a recent robber pit in the as yet uninvestigated cemetery at the South Mound yielded useful information, although almost the entire substructure of the grave had been destroyed.[20] At a depth of only 250mm, we found the outline of a rectangular red-brick structure 2.16 x 1.86m in size preserved to a height of 450mm, its walls and floor being covered inside with Nile mud. Bricks, bones and a considerable number of wood fragments were scattered across the area. The latter likely came from a coffin or a covering for the grave. Neither the skeletal remains nor any artefacts were found *in situ* and, although the complete excavation spoil was sieved, no grave goods were recovered. The anthropological examination of the bones[21] revealed that they belonged to an adult, middle aged male and a child of about 3 years buried in the grave together. The man with an unusually robust physique appears to have had a height of more than 1.7m. The examination revealed no indications of any remarkable illnesses or trauma.

[19] A charcoal sample from a fireplace of one of these round structures provided a date of AD 1484-1648 (2 sigma 315 ±30 BP; Poz-60475, HSP 13-007), cf. Wolf *et al.* 2014, 118.

[20] Superstructures are not preserved at the South Mound's cemetery.

[21] Undertaken by Friederike Jugart (University of Münster) and Theresa Klatt (University of Göttingen) from the Wadi Abu Dom Mission (directed by Angelika Lohwasser).

The archaeological reconnaissance survey

While the survey in season 2014 concentrated on the area west of the tarmac road between the Wadi el-Hawad and Meroe City,[22] this season's survey focused on our concession area to the east of the road (Figure 2). Altogether 112 sites with more than 516 features have been identified during the season (Figure 4).[23] They comprise 89 funerary sites, ranging from cemeteries with just a single grave to extensive cemetery fields with up to 160 graves, 23 occupation and activity-zones including seven assumed mining locations. The collected surface finds mainly date to the Meroitic to Post-Meroitic, but also to the Mesolithic, Neolithic and Napatan periods. In addition, we recorded several recent or pre-modern occupation sites, most likely temporary settlements of semi-nomadic groups. Pottery dating to the third to second millennia BC and to the Medieval period is apparently absent.

Funerary sites

The cemeteries to the east of the tarmac road are usually situated at prominent positions like elevated gravel and sandstone plateaus and their slopes, but sometimes also in the plains between. On the plateaus and slopes of the northern *jibal*, we observed single graves or cemeteries with just a handful of tumuli.[24] The larger cemeteries appear to show a kind of genealogical aspect to their arrangement. Sometimes smaller graves were situated around one or more larger tumuli. The materials used for the construction of superstructures depends largely on the local geological conditions. The tumuli west of the tarmac road are usually mounds of sand and gravel, often with a substantial content of calcretes (*zara*); tumuli located farther east are often covered with black sandstones collected from the surrounding plateaus. Near the *jibal* in the north, the superstructures show an increasing amount of stony material. The most commonly recorded type of superstructure was type FT08,[25] represented by circular, shallow, dome-shaped mounds. At several cemeteries we recorded dome-shaped tumuli with a flat top, often with a slightly depressed centre filled with sand, characteristic of type FT05a.[26] Farther east, close to the boundary of the concession area, we recorded a type of dome-shaped cairn that is very similar to type FC01b (Plate 9).[27] Without excavation, however, it is hard to describe their superstructure more exactly or to define whether they date to a period contemporary with the Kerma culture further north.

The largest number of graves within a single cemetery

[22] For introductory remarks on the survey and the results of its first two seasons, see Wolf *et al.* 2014, 110-115.

[23] A total number of about 230 sites with 950 features have been newly identified and recorded within the framework of the QSAP since the autumn 2013.

[24] Sites 4-F-055, -059-062, -065, -069-071, -076-081. In the citations of site-numbers, the general prefix for this region 'NE-36-O/' is omitted.

[25] Following the typology of Borcowski and Welsby 2009.

[26] For example at sites 4-K-013, -016, -023; 3-O-420, -423, -425; 3-O-428 and 3-J-1280.

[27] For example at sites 4-K-015, -019, -025, -026; 3-O-425, 4-F-070, -076, -079, -080. Cf. Borcowski and Welsby, 2009, 11 and fig. 6.

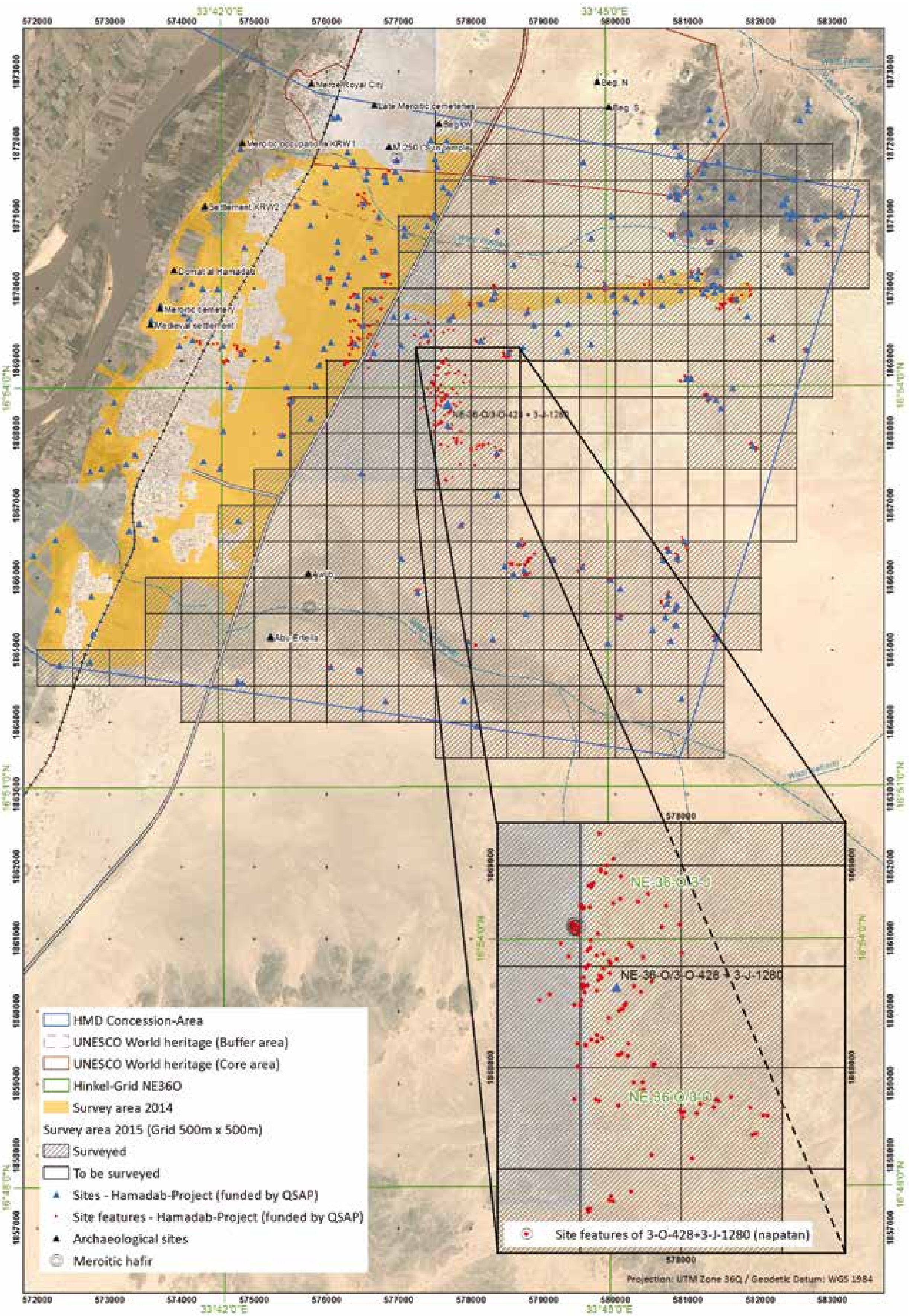

Figure 4. Satellite image of the Meroe region on which are superimposed the area of the reconnaissance survey and the sites discovered in 2013-2015 (blue) and their features (red) as well as previously known sites (black). Area of cemetery 3-J-1280/3-O-0428 is enlarged (compiled by N. Salamanek, 2015).

Plate 9. View of the cairn at site 4-F-080 from the east (photo: G. Raab, 2015).

was recorded at sites 3-J-1280 and 3-O-0428, roughly in the centre of the surveyed area and to the south of the newly built QSAP-compound (Figure 5, cf. Figure 4). Here we documented 159 graves along the elevated, north-south running gravel ridges and plateaus extending over an area of 1.7km north-south and 1.26km east-west.[28] Most of the superstructures belonging to this cemetery are of type FT08. At a robbed grave the inner structure of such a tumulus was visible. It was constructed of large sandstone slabs at its bottom and medium to small-sized rubble that were finally covered by gravel. In the central part of the cemetery, next to a number of partially destroyed superstructures with an outer ring of large black sandstones, we recovered fragments of wheel-made amphorae with a greenish-beige wash dating to the Napatan time (Figure 6). Next to other graves in that area, we found fragments of similar vessels associated with Meroitic pottery. Thus, the cemetery might date back to the first half of the last millennium BC. Like cemetery Begrawiya West, it might have been continuously used throughout the Napatan and Meroitic periods, with its oldest part being possibly the central area of the site.

Figure 5. Orthographic photograph of the western part of the cemetery 3-J-1280 / 3-O-0428 (G. Raab, 2015).

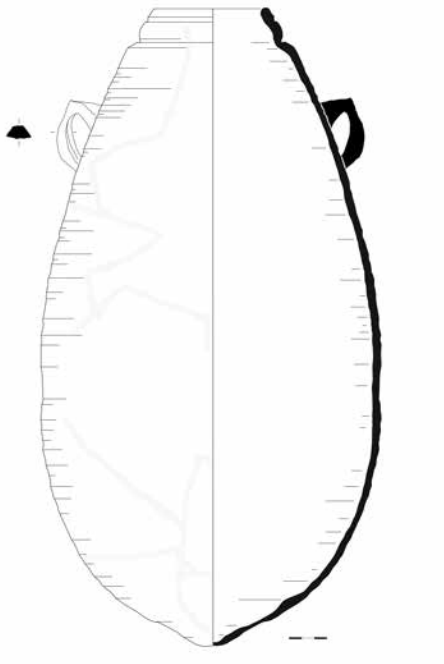

Figure 6. Drawing of the amphora HVU-15-158 recovered at cemetery 3-J-1280 / 3-O-0428; scale 1:6 (S. Büchner, 2015).

Occupation sites and activity areas

Compared with the Nile's floodplain, occupation sites in the eastern part of the research area are rare. Two large Mesolithic to Neolithic occupation sites are located on the several metre high southern bank of the Wadi el-Hawad.[29] They are scattered with large amounts of potsherds with thick walls, coarse surfaces and various types of decoration (Plate 10), indicative of continuous settlement over a long period. The pottery is tempered by mica and other inorganic materials such as lime and quartz. Large amounts of lithic material comprising small flakes with continuous retouch and use-wear on their edges, cores and various types of blades and scrapers were also recovered. The main raw material is quartz and Hudi Chert.[30] A number of sites with less pottery and lithics, located on the plateaus around the Wadi Hadjala,[31]

[28] The cemetery can be probably connected to other sites such as 3-J-1252, -1254, -1256, -1257, and 3-J-1272-1278. Together with sites recorded in the 2014 season to the west of the tarmac road, it could comprise a cemetery with about 300 graves.

[29] Sites 3-O-411 and -415. Following an inspection of some pottery photographs by D. Usai, both multiperiod sites contain material of the seventh and the late fourth to early third millennia BC (pers. comm. 2015). The area comprises also Meroitic/Post-Meroitic cemeteries and is partially devastated by present-day gravel quarries.

[30] A silicified lacustrine limestone, originating in the region of Hudi, east of Atbara.

[31] Sites 3-O-418, 3-O-430 and 4-F-048.

Plate 10. Potsherds from Mesolithic to Neolithic site 3-O-415 (photo: M. Sip, 2015).

might represent temporary-use sites such as lithic workshops.

Several sites on top of the Jebel Tarabil complex and the surrounding mountains comprise depressions filled with aeolian sand and bordered by piled up, black patinated sandstones (Plate 11).[32] They may have been related to mining activities,

Plate 11. Features at site 4-F-067 (photo: G. Raab, 2015).

representing for example silted up exploratory soundings for raw materials such as iron ore or sandstone. Artefacts (fragments of red brick that perhaps date to the Meroitic period) have been recovered only at site 4-F-67. Stone circles of small- to medium-sized sandstones (site 4-F-57) associated with very small, partially burned bone fragments have been located on top of Jebel Qudeim in close proximity to heaps of crushed pottery (site 4-F-58) on the southern and eastern slopes of that *jebel*. These sites may be related to each other and to building 4-F-1 at the foot of the *jebel* (cf. Wolf *et al.* 2014, 115 and pl. 9).

The palaeo-environment of the Meroe and Hamadab region

The floodplain of the Nile

Naturally, the Nile significantly influenced any settlement activity in the region around Meroe. Based on Peter Shinnie's recovery of fluvial deposits to the east of Meroe City, hypotheses regarding the Nile course in the last millennium BC have been discussed already in the 1980-90s (Bradley 1982, 163-169; Wolf 1996, 39-42; Török 1997, 23f; Khidir 1999; Grzymski 2005, 55f). They focussed on the existence of palaeochannels, a possible westward shift of the river, and whether or not parts of Meroe might have been situated permanently or seasonally on an island. A better understanding of the past landscape along the Nile Valley is also one of our major research aims in the frame of the QSAP,[33] since it constitutes the immediate environment of Meroitic settlements such as Meroe and Hamadab.

Starting from the above-mentioned hypotheses, we studied, as a first step, the fluvial behaviour of the Nile between Kabushiya and Meroe over the last 80 years by means of remote sensing data. Due to the westward bend of the Nile in this region, a floodplain developed here with sidebars on the west bank and a cut bank along the east bank (Figure 2). The general course of the Nile in this reach causes an eastward shift of the river. However, the Nile monitoring as well as the channel pattern clearly demonstrated that the river is constrained on its eastern side. For example, historical aerial photographs illustrate that the present-day sidebar in front of Meroe aggraded not before the second half of the last century. Prior to that, the river terrace in front of Meroe must have been subject to heavy degradation (Plate 12). However, the Nile was apparently not able to erode the terrace bank, which runs along an almost straight line 200m west of Hamadab and Meroe.[34] The reason is probably an assumed wider palaeo-riverbed of the Nile, which has left subsurface barriers of rubble and gravel that the present Nile is not powerful enough to remove. Coring and electric resistivity profiles along specified transects across the floodplain seem to substantiate this assumption. A core drilling about 50m north of the site of Hamadab confirmed subsurface constraints with evidence for large river pebbles at 3-4m below the present surface.

Within its present-day riverbed, however, the Nile demonstrates a highly dynamic sinuous course (Figure 7). Consequently, its side- and mid-channel bars migrate downstream reworking the entire riverbed within a few centuries. Figure 7 and Plate 12 demonstrate that it relocated bars of up to five times the size of Meroe City within just eight decades. The hypothesis that parts of Meroe might have been situated

[32] Sites 4-F-067, 4-F-068, 4-F-072 and 4-F-075.

[33] For preliminary investigations into the regional sedimentology, present-day ecology and land use see Wolf *et al.* 2014, 115-118 and figs 8-10. For general literature on alluvial geoarchaeology, see for example Brown 1997; for the Nile see especially pp. 5-13.

[34] The maps of Frédéric Cailliaud (1823, pl. 31), the Lepsius-Expedition (Lepsius 1849-59, pls 132-133) and John Garstang (Garstang *et al.* 1911, pl. 2) reveal that this stable situation prevailed already throughout the 19th century.

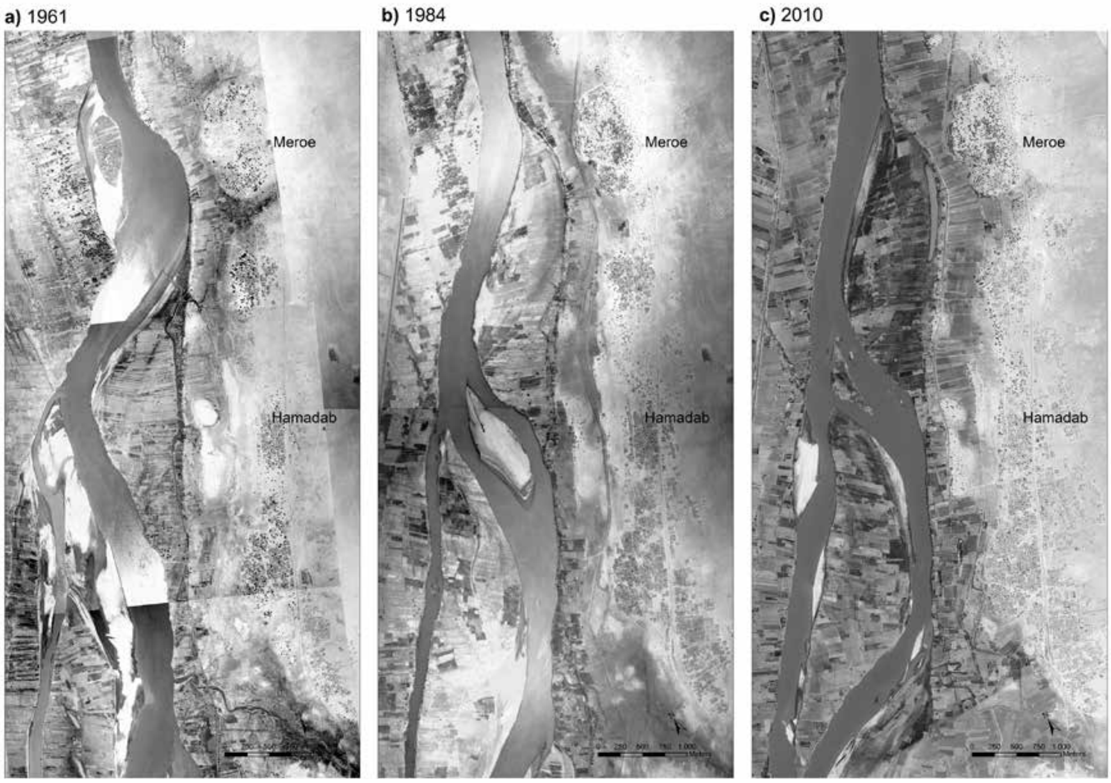

Plate 12. Aerial photographs and satellite data illustrating the northward shift of mid and side bars in the Nile's riverbed between Kabushiya and Meroe (compiled by N. Salamanek, 2014: sources: a – Aerial image 831 056-060, acqu. date: 5.11.1961 (Khartoum Survey Department); b – Aerial image AC23 053-059, acqu. date 22.6.1984 (Khartoum Survey Department); c – Satellite image: DigitalGlobe, acqu. date: 2.12.2010 (UTM Zone 36Q, WGS1984, Google Earth)).

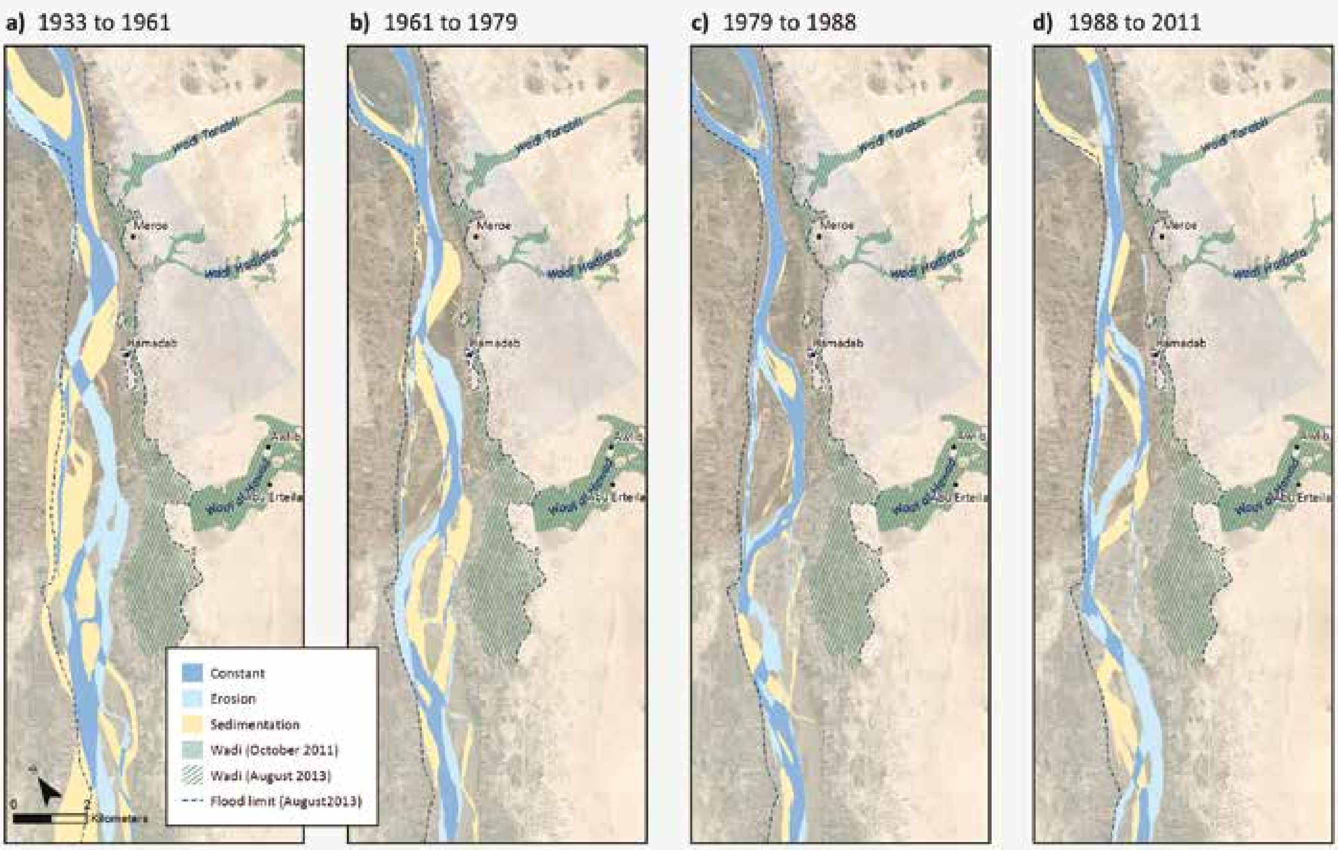

Figure 7. Monitoring the dynamics of the Nile between the Wadi el-Hawad and Meroe between the 1930s and 2011 (N. Salamanek, 2014).

on river islands is thus as implausible as a westbound shift of the Nile. Its riverbed is unstable to such an extent that any occupation activity on islands and mid-bars must have been already in antiquity limited to only a short episode, and a westbound shift of the Nile during historical times is unlikely because of its bias towards the east, which is due to the river's general course in the region. Another possibility to explain the above-mentioned fluvial deposits to the east of Meroe solely as a result of the Nile's fluvial behaviour is the assumption of higher Nile levels and floods, which is, regarding the general climate development, likely at least for the first half of the last millennium BC. However, there are other options to explain that evidence (see below).

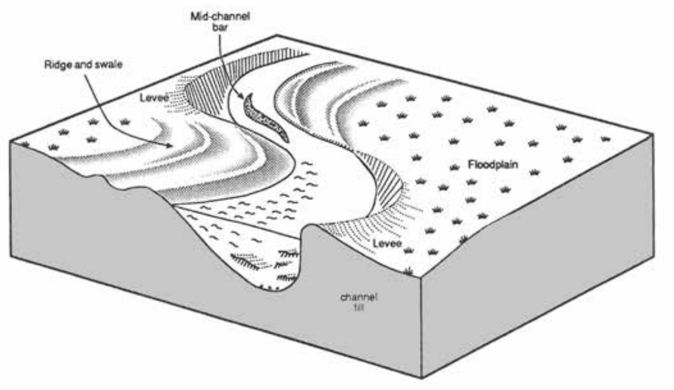

Figure 8. Schematic block diagram of a river channel and its floodplain with cut banks and natural levees (after Brown 1997, 21 fig. 1.1).

Sites for human and especially urban aggregation for occupation along rivers are usually selected so as to provide a balance between proximity to water and arable land resources for farming crops and grazing animals on the one hand, and safety from flooding and land degradation on the other. Such places are often river terraces (cf. Brown 1997, 7f, 254). The larger Meroitic settlements such as Meroe and Hamadab, as well as a number of small occupation sites documented by our reconnaissance survey, evolved and developed on the eastern terraces of the Nile between the Wadi el-Hawad and Meroe, since they apparently provided such well-balanced geomorphological conditions over many centuries. These generally favourable conditions for urban settlement might also explain the wealth of Meroitic sites on the Nile's east bank in contrast to the paucity of similarly prominent archaeological sites on the opposite bank. The flat side bar along the west bank was much more susceptible to Nile floods and, therefore, any occupation activity must have been at a much greater distance from the river. The present-day settlements between Kabushiya and Meroe developed at a greater distance from the Nile, on higher and safer river terraces, since they are much less dependent on the river's water resources because of deep-wells and mechanical pumps. It is, therefore, not incidental that the establishment of modern Hamadab was initiated by the digging of a new well some two centuries ago (Wolf *et al.* 2014, 118).

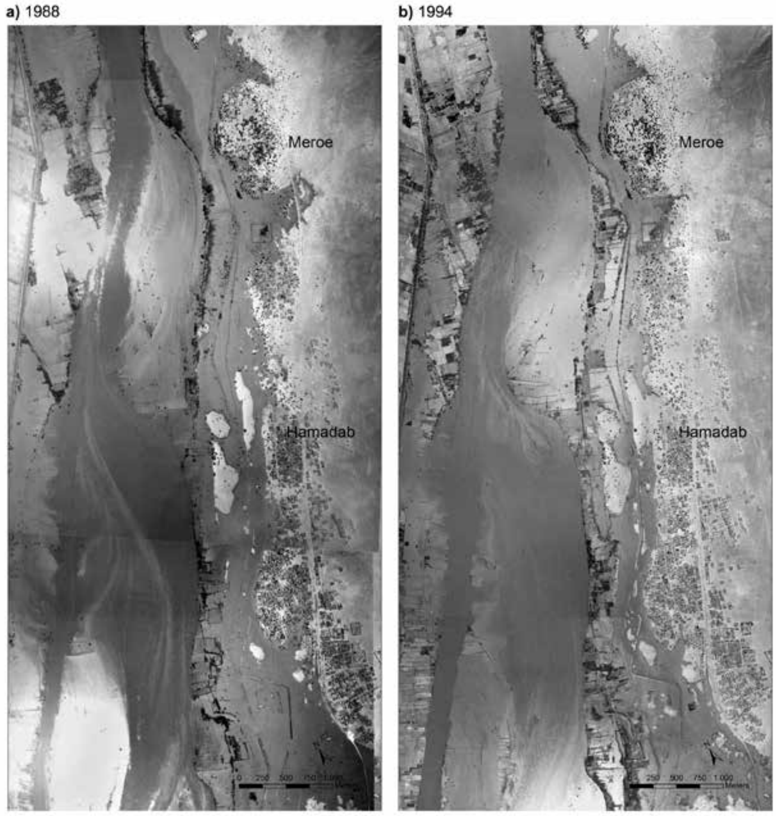

Plate 13. Partially drained natural levees with their sand dunes and gallery forests are well recognisable during the Nile floods in 1988 and 1994 (complied by N. Salamanek, 2014: Sources: a – Aerial image AF08 109 and 111, acqu. date: 18.9.1988 (Khartoum Survey Department); b – Aerial image AK1 180 and 182, acqu. date: 22.8.1994 (Khartoum Survey Department)).

Natural levees

Another geomorphic feature significant for our understanding of the landscape and settlement history in the floodplain between Kabushiya and Meroe comprises natural levees, which the Nile develops at the edges of its floodplain terraces. These are barriers generated by the spread of the river's suspended sediments into the floodplain, when the water level rises above the riverbank. The sediments accumulate there with decreasing grain size and volume towards the floodplain (cf. Brown 1997, 98), resulting in slightly elevated natural barriers parallel to the river course (Figure 8). Being first drained after the flood, they allow for the growth of gallery forests (Plate 13, Wolf *et al.* 2014: 115f and fig. 8; cf. Brown 1997, 108-111), which fix the levees and catch aeolian sands eroded from sand bars at lower water levels. The annual floods are usually not forceful enough to remove these sand dunes, especially those on so-called 'abandoned levees' on higher and older floodplain terraces more distant from the main stream. Hence, larger dune bodies develop which retain some of the floodwater that irrigates and fertilises the floodplain by its suspended sediments. Apart from that, the shallow rising slope of the levees toward the river allows for an effective channel irrigation of small terraced fields. Finally, the natural levees and overlaying sand dune bodies facilitate a 'downstream displacement' of the Wadi el-Hawad's and the Wadi Hadjala's discharge into the Nile by forcing it into channels parallel to the river (Wolf *et al.* 2014, 118 and fig. 10). The North and South Mounds of Hamadab are turned almost every summer into an island by this phenomenon – less dependent on the Nile flood but rather on the discharge of the Wadi el-Hawad.

In the region between Hamadab and Meroe these riverine landforms are easily recognisable (Figure 9) and the preliminary results of our electric resistivity transects and core drillings across the floodplain seem to prove the appropriate sequences of fine-grained channel deposits overlain by levee-

Figure 9. Satellite image on which are superimposed the larger preserved natural levees and sand dunes marked by blue and yellow dots in the Hamadab reach (R. Schomacker, 2015: background satellite image: DigitalGlobe, acqu. date: 2.12.2010 (UTM Zone 36Q, WGS1984, source: GoogleEarth)).

sediments and sand dunes. Such dune bodies are relatively safe from flooding and surrounded by fertile land but are themselves of little use for agriculture. Hence, by representing well-balanced places regarding water resources, arable land and safety from flooding, they are perfect sites for smaller scale occupation as well as for larger settlements. The sediment sequence in our excavation trenches that reached into the geological horizons below the settlement on the North Mound demonstrates that Meroitic Hamadab did indeed develop on top of a sand dune of an 'abandoned natural levee' (Figure 10, cf. Plate 2). It belongs to a lower and thus more recent river terrace and its sand dune probably evolved around the 4th century BC.[35] Meroe City, however, developed

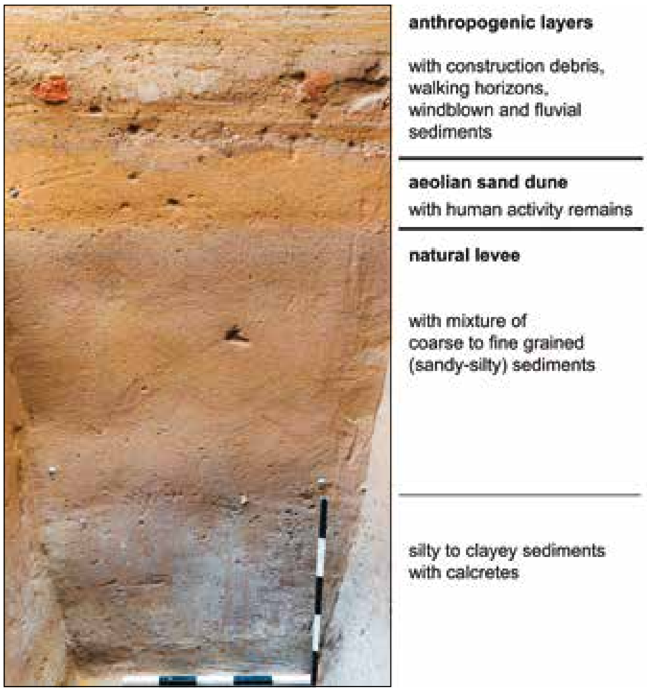

Figure 10. Section cutting through the sand dune and the natural levee sediments into the channel fill of the river terrace below the Meroitic town of Hamadab (cf. Plate 2; P. Wolf, 2015).

on a levee of a higher and thus older palaeo-terrace, which was very likely imune from flooding by the Nile in the last millennium BC.[36] Given a larger discharge volume of the Wadi Hadjala, which is, regarding the general North-East African palaeo-climate development, not unlikely for the first half of the last millennium BC (see below), a 'downstream displacement' of its run-off could have easily turned Meroe into a seasonal island (cf. Wolf 1996, 39-42; Grzymski 2005, 55f). The effect may have been amplified in combination with assumed higher Nile levels and floods, which might have caused backwaters reaching farther into the mouth of the Wadi Hadjala and to the east of Meroe than is the case today. Hence, a floodplain morphology with levees and sand dunes in combination with the hydrology of the regional *wadi*-streams may well have produced a (seasonal) island out of Meroe City.

Beyond the Nile Valley

In addition to the geomorphic setting in the Nile's floodplain, the seasonal streams such as the Wadi el-Hawad and the Wadi Hadjala obviously also played a significant role in the development of the region, demonstrating that Meroitic society was, in contrast to ancient Egypt, not exclusively dependent on the Nile (cf. Brown 1997, 5). The Wadi el-Hawad, the largest *wadi* system in the Butana, links the Nile Valley to agricultural resources in the hinterland such as at Basa, where large-scale cash cropping of dhurra is still carried out today. In addition, the lower reaches of these *wadein* might have supplemented the floodplain already in antiquity with additional arable land

[35] Cf. the radiocarbon dating Poz-65804, HSP 14-469 in note 4.

[36] It is the palaeo- terrace where the present-day settlements are situated.

for growing sorghum, legumes, cash crops such as cotton, fuel resources and grazing areas (cf. Akhtar 1990, 114f). That the potential of these streams was exploited by the Meroites is demonstrated by the *hafireen* dug into the lower reaches of the Wadi el-Hawad and the Wadi Hajala. The morphology of the middle and lower reach of the Wadi el-Hawad causes a slow and non-destructive water discharge resulting in a broad and braided *wadi* mouth (Akhtar 1990, 89f, 112f). The distribution of archaeological sites, especially the location of Abu Erteila and Awlib very close to its banks and the position of the *hafir* in the middle of its stream (cf. Figure 2), indicate that the relatively gentle water regime has persisted already since the Kushite period. The *wadi*-mouth is covered with Nile sediments for several hundred metres upstream, illustrating that it is regularly flooded by the Nile.[37] It is thus very likely that the *hafir* was intentionally situated at a location where it could retain water from the seasonal *wadi* run-off and from the annual Nile flood,[38] the latter assumption being supported by the fact that the large out- or inlet of the *hafir* is oriented downstream towards the Nile.[39]

A similar situation may be assumed for the Wadi Hadjala, immediately south of Meroe City, and its *hafir* next to the 'Sun Temple' (cf. Figure 2). To better understand its history and function we documented the *hafir* by airborne orthographic photography and investigated it by electrical resistivity tomography, magnetometry, ground penetrating radar, and coring as well as archaeological soundings and sampling (Figure 11 and Plate 14). The most astonishing find was that the *hafir* is small and shallow. Its effective water storage area had a diameter of just 80m and was on average about 1m deep. The diameter of its ring-like-deposited upcast is, at 170-180m, much wider. The *hafir*, therefore, appears much larger than it was. It features a water inlet to its north-eastern side and a larger out- or inlet towards a flat plain in its south west. Unfortunately, the magnetometry did not reveal any ancient man-made features within this plain. A sounding in the upcast heap at the northern side of the *hafir* revealed that it was carefully planned and executed in several phases (Plate 15). First, three rows of roughly hewn sandstone blocks[40] were laid directly onto the subsoil. The magnetometry shows that they encircle the entire *hafir* and it is likely that they were designed to stabilise the upcast against degradation. The upcast was deposited in two phases, between which a sand dune accumulated. During the second phase, the upcast was deposited from the outer and not from the inner side of its circle, perhaps to prevent its destabilisation at the inner face. The evidence suggests that cleaning or enlarging of the small 80m diameter *hafir* was started, but this work was never completed. Because of its relatively large evaporation area in relation to the small volume, the *hafir* cannot have retained water for long periods, which might indicate that it was used for supplementary irrigation to increase agricultural output.[41]

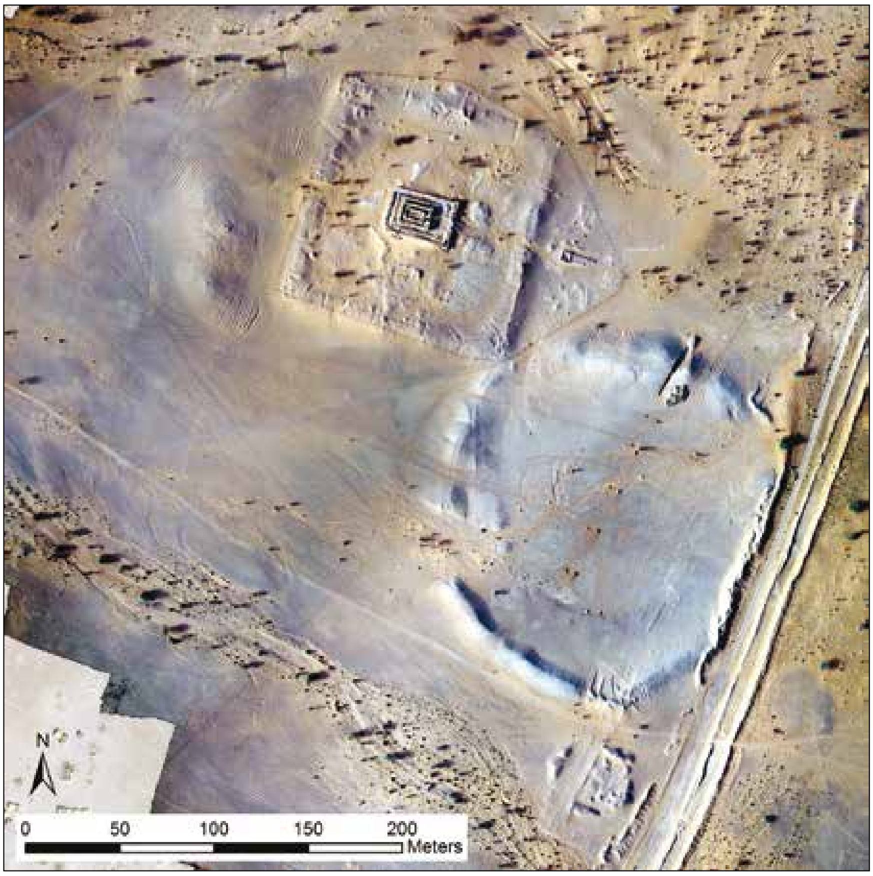

Plate 14. Airborne orthographic photograph of the hafir *in the Wadi Hadjala next to the 'Sun Temple' M 250 (F. Stremke, 2015).*

Regional ecology and climate in the last millennium BC

During the second half of the last millennium BC, the Meroe region developed into an important centre of the Kushite kingdom. As noted already by John W. Crowfoot, this development cannot have been based merely on Meroe's favourable position in the trans-regional trade network (Crowfoot and Griffith 1911, 7). It presupposed a fertile place and favourable ecological conditions that could sustain a large population, allowing for the cultivation of cash crops and yielding

[37] See also Wolf *et al.* 2014, 118 and n. 24. The aggraded sediments are nowadays used for cultivation farming.

[38] In addition, it probably receives interflow-run-off from the wadi-banks.

[39] Would it have been merely an outlet, its drain would probably consist of channels and stone pipes like at the *hafa'ir* in Musawwarat es-Sufra (see Scheibner 2003; 2004).

[40] Comprising column parts that possibly derive from the construction of the 'Sun Temple'.

[41] As has been generally argued by Scheibner (2014, 308-320); cf. also Hinkel 1991. A function as a watering place for animals cannot be excluded, though animals could have been watered at the nearby river as is still customary today.

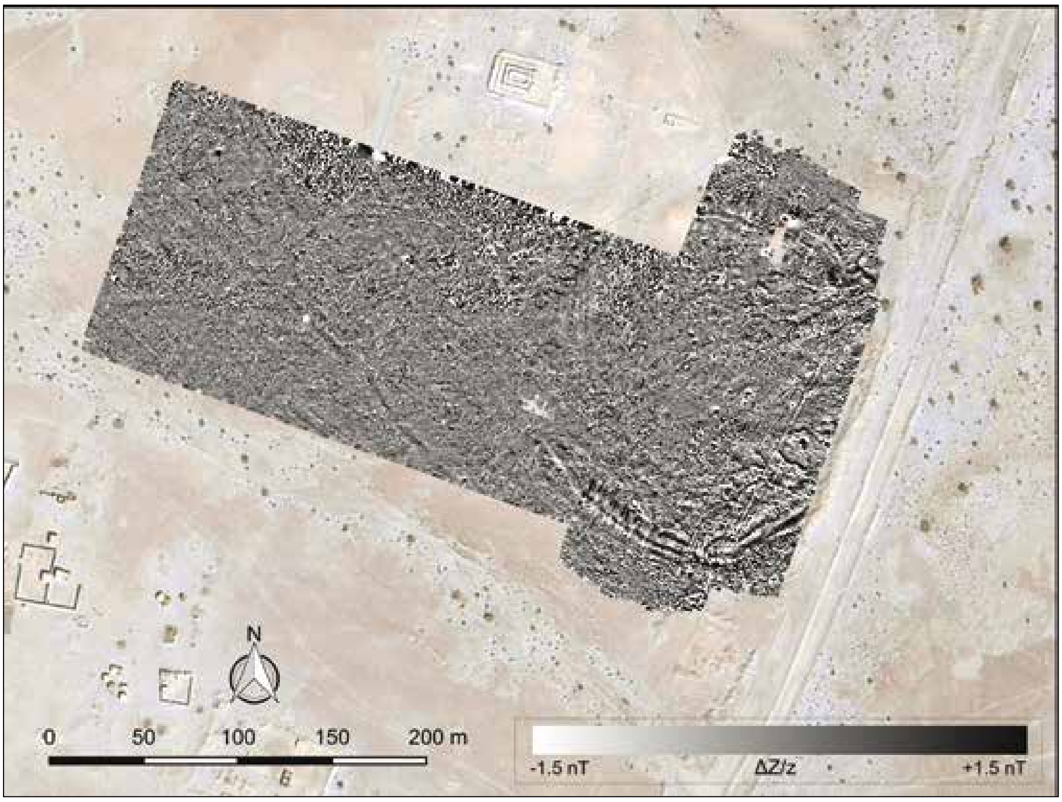

Figure 11. Magnetometry plot of the hafir *in the Wadi Hadjala next to the 'Sun Temple' M 250 (Magnetic data by Eastern Atlas/Berlin 2015 (System: LEA-MAX; Registration: LEA-02; Sensor: 10 x Foerster FEREX 4031/4032 CON400/650): background satellite image: DigitalGlobe, acqu. date: 2.12.2010 (UTM Zone 36Q, WGS1984, source: GoogleEarth).*

sufficient water and fuel resources – the latter especially with regard to Meroe's vast iron production. The fertility of the Meroe region may already have inspired Herodotus to write his famous passage on the 'Table of the Sun' (see Török

Plate 15. Section through the upcast of the hafir *in the Wadi Hadjala next to the 'Sun Temple' M 250 (photo: P. Wolf, 2015).*

2014, 33 and 97) and, in view of the contemporary ecological conditions elsewhere in the northern Sudan, its fertility and its cash-crop oriented agriculture are still today outstanding features.[42] The development of the Meroe region as the centre of the Kushite kingdom falls within generally arid conditions in North-East Africa, which gradually developed after 3300 BC and reached hyper-arid conditions around 1450 BC (Kuper *et al.* 2007). Today's hyper-arid ecosystem seems to have been established in the eastern Sahara by about 700 BC (Kuper and Kröpelin 2006; Kröpelin *et al.* 2008). The Nile experienced a general decrease of its water levels after 2500 BC (Pachur and Kröpelin 1987; Woodward *et al.* 2001; 2007) and established its present-day course – at least in the Northern Dongola Reach – at the beginning of the last millennium BC (Macklin *et al.* 2013). However, related palaeo-environmental research has focused hitherto on desert regions beyond the river, where climate archives for the past 3500 years are lacking due to sparse aquatic deposits (Kuper and Kröpelin 2006). What is required is more thorough research at a regional level within the Nile Valley.

It is likely that a riverine region like Meroe, situated still today inside the rain belt, had a relatively humid eco-system until the turn to the last millennium BC, which might have made it less attractive for larger-scale occupation – for example due to a broader riverbed of the Nile and a more violent inundation regime or due to inhospitable swamps with

[42] Corroborated by our survey of the present-day ecology and land use (Wolf *et al.* 2014, 115f and figs 8-9).

pathogenic insects and infections. For example, compared to the present-day floods, substantially higher Nile floods in the second millennium BC must have submerged the entire site of Meroe (cf. Plate 13).[43] After the beginning of the last millennium BC, while decreasing Nile levels and the advancing aridification gradually impeded life and the subsistence of a larger population in the north, the Meroe region, in turn, may have developed into an ecologically favourable region with the geomorphology of its floodplain and its seasonal streams favouring its economic and political development. In the second half of the first millennium AD, however, increasing flood levels (cf. Brown 1997, 10) may have triggered at Hamadab an assumed resettlement from the North to the higher and safer South Mound, which is indicated by the archaeological record and the pottery assemblages of both mounds (see above). In addition, higher floods may have been responsible for the aggradation and erosion of the lost upper levels of both mounds.

It is still a matter of speculation as to whether climate and wind regimes in the last millennium BC may have permitted a higher seasonality with summer and winter rains supplied by the regional moisture source reservoirs farther south. According to Geb (2000, 86-95), for example, moisture reservoirs in North Africa reached their maximum spatial extent between 10° N and 30° N during the last humid period 6000-3000 BC, allowing for a wintertime precipitation that recycled the *in situ* evaporated moisture to the ground with probably greater abundance from October to April extending to at least 20° N (cf. also Rodrigues *et al.* 2000). After 3000 BC, various global factors eliminated the climatological basis for the abundance, duration and northward expansion of the North African monsoonal rains. This, in turn, gradually overstressed and diminished the moisture reservoirs, which finally led to the present-day situation without winter rainy seasons. However, as the dynamics of present-day weather episodes are, according to Geb (2000, 95), in principle not different from those of that humidity period, it cannot be ruled out that regional weather conditions in the last millennium BC might still have permitted short winter rainfall in the 'Island of Meroe' based on regional moisture sources.

Another question is whether the wind regimes in that millennium permitted the region to profit from a winter rainy season in the east, such as the *belg* season in February–March in the Ethiopian and Eritrean highlands.[44] Recent geochemical analyses carried out by Christian Weiß in Yeha (Tigray/Ethiopia) illustrate that the highlands experienced at least three humid phases with relatively high precipitation rates during the last millennium BC (I. Gerlach, pers. comm. 2015). Given appropriate wind regimes between these highlands, the Red Sea Hills and the huge catchment area of the Wadi el-Hawad, 300 km distant from the north-western margins of the highlands, it is conceivable that Meroe indirectly benefitted from such humid phases by additional intermittent flooding of the Wadi el-Hawad. Almost perennially filled *hafa'ir* and a winter-irrigation of the *wadi*-mouth as well as perhaps of the Nile's floodplain terraces[45] might have further increased the crop yield by several harvesting seasons.

[43] For a short outline on the history of Nile floods see for example Brown 1997, 9-11; Macklin *et al.* 2013.

[44] The climatic phenomenon of these winter rains related to the orography of the Abyssinian highlands is still poorly explored. Occasional winter rains are, however, also known relating to the Red Sea Hills farther north (pers. comm. F. Welc and R. Schild, July 2015).

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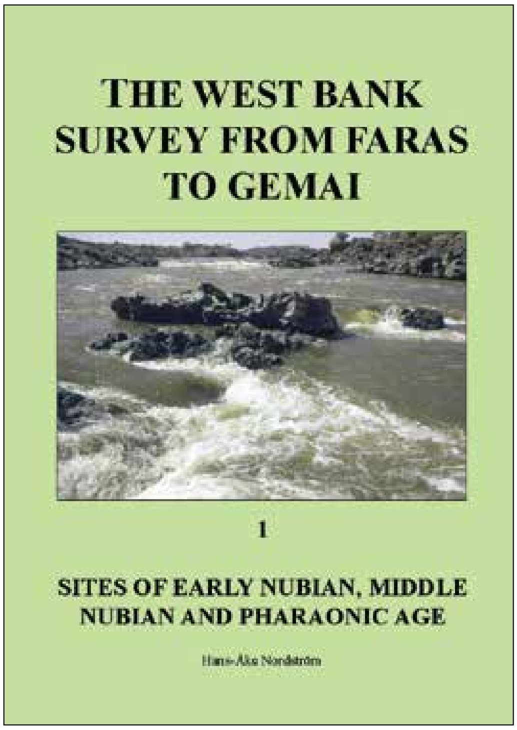

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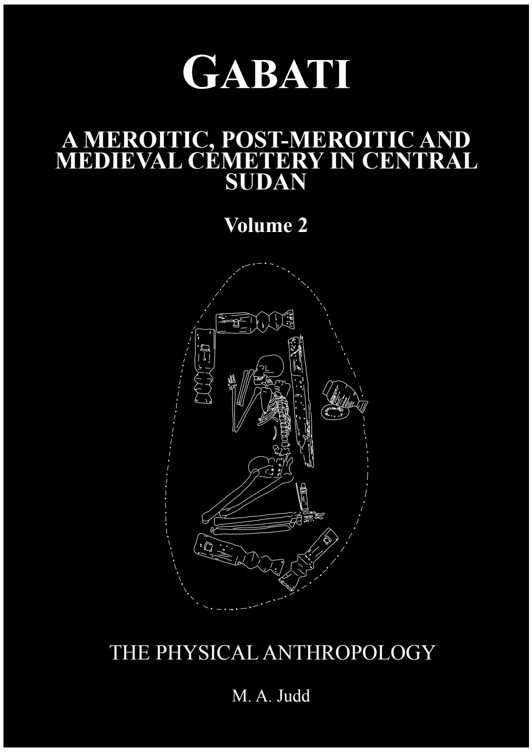

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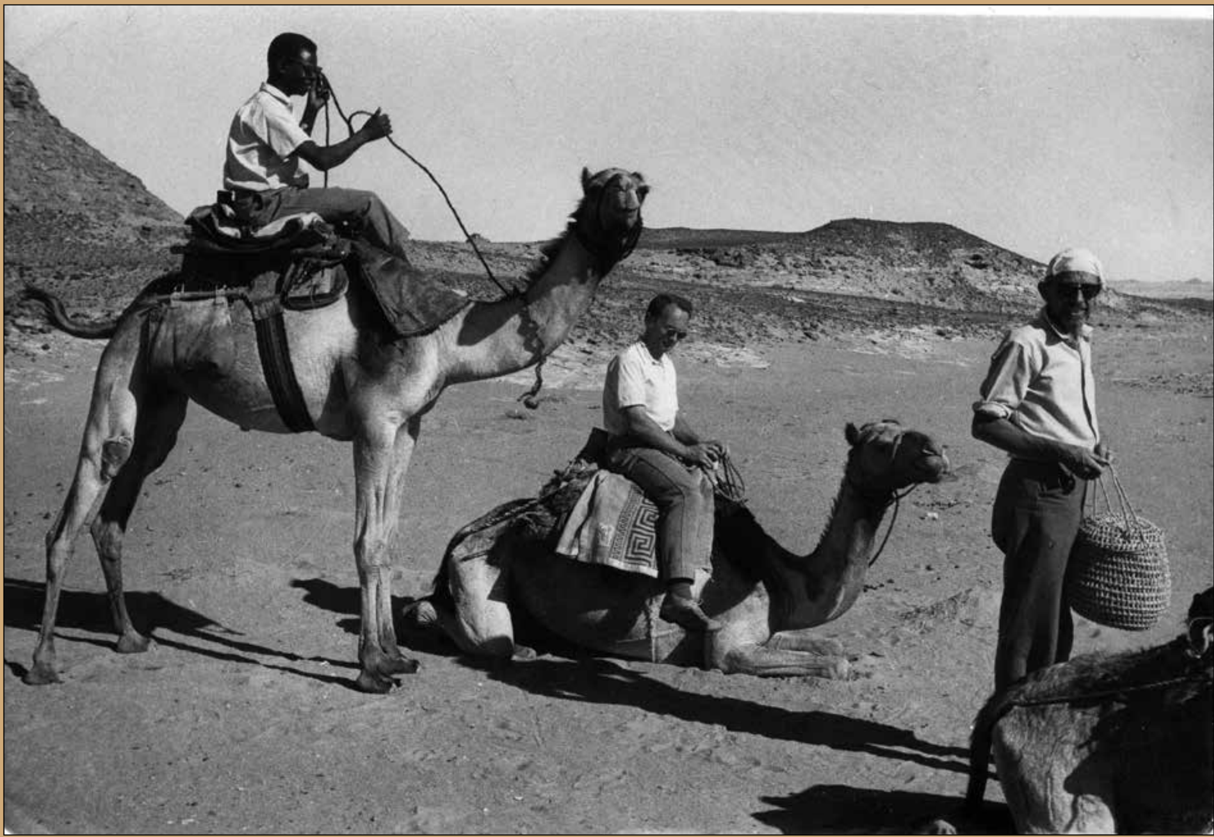
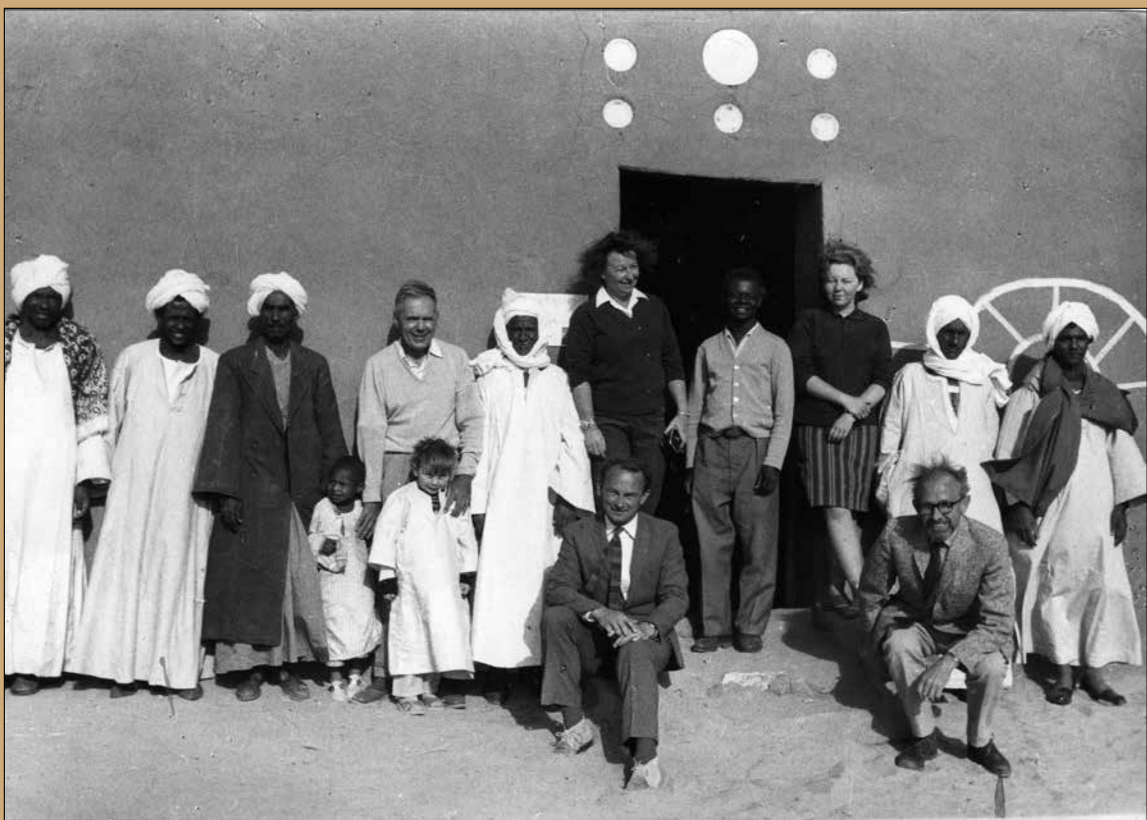


Members of the University of Ghana Expedition to Sudan. John Alexander (centre), James Anquandah (left), Tony Bonner (right) (photo: SARS Alexander Archive, ALE P003.05).



The Debeira West excavation team 1964 with amongst others, Peter and Margaret Shinnie, John Alexander, John Anquandah and Tony Bonner (photo: SARS Alexander Archive, ALE P003.04).

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