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1995-1996 1996-1997

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ARCHAEOLOGICAL EXCAVATIONS AT KERMA (SUDAN): PRELIMINARY REPORT ON THE 1995-1996 AND 1996-1997 CAMPAIGNS

By Charles Bonnet

Before presenting the results of the last two campaigns, we wish to express our gratitude to those responsible for the journal *Genava* for the warm welcome they have given us for over twenty years, and to pay tribute to the remarkable quality of their editorial work. The award by the town of Geneva of a substantial grant in 1986 is further evidence of the fruitful collaboration between the Museum of Art and History and the Mission of the University of Geneva. The archaeological material shared with us by the Sudanese authorities regularly adds to the Museum's collections. Our thanks are also addressed to the Swiss National Fund for Scientific Research which has given us substantial support for many years, and to the Excavations Commission of the University of Geneva, under the presidency of our colleague Michel Valloggia; his interest in our work has never faltered. It is clear that without these generous grants and those from private sources it would not be possible to mount an excavation of this scope each year.

The excavations took place from 6 December 1995 to 3 February 1996, and from 9 December 1996 to 5 February 1997. The relationships of trust that have developed over the years with the Antiquities Service and the National Museums of the Sudan, under the directorship of Hassan Hussein Idris, have not only made our work easier but have also allowed us to develop a long term archaeological policy. The inspector was Salah el-Din Mohamed Ahmed, Director of Archaeological Excavations for the Sudan. One hundred and fifty workers worked on the different sites; they were directed by the Raïs Gad Abdallah, Saleh Melieh, Abdelrazek Omer Nouri and Idriss Osman Idriss. In the **ancient town**, the southern area was investigated, and also the north-south access road, which was without doubt the most important one as it linked the port on the Nile and the religious quarter. Several habitation units were cleared, and their layout gave us information about social and economic structures. A stratigraphic study was undertaken in the north-east sector of the **secondary settlement**, the seat of a religious institution whose importance was demonstrated as much by the development of the cult buildings and workshops with which it was associated as by the powerful defensive system which surrounded it. Numerous ovens and hearths for the preparation of food offerings were found. In the **Pre-Kerma settlement**, the cleaning of a vast area revealed new huts and rectangular structures; they are discussed by Matthieu Honegger in an annex to this report. In the **eastern necropolis**, the excavation of an Ancient Kerma sector recovered objects of high quality and also new information on the presence of temporary wooden structures indicated by a series of postholes on the edges of grave pits. We also had to intervene in a Middle Kerma area that was particularly badly affected by erosion. Work on the funerary temple K XI was mainly carried out on the facing of the facade and the northern apse. Finally, at the site of **Doukki Gel**, we discovered a Meroïtic temple 45 metres long, of which only a part of the pylon and the peristyle courtyard was excavated. Traces of fresco painting were found on the inner wall of the pylon. Salah el-Din Mohamed Ahmed took responsibility for this site, having for a long time specialised in the study of Napatan and Meroïtic monuments.

We carried out work to protect and restore at the same time as undertaking the archaeological research. The area of the deffufa is now entirely protected by a surrounding wall, with a monumental entrance gate of Nubian style. Remains of fortifications were restored in some places and also the layout of many small houses. The site of Doukki Gel, which is particularly vulnerable due to its close proximity to cultivated land, was surrounded on three sides by an enclosure 2.3 m high, and the remains of the Meroïtic palace were consolidated and improved.

The simultaneous opening of several sites demanded much of the members of our team, most of whom had a great deal of experience in the field. Béatrice Privati took charge of the study of the archaeological material, particularly the pottery. Thomas Kohler, who was replaced for one of the seasons by Marc Bundi, recorded the architectural features in the ancient town. Daniel Berti, who also drew the leather objects and the inscribed blocks found in the Meroïtic temple at Doukki Gel, was responsible for the photographic

record. Marion Berti took part in the excavations of the secondary settlement and the necropolis. Louis Chaix analysed the bones of the animals that played an essential role in the funerary rituals at Kerma. Christian Simon was only able to carry out his anthropological studies during the 1995-1996 season, due to illness. In the Pre-Kerma settlement, the work needing more specialised techniques was again entrusted to the prehistorian Matthieu Honegger. The administration was undertaken by Pascale Rummier, Patricia Jegher and Anne Smits, who also took part in excavation and survey work. We should like to express our sincere gratitude to all. We should also like to offer our thanks to Nora Ferrero for her work on the documentation and analysis in Geneva.

We should like also to mention the research undertaken by the geomorphologist Nicola Surian, based on aerial photography; this aided our understanding of the hydrological systems in the past, and clarified the topography of the archaeological sites in the Kerma basin. Detailed results are given in an annex to this report[1]. Several publications on Kerma have appeared during the last few years, several in connection with the travelling exhibition "Sudan, Kingdoms on the Nile" which opened in Munich in October 1996, and then travelled to Paris, Amsterdam, Toulouse and Mannheim[2].

The eighth International Conference for Meroïtic Studies, held in London from 9-14 September 1996 provided the opportunity to present the Meroïtic palace of Doukki Gel and the Napatan necropolis established in the secondary settlement[3].

THE PRE-KERMA SETTLEMENT

The study of this 4th millennium BC settlement was continued by means of surface cleaning within the Middle Kerma (c. 2000 BC) sector CE 12 of the eastern necropolis. Occupation levels, which were very impoverished in material, were difficult to distinguish, partly because of frequent flooding and partly through disturbance during the construction of the graves and superstructures of the tombs, and of the oratories and chapels built to the west of the burials. The distribution of finds suggests an interaction between the two main phases of occupation, but this hypothesis remains to be verified as we do not yet know the precise limits of the settlement. In any case, it seems that it was abandoned around 2400 BC, a little before the construction of the first Ancient Kerma tombs approximately 800 m to the north of the buildings studied. A more detailed account of this research is given by Matthieu Honegger[4].

THE ANCIENT TOWN

In these last two seasons a study was made of the fourth access road, which was oriented north-south; this was a main thoroughfare as it led to the great roundhouse and the religious quarter, channelling people and goods from the port. In places, its width did not exceed ten or so metres. After the removal of a considerable quantity of rubble and wind-blown sand, the remains of two enormous round bastions appeared, running alongside the road for almost 100 metres. Drains dug into the silt in order to collect surface waters were also found. To the south, the course of the road was interrupted by the limit of the archaeological site, beyond which lies farmed land. The structures discovered were particularly difficult to analyse. They were not made of mud brick but of "galous" that is lumps of clayey earth of variable size, placed one against the next, and then, after they had dried, superimposed layer on layer; this technique is still used today to build the walls of houses and courtyards. Within these structures were found various phases of a fortification that was regularly modified throughout its long history, and also innumerable postholes of various diameters belonging to palisades and barriers which reinforced, or sometimes replaced, bastions that were too eroded. The entrance itself had not survived, but the plan of a rectangular tower remained, similar to those found at two other strategic points of the town - to the west of the great roundhouse and in the secondary settlement. These three towers, which had the same proportions (between 3.5 and 5 m) allowed full surveillance of the main approaches. The entrance would certainly have been near the tower, directly in line with the road. A document, in the form of a baked mud seal found in an neighbouring administrative building has perhaps provided a picture of its elevation; the seal was engraved with a motif evoking the Egyptian *serekh*, but which could also be interpreted as a representation of an entrance with a double doorway, surmounted by arrow slits or loopholes indicated by the nine small incisions on top. The seal is crossed with two lines indicating that it was no longer in use (fig. 3).

A secondary entrance which gave access to an east-west side road was relatively well preserved. It was made from two elongated structures terminating with a rounded face; only the sill was made from mud brick. On the north side the approach was defended by a powerful round bastion while on the south was a third elongated structure, set perpendicularly to those of the door. On one of its sides it was possible to discern the remains of a stair, which probably gave the guards access to positions on the top. During the Classic Kerma period, the gateway was restored and developed behind the original building. Its approach was also

modified: the large bastion to the north was refaced, palisades supported by enormous posts were added and a series of irregular bastions, linked together, were placed on the southern side.

This road delimited a fairly large district whose organisation was probably in part linked with the traffic of goods passing along the southern road. A series of seals and seal impressions were found in a building close to the presumed site of the main entrance. They were associated with a collection of small cones of seal clay, ready for stamping. Other such reserves have been found elsewhere, notably in the palace, where more than 5000 similar pieces were stockpiled in a square receptacle, in the deffufa annexes, and also in an administrative building of the harbour district[5]. They show that at Kerma sealing merchandise or dispatches was a common operation that took place in particular places. While the seal with the image of the door or *serekh* seems to be of local manufacture, the majority of the impressions were of Egyptian type[6]. Found in the same context as the seals were fragments of a slab of clay which was probably an offering table, placed on a bed of red ochre and decorated with a drawing of an elephant, inscribed in the unfired clay.

In the immediate vicinity of this store of seal clay was a building (M 156) of approximately 15 m by 10 m which was probably intended for the officials responsible for the registration of merchandise. The building consisted of a rectangular room divided by a row of wooden posts and a courtyard which had a portico of five columns on the eastern side. Its roof was still supported by five pilasters with rounded bases, inserted in the western wall, opposite the columns. This very well built structure was characterised by thick walls which must have been at least 4 m in height.

On almost the same alignment, in the north-east corner of the district, was another large construction (M 150), of similar type to M 156. It consisted of two structures separated by a central courtyard. The eastern building is open to the south, a feature provided for from the outset (Middle Kerma), perhaps to facilitate the handling of goods. A large exterior courtyard extends the unit on the southern side, where doorways reinforced by large buttresses led towards a large oven and a third courtyard in which a circular mud brick house was erected.

These two constructions are perhaps related to an ancient building, M 155, on the other side of the access route, closer to the deffufa. The main room, the only one preserved, measures 12 m in length. It is constructed from a row of seven posts and is also open to the south where, however, the presence of a barrier is indicated. Like the other buildings, it was constructed on earlier foundations, then rebuilt to a new plan. A courtyard enclosed by a rather thick sinuous wall, stretched to the south; in the interior was a circular mud brick house as well as a silo. After the abandonment of M 155, two circular huts, indicated by postholes, occupied exactly the same site as the room with seven pillars of wood.

The access route opened onto the religious district and in front of its entrance was probably a courtyard, a place where many viewpoints converged[7]. We recorded two enormous stones that may have been used as the threshold of the doorway. The surface was cleaned in front of these stones, which were probably in their original position, and two semi-circular bastions could be traced by the yellow colour of the clay from which they had been made. They must have stood on either side of the entrance. In a second phase, large posts were driven into the pillars to act as another system of defence. These systems seemed to be very ancient, but it was not possible to clarify their date as no significant material was recovered.

At the beginning of the Middle Kerma period, the religious quarter spread further to the west, as could be seen from the foundations of an elongated construction which went well beyond the enclosure wall. Its orientation was slightly at an angle to the deffufa. The trench opened in this sector showed that the remains were completely eroded; however, it is still possible that an extension of the excavations might reveal architectural remains of fortifications or a gateway.

Several habitation units were found in the south-west quarter. The large courtyard of houses 26 and 27 provides a particularly interesting example because of the diversity of the buildings it contained. Surrounded by a curving wall, it included several craft areas, granaries and circular silos. At least three levels were recognised, confirming a relatively long period of utilisation. Numerous hearths were also uncovered; some had been used to cook meat or bread, and others to fire pottery. Two moulds for making bread offerings were also recovered. Two modest habitation units built in the corners were probably intended for watchmen or craft workers. The one in the north-east, M 145, had a more African than Nubian appearance. It comprised a circular hut of mud brick against which was built a small circular annex - perhaps for children - and a small-scale courtyard protected by a rounded wall; in this was a granary for food storage. Various domestic objects were found such as millstones, bone points, grinders and fragments of pigments were recovered inside and around the houses. The unit in the north-west corner (M 146) was made up of three small square rooms. Two other small shelters (M 147-148) were added later in the south.

THE SECONDARY SETTLEMENT

A detailed investigation was undertaken of the whole of the north-east sector, where the remains of a chapel (E XVII-XVIII) and several earlier rectangular buildings (E XVI) had been excavated. The perimeter was well delimited: to the north we found the continuation of the powerful stone foundations that ran along the ditch separating the ancient town from the settlement on the eastern side (fig. 4).

It is rare to be able to trace the architectural evolution of such an extensive group. The different phases, which were of considerable complexity, demonstrated the distinctive character and importance of the veritable religious institution which made up the secondary settlement. The most prominent aspect of its history is undoubtedly the permanence of the occupation; although the fortification systems were regularly modified, the development of the buildings, such as the craft structures, remained confined to the same area throughout the Middle Kerma period. It is in the Classic Kerma period that the changes became more radical, witnessing the same excessiveness which characterised the latest princely tombs, in which the bodies of several hundred sacrificial victims are found.

The first phase, recognised around the south-east corner, is associated with a square gate with sides measuring more than 5 m. The interior was divided into two. The passage way, oriented east-west, ran along the southern wall which was reinforced by an internal pillar. Ancient Kerma potsherds found in this level belong to the earlier levels which have not yet been excavated. The remains are dated to the beginning of Middle Kerma, around 2000 BC (fig. 5-I).

The second phase, for which we can reconstruct a partial schematic plan, is represented by a square unit with sides around 30 m, situated in the north-east of the sector. Its eastern side was defended by a series of rounded bastions; one of these, which was well preserved, was 1.50 m wide and 2 m deep. To the north there were three long narrow annexes, and others probably existed to the south. This first area, which maintained practically the same dimensions for around 300 years, until the Classic Kerma period, has analogies with the C Group settlement excavated at the beginning of the century at Amada, where square units seemed to form groups that were well defined and more or less independent[8] (fig. 5-II, fig. 6).

The third phase completes the picture of this sector. A square chapel was superimposed over the three annexes of the previous phase. It had an axial row of four supports and a side annexe. In front was a strange space into which many pits had been cut for the bases of columns, many of which were still preserved. The bases were set in a rounded lump of silt over a layer of fine sand. It was very difficult to reconstruct the arrangement of the pillars of this hypostyle room because it had been disturbed as a result of numerous restorations. The hardened earth floor had also been refurbished several times by the addition of an extra layer (fig. 5-III, fig. 7).

The excavation within the interior of the long building E XVII uncovered the remains of an earlier oven below the one in the south of the building. It was on different alignment to the later structure and placed at right angles between two supports. There were silos for storing the provisions necessary to keep the bakeries going. Still deeper were the very eroded remains of a bronze kiln. The narrow elongated hearths were covered with a destruction level in which fragments of crucibles and a half mould for an axe were found. Another building (E XX), 5 m wide, extended for 13 metres at right angles to this building. In the eastern end of the building there was a range of ovens arranged in a fan shape against a rounded wall. Four levels of hearths were discovered. In a courtyard to the south a second collection of ovens were also found, also built above earlier hearths. Between these two was a small pottery kiln.

This concentration of workshop areas is most impressive. There is no doubt that almost all the activities that took place here were concerned with the preparation of food offerings: as well as evidence for the production of bread, usually baked in moulds, and probably also beer, we found a large quantity of bovid bone remains from all parts of the skeleton and blades of quartzite which were used for butchery. In the workshops, objects of bronze and pottery were also made. These products, and the raw materials and the reserves of cereals stored in the silos, would need to be protected and this is probably the reason that the fortifications were strengthened with more powerful bastions. The gateway was also reinforced with the addition of two large round structures.

The fourth phase corresponds to the demolition of buildings E XVIII and E XX, which, unusually, were replaced by a round building (132) whose door, situated to the north, opened near to the entrance of a courtyard (133). Here cereals, goods and objects of value must have been stored, as the entrance, which had a vestibule in front, was defended by several large structures establishing a complicated traffic flow (fig. 5-IV).

The fifth phase saw the complete reconstruction of chapel E XVI. The general layout was preserved, but the walls were thickened, and a sort of porch was built in the "hypostyle room" which had been heightened. Building E XVII was

incorporated within the new cult site. The wooden chapel near the round building (132) was also entirely rebuilt (E X) (fig. 5-V).

The sixth phase was characterised by extensive works, mainly undertaken along the ditch separating the secondary settlement from the ancient town. A stone foundation, a metre in width, was built as a foundation for large mud brick walls. To the north, blockhouses completed the system. The eastern gateway was again modified and its approach flanked with new massifs and a double bastion, rendering the eastern facade practically impregnable. Chapel E XVI must have been abandoned, as the masonry of the defensive terrace overlaid the ancient sanctuary. It seems that the north-eastern sector was progressively turned over to defence so that it became a sort of base of operations for the gigantic fortification that surrounded the chapels built in the centre of the secondary settlement. Their function was probably similar to that of the Egyptian "hout-ka", that is foundations mainly devoted to the cult of royalty and of people of high status. The amount of energy invested in these works seems all the more considerable since it is in addition to that employed in the construction of the latest royal tombs, whose tumuli can be as much as almost 100 m in diameter. The end of the kingdom was perhaps not solely due to conquest by Thutmes; the effort expended for the necessities of the cult alone had perhaps become too onerous (fig. 5-VI).

THE EASTERN NECROPOLIS

A large areabetween the Ancient Kerma sectors CE 2 and 5 was cleared in order to find the insubstantial structures built around the tombs. We had often found traces of one or two wooden posts near the tumuli, but had not understood their function. The area chosen for this study was badly eroded because it is on the edge of a cultivated area and a farm; as the tumuli were no longer preserved, our excavation could be taken down to the natural alluvium.

This funerary zone belongs to a phase later than the earliest Ancient Kerma period. The dimensions of some of the graves, and the funerary equipment, demonstrated an evolution in ritual and, above all, indicated a social stratification. Of the 34 graves excavated, seven contained the bones of two or four individuals, adults or infants. They were undoubtedly human sacrifices. The main corpse was often equipped with a bow and accompanied by his dogs.

The pottery found on the surface and, less frequently, in the graves is of an exceptional quality, particularly the red bowls with a black border which were polished perfectly and decorated with fine incised motifs; they undoubtedly count amongst the most beautiful achievements of the artisans of the kingdom of Kerma. The leather work also demonstrated a fine mastery; the quality of the tanning and of the sewing used to assemble the various pieces, whether garments, nets or bags, is altogether remarkable. For the first time, a red ochre decoration was still preserved on two of the covers protecting the dead; it was made up of a series of semicircles, hastily drawn, probably representing stelae. The corpse usually wore sandals but on some the sandals were reversed. This was the case in burial t 237, where the left sandal had been attached to the right foot, with the thong which usually passed between the big toe and the second toe, slipped between the fourth and fifth toes! Some jewellery had been left by tomb robbers, and it included necklaces, pendants and bracelets made from shells from the Red Sea and mother of pearl. There was an altogether exceptional discovery for this period of a bowl imported from the Mediterranean basin as well as a fragment of an Egyptian Ancient Kingdom alabaster bowl, both found in the disturbed filling of tomb 228 (fig. 8).

Many postholes came to light but it was impossible to identify all the structures to which they related. However, a palisade or a shelter, probably serving as a wind break, was recognised on the northern side of the grave in around twenty cases. The wood was often preserved and we were able to see that the stakes were not driven very far into the ground. They were ultimately covered by the tumuli which shows that these structures were built at the beginning of the funerary ceremonies. Once only the stakes were driven into the filling of a slightly older grave. In three cases there were small structures that could have been for offerings but further work is still necessary before an accurate plan of them can be made (fig. 9).

In sector CE 12, where the remains of the Pre-Kerma settlement are found, we were able to see the layout of the tombs that seem to have developed around some larger privileged burials that were probably those of people of importance. A rescue excavation had still to be carried out to the south of sector CE 12 where there were jars protruding from the surface. This new sector, CE 24, is also of the Middle Kerma period: four shallow pits were excavated. The material they contained was typical of this period; we shall only record here the find of a large bronze razor that was still inside a case made of several pieces of pegged wood.

THE FUNERARY TEMPLE K XI

Following the study of the painted murals in the interior of the building, investigations turned to the facade and the back of the building, which were completely cleared. The

stone wall belonging to the last stage of alteration was designed as a facing to protect the walls from erosion. Its foundations were built on a thick destruction level, in which were found mud bricks of a particular shape used for vaults. It seems that the two rooms had initially been covered with a vault, as is the case in the eastern deffufa. Following the collapse of this roof, a less substantial one was built. The masonry of the early phase had been reinforced by an anchoring of boards and beams forming a veritable framework. There were also vertical posts found on the wall of the facade, some of which were protruding while others were incorporated within the brickwork (fig. 10).

THE TEMPLE AND THE MEROITIC PALACE OF DOUKKI GEL

During our last season, a major discovery was made at the site of the "Bodegas" or Doukki Gel of a temple of the Meroïtic period, measuring more than 40 m in length. Only the western pier of the gateway and half the peristyle courtyard were cleared. This monument was part of a very extensive development situated approximately a kilometre north of the deffufa and the ancient town. It included several sanctuaries, one of which was also very large but slightly earlier, bakeries and the recently discovered palace[9]. Sherds of Classic Kerma date were found during excavation and further investigations will perhaps allow us to recover structures of this date (fig. 11-12).

The walls of the temple consisted of a core of mud brick covered with a thick facing of fired brick. The surface area of the courtyard could be reconstructed: it measured 16 m long by 14 m wide. Originally, the roof of the peristyle had been supported by square pillars. During a late restoration, column shafts were placed on the remains of the pillars. The execution of this repair was very mediocre and the section of the columns was distinctly larger than that of the pillars. The fired brick facing still bore the traces, on several preliminary layers, of a fresco decoration enhancing some of the architectural elements. Some rare fragments of sculpted and painted blocks also belonging to the decoration of the temple were found. Both the door jamb and its paving were made from blocks of a rather friable sandstone.

Our current state of knowledge leads us to propose a date in the first century AD. This is based partly on the techniques of construction and partly on the ceramic material - sherds of a fine white pottery decorated with circles and plant motifs, fragments of globular jars decorated with borders of stylised lotus flowers, etc. - which, in the main, belongs to the classic Meroïtic period. Some sherds of the Napatan period were also found, and are associated with an earlier occupation, attested by the traces of more ancient walls, some blocks engraved with hieroglyphic inscriptions and also a re-used capital.

Of the same period as the temple, or slightly earlier, are the remains of a palace constructed at right angles to the axis of the temples, along the dromos[10]. This situation recalls other examples in the region or in Egypt. The building was very large, approximately 40 m long and 35 m wide. Unfortunately it is very badly preserved and its western end has completely disappeared. A square room with sides of 8 m seems to mark the centre. It was possible to reconstruct two rooms with columns from their bases which were still partially preserved. There was also a vaulted corridor and the sill of a side door (fig. 13).

Like the temple, the palace was built on top of a Napatan structure; however, the few traces which remained were too badly preserved to give a precise date, although some might even date back to the Kerma period. A circular structure, 18 m in diameter, was found under the southern terrace of the palace, but its function could not be determined. There was no trace of any features apart from a small hearth, protected by a wall, which was found on the outside, against the curved wall.

THE WESTERN NECROPOLIS

The excavation of the Napatan cemetery within the secondary settlement was partly completed. The tombs were arranged around a central location in which there were the remains of several chapels of the Middle and Classic Kerma periods. The memory of these ancient cult sites seems to have been preserved for a long time; moreover, it is possible that some chapels were reused after the conquest of the town by the Egyptian armies. It is worth noting that two contemporary types of inhumation have been recognised: one, the most common, is characterised by extended burials with the corpses on their backs in a sarcophagus and the other by corpses in contracted or flexed position, as in the native tradition[11].

Extremely meticulous cleaning revealed some elements of the polychrome painted decoration on the sarcophagi. The operation was all the more delicate because all that usually remained were pieces of the layer of stucco, the wood having been entirely destroyed by termites. The motifs identified were from the repertoire commonly found on sarcophagi: at the level of the chest, a necklace with several strands and outspread wings; at the level of the legs, decorations made up from at least four funerary divinities including Thoth in the form of an ibis and Anubis. Two

nets of beads placed on the female corpses were also studied in detail. On one, beads that were still in situ traced a red face or a funerary mask and on the other, a black scarab. These two nets are similar to those found by G. Reisner at Meroë, although the reconstruction carried out at the beginning of the century is very likely to have resulted in the loss of some details[12].

Translated by Annie Grant

Notes:

1 "Kerma and Kadruka archaeological sites in their geomorphological context", *infra*

2 Dietrich WILDUNG *et al., Sudan. Antike Königreiche am Nil,* Exhibition catalogue, Munich (Kunsthalle der Hypo-Kulturstifgung) and Paris (Institut du Monde Arabe), 1996; *Soudan 5000 ans d'histoire, Dossiers d'archéologie,* hors-série no. 6, Dijon, 1996; Charles BONNET, "Habitat et palais dans l'ancienne Nubie", in *Haus und Palast im Alten Ägypten, Internationales Symposium 8, bis 11 April 1992 in Kairo,* Vienna, 1996, pp. 45-52; Charles BONNET and Nora FERRERO, "Antike Kulturen im Sudan: 4, bis 2 Jahrtausend v. Chr.", *Das Altertum*, vol. 42, 1996, pp. 49-63; Louis CHAIX and Annie GRANT, "Palaeoenvironment and economy at Kerma, Northern Sudan, during the third millenium BC: archaeozoological and botanical evidence", *Studies in African Archaeology*, 1993, 4, pp. 399-404; ID., "Nouvelles données de l'archéozoologie au nord du Soudan", in *Hommages au Professeur J. Leclant, Bibliothèque d'Etudes,* IFAO, 1994, vol. 2, pp. 105-110; Christian SIMON and Bruno MAUREILLE, "Taphonomic and Anthropological Study of some Napatean graves from Kerma and the Island of Saï (Lower Nubia, Sudan)", in *Proceedings of the 8th International Conference for Meroitic Studies* (in press)

3 Charles BONNET, "The Funerary Traditions of Middle Nubia", in *Proceedings of the 8th International Conference for Meroitic Studies* (in press); Salah el-Din MOHAMED AHMED, "Le palais méroïtique de Doukki Gel", *ibid.*

4 "The pre-Kerma Settlement", *infra*

5 Brigitte GRATIEN, "Empreintes de sceaux et administration à Kerma (Kerma Classique)", *Genava*, n.s., t. XXXIX, pp. 21-24; ID., "Nouvelles empreintes de sceaux à Kerma: Aperçus sur l'administration de Kouch au milieu du 2^{e} millénaire av. J.-C.", *Genava*, n.s., t. XLI, 1993, pp. 39-43; ID., "Les institutions en Nubie au Moyen Empire", *CRIPEL*, 17/1, 1996, pp. 162-163

6 They are currently being studied by Brigitte Gratien. Among the imprints of the Hyksôs period are two with the name of a king of the XVth Dynasty, M3^{c}-jb-R^{c}.

7 Charles BONNET, "La topographie urbaine de Kerma", *Bulletin de la Société Française d'Egyptologie,* no. 133, June 1995, pp. 6-16

8 D. RANDALL-MACIVER and C. L. WOOLLEY, *Areika*, University of Pennsylvania Museum, Eckley B. Coxe Junior Expedition to Nubia, Philadelphia, vol. 1, 1909, pp. 1-18

9 Salah el-Din MOHAMED, *op. cit.*

10 Charles BONNET, "Habitat et palais....", *op. cit.*; ID., "Palais et temples dans la topographie urbaine. Les exemples du Bassin de Kerma", *RdE*, 45, 1994, pp. 41-48

11 Charles BONNET, "The Funerary Traditions....", *op. cit.*

12 Dows DUNHAM, *The West and South Cemeteries at Meroë,* (RCK V), Boston, 1963

THE PRE-KERMA SETTLEMENT

By Matthieu Honegger

The two most recent seasons of excavation on the Pre-Kerma settlement allowed detailed study of vast cleaned areas, with the aim of better understanding the general lay-out of the settlement. To date, more than 250 storage pits have been located, and in addition numerous wooden structures of which only postholes remain. They indicate huts, palisades, granaries and other rectangular buildings. They were organised in an altogether coherent manner, showing that in Nubia at around 3000 BC the layout of the settlement was already complex.

STRATIGRAPHY

There were at least three phases of occupation, but there does not seem to have been a real continuity between them. The oldest level antedates Pre-Kerma. It was discovered two years ago at a depth of 30 cm in the northern sector of the area excavated[1]. The finds included a hearth, several postholes, faunal remains and a few objects. The extent of this layer has now been considerably augmented by the discovery, fifty metres to the east, of a hearth 25 cm below the Pre-Kerma level. As in the first sondage, the soil was leached and only a few remains survived. The Pre-Kerma level is no better preserved. Right up until the previous year all the areas excavated were systematically eroded, and it was only at the beginning of this year that pottery and stone tools were discovered in a layer at the extreme north of the known settlement. The latest occupation of the site consisted of tombs of middle Kerma date which had seriously disturbed the early structures. They were organised in a very dense network to the east, but they tend to be more spaced out towards the north-east, making it easier to analyse the settlement remains (fig 1).

Over the excavation area as a whole, the preservation of the archaeological levels is better to the north. Towards the south, there is more severe erosion, the ground slopes and the Pre-Kerma pits become markedly shallower. In this zone it is likely that the most ancient occupation level is to be found at the surface and this blurs somewhat our picture of the Pre-Kerma settlement.

The Nile is partly responsible for the poor conservation of those occupation levels that are earlier than the middle Kerma necropolis. A microscopic analysis of the stratigraphy indicated the presence of several episodes of flooding, which were the cause of the partial destruction of some of the archaeological levels[2]. It seems that at times when sedimentation ceased, wind erosion also played its part.

All the occupation levels are in the process of being radiocarbon dated. While the results for middle Kerma conform to the known chronology, the lower level gives unexpected dates which place it in the Neolithic[3]. As for the Pre-Kerma, it has not yet been dated by this process and for the present we must make do with comparisons of the ceramic material with that of ancient Kerma and group A from lower Nubia; these give an approximate date within the range 3500 to 2500 BC. The absence of imported Egyptian pottery prevents a more precise dating.

THE PRE-KERMA STRUCTURES

The pits, which number 253, remain the structures most easily identifiable. The deepest are of almost a metre, but the majority are between 30 and 40 cm in depth. In the southern part of the excavation, where the layers are eroded, they vary between 5 and 20 centimetres. With the exception of two pits which contained whole pots, the cavities are almost always empty. Only a few broken objects are found in their fills. They give the impression of having been emptied before abandonment and not then always reused for rubbish. As has already been proposed[4], their function must have been for the storage of solid or liquid foodstuffs. Other settlements in the Nile valley also have storage pits. At Khor Daoud[5], for example, the 578 pits discovered frequently contained jars turned upside-down. In the Neolithic and Predynastic of Egypt, vast settlements such as Merimde, El Omari and Maadi[6] had jars buried in cavities and pits containing cereals. In the Pre-Kerma settlement, these two storage methods must have coexisted. It is probably the circumstances of the site's abandonment and erosion factors that have prevented the discovery of more abundant remains in the pits.

Several types of construction have been recognised from postholes. The most numerous correspond to circular structures with diameters varying between 1.10 and 7.40 m. To date, 48 of these structures have been identified. Classifying them according to their dimensions, allows them to

be separated into three distinct groups which probably correspond to functional differences (fig. 2). The most common type are huts with an average diameter of 4.20 m., which where probably houses. As is frequently the case today among many ethnic groups of Eastern Africa[7], the wooden huts have a superstructure of posts that serve both as a framework for the walls and as support for the conical roof resting above. The walls are formed from branches woven between the posts, sometimes coated with mud.

Some of the Kerma huts are of a larger diameter, which can exceed 7 metres. These may be buildings with a special function: meeting places, houses for important people, workshop or even stables, as is today the case amongst the Nuer of southern Sudan. Within the settlement are also about ten smaller circular structures. By analogy with ethnographic examples, it is tempting to see these as raised granaries.

Several rectangular buildings were also constructed from wooden posts. The two largest of these buildings, rather late within the Pre-Kerma settlement, had the same dimensions, 5.5 m by 6 m. However, their orientation was different; the first was on an east-west axis while the second was aligned north-south. This latter was with another rectangular building which had been reconstructed three times (fig. 3 and 4). The three successive buildings all followed the same elongated plan. They were oriented east-west and were approximately 4 m by 6 m. It was not easy to determine the position of the entrances to these wooden buildings; the post holes did not always provide sufficient information and the tombs of middle Kerma had frequently destroyed part of the remains. However, in the case of the building that had been reconstructed several times, it seems clear that the entrance was on the eastern side. These rectangular constructions doubtless had a specific function that distinguished them from the huts which had a domestic use. The importance attached to this type of building is demonstrated in the trouble taken to reconstruct several times on exactly the same site. Circular and rectangular huts are known from several Predynastic sites. Both architectural types are found at Maadi and Hieraconpolis, although it is not known if they coexisted within the same settlement. A reconstruction has been suggested for a rectangular house at locus 29 in Hieraconpolis[8]. Inspired by the model of a house found at El Amrah, it is shown as a completely flat building with structure made of wood, covered in clay.

Some regular alignments of posts could only correspond to fences. They were sometimes double or even triple rows, suggesting that they had been reconstructed several times. Some, such as those situated to the north of the excavation, were perhaps palisades that protected the settlement. They could also have been vast animal enclosures, whose circumference is as yet unknown. Post alignments could also have served to separate habitation units. Each plot, with its courtyard, huts and granaries, was separated from the next, as is still the case today in many African villages (fig. 5).

In addition to pits and postholes, the excavation uncovered a number of hearths and ovens. They were sometimes badly eroded, and all that survives is a reddened circle indicating an area where there had been a fire. Other hearths were better preserved because they were partly buried in the earth. Sometimes they were found with postholes in a more elaborate arrangement that must have been an oven. These traces of fire are not only associated with the Pre-Kerma occupation; some are within the Neolithic level of occupation.

THE ORGANISATION OF THE SETTLEMENT

The collection of structures excavated was organised in a coherent manner (fig. 1). The storage pits are mainly concentrated in the north-west zone, in contrast to the huts which are mainly found in the south and east. The majority of the palisades are found in the hut area or at the eastern edge, where the occupation is less dense. The distribution of the hearths is not very significant. The contrast between the storage and habitation zones is interesting. It could be similar to the organisation of some African villages in which all the granaries are in the centre for protection. However, it could be that the management of stocks of foods was more complex, if the presence of small circular granaries is confirmed. These latter are associated with houses and are interpreted as individual storage facilities for each house, contrasting with collective storage possibly destined for another purpose.

The huts, the rectangular buildings and palisades show frequent recuttings that indicate a succession of rebuildings on the same site. Thus huts form groups of three or four superimposed structures, the palisades could be of two to four rows, and one rectangular building had been rebuilt three times. These indicate a period of occupation during which a permanence in the location of buildings can be clearly seen. However, the settlement did not have a rigid plan, and the numerous superimpositions between pits and houses shows that there was also a certain dynamic in the development of the settlement.

It was frequently difficult to establish a chronology for the different phases of construction, as the layers are almost always eroded. However, to the north of the excavation it was possible to reconstruct the order of events. During the cleaning process, the postholes did not all appear at the

same level. There seems to have been a stratification in extremely fine layers, invisible to the naked eye, but no doubt detectable microscopically[9]. In this way a reconstruction of the sequence of the three rectangular buildings was possible (fig. 3).

The evidence of the reconstructions and the presence of many storage facilities in the heart of the settlement emphasises the permanence of the occupation. The population that lived here was probably sedentary and it is likely that they had a mixed economy. Agriculture is suggested by the importance of storage areas, while stock raising, which seems to play an important role at this period in Nubia, could be confirmed if some of the fences really were part of vast enclosures.

The settlement must have been situated near a branch of the Nile which is now dried up. A geomorphological study currently in progress[10] should establish the location of this branch and thus facilitate future survey work to evaluate the extent of the Pre-Kerma settlement. For the present, everything suggests that it is vast. In all directions around the site, sometimes hundreds of metres away, we have found hearths, on the surface or buried, and sometimes Pre-Kerma potsherds. In contrast, no tomb of this period has ever been found in the vicinity. We thus know nothing of the cemetery associated with this settlement.

It is still difficult to know if the Pre-Kerma site is one of a number of settlements, inhabited by the members of a society that was probably organised in chiefdoms, or if it was a more important centre, which would indicate a greater social complexity. The apparent specialisation in the function of some of the buildings, and the possible presence of a defensive system of palisades could argue for a fairly complex organisation. Around 2800 BC, Lower Nubia, occupied by Group A, seems to have depopulated, and it is possible that Pre-Kerma was partly the result of an influx of this population into the Kerma basin[11]. The settlement, which must thus be dated to between 2800 and 2500 BC, could therefore be the evidence of a new stimulus related to the arrival of Group A people. It would thus be at the beginning of a process whose culmination could well have been the foundation of the kingdom of Kerma.

Translated by Annie Grant

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2 M. GUELAT, "Analyse micromorphologique d'un échantillon provenant de la fosse S. 172, Kerma CE", preliminary report, 1996

3 A small pottery sherd with rippled decoration found in this level suggests a more recent date, close to that of Pre-Kerma. Considering the amount of disturbance in this sector (pits and postholes) it is possible that this sherd could be intrusive and from the layer above.

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KERMA AND KADRUKA ARCHAEOLOGICAL SITES IN THEIR GEOMORPHOLOGICAL CONTEXT (NORTHERN PROVINCE, SUDAN)

By Bruno Marconlogo and Nicola Surian

INTRODUCTION

Space analysis of relationships between archaeological sites and natural sources is more and more applied in researches which aim to the comprehension of the mutual influences man-environment. Particularly in the last years a large diffusion of high quality satelllite multispectral images and availability of advanced techniques for interpretation and integration of such a data, it has made possible to further improve this geoarchaeological approach. In this case we intended to insert the important archaeological excavations and studies carried out in the Kerma Basin (Northern Province, Sudan) by the University of Geneva and C.N.R.S. (Lille) since the end of the sixties in their geomorphological context. The late Quaternary paleohydrographic evolution of the Nile River upstream of the third cataract up to Ed-Debba has been taken into account, being fluvial morphogenesis the prominent aspect of the local landforms. The recognised vicinity of the archaeological sites to the old Nile courses is a meaningful key of lecture to understand ancient settlement pattern and its evolution, both in space and time.

In the last few years a geomorphological research has been started to investigate the physical environment and its Quaternary evolution and particularly the dynamics of the Nile River. From the interpretation of a SPOT image, a general outline of the paleohydrographic situation was already drawn (Marcolongo and Surian, 1993). This interpretation showed that the area is very rich of paleohydrographic features, especially the right bank of the Nile River, and four main flow directions were recognised. Then recent researches have been developed through more detailed satellite image analysis, aerial photo interpretation, and ground survey.

Two Landsat 5 TM multispectral images were elaborated with a dedicated software (G.I.S. - "Idrisi") to expand the analysis to a wider area covering also a large bend to the west of the present Nile where a well developed and continuous paleocourse was identified in all its lengh. Moreover the two archaeological complex of Kerma and Kadruka were investigated at a larger scale through interpretation of panchromatic B/W aerial photos. This allowed to enrich in terms of fluvial features the previous picture. Ground survey, specifically carried out in Kerma area and partially in Kadruka area, confirmed the photo interpretation general outline. In addition, it furnished morphological and stratigraphical elements for a better understanding of morphogenesis mechanisms and temporal changes.

GENERAL SETTING

The study area, located upstream of the third Nile River cataract up to Ed-Debba, belongs to the Northern Province of Sudan which is one of the most arid area of this country. There is a desert climate with negligible rainfall wich falls in the form of heavy showers every few years. The 50 mm isohyet lies E-W nearly along the latitude 18° (Ed-Debba). The present arid phase began about 4.000 years B.P. and it was preceded by an early-middle Holocene humid phase (from about 11.000 to 4.000 years B.P.) which followed an older arid phase dryer than the present one (Hoelzmann, 1993).

The area is part of the extensive peneplaned surface which characterizes the Northeastern Africa and is locally interrupted by inselbergs of modest elevation (a few tenth of meters up to some hundred of meters). The desert flanking the alluvial plain of the Nile is characterized by active dunes (longitudinal dunes and barchans) and large areas are covered only by thin sand sheets (Warren, 1970).

The Nubian Sandstone Formation, deposited in a continental environment during the Cretaceous, covers about a third of the surface area of Sudan (Vail, 1978), and represents the bedrock in the whole study area. Locally is covered by more or less thick layer of loose sediments (eluvial-colluvial, alluvial, and eolian). The sandstones are mainly composed by quartz and feldspar minerals. The third cataract region is the limit between the Nubian Sandstone Formation and the underlying crystalline rocks of the basement complex (Vail et al., 1973).

The average gradient of the Nile River between the fourth and the third cararact (reach 313 km long) is 0.00008 (Said, 1993). As for the channel pattern, in the reach between Dongola and the third cataract the streamflow is

divided in more the one channel. Large islands, relatively stable, formed within the channel and are now cultivated and inhabited areas (Argo Island, Artigasha Island, Bedin Island, etc.). The river width is 600-800 m; the mean annual discharge of the river at Dongola is 2.713 m^3/s.

METHODS

Remote sensing

After the preliminary analysis carried out on a SPOT panchromatic image (Marcolongo and Surian, 1993), the research has continued using two Landsat images, covering a larger area than the SPOT image, and aerial photos. The Landsat TM images (taken on 20 January 1988), suitable elaborated with a software ("Idrisi") were used to extend the study both upstream of the Kerma Basin and to the west of the Nile in the area of Wadi el Qa'ab. This kind of analysis, which inserts the Kerma Basin in a larger physiographic context, it is necessary for a coherent and complete reconstruction of the Quaternary dynamics of the Nile in this stretch. On the other hand a very detailed analysis was carried out around the archaeological sites of Kerma and Kadruka, through interpretation of aerial photos (approximate scale: 1:33.000).

Field survey

The aim of the field survey was to check the intepretations previously carried out on remotely sensed images (satellite images and aerial photos) and to collect morphological, stratigraphical and sedimentological data. Traditional wells were useful sites for stratigraphic observations and for sample collection. Since the only available topographic maps are at 1:250.000 scale, a geometrical base produced from georeferenced enlarged SPOT image and the aerial photos were used for mapping in the field. In this way it was possible to complete a detailed field survey also because for every significant data (landforms, well ubication, etc.) the exact position was estimated with a G.P.S.

Dating

Numerical dates are needed if a clear paleogeographic reconstruction is requested. Five samples were collected from different well sections to be dated by radiocarbon (C-14) and termoluminescence (T.L.) analysis.

Mineralogical analysis

Analysis were carried out to have some preliminary informations about the mineralogical composition of the alluvial sediments of the Nile River. Besides, also some samples from a ditch within the ancient town of Kerma were analysed in order to have indications about the possible handicraft activities.

EVOLUTION OF THE NILE RIVER IN THE QUATERNARY

Interpretation of Landsat 5 TM images has led to the identification of a major fluvial feature to the west of the Nile, which partially coresponds to Wadi el Qa'ab (fig. 1). This Nile paleocourse starts from El-Khandaq heading NW and it develops through the sandstone bedrock forming a very large bend; then its lower portion turns towards NE joining the present river course just in front of Kerma. This depression is today partially followed by Wadi el Qa'ab which some authors already suggested to have been a possible Nile or other Wadies (Wadi Howar and Wadi Magrur) flow direction (Vail, 1978; Kheir, 1986).

Figure 1 provides a general outline of the Nile Quaternary evolution upstream of the third cataract and shows the relations between the western paleocourse and the eastern ones. The identification of at least four continuous paleo flow directions to the right ot the Nile, where younger courses are closer to the present course (shifting from E to W during the Holocene), supports the idea that the paleocourse of Wadi el Qa'ab is older than Holocene and likely of Pleistocene age. Therefore the Nile firstly shifted from W to E, then from E to the present central position.

Neotectonic movements could be the main cause of these shiftings, since the area is characterized by very slow epirogenetic movements which determine graben-like structures parallel to the Gulf of Aden strike system (60-80°) and the Red Sea strike system (330-350°). These directions are followed by the river respectively upstream and downstream of Ed-Debba. Moreover Kheir (1986) indicates the presence of a fault line running about 15-20 km east of the Nile, parallel to it, and with a downthrow in the west side.

KERMA AND KADRUKA AREAS

A detailed geomorphological study was carried out in the area around the archaeological sites at Kerma (particularly the ancient town and the necropolis) and Kadruka (fig. 2 and 3). The interpretation of aerial photos at approximate scale 1:33.000 preceded the field survey, which allowed to check the interpretation and to obtain new important morphological and stratigraphical data. Some samples for dating (radiocarbon and thermoluminescence analysis) and for mineralogical analysis were collected.

The field survey gave the following results. The alluvial plain of the Nile around Kerma is very flat: no terrace levels were recognised moving from the present river course up to the desert. Therefore in the past the river has been mainly characterized by lateral shifting ("avulsion") rather than incision. Also stratigraphical data, collected at about seventy traditional wells, support this idea. Alluvium thickness is very uniform (8-10 meters) and stratigraphic sequences are typical of channel-fill (fining upward).

The main geomorphic features which characterised the alluvial plain of the Nile River aroud Kerma are paleochannels and natural levees (fig. 2). The paleochannels have good evidence on the aerial photos but not always they have a clear morphological and/or sedimentological evidence in the field. In the field they are recognisable as sandy areas lower than the surrounding areas.

The paleochannel close to the ancient town of Kerma (2500-1500 B.C.) was detailed surveyed. It has a good continuity and its width is on average. The channel is more sandy and, locally, 1-1.5 meters lower than the surrounding areas. In a well within the channel and close to the ancient town, two samples were collected for age determination. One is silty and will be analysed with T.L., whereas the other one is sandy with some organic matter and seems to be suitable for C-14 analysis. Dating of this paleochannel is very meaningful because it could help to explain the more recent history of the Nile and relationship between the river and this important ancien town.

A natural levee borders the present channel and flood plain of the Nile. The top of the levee is about 2 meters higher than the old alluvial plain (where the new and the ancient towns of Kerma are located) and about 3-5 meters higher than the present flood plain. Since this latter surface is lower the old alluvial plain (2 meters on average), also a fluvial scarp was indicated on the Map (fig. 2). Besides this main levee, two old levees were recognised during the field survey.

The situation around Kadruka (fig. 3) is very similar to the one in the Kerma area. Also here many paleochannels were identified and some of them are clearly related to the archaeological sites. The paleohydrographic features support the idea that a progressive shifting of the Nile from east to west occurred, according to an "avulsion model" which implies progressive abandonment of eastern channels. The evolution of the Argo Channel, which in the past was much wider and probably including the paleochannel near Tabo, is a present example of this model. In the future it will be left for the main channel already located to the west of Argo Island.

Mineralogical analysis were carried out on the alluvial sediments of the Nile and some samples from a ditch within the ancient town of Kerma. The latter one were analysed in order to have some indications about the possible handicraft activities of that period. The main mineralogical composition, estimated using a polarizing microscope and powder x-ray diffraction (XRD), is the same both of the natural sediments and the "artificial" sediments within the ditch: quartz, more abundant, and feldspars are the main minerals. Other analysis were also carried out to investigate the possible presence of copper and gold but no traces were identified. Of course these results must be considered as a preliminary approach that in the future should be extended to other samples, also with more specific analysis.

CONCLUSIONS

The recent researches in the Kerma Basin, based on the integration of remote sensing and field survey, gave new significant results in the geoarchaeological domain. Quaternary dynamics of the Nile River is becoming more and more clear and this will help to better understand relationships between the natural environment and ancient human settlement.

As for river dynamics, it is recognizable that in the study area, upstream of the third Nile cataract up to Ed-Debba, during the Holocene, and maybe part of the Pleistocene, complex channel changes of the Nile River occurred. At first, the river flew to the west of the present position along a large depression today partially occupied by Wadi el Qa'ab. Then, likely because of neotectonic activity reactivating old fault lines in horst-graben structures, Nile definitely moved to the east. At last, during the Holocene, the river has shifted towards west reaching the present course. Also today the fluvial evolution shows some evidence of this phenomenon. For instance the Argo channel, now active only during high flows, represents an occasional flow direction which will probably be abandoned in the future.

The morphological and stratigraphical observations, done during the field survey in the specific area of the Kerma Basin, suggest that no significant phases of river aggradation or degradation occurred in the past. There are not clear evidences of higher levels of the riverbed, therefore the main process seems to be shifting rather than incision of the river. This horizontal instability of the river, which occurs as bank erosion and lateral channel shifting ("avulsion"), very likely influenced human settlement distribution and activities. A reconstruction of archaeological site distribution carried out by J. Reinold in this area seems to

confirmed this idea, with a progressive shifting of sites westward, towards the present river course (J. Reinold, personal communication).

In the next campaign we expect to continue this study giving more emphasis on chronological and sedimentological aspects. Besides the numerical ages that are expected to be obtained from the samples already collected, more ages are needed for a precise reconstruction of the river evolution. A specific sedimentological study (facies and depositional environments analysis) of fluvial and aeolian deposits would be very useful for paleoenvironmental and paleohydrological purposes. Moreover specific mineralogical analysis could integrate this sedimentological approach, to investigate either source of natural sediments and probable traces of activities in the anthropic sediments.

Last but not least, detailed topographic survey aimed to reconstruct the micro-relief of Nile alluvial plain is needed to improve the model of fluvial evolution and recognise possible incision phases.

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Acknowledgements:

We thank Dr. A. Carlin for carrying out the mineralogical analysis.

La revue GENAVA paraît en décembre de chaque année

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Editions Médecine + Hygiène
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CH - 1211 Genève 4
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e-mail: Librairie@medecinehygiene.ch

Vente au numéro et diffusion

Georg Editeur
Editions Médecine + Hygiène, département livre Georg
46, chemin de la Mousse
CH - 1225 Chêne-Bourg
Téléphone: 41 22 869 00 29
Télécopie: 41 22 869 00 10

ISSN 0072-0585 **ISBN 2-8257-0593-4**

EXTRAIT DE GENAVA - NOUVELLE SÉRIE - TOME XLV - 1997