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4TH AND 5TH SEASONS OF THE NUBIAN EXPEDITION OF THE ANUCHIN RESEARCH INSTITUTE AND MUSEUM OF ANTHROPOLOGY, LOMONOSOV MOSCOW STATE UNIVERSITY AT THE SITES OF DERAHEIB AND ONIB (THE REPUBLIC OF SUDAN). PART I. SURVEY OF THE STONE AGE SITES AT THE ONIB DEPRESSION

Introduction. *The Nubian expedition of the Lomonosov MSU carried out survey in the Onib Depression in December 2022. The survey revealed several surface scatters and two stone age sites Onib-1 and Onib-Outcrop.*

Materials and methods. *The materials for the article were artifacts (stone tools and debitage, fragments of ceramics) discovered at the surface scatters and sites as well as samples for OSL dating, loss-on-ignition and pollen analysis taken from sites. For comparison, we used stone tools discovered by the Nubian expedition of the USSR Academy of Sciences in 1961-1963. The artifacts found at the sites were documented (marked on a map, photographed and described). Several samples for OSL dating were taken at both sites. Sample preparation and gamma spectrometry, as well as OSL measurements, were conducted by standard methods. Analysis of the decoration of ceramic fragments found at the Onib-1 site was carried out. Also, based on the prepared thin sections, a technological and petroglyphic analyses of the obtained fragments were carried out. Samples were taken from different layers of the sites Onib-1 and Onib-Outcrop to determine the content of organic residues and spore-pollen analysis. Sample preparation and analysis were carried out following the standard procedures.*

Results and Discussion. *Analysis of the finds made at the sites indicates that the entire Wadi al-Allaqi region from the Red Sea Mountains to the Nile Valley was inhabited during the Neolithic period. OSL dating for Onib-1 and Onib-Outcrop sites indicates that the sedimentary deposits were formed during the Neolithic Subpluvial. These data are also confirmed by the results of ceramic analysis. The layers in which the ceramic fragments were found can be dated back to the 3rd millennium BC. Petrographic analysis of thin sections of ceramics from Onib-1 site indicates the use of local material for the manufacturing of ceramics. The results of loss on ignition analysis did not reveal a sufficient content of organic residues for a comprehensive paleoecological study that overall indicates unfavorable conditions for the accumulation of organic matter in the studied deposits.*

Conclusion. *The results obtained indicate high prospects of continuing field research in the Onib Depression aimed at discovering and excavating Neolithic sites.*

Keywords: Sudan; Wadi al-Allaqi; Deraheib; Onib Depression; Nubian Middle Stone Age; Neolithic period

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Introduction[1]

The fourth season of archaeological, anthropological and ethnological works at the sites of Deraheib and Onib (the Republic of Sudan) of the Nubian archaeological and anthropological mission of the Anuchin Research Institute and Museum of Anthropology, Lomonosov Moscow State University took place from February 7th to March 10th 2022 (fig. 1).

Members of the mission

Abd el-Hay Abd el-Sawy, PhD – Deputy Director of NCAM; Mr. Taha al-Bashir – Inspector of NCAM; Alexei A. Krol, PhD (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – director of the mission; Jurii P. Zaitsev, PhD (Museum-reserve "Naples Scythian", Republic of Crimea) – field director of the mission; Elena G. Tolmacheva, PhD (Paleoethnology Research Center) – study of pottery and archaeological textile; Mr. Kirill S. Samurskii (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – field photographer; Mr. Konstantin A. Karganov (Pushkin State Museum of Fine Arts) – archaeologist; Alina Kh. Chirkova, PhD – (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – anthropologist; Natalia Y. Berezina, PhD (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – anthropologist; Ms. Olga S. Kalinina (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – architect; Ms. Julia V. Dmitrieva (Paleoethnology Research Center) – pottery drawing; Mr. Grigorii S. Vidrin – physician; Jurii V. Dedov – cook.

In course of the fourth season, we continued excavations on the Southern Necropolis of the Deraheib site. A total of 24 graves were unearthed.

In the Northern Fortress area, a pit 200 x 200 x 220 cm was laid under a rectangle (55 x 65 cm) through opening in the center of the northwestern wall of the Fortress. It was the same place where a mound of filling from Room I, located inside the fortress, was sifted in the third season (February 2020) [Krol et al., 2022, pp. 105-106]. An analysis of the finds (ceramics, animal bones, coals) shows that a multi-meter midden was found near the northwestern wall, and it was formed during a very short period when the fortress was functioning. The midden formation dates back to the 10th century based on the analysis of luster ceramics originating from the excavation area [Krol et al., 2022, 105-106].

On February 21st–22nd, 2022, a reconnaissance trip to the Onib Depression took place. The site is located 40 km southeast of Deraheib. Onib was explored by an expedition of the Centro Ricerche sul Deserto Orientale (CeRDO) in March 1990 [Traveling the Korosko Road, 2020, p. 65]. Alfredo and Angelo Castiglioni suggested that in Onib, which they called the Onib crater or el-Khofra, they discovered a necropolis of the Beja kings who lived in Deraheib [Traveling the Korosko Road, 2020, 65]. In Onib Italian researchers excavated a circular platform mound of about 10 m in diameter (C 33.3). The mound turned out to be robbed. In the chamber archaeologists have found only scattered bones and a few beads, the analysis of which allowed the researchers to date the mound to the 5th century AD [Sadr et al., 1998, p. 220]. The CeRDO did not conduct more seasons of archaeological work at the site.

[1] This section was written by Alexei A. Krol.

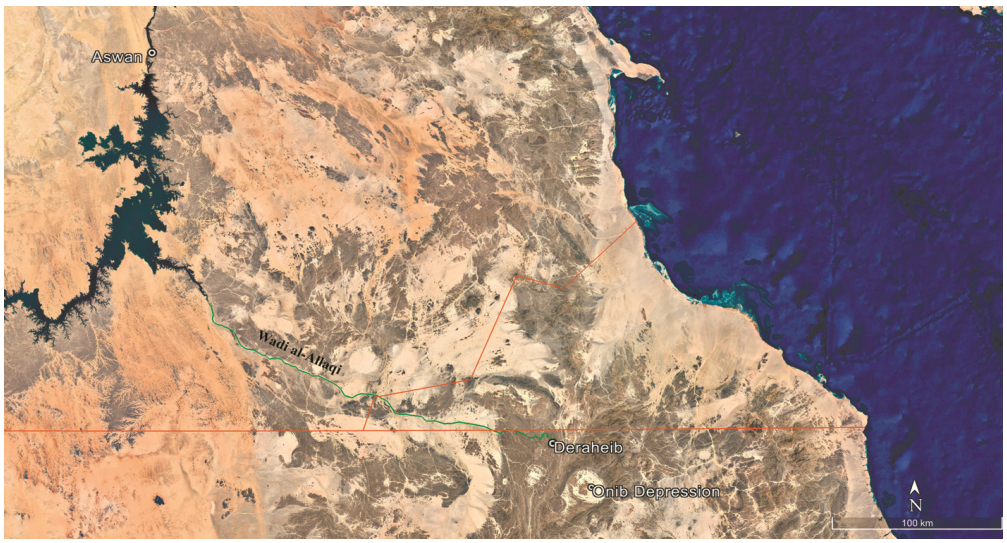

Figure 1. Map showing location of the archaeological concession of the Lomonosov MSU Nubian mission (Map made on the basis of the Google Earth image)
Рисунок 1. Карта с указанием местоположения частей археологической концессии Нубийской экспедиции МГУ (Карта сделана на основе сервиса Google Планета Земля)

The Onib Depression and surrounding area (32 x 32 km) has been added to the concession of the Nubian mission in June 2022 by the decision of the National Corporation for Antiquities and Museums (NCAM) of Sudan. The fifth seson was carried out from November 4th to December 9th 2022.

Members of the mission:

Mr. Elnazeer Tirab Abaker Haroun – Inspector of NCAM; Kaddafi Yousef, PhD – Inspector of NCAM; Alexei A. Krol, PhD (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – director of the mission; Jurii P. Zaitsev, PhD (Museum-reserve "Naples Scythian" Republic of Crimea) – field director of the mission; Elena G. Tolmacheva, PhD (Paleoethnology Research Center) – study of pottery and archaeological textile; Mr. Evgenii V. Smirnov (Moscow State University of Geodesy and Cartography) – topographer; Ms. Anna N. Skurat – field photographer; Mr. Anton A. Simonenko (State Historical Museum) – archaeologist; Mr. Juriy V. Makarenko – archaeologist; Mr. Konstantin S. Karganov (Pushkin State Museum of Fine Arts) – archaeologist; Viktoria B. Ershova, PhD (Institute of Earth Sciences, Saint Petersburg State University) – geologist; Alina Kh. Chirkova, PhD – (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – anthropologist; Natalia Y. Berezina, PhD (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – anthropologist; Mr. Fedor I. Gordeev (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – ethnographer; Ms. Daria N. Fedorova – (First Geotechnical Company) – archaeologist; Ms. Olga S. Kalinina (Anuchin Research Institute and Museum of Anthropology, Lomonosov MSU) – architect.

Excavations of the Southern Necropolis have been continued. 19 graves have been unearthed. From the 26th of November till the 4th of December part of the expedition has moved to the Onib site in order to carry out reconnaissance mission. During one week the following works have been carried out:

– Documenting various types of graves in the Necropolis Hofra-1 (South part of the Onib site);
– Documenting the rock art sites;
– Geological study of the Onib Depression;
– Stone age sites and surface scatters' survey;
– Ethnological survey.

This article is devoted to the results of the

(1) Geological and geomorphological characteristics of the micro-region;

(2) Search and fixation of the surface scatters with typologically expressed forms;

(3) Identification of prehistoric stratified sites on the territory of Onib.

Some artifacts (stone tools, debitage, potsherds etc) discovered in Onib as well as samples for OSL dating, loss-on-ignition and pollen analysis were exported to the Russian Federation in agreement with the National Corporation for Antiquities and Museums of the Republic of Sudan.

Geological and geomorphological characteristics of the Onib Depression micro-region[2]

The study area is located within the Red Sea Hills (Itbāy (Arabic: اطبيه) or ʿAtbāy), the chain of mountains, running north-south and parallel with the Red Sea (fig. 1). The mountains separate the narrow coastal plain of Red Sea from the vast Nubian Desert. It was formed during Cenozoic as a result of uplift along the margins of the Red Sea rift system [Williams, 2018]. The relief elevation reaches 2000 m in the Sudanese part of Red Hills and within study area varies from approximately 500 to 1500 m. The study area in the geological sense located within the basement complex of the Arabian-Nubian Shield. The basement complex is composed of Precambrian metasedimentary and metavolcanic rocks, penetrated by granitic or granodioritic plutons and mafic and felsic dykes [Saeed et al., 2020]. The Onib Depression is oval shaped with the width of 15 to 20 km. It is underlaid by Precambrian granites and covered by quaternary fluvial and eolian sediments. It was formed due to different resistivity to weathering of surrounding Precambrian rocks. Thus, granites weathered faster than metamorphic rocks, which formed a mountainy area bordering the Depression.

Climate and water resources

Onib Depression is part of a hyper-arid region with hot, rainless summers and mild winters. Precipitation falls mainly in autumn and in winter. The monthly mean temperature varies between 24 and 38°C in summer, and 12 and 26°C in winter. The area is occasionally subjected to heavy showers during winter followed by torrential floods, which may damage roads and displace structures [Mahmoud, 2010, pp. 6-7]. Water resources in the Onib Depression as in the Eastern Desert wadis originate mainly from occasional rainfall that infiltrates the friable loose sediments and accumulates in basement depressions or is trapped by faults and buried dykes [Mahmoud, 2010, p. 8].

Vegetation of Onib

Onib belongs to the arid desert. The vegetation is mainly presented by two growth forms: ephemerals and perennials. Ephemerals almost exclusively depend on rainfalls, whereas the perennials may exploit moisture stored in subsurface layers of the soil.

Among trees which grow in Onib the following species were identified: *Acacia tortilis* subsp. *raddiana*, *Acacia tortilis* subsp *tortilis*, *Acacia vachellia*, *Balanites aegyptiaca* and *Maurea crassifolia*; among other plant forms: *Solenostemma argel* and *Calotropis procera*.[3]

Materials and Methods

Search and fixation of the surface scatters with typologically expressed forms. Identification of prehistoric stratified sites from the Onib Depression[4]

The archaeological survey in Onib was carried out by walking a visual inspection of the area and fixing the route of archaeological exploration on the map and photo-fixation of finds and prehistory sites. The collection of archaeological finds was carried out with the designation of the location on the map; the coordinates of the locations were determined using Garmin GPS map 62s, using the WGS 84 coordinate system. During the survey several samples were collected for optically stimulated luminescence (OSL) dating. The samples were collected from sedimentary sections using opaque PVC tubes hammered into freshly exposed outcrops. Sample preparation and gamma spectrometry, as well as OSL measurements, were conducted at the OSL Laboratory of the Russian Geological Research Institute (St. Petersburg, Russia). The samples were prepared by standard methods [Wintle, 1997], with sand-sized quartz grains selected from the 180–250 μm and 90–180 μm fractions.

The OSL measurements were conducted using Risø TL/OSL Readers [Bøtter-Jensen et al., 2010] on stainless steel discs (quartz). The equivalent dose (De) measurements in quartz followed the single aliquot regenerative-dose (SAR) protocol [Murray, Wintle, 2000, 2003]. The OSL signal was summed over the initial 0.32 s, and the signal from the subsequent 0.8 s was deducted (early background subtraction, EBG). Average De values were calculated using the arithmetic mean. All uncertainties are given at 1r (68% confidence interval).

In course of the survey several archaeological sites were discovered, which could be divided into three groups:

1. Surface scatters with several finds;
2. Surface scatters with finds and features (fireplace, hearth, toss zone, tent ring);
3. Stratified sites (fig. 2).

[2] This section was written by Viktoria B. Ershova.

[3] We are very grateful to Irina Springuel, PhD for identification of trees and plants by pictures taken in the Onib Depression during the fifth season.

4 This section was written by Anton A. Simonenko and Viktoria B. Ershova.

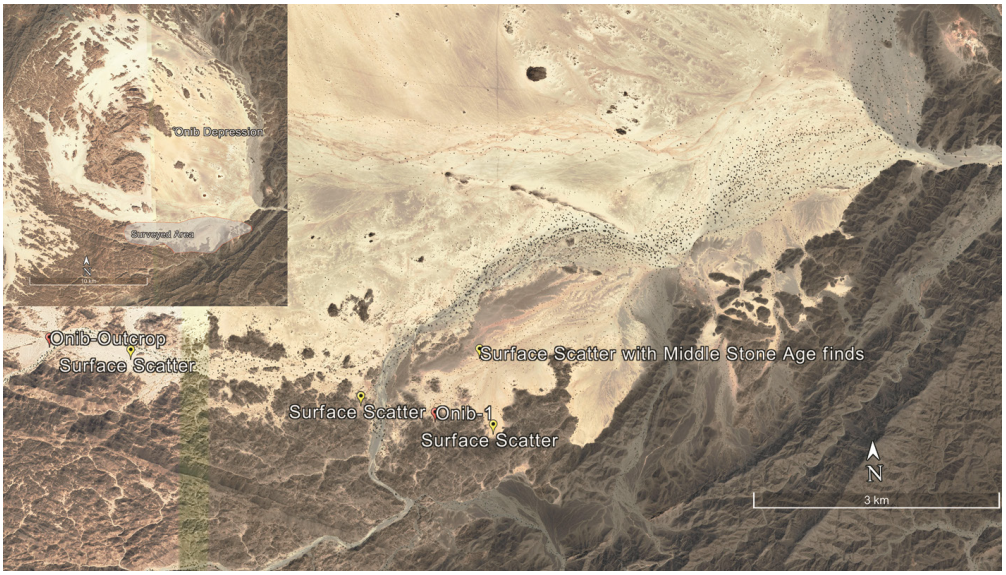

Figure 2. Map showing location of surface scatters and sites (Map made on the basis of the Google Earth image)
Рисунок 2. Карта с указанием расположения местонахождений и стоянок каменного века (Карта сделана на основе сервиса Google Планета Земля)

The oldest data came from the first type of the sites: on the area of 15 m x 15 m situated on the right bank of the wadi where several Levallois point and Levallois flakes made from basaltic-andesite raw material were found. Artefacts have rich desert varnish and traces of weathering. Levallois points are typologically close to the similar types of Nubian Middle Stone Age. Nubian expedition of the USSR Academy of Sciences which conducted survey and epigraphical work back at the mouth of Wadi al-Allaqi in 1962–1963 fixed different Paleolithic surface sites with finds as a hand-axes (fig. 3.1; 3.2), Levallois points and Levallois cores (fig. 3.3; 3.4), which were made from fine grained ferruginous quartz sandstone. According to typology we could date these artefacts to somewhat between the Upper Acheulian until the end of Middle Stone Age. We could conclude that over all Wadi al-Allaqi (the length of the valley from the source to the mouth more than 300 km long) we have evidence of the human activity during the Paleolithic period.

The second type of surface scatters contains not only finds but features. We have usually fixed this type close to the mountains in small valleys. For the second type the following categories of finds are typical: fragments of pottery, stone tools (fig. 4), and debitage (from the different types of raw material: basaltic-andesite, quartz, sandstone and granite), bone fragments, and shells. We have fixed many situations when finds and features were in context. One of the main questions for such kind of sites is dating, and the most informative category for analysis in that case is pottery[5].

The most interesting and perspective discoveries were sites, related to the third type - stratified sites. Onib-1 and Onib-Outcrop are open-air multilayer sites with stratified materials.

Onib-1 site is associated with the right bank of the small valley and is located on a flat and slightly elevated area on the SE margin of Onib Depression between two small hills composed of Precambrian rocks (fig. 5). The area is comfortable for setting a camp, because it's shielded from winds. The site is covered by beige and brown fine-grained aeolian deposits, which become eroded by small modern ephemeral stream.

Overall thickness of aeolian deposits does not exceed 20-70 cm. The following several categories of finds and features were represented at the Onib-1 site:

1. Stone tools from different raw materials: quartz cores (fig. 6.1) and flakes (fig. 6.2), flakes (fig. 6.3) and basaltic-andesite cores (fig. 6.4), schist sinker (fig. 7.1), and a quartz sandstone grating stone (fig. 7.2);

[5] See the section written by Natalia Yu. Petrova.

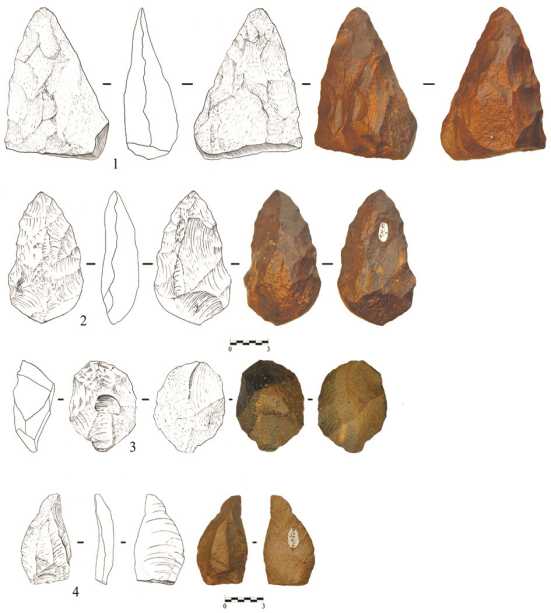

Figure 3. Stone tools collected during the second season (1962–1963) of the Nubian expedition of the USSR Academy of Sciences in Wadi al-Allaqi. Drawing by J. Kuzminova
Рисунок 3. Каменные орудия, найденные в ходе второго сезона Нубийской археологической экспедиции АН СССР в Вади-аль-Аллаки. Рисунок Ю.В. Кузьминовой

Figure 4. Large end-scraper on the surface.
Рисунок 4. Остроконечный скребок

Figure 5 Onib-1 site, general view from the West
Рисунок 5. Стоянка Ониб-1. Общий вид с запада

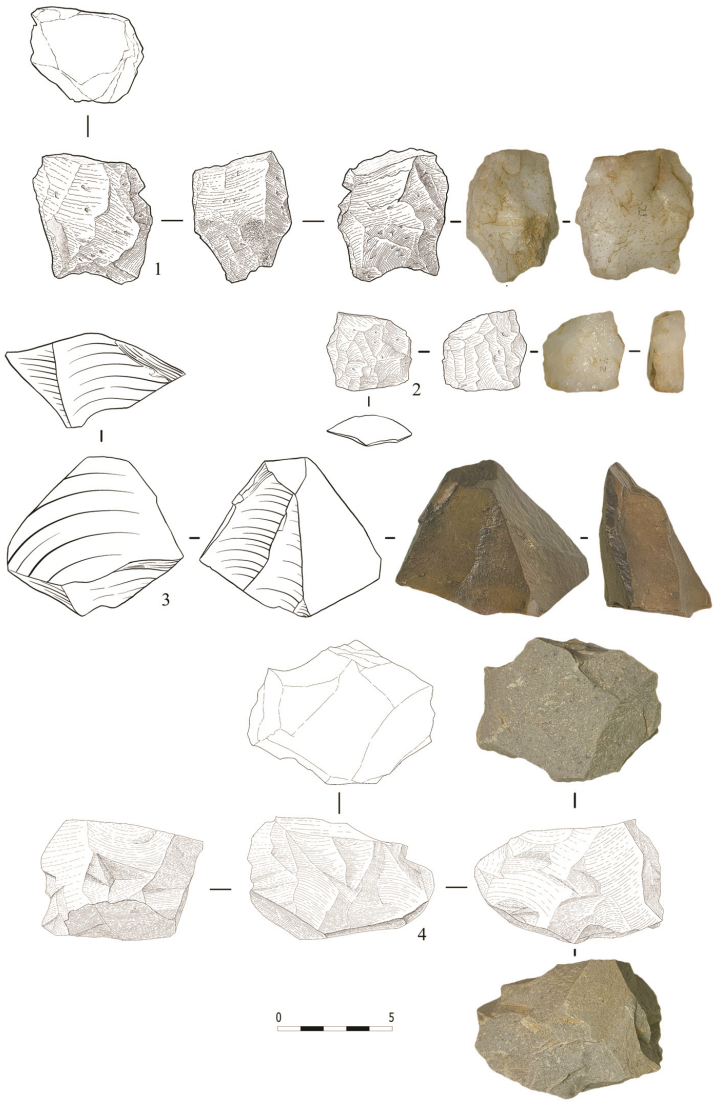

Figure 6. Onib-1 site, cores and flakes. Drawing by J. Kuzminova
Рисунок 6. Стоянка Ониб-1: нуклеусы и отщепы. Рисунок Ю.В. Кузьминовой

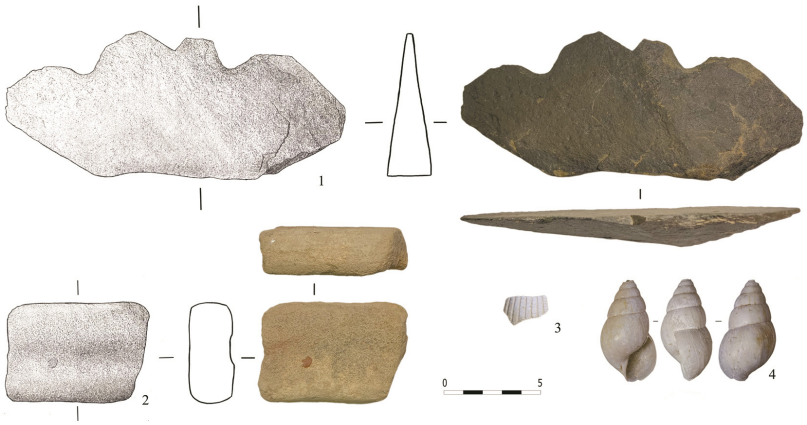

Figure 7. Onib-1 site, stone tools and other finds (1-3); Onib-Outcrop site, mollusk shell (4). Drawing by J. Kuzminova
Рисунок 7. Стоянка Ониб-1: каменные орудия и иные находки (1-3); стоянка Ониб-разрез: раковина моллюска (4). Рисунок Ю.В. Куьзминовой

Figure 8. Onib-1 site, location of OSL sample
Рисунок 8. Стоянка Ониб-1. Место взятия образца на ОСЛ датирование

Table 1. Optically stimulated luminescence (OSL) dates
Таблица 1. Даты, полученные методом оптически стимулированной люминесценции (ОСЛ)

Sample	Sand size fraction (μm)	N accepted/ rejected	Specific activity (Bq kg^{-1})				Dose rate (Gy ka^{-1})	Equivalent dose (Gy)	OSL age (ka)
			^{238}U	^{226}Ra	^{232}Th	^{40}K			
Sud 3	180-250	6/21	3±1	4.5±0.1	3.6±0.1	175±9	0.95±0.04	8.1±0.6	**8.5±0.7**
Sud 4	90-250	3/32	4±1	4.6±0.2	3.4±0.1	189±10	0.90±0.05	7.4±1.7	**8.2±1.9**
Sud 5	180-250	16/2	6±1	6.0±0.2	4.2±0.2	206±11	1.02±0.04	6.7±0.3	**6.6±0.4**

Figure 9. Onib-Outcrop site, general view from the North-East
Рисунок 9. Стоянка Ониб-разрез. Общий вид с северо-востока

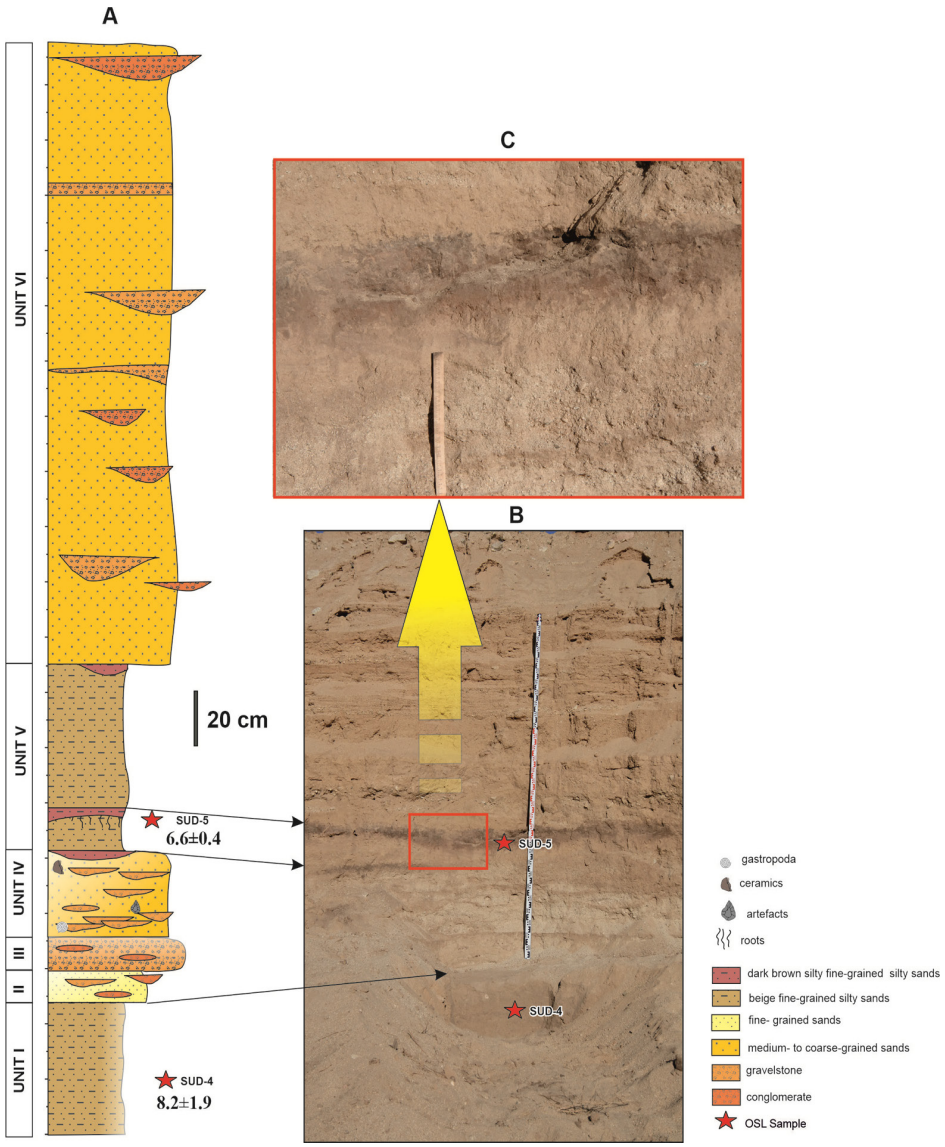

Figure 10. Summarized geology and archaeology of the Onib-Outcrop site. A) Composite stratigraphic section B) the general view of section C) the close-up view of dark brown silty sands, possibly represented the paleosoils level or settlement layer

Рисунок 10. Схема расположение геологических и археологических слоев стоянки Ониб-разрез. А) стратиграфический разрез с указанием слоев Б) общий вид разреза В) вид темно-коричневого песчаного слоя являющегося либо палеопочвой, либо культурным слоем

2. Bone fragments and mollusk shells. One bivalve mollusk fragment (fig. 7.3), according to the nature of the sculpture and growth lines, could belong to the family Cardiidae, subfamily Fraginae (cf. *Plagiocardium*)[6]. These mollusks are typical for Red Sea;

3. The most numerous category of the finds is pottery;

4. All categories of finds are in context with several levels with stone features (fireplaces).

Here the samples for OSL dating were collected – SUD3, in the layer with ceramics findings (fig. 8). OSL-date (table 1) correlate with the data obtained as a result of typological and technological analysis of pottery and other categories of finds. OSL dating indi-

[6] Identified by Sergey V. Popov, Dr.Sci. (Paleontological Institute, Russian Academy of Sciences).

cates that the sedimentary deposits with ceramics were formed during the late Neolithic period.

Another open-air multilayer site Onib-Outcrop is located on the SE margin of Onib, where a fairly large wadi flows from the mountains into the Depression. The wadi eroded the older Quaternary and Holocene deposits. The outcrops extend for several hundred meters and have a similar structure (fig. 9). The outcrop is topped by a Neolithic(?)/Bronze age burial ground (with some burial mounds). It means that surface on the top was shaped many centuries ago.

The sedimentary deposits are about 4 m thick and can be divided into six units as follows (fig. 10):

Unit I is comprised of beige to light brown massive fine-grained silty sandstones, likely of aeolian origin.

Unit II is represented by fine-grained polymictic sands with lenses of gravels and small pebble conglomerates.

Unit III consists of stratified pebble gravel and massive sand, suggesting sediment deposition in the braided streams.

Unit IV is comprised of massive coarse-grained sandstones with lenses and layers of gravels and small pebble conglomerates which possibly formed in braided streams environments. In these lenses we found rejuvenation core tablet made of the raw material which is considered exotic for this region - good quality black flint and mollusk shell (fig. 7.4) belonging to the family Achatinidae (cf. *Lissachatina*).[7]

Unit V is represented by beige to light brown massive very fine-grained silty sands. It has three levels with dark brown silty sands, which possibly marks the levels of paleosoils development and/or settlement layers. This unit is presumably of aeolian origin.

Unit VI is comprised of planar-to cross-stratified medium- to coarse-grained sandstones with layers and lenses of pebble gravel possibly deposited within braided river.

OSL dating SUD4 and SUD5 (Table 1) for Onib-Outcrop site indicates that the sedimentary deposits were formed during the Neolithic Subpluvial (African humid period).

To make final conclusion about all materials, the authors have to continue survey project and start field investigations to get more data.

Pottery from the Onib-1 site[8]

From the research of A.J. Arkell back in 1940s at the Khartoum Hospital settlement [Arkell, 1949], early Sudanese pottery has been studied many times. However, it should be noted that most of the material comes from the Central Sudan region [Caneva, 1989; Mohammed-Ali, Khabir, 2003; Garcea, 2006; Lange, 2006 D'Ercole, 2021, etc.]. In general, early ceramics of the Sudan region are divided into the following archaeological periods: "Mesolithic" or "Early Neolithic", within which the ceramics date back to approximately the 7th-6th mil. BC, "Neolithic" or "Middle Neolithic" – 5th- 4th mil. BC and "Late Neolithic" – 3rd-2ndmil. BC [Lange, 2006, fig. 2; Sadig, 2010; Usai, 2020; David, Salvatori, 2019, fig. 2].

Mesolithic-Neolithic ceramics, despite the considerable extent of these periods, demonstrate significant continuity. When studying the source material in both Mesolithic and Neolithic ceramics, a large number of natural mineral impurities are recorded, the amount of which in ceramics decreases over time. They vary by region, indicating that the pottery was made of materials of local origin. Also, in some cases, the deliberate addition of mineral impurities is assumed during the manufacture of earlier ceramics (quartz, feldspar and mica). The later one contains grog, bone, shells, and dung. The most common method of surface treatment is burnishing [Mohammed-Ali, Khabir, 2003, p. 32-33; Garcea, 2006, p. 96-97; Keding, 2006; Dal Sasso et al., 2014, p. 129-131; D'Ercole, 2021, p. 356]. The use of coiling as a construction method is mentioned [Keding, 2006, p. 88]. Most of the ceramics are decorated with various types of stamps or carved designs. Dotted wavy and straight lines, made with stamps (Dotted Wavy Line pottery) or incised (carved) wavy or straight lines (Wavy Line Pottery) are most specific to the earliest Mesolithic pottery (Early Khartoum). In the ornamentation of Neolithic ceramics, the tradition of dotted and carved patterns continues, but many new types of the ornament and new stamps appear [Arkell, 1949, p. 84-85; Mohammed-Ali, Khabir, 2003; Garcea, 2006, p. 97-100, fig. 5-7]. For a dotted pattern, a jagged stamp is most commonly used. For example, the find of the latter, made of sandstone, is known [Reimer, Jesse, 2006, p. 64. Fig. 2,3]. It is assumed that the drawn lines were made using the backbone of a catfish with broken bones. Similar

[7] Identified by Pavel D. Frolov, PhD (Geological Institute, Russian Academy of Sciences).

[8] This section was written by Natalia Yu. Petrova.

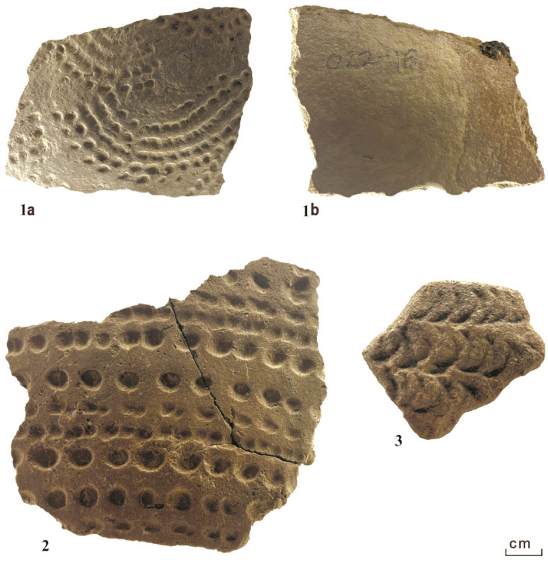

Figure 11. Ceramics from the Onib-1 site with various types of stamped ornaments
Рисунок 11. Различные типы штампованного орнамента на керамике, найденной на стоянке Ониб-1

Figure 12. Ceramics of the Onib-1 site with carved (1,2) and combined carved and stamped fine-toothed ornaments (3)
Рисунок 12. Керамика со стоянки Ониб-1 с резным (1,2) и комбинированным резным и штампованным мелкозубчатым орнаментом (3)

items were not found at the Khartoum Hospital settlement [Arkell, 1949, pl, 59, 61; D'Ercole, 2021, fig. 2]. But probably, other ornaments using bone were also used [Simonenko et al., 2022 p 120-121].

Analysis of the pottery collected by the Soviet expedition in Wadi al-Allaqi in 1962-1963 has revealed early ceramics dating back to the Mesolithic period and decorated with simple, uniform jagged ornaments [Simonenko et al., 2022, p. 119-121].

Figure 13. Use of coils in the ceramic production (fragment in Fig. 11.2).
1-2 – cross-sections of ceramic fragment,
3 – inner surface of ceramic.
a – open surfaces of different coils, b – imprint of a coil in a cross-section of a ceramic fragment,
c – imprint of skin under a layer of additional coating on the ceramic inner surface
Рисунок 13. Использование жгутов при изготовлении керамики (фрагмент на Рис. 11.2). 1-2 – изломы фрагмента керамики,
3 – внутренняя поверхность.
a – открытые поверхности разных жгутов, b – отпечаток жгута в изломе фрагмента керамики, c – отпечаток кожи под слоем дополнительной обмазки на внутренней поверхности керамики

The present collection, originating from Onib Depression shows a significantly greater variety of stamped and carved ornamentation (fig. 11, 12).

From the point of view of studying the raw materials and molding compounds, the ceramic fragments are very uniform. The raw material contains a significant amount of small mineral inclusions (for more detail see petrographic study). There are no artificially added impurities in all cases. The ceramics were made using sequential sticking of clay elements technology, but the construction method could only be determined in one case. This is a coiling, very clearly visible on several dried open surfaces (Fig. 13.1a, 3a) and the imprint of a coil in a cross-section of a ceramic fragment (Fig. 13.2b). The width of the deformed coil is approximately 2 cm. Inside this vessel there is also a coat-

ing, under which impressions of skin are visible (a preserved imprint of the surface on which the coil was made?) (Fig. 13.3c). The coating has not been found anywhere else. In general, the surface of the fragments is characterized by flatness. There were rounded marks on the inner surface, possibly associated with a tool that was used inside to support the walls during paddling (Fig. 11.1b). Also, on the inner surface there are poorly visible traces of smoothing (Fig. 12.1b). Burnishing is not noted on any fragment.

As already noted, the ornamentation on ceramics is very diverse and can be used for dating the fragments. The following types of ornamentation are noted:

The ornamentation on the pottery fragment with a series of semicircular dotted lines (fig. 11.1a) is comparable to the Neolithic design of Central Sudan and was noted in the form of incised lines as early as the 6th mil. BC [Gatto, 2002, fig. 5.6]. However, it is most commonly found in the Late Neolithic [David, Salvatori, 2018, fig. 5] and, for example, is present on the thicket in the form of stamped lines at the Kadada settlement (A-Group of Lower Nubia) and dates back to about 3000 BC [Sadig, 2010, p. 47, fig. 3.1].

Analogies of ornament with large pitted impressions (up to 6 mm) (fig. 11.1b) were found at the Erkowit settlement, located near the Red Sea coast [Wahida, Khabir, 2003, fig. 5] and at the settlement of Jebel Moya in Central Sudan [Brass, Gregory, 2021, fig. 6b]. Pottery with similar ornament belongs to the Late Neolithic layers, which date back to approximately 3000 BC.

The decoration on ceramics in the form of rows of semicircular imprints (fig. 11.3) may also date back to the end of the 3rd - 2nd mil. BC and is comparable to the decoration on a fragment of pottery from the Tumuli 3 settlement from Jebel Makbour in Central Sudan [Sadig, 2010, p. 49, fig. 3.2].

Judging by the complicated composition and analogies, ceramics with carved ornament (fig. 12.1a,b), as well as combined carved and stamped ornaments (fig. 12) also belong to the late Neolithic period. It is comparable to ceramics of the 3rd-2nd mil. BC from the Islang 2 and Nofalab 2 settlements in Khartoum province [Sadig, 2010, fig. 3.4; Khabir, 2015, pl. 1].

In general, we can conclude that, based on the characteristics of the ornamentation, most of the ceramics can be attributed to the late Neolithic period and are dated to no earlier than the 3rd mil. BC. It is interesting that no artificially added impurities typical for contemporaneous ceramics of Central Sudan, as well as burnishing, were found. The latter, as already noted, is typical for the earlier ceramics of Wadi al-Allaqi. Unfortunately, so far in this part of Sudan there is no comparative material from the Late Neolithic period (the closest settlement is on the Red Sea coast). Therefore, for now we can assume that the above-mentioned differences (the absence of artificial impurities and burnishing) represent the characteristics of this particular region.

Petrographic study of ceramics from Onib-1 site[9]

The prepared thin sections were examined at the Research Institute and Museum of Anthropology of the Lomonosov MSU.

The analysis of thin sections showed that the studied fragments of ceramics from the Onib-1 site have a coarse, clearly layered structure of the main mass, which includes a large number of angular, unrounded fragments ranging in size from 1 to 0.05 mm. The number of such fragments can reach 50% (fig. 14.1).

The fragments contain quartz, feldspars, and microcline grains. Pyroxene grains with crystallographic outlines are also found. Pyroxene is monoclinic, sometimes with a zonal structure. In terms of composition, pyroxenes belong to Ca-clinopyroxenes or alkaline aegirine-augites (?) (fig. 14.2). Along the periphery of the grains, pyroxenes are altered – perhaps they are replaced by bastite (a type of serpentine) or talc.

Feldspar has its characteristic twins and is partially replaced along the periphery by carbonate and sericite (fig. 15.1, 15.2). Lath-shaped grains of the mineral from the amphibole group are also found. They are observed in the form of small single grains of greenish color. This is probably hornblende or actinolite. Larger similar fragments are partially replaced by sericite to muscovite. There are also individual flakes of highly altered (greenish in thin section) biotite.

The bulk of ceramics contains droplets of volcanic glass less than 0.1 mm in size. In addition, there is brown fine-grained ash material. In terms of mineral composition, both the clastic fraction and the bulk of the ceramics correspond to either trachyte, which is characterized by the presence of potassium feldspar and acid plagioclase, as well as the presence of small amounts of biotite, amphibole and pyroxene. The presence of volcanic glass al-

[9] This section was written by Michail N. Kandinov.

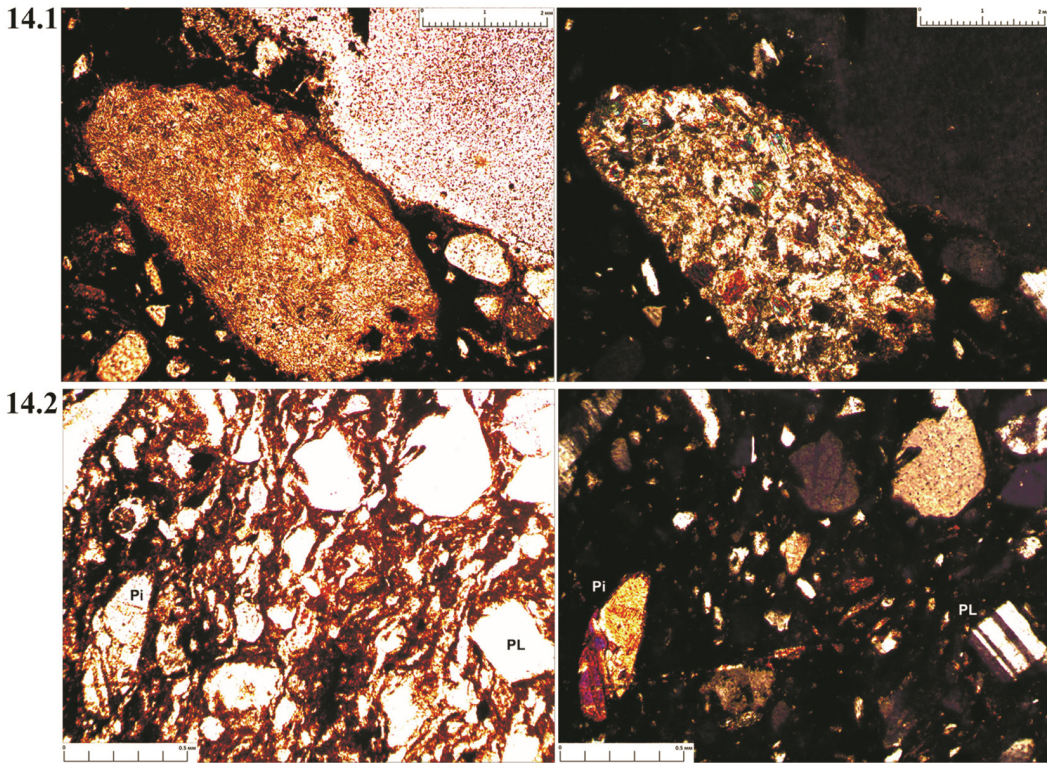

Figure 14.1. Section No. K-3. A large fragment of rhyolite tuff in the bulk of ceramics. The breccia structure of the rock is clearly visible. The chip is highly modified. Grains of modified pyroxene and amphibole are visible (bright spots on the right picture). Here and further: the nicols are parallel on the left, crossed on the right

Рисунок 14.1. Шлиф № К-3. Крупный обломок риолитового туфа в основной массе керамики. Хорошо видна брекчиевая структура породы. Обломок сильно изменен. Видны зерна измененного пироксена и амфибола (яркие пятна на правом снимке). Здесь и далее: слева николи параллельны, справа – скрещены

Figure 14.2. Section No. K-3. Fragments of pyroxene (Pi) and plagioclase (PL) grains in the bulk of the ceramics. With parallel nicols (left), the fibrous structure of the main mass enveloping the fragments is clearly visible. At crossed nicols (right) it can be seen that the fragments have an angular nature of the fragments.

Рисунок 14.2. Шлиф № К-3. Обломки зерен пироксена (Pi) и плагиоклаза (PL) в основной массе керамики. При одном николе (слева) хорошо видна волокнистая структура основной массы, обволакивающей обломки. При двух николях видно (справа), что обломки имеют угловатый характер обломков

lows us to classify the rock as tuff or tuffite. Thus, the initial raw material for the preparation of the studied ceramics can probably be considered trachyte tuff, which is present in sufficient quantities in the vicinity of Wadi al-Allaqi.

Loss-on-ignition and pollen analysis of samples from Onib-1 and Onib-Outcrop sites[10]

At Onib-1 two samples were extracted from outcrops located at various hypsometric levels. At Onib-Outcrop site, eight samples were collected along a 4 m-long profile, which were exposed as a result of erosion caused by seasonal waterflows.

In order to determine the possible organic content in the samples, loss on ignition (LOI) analysis was performed following the method proposed by Dean [1974]. 10 cm^3 of sample substrate was dried at a temperature of 105 °C for 5 h to a constant mass (m_{dry}), which was determined using analytical scales. After that, the samples were placed in pre-weighed crucibles and ignited in a muffle furnace at a temperature of 550 °C for 5 h. Then the crucibles were cooled in a desiccator to room temperature and weighed ($m_{ignited}$). The proportion of

[10] This section was written by Artemii D. Chulei, Natalia G. Mazei, Yuri A. Mazei, Yuliya A. Pastukhova, Andrei N. Tsyganov

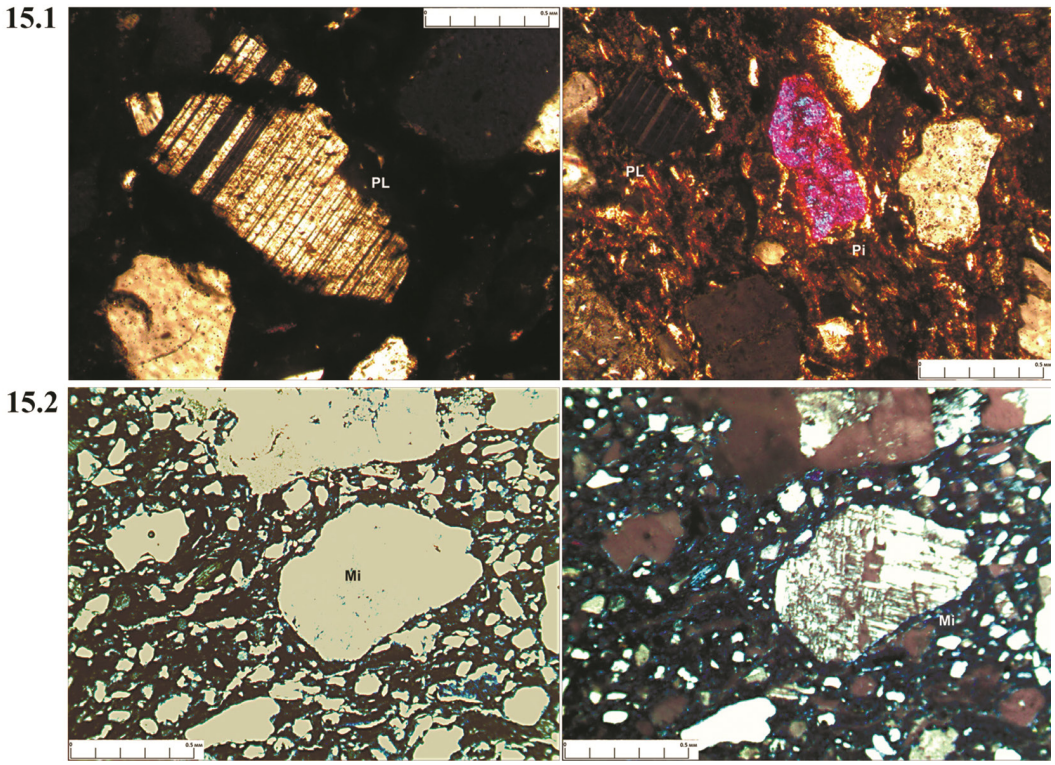

Figure 15.1. Section No. K-4. A fragment of plagioclase grain (PL) (left) and a pyroxene crystal (Pi) (right) in the ceramic groundmass. Along the periphery, the pyroxene grain is altered (carbonatization). The fibrous structure of the main mass enveloping the fragments is visible. Both pictures were taken with crossed nicols

Рисунок 15.1. Шлиф № К-4. Обломок зерна плагиоклаза (PL) (слева) и кристалл пироксена (Pi) (справа) в основной массе керамики. По периферии зерно пироксена изменено (карбонатизация). Видна волокнистая структура основной массы, обволакивающей обломки. Оба снимка сделаны при скрещенных николях

Figure 15.2. Section No. K-4. A fragment of an alkali feldspar grain - microcline (Mi) in the bulk of ceramics. The distribution of grains (fragments) of minerals in the groundmass is clearly visible

Рисунок 15.2. Шлиф № К-4. Обломок зерна щелочного полевого шпата - микроклина (Mi) в основной массе керамики. Хорошо видно распределение зерен (обломков) минералов в основной массе

organic matter (%) was calculated by the formula: LOI (%) = (m_{dry} - $m_{ignited}$)/ m_{dry} * 100%. Soil treatments and pollen extraction followed Moore et al. [1991]. Slides were mounted in glycerin and examined with a light microscope at 200× magnification

The LOI values for the samples from Onib-1 was very low 2.06–3.49% indicating low organic matter content. Similar patters were observed at Onib-Outcrop (fig. 16) (overall range of 0.64–2.4%), with the maximal values in depth range of 125–165 cm where LOI values varied from 1.7–2.4%. The further microscopic analysis did not reveal any considerable amounts of identifiable organic remains (pollen) that could be used for palaeoecological reconstructions and did not allow us to draw any reliable conclusions on the past vegetation of the region. The observed loss on ignition values could be ascribed to the presence of hydrogencarbonates that has decomposed instead or to the mineral dehydration, which takes place at temperatures between 100 and 380 °C [Hoogsteen et al., 2015]. Apparently, the low pollen content is a common obstacle for such studies as even the modern pollen spectra in lowlands of Sudan often contain low pollen counts [El Ghazali, Moore, 1998]. Similar issues were previously reported for the Holocene samples as well [Florenzano et al., 2019].

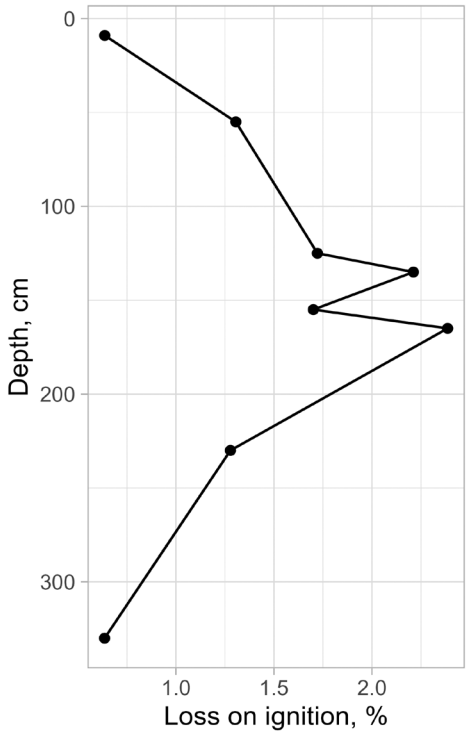

Figure. 16. Loss-on-ignition in the Onib-Outcrop (profile)
Рисунок 16. Результаты анализа потерь при прокаливании на стоянке Ониб-разрез

Conclusion

The results obtained indicate high prospects of continuing field research in the Onib Depression aimed at discovering and excavating Neolithic sites.

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ЧЕТВЕРТЫЙ И ПЯТЫЙ СЕЗОНЫ НУБИЙСКОЙ ЭКСПЕДИЦИИ НИИ И МУЗЕЯ АНТРОПОЛОГИИ МГУ НА ПАМЯТНИКАХ ДЕРАХЕЙБ И ОНИБ (РЕСПУБЛИКА СУДАН). ЧАСТЬ I. ИССЛЕДОВАНИЕ СТОЯНОК И МЕСТОНАХОЖДЕНИЙ КАМЕННОГО ВЕКА В КОТЛОВИНЕ ОНИБ

Введение. *В декабре 2022 г. в ходе пятого сезона Нубийской археолого-антропологической экспедиции НИИ и Музея антропологии МГУ были проведены разведки в котловине Ониб, которые выявили ряд местонахождений и две стоянки каменного века.*

Материалы и методы. *Материалами для статьи послужили артефакты (каменные орудия и дебитаж, фрагменты керамики), обнаруженные на местонахождениях и стоянках Ониб-1 и Ониб-разрез. Найденные на памятниках артефакты были задокументированы (отмечены на карте, сфотографированы, описаны). При их изучении в качестве сопоставительного материала привлекались каменные орудия, обнаруженные Нубийской экспедицией Академии наук СССР 1961-1963 гг. На обеих стоянках были взяты образцы для ОСЛ-датирования. Из разных слоев стоянок были отобраны образцы для определения содержание органического вещества и спорово-пыльцевого анализа. Был проведен анализ декорировки фрагментов керамики, обнаруженных на стоянке Ониб-1. Также на основании изготовленных шлифов был проведен технологический и петроглифический анализ найденных фрагментов.*

Результаты. *Анализ сделанных на стоянках находок свидетельствует о том, что весь регион Вади-аль-Аллаки от Красноморских гор до Нильской долины был заселен в неолитический период. Полученные данные ОСЛ датирования свидетельствуют о том, что обе стоянки относятся к периоду неолитического субплювиала. Эти данные подтверждают и результаты анализа керамики. Слои, в которых были найдены фрагменты керамики могут быть датированы 3 тыс. до н.э. Петрографический анализ шлифов керамики свидетельствует об использовании местного материала для ее изготовления. Результаты анализа потерь при прокаливании не выявили достаточного содержания органических остатков для проведения комплексного палеоэкологического анализа, что указывает на неблагоприятные условия для накопления органического вещества в изученных отложениях.*

Заключение. *Полученные результаты свидетельствуют о высокой перспективности продолжения полевых исследований в котловине Ониб с целью обнаружения и раскопок неолитических стоянок.*

Ключевые слова: Судан; Вади-аль-Аллаки; Дерахейб; котловина Ониб; среднекаменный век Нубии; неолитический период

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