REI CRETARIÆ ROMANÆ FAVTORVM ACTA 46, 2020 ISSN: 0484-3401 ISBN: 978-1-78969-748-3
doi: http://dx.doi.org/10.32028/9781789697483-61

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TRADE AND PRODUCTION IN UPPER EGYPT. A CERAMIC PRODUCTION CENTRE IN THE ASWAN REGION AND ITS DISTRIBUTION

In the region of Syene and Elephantine, modern Aswan/Upper Egypt a huge ceramic production emerged in the 2nd century BCE. The vessels of the so-called Aswan Pink Clay were exported all over Egypt from the early Imperial period onwards. At least for late antiquity, an export beyond the borders is proven. Since, so far, no archaeological evidence for larger workshops in the vicinity of Aswan does exist, the question of a pottery production centre must remain open. The Aswan Pink Clay visually appearing in a pinkish colour and being associated to kaolinite was probably mined at many different extraction sites. To characterise the local clay deposits, a geological survey was conducted in the region of Aswan. The aim of these investigations was to determine the different clay deposits with the help of geological samples and to draw possible conclusions about the origin and homogeneity or heterogeneity of the various clay pastes.
Despite this massive local ceramic production, imports found their way to Aswan. Especially in the early Imperial period vessels of common wares were imported to ancient Syene.

Aswan Pink Clay – Upper Egypt – Ceramic Petrography – Geological Survey

1. Introduction

One of the major ceramic production centres in ancient Egypt was situated in the Aswan region in Upper Egypt and was specialised in the manufacture of ceramic objects made of so-called Aswan Pink Clay.[1] Modern Aswan is synonymous with the ancient cities of Syene and Elephantine, which evolved into a political and economic centre at the first Nile cataract already in the Ptolemaic period (Hölbl 2004: 54-57). Geographically, Syene represents the southernmost town in the Ptolemaic empire and subsequently in the Roman empire. This prominent position along with the nearby island of Elephantine was of particular significance with respect to, for example, the exchange of goods with Nubia to the south and the trade with the well-known rose granite extracted from local quarries since Pharaonic times (Klemm and Klemm 1993: 305-353; Lochner 1999: 68-72). The granite was distributed northwards through the river ports of both Syene and Elephantine. Syene flourished, particularly due to the trade, and reached an economic upturn in Hellenistic times, which is recognizable by the expansion of the inhabited city area.

[1] The Aswan Pink Clay as well as the Hellenistic – late antique ceramic finds from Syene and Elephantine were studied as part of the FWF-project P23866-G 18 "Housing in Antiquity (Late Ptolemaic, Roman and Late Antique Period) in Syene/Elephantine, Upper Egypt" directed by S. Ladstätter, Austrian Archaeological Institute, in cooperation with the Swiss Institute of Architectural and Archaeological Research in Ancient Egypt, Cairo. The detailed results of this production centre are published in three doctoral theses: Peloschek 2015; Katzjäger 2017; Rembart 2018.

2. Aswan Pink Clay Pottery production centre

At the beginning of the 2nd century BCE the region of Syene developed into a significant ceramic production centre. According to the completed statistical analysis, 10% of the vessels in use there were made of the local clay paste in Hellenistic and Roman times while 75% of the overall late antique ceramic material is represented by Aswan Pink Clay (Katzjäger 2017: 30-33; Rembart 2018: 428-430). This clay paste was used for the production of different kinds of wares and vessel forms, with tableware and amphorae dominating by far. The Aswan Pink Clay is tentatively connected to kaolinitic sediments which are said to derive from the decomposition of pinkish feldspar minerals found in the local rose granite, available abundantly in the entire broader area (Ballet and Vichy 1992: 113-116; Gempeler 1992: 19; Rodziewicz 1992: 103f). Petrographic analyses, performed on 53 ceramic fragments that macroscopically had been identified as Aswan Pink Clay, allowed a differentiation of four clay pastes based on the character of non-plastic particles embedded in the clay matrices (Peloschek 2015: 100-110; Katzjäger, Peloschek and Rembart 2016: 731f.). The petrofabric ASW-PC_01 can be designated as the typical, most common Aswan Pink Clay already described by Tomber and Williams (1996: 385) who first examined a sherd of Aswan Pink Clay pottery in thin-section. Petrofabric ASW-PC_04, gives best evidence for a relatively pure and fine-grained kaolinitic sediment. Two other variants of Aswan Pink Clay deviate slightly: Petrofabric ASW-PC_02 has an increased content of dark-reddish to orange shale, already visible with the naked eye and ASW-PC_03 is defined by an increased amount of opaque isotropic particles, most likely identifiable as iron-rich inclusions and dark reddish shale. A re-firing experiment not only demonstrated that the clay gained the characteristic

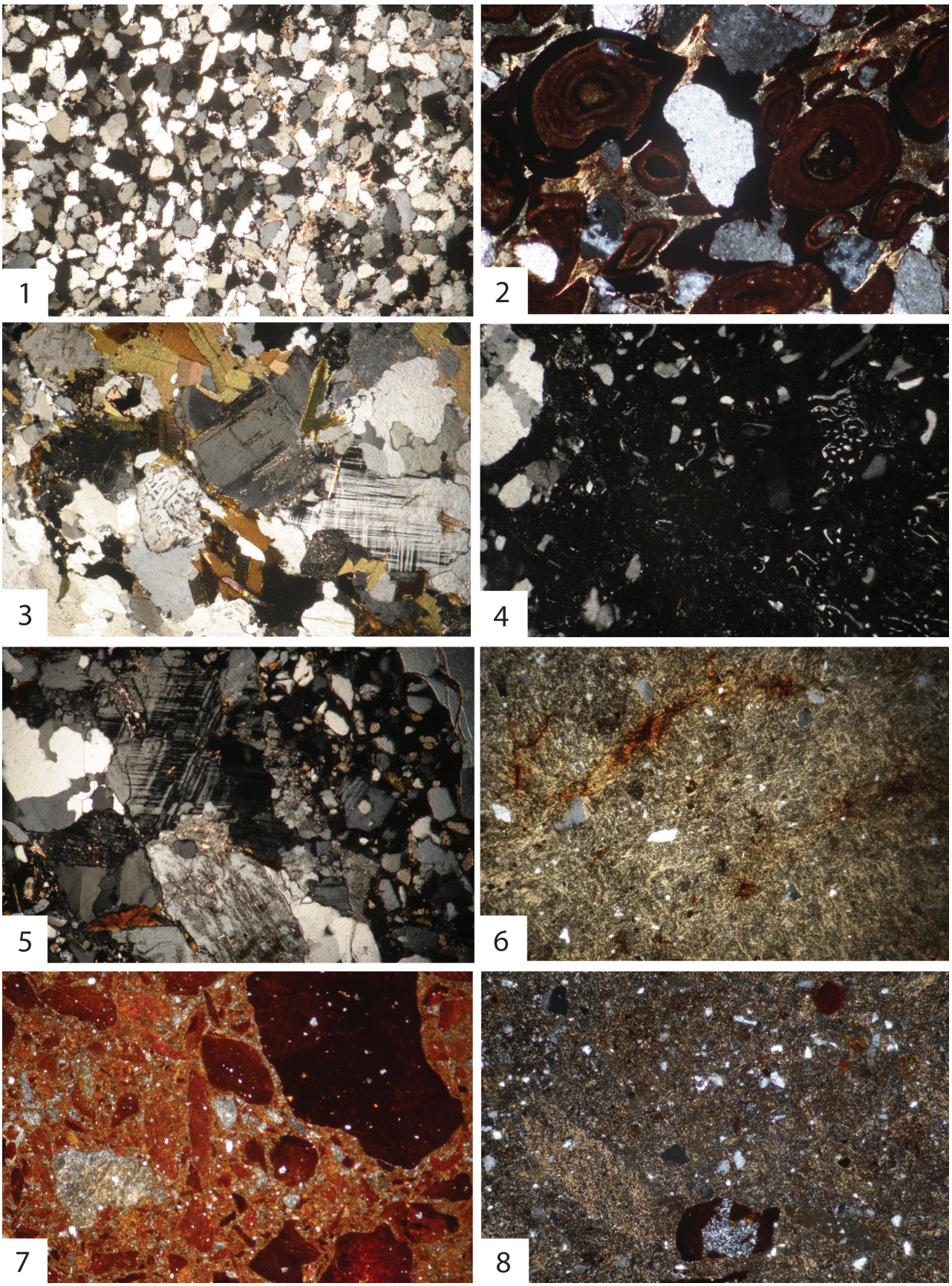

Fig. 1. Photomicrographs of rock and clay samples from the Aswan region. 1. sandstone; 2. oolitic ironstone; 3. granite; 4. weathered kaolinite; 5. granite fragments in a sediment collected south of Aswan; 6. relatively pure kaolitinic clay; 7. clay enriched with shale; 8. shale and chert in a kaolinitic sediment. All images taken in cross-polarised light. Field of view: 3.2 mm (photos: L. Betina).

Fig. 2. Visual characteristics of Aswan's clay raw materials. 1. raw clay during preparation in the laboratory; 2. example of clay briquettes after firing (photos: L. Betina).

pinkish colour at 850°C, which led to the name Pink Clay, but also illustrated the different colour shades Aswan Pink Clay might exhibit (Katzjäger, Peloschek and Rembart 2016: 732f). Although no complete pottery workshop structures were discovered in Syene to date, neither in the vicinity of the town, nor on Elephantine Island, ceramic wasters such as unfired or misfired pottery indicate the existence of potteries in this area (Gempeler 1992: 25f; Rodziewicz 2005: 43-49; Ulbert 1971: 235-237). Remains of kilns as well as pottery waste were found between the modern Aga Khan mausoleum and the monastery of St. Simeon in the 1980s (Ballet et al. 1991: 140-142). As a result a possible production centre has been assumed along the West Bank of the Nile.

Two important remarks need to be made: a) The geology of Aswan and the area further north is relatively homogeneous, meaning that potentially clays with similar properties could have been provided from within an extensive area; b) The availability of kaolinitic clay sediments in the Nile valley spanning from Aswan to Nag el-Hagar, 30 km downstream, might make it more difficult to pinpoint possible areas of clay supply for Aswan's ceramic workshops; not least, because of the existence of yet another ceramic production centre in Nag el-Hagar at the same time (Sieler 2008: 276).

3. Aswan Pink Clay survey[2]

The survey covered an area of around 480 km² between Wadi Abu Subeira in the north and the new Aswan Dam in the south (Peloschek and Katzjäger 2017: 1000-1004), whereby the sites of interest were investigated by photographing the geological formations, mapping the spots of interest with GPS points and taking samples (Peloschek 2015: 84-96). These geological samples comprised clays, desert sand and rock specimens that best reflect the geology of the respective sites surveyed. The main research questions concerned the geological homogeneity or heterogeneity of the Aswan region, specifically: Can clays of similar composition be found at different locations within that region or are distinctive clay compositions associated with particular sites? And, based on these observations, do the clay pastes utilised in ancient pottery production match or at least resemble the native clay deposits? And finally, is the evidence obtained from the geological field survey strong enough to prove with hard scientific data the exclusive production of Pink Clay Pottery in the Aswan region, or might similar ceramics have well been made also further downstream, e.g. around Nag el-Hagar?

Aswan's West Bank indeed is mainly characterised by silicified sandstones (**fig. 1, 1**), spreading at least north to Qubanieh South. Clay sediments that might be identified as kaolinitic can be found interbedded with sandstone in various locations on the West Bank. Nevertheless, pinpointing a clay quarry in exactly the area between Qubbet el-Hawa and the Aga Khan mausoleum might need to be reconsidered: bands of clay in this area are relatively thin, not plausibly supporting the theory of large-scale exploitation of clay raw materials, as would be expected for a mass production. The East Bank of the Nile is characterised by a higher diversity of rock formations. In the north at Wadi Abu Subeira, kaolinitic clays again are associated with sandstones. It is further south around Wadi Abu Agag and Wadi Kasara that iron ore and oolitic ironstone (**fig. 1, 2**) deposits are located in close proximity to the river Nile. Moreover, the presence of mica schists needs to be stressed. To the east of Wadi Kasara, again sandstone formations

[2] The geological field survey was part of the FWF-project in cooperation with the Egyptian Ministry of State for Antiquities and was conducted in February 2013 and completed in November 2014.

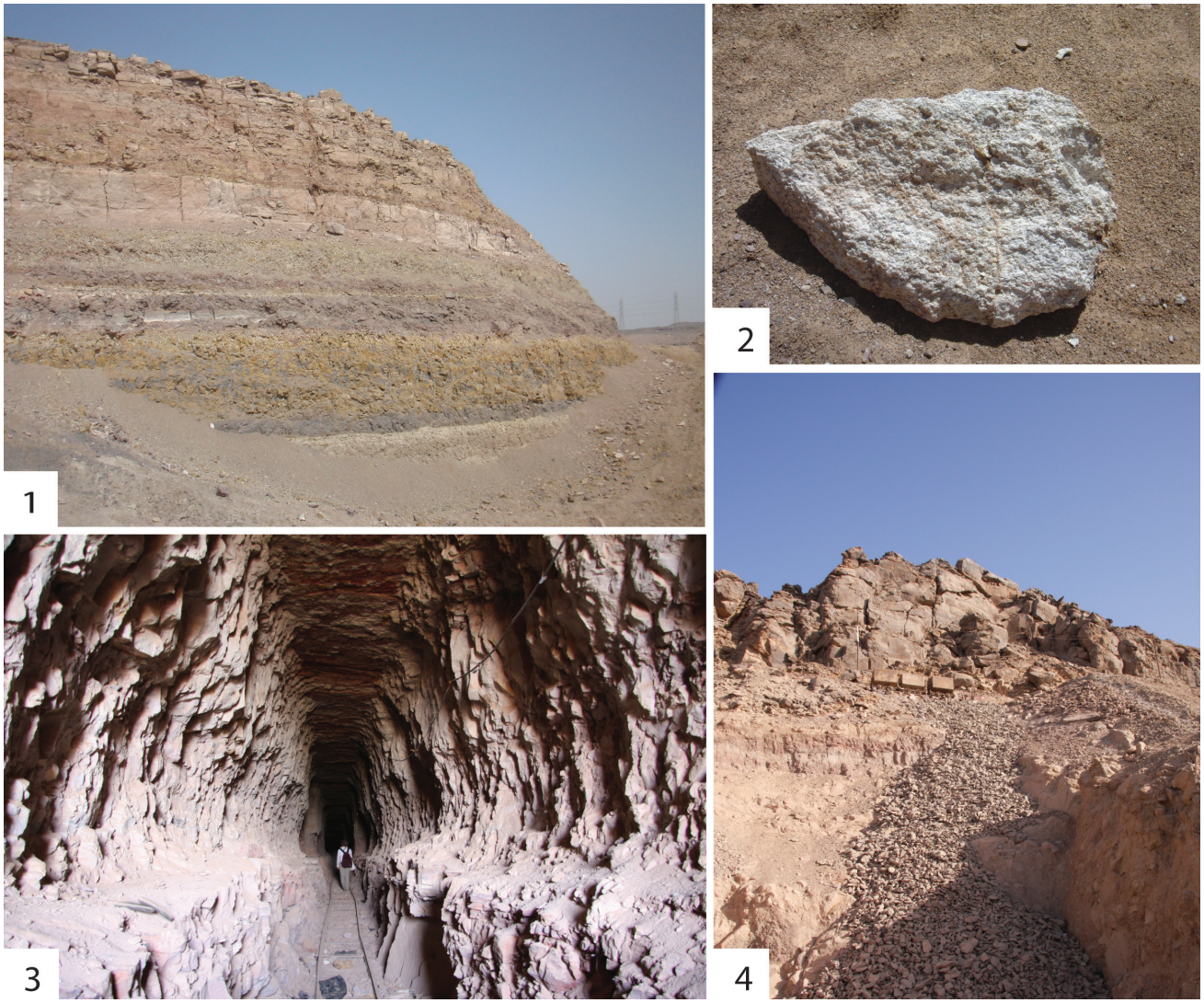

Fig. 3. Clay resources. 1. clay deposit in Wadi Kasara; 2. pure kaolinite; 3-4. modern clay mining areas in Wadi Abu Subeira (photos: L. Betina and L. Rembart).

define the geological landscape. Metre-thick clay deposits are distributed across the whole area. However, sporadic granites (**fig. 1, 3**) must be native to the region, as pure kaolinite has been detected in a side wadi between Wadi Abu Agag and Wadi Kasara (**fig. 1, 4** and **fig. 3, 2**). South of Aswan, granites dominate the geological environment. Yet, kaolinitic clay has been identified in sediments washed off the weathered rocks, rather than appearing as massive clay deposits *per se*.

Thin-sections of rock samples collected illustrate their mineral constituents and quantities of the individual minerals. Can traces of such rock fragments be found in clays sampled in the region? Can traces of such rock fragments and their mineral compounds be detected in ancient pottery fragments? And, most importantly, can the origin of Aswan Pink Clay from kaolinite (Ballet and Picon 1987: 43), being weathered granite, be confirmed?

The 30 clay samples from Aswan were soaked in water, levigated and refined, shaped into clay briquettes and fired under laboratory conditions at the Institut Français d'Archéologie Orientale (IFAO), pôle d'archéométrie in Cairo. In their raw state (**fig. 2, 1**), but also after firing (**fig. 2, 2**), a high diversity of yellowish, reddish, brownish to greyish colour shades became apparent.

Starting with the area southeast of Aswan, between the Old and the New Aswan Dam, the dominance of granitic rocks defining the landscape is also evident in the clay samples. Fragments of granites, but also their minerals, such as feldspars and biotite, frequently occur in native clays and sediments (**fig. 1, 5**). Noteworthy is, moreover, the presence of micritic limestone and microfossils, probably related to marls. These features do not correspond with the identified Aswan Pink Clay pastes, excluding the region as a possible clay mining area exploited in antiquity.

Northeast of Aswan, just outside of the borders of the populated town, the case of Wadi Reish and Wadi Kasara, placed next to each other, can demonstrate the variability of clays in a micro-region. In Wadi Reish, being closer to the shore of the river Nile, the clays contain increased quantities of micrite and minerals deriving from granite. Further inland, in Wadi Kasara, the co-existence of granitic and metamorphic

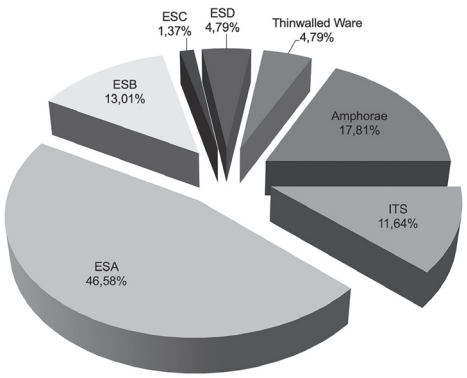

Fig. 4. Distribution of Hellenistic and Roman imports in Syene (L. Rembart).

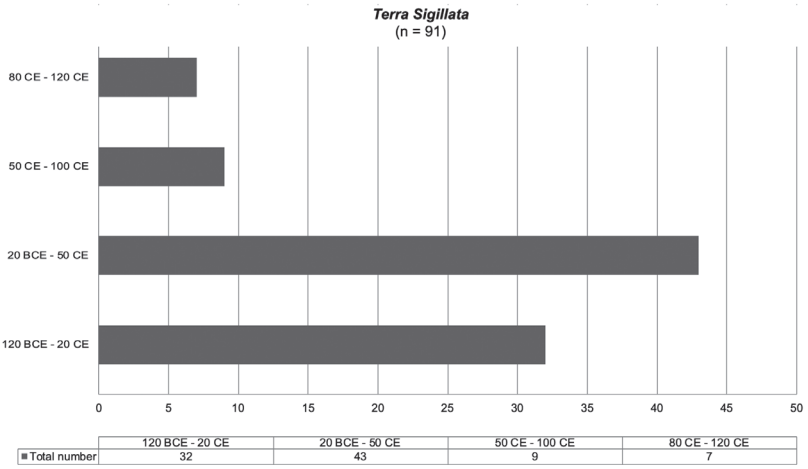

Fig. 5. Chronological distribution of all the *terra sigillata* from Syene (L. Rembart).

rocks can be proven through the analysed clay samples. Both sources can be excluded as potential clay mining areas in the Ptolemaic to late antique periods. However, following the Wadi further inland, highly kaolinitic clays in visually diverse clay colours have been identified (**fig. 3, 1**). Microscopically, the clays are relatively fine, containing small amounts of quartz, chert and biotite, but an increased volume of shale. It appears that the amount and colour of shale embedded in the clay (variegated shales can exhibit different colour variations) is responsible for this diversity.

Modern clay mining businesses have been operated further north in Wadi Abu Subeira (**fig. 3, 3** and **3, 4**). Here, again, relatively pure kaolinitic clays are deposited (Baioumy and Ismael 2014: 208-210), being defined by the accessory minerals quartz, muscovite, augite and amphiboles (**fig. 1, 6**); few sandstone fragments can be embedded in the clay matrix as well. Kaolinitic clay groundmasses and shale components are distinctive for Aswan Pink Clay pottery, and the examples from Wadi Abu Subeira and the large outcrop at Wadi Kasara attest the occurrence of geologically related clays northeast of Aswan, although the accessory non-plastic ingredients do not match in their entirety. The investigation of clays at Aswan's West Bank has been more promising. Shales (**fig. 1, 7**) combined with sandstone are widespread in this location, continuing also further northwards, as they have been also detected at Wadi el Faras and Qubanieh South.

Shales are related to chert (**fig. 1, 8**) – traces of both have been found in Aswan Pink Clay pottery and the geological samples. The presence of minerals such as clinopyroxenes, amphiboles, serpentine and volcanic rock fragments in these primary clays is surprising. A similar spectrum of inclusions is symptomatic for Nile sediments. Aswan Pink Clay, particularly variant ASW-PC_01, has been defined as a possibly natural mixture of kaolinitic sediments and Nile mud in varying quantities. Taking into consideration the results of our raw clay analyses, the scale of Nile sediments as ingredients of Aswan Pink Clay pastes needs to be re-evaluated.

The best match of a clay source and ceramic fabric comes from Wadi Saman (sample AW 12B), just opposite Elephantine island on the West Bank. The clay groundmass is kaolinitic, the spectrum of inclusions comparable; shales and opaque minerals are both present. Also, macroscopically the clay exhibits a greyish colour before and soft pinkish colour after firing. Clays geologically similar to this example, but exposed at different localities, might have been used as (base) material for the manufacture of ancient pots. It might be suspected that a certain natural variability of this clay at the West Bank of Aswan, or also the extended area, is given, that might result in the diversity of the four Aswan Pink Clay pottery fabric variants.

Based on the results of the clay analyses, it is reasonable to understand the clay deposits located at Aswan's West Bank as most closely related to ancient potting resources, although the occurrence of similar clays, in areas not surveyed or around Nag el-Hagar, cannot be excluded.

It can however be excluded that the clays used in the fabrication of Aswan Pink Clay ceramics were extracted from exactly the same spot that we sampled, but appropriate clay beds with abundant raw material might have existed nearby. In order to narrow down the areas of possible provenance for Aswan Pink Clay, more archaeometric reference data is needed, especially from Nag el-Hagar. Assessing the character of the ceramics produced will certainly contribute to a better understanding of Greco-Roman ceramic industries in the south of Egypt.

4. Trade patterns

Despite the massive local ceramic production of Aswan, imports did reach that region. Especially in the early Imperial period vessels of the common *sigillata* manufactures (**fig. 4**) arrived in the ancient cities as well as olive oil, wine and garum, packed in amphorae, imported from all over the Roman Empire (Rembart 2018: 23-29, 44f). In the course of the 1st century CE imports, in particular the imported tableware, steadily decreased until they seemed to disappear almost completely at the beginning of the 2nd century CE (**fig. 5**).

The reason can probably be found in the local ceramic production, which experienced an enormous growth at that time. It was not until the end of the 4th-beginning of the 5th century CE that the local mass production reached its peak, when vessels of Aswan Pink Clay became the most important commodity, consequently exported all over Egypt as well as beyond its borders (Katzjäger 2017: 461-463). So far only a few fragments of imported amphorae found in excavations on Elephantine testify an exchange with Northern Africa, Greece, Asia Minor, Cyprus and Palestine in late Antiquity (Katzjäger 2017: 51f). In that regard it should also be stressed that vessels of the common tableware, like the ARS, are almost missing from the spectrum of finds at that time. In particular no LRC products were found so far. All this shows the importance of the Aswan region as a pottery production centre, at least for late antique times.

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