

Archaeological Excavation and Documentation of Kafir Kala Fortress

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The site of Kafir Kala is located in the south-east of modern Samarkand city, Uzbekistan, and well-known for its unique sealings and other artifacts. Since 2013, the Japanese-Uzbek joint archaeological expedition has been carrying out excavations and digital surveys on this site, mainly focusing on the fortress area. This paper is a preliminary presentation of newly excavated pre-Islamic structures and 3D models, contributing to a better understanding of the urban settlement history of pre-Islamic Samarkand, as well as other regions of Central Asia.

Key words:

Kafir Kala, Fortress, Fire layer, Laser scanning technology, 3D models

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1. INTRODUCTION

Central Asia is generally characterized by its vast expanse of steppes and deserts with an arid climate. The oasis of Samarkand, however, is rich in water, and has fertile lands suitable for agriculture and pasturage, owing to the Zarafshan River that flows through the region. It is perhaps one of the main reasons that several important and populous urban settlements along the Silk Road emerged in this oasis. Only a few of these urban settlements have been thoroughly studied. The site of Kafir Kala, however, was only sporadically excavated and studied until the early 2000s.

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Between 2001 and 2008, the Italo-Uzbek expedition carried out excavations mainly on the citadel of Kafir Kala, a lofty and well-arranged fortress located in the south-east of Samarkand. During the excavations, the expedition unearthed various artifacts of Islamic and pre-Islamic periods. The expedition also identified the presence of the layer where a severe fire occurred. The fire presumably broke out during the conquest of Central Asia by the Arabs. From the fire layer, numerous sealing finds were discovered. This indicated that the citadel of Kafir Kala may have functioned as an important administrative center. The Italo-Uzbek expedition identified the structure and main functions of the citadel after the occupation of the site. However, the structure and function of the citadel before the occupation remained unclear due to the discontinuation of the excavations. Only a small part of the fire layer in the south of the citadel was excavated. In 2013, the Japanese-Uzbek¹ expedition launched its archaeological research mainly to disclose the structure of the citadel below the fire layer, and to identify the function of the citadel before the fire occurred. Along with excavations, the expedition also carried out digital documentation. The present paper aims at presenting the results of excavations on Kafir Kala conducted in recent years, as well as the production of 3D modeling of newly unearthed structures below the fire layer of the fortress.

THE RESEARCH BACKGROUND

The site of Kafir Kala is located approximately 12 km south-east of the famous site Afrasiab (old Samarkand) along the Dargom river, which branches off from the upper-middle Zarafshan River (Fig. 1). Its location perhaps played a strategic role in connecting Samarkand with the eastern areas, such as Penjikent, and the southern part, which includes the key cities of the modern Kashkadarya region, as well as the cities in the modern Surkhandarya region or even further south. This site consists of three main parts: citadel, inner city (*shakhristan*) and suburb (*rabad*). The citadel, which occupies the central area of the Kafir-Kala complex, is a considerably high square fortress (about 20m high and 75×75 m at the base) surrounded by three towers in the northeast and southwest (Fig. 2).

Kafir-Kala (Arabic: كافر *kāfir* “unbeliever”, قلعة *qal’a* “fortress”) meaning “fortress of unbelievers” is a toponym which replaced the original name of the site sometime after Central Asia shifted to Islam. This kind of replacement of site names is observed elsewhere in Central Asia, thus causing serious difficulties for researchers in identifying the site from written sources. Nevertheless, Grenet and de la Vaissière (2002) proposed that Kafir Kala may as

¹ The Japanese-Uzbek expedition began its collaborative research in the oasis of Samarkand in 2005. In 2007-2012, the expedition carried out a number of excavations on the citadel, inner city and suburb of the archaeological site Dabusia; this is a large urban site (approx. 80 ha) situated halfway between Samarkand and Bukhara, two core cities along the Silk Road. The expedition revealed details about the emergence of the settlement and its later development as a major economic center (Uno and Berdimurodov 2013). The members of the Uzbek part of the Japanese-Uzbek expedition were mostly the same as in the Italo-Uzbek expedition. It was at the initiation of the Uzbek part that the archaeological research on Kafir-Kala was organized.

well be identified as Rewdat² which was noted by Ibn-Hawqal, a medieval historian, as the residence of the king of Fergana, located one *farsākh* (i.e., ca. 6 km) south of Samarkand. This was convincing because Kafir Kala is the biggest archaeological site in the southern vicinity of Samarkand. However, coin finds unearthed from the fire layer of the site indicate that Kafir Kala had already been occupied once, a few years earlier than the arrival of the king of Fergana to form an alliance with the *ikhshid* (king) of Sogd against the Arabs. Thus, we cannot precisely identify the site from the written sources.

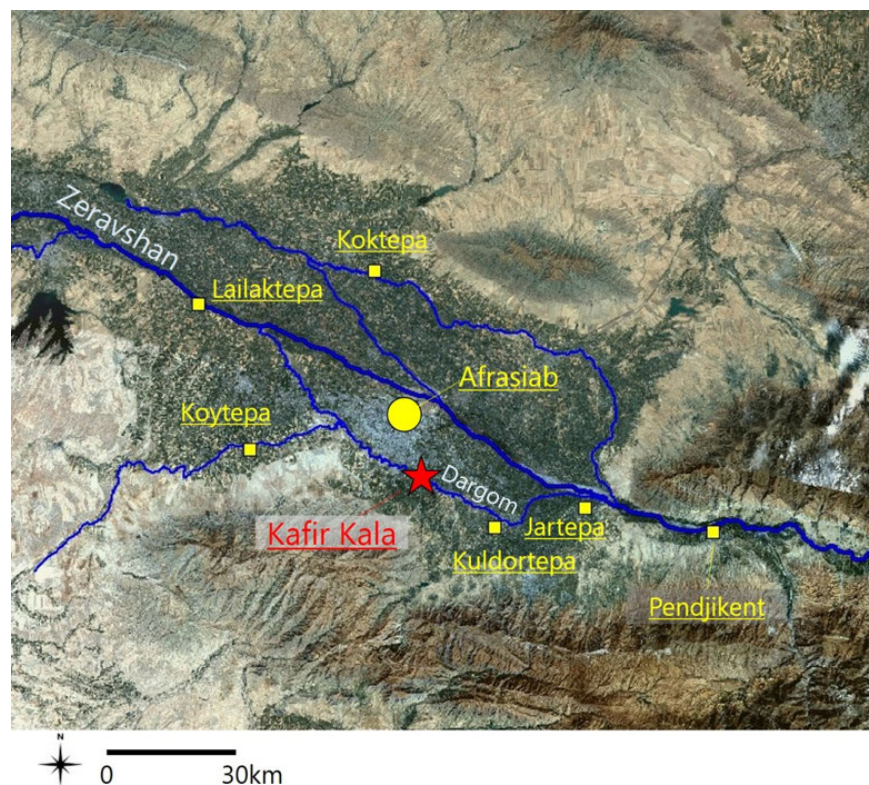


Figure 1. Location map of Kafir Kala on a Landsat TM satellite image.

Prior studies on the site Kafir Kala go back to the late 1920s, and they provide valuable primary information about this site. The first topographical map of this site was made by Masson (1928). The first systematic excavations were carried out by Grigorjev (Grigorjev 1941, 1946), an who mainly focused on the suburb area of Kafir Kala and unearthed craft materials, including a pottery kiln. It was followed by Obel'chenko and Shishkina after over a decade. Obel'chenko identified two main

² Rewdat was traditionally identified as Tali Barzu, located about 6 km south of Samarkand. This site was systematically excavated by Grigorjev.

periods for the settlement in the city and Shishkina excavated a necropolis in the suburb (Shishkina 1961, 1969); this necropolis was reconstructed by Nil'sen (Nil'sen 1965, 1966). At the end of the Soviet era and right after Uzbekistan became an independent Republic, the institute of Archaeology of the Academy of Sciences of Uzbekistan launched a few test trenches in the citadel (Berdimurodov and Samibaev 1995). A decade later an Italo-Uzbek expedition (University of Bologna and the Institute of Archaeology of the Academy of Sciences of the Republic of Uzbekistan) carried out large scale and systematic excavation campaigns focusing on the fortress/citadel between 2001 and 2008. The outcomes of this joint research significantly enriched our knowledge about Kafir-Kala. In the early years, the expedition discovered a part of the fire layer, which yielded nearly 500 specimens of sealings. The fire layer is presumably one of the clear traces that reflects a tragic event which occurred during the Arab conquests of the region (see Mantelini and Berdimurodov 2005; Cazzoli and Cereti 2005).



Figure 2. The view of the fortress: a) from the north-west, b) from the south-west (photo by Tomoyuki Usami)

As mentioned earlier, the investigations by the Japanese-Uzbek expedition on the fortress/citadel began in 2013. The actual function of Kafir Kala before the occupation remained obscure after three seasons of excavations. There were some assumptions that the fortress may have functioned as a Zoroastrian temple, as its structure – four corner towers, a courtyard in the center and long benches (*sufa*) along the inner walls – was similar to the structure of Jar-tepa (Berdimurodov and Samibaev 1999). This site was a Zoroastrian temple situated about 30 km east of Kafir Kala which was also presumably destroyed during the Arab occupation of the region (see Fig. 1). However, the results of recent excavations on Kafir Kala shed some light on this issue. New findings such as fragments of wall paintings discovered in the citadel indicate that the site may have functioned as a fortress. Nevertheless, we will have to excavate the last remaining small part in the north of the citadel in order to adequately explain its structure and function.

2. OUTLINE OF THE RESULTS OF THE INVESTIGATIONS

Following the work done by the Italo-Uzbek expedition, the Japanese-Uzbek expedition has continued further investigations on this key site, mainly focusing on the fortress area. As mentioned above, nearly 500 specimens of sealings were discovered by the Italo-Uzbek expedition on Kafir Kala. Furthermore, during the Japanese-Uzbek excavations, over 200 specimens of sealings have additionally been unearthed from the same fire layer. The finds of 700 sealings in total from a single site is, thus far, the largest number ever found in Central Asia. The sealings bear impressions of various divine, human and animal figures, as well as geometric shapes, and some have Sogdian and Bactrian inscriptions depicted on them (Fig. 3). The seal finds show a clear evidence that Kafir-Kala played a vital role in the region (see also Cazzoli and Cereti 2005; Begmatov et al. 2016).



Figure 3. Examples of sealings unearthed from Kafir-Kala (photo by Alisher Begmatov).

A few dozen bronze and silver coins of the pre-Islamic period were also found in the same fire layer, and these allow us to identify the date of this layer. The fact that the latest coins discovered from this layer are known to have been issued during the Tarhun reign (AD 700-710) has reinforced our view that the fire at the citadel occurred in the beginning of eighth century.

Apart from coin and seal finds, various artifacts, metal and pottery and were unearthed. The pre-Islamic pottery finds especially represent unique examples of the area.

Throughout the regular excavation work, the Japanese-Uzbek expedition has identified the whole structure of the fortress in the fire layer – discoveries of *sufa* (a bench made of rammed earth or bricks) along the eastern and western walls in 2013-2014; a courtyard in the center in 2014; corner towers in 2013-2016 remains of a large building with several square holes for wooden pillars, and finally fragments of wall painting in 2015-2016. Additionally, the expedition discovered that the fire layer spread almost all over the inner ground surface of the fortress. This fact convinces us again that a huge fire must have occurred in the citadel.

Between 2013 and 2014, the Japanese-Uzbek expedition identified two *sufas* along the east and west walls. The *sufa* along the eastern wall is preserved in a relatively good shape (Fig. 4). Its length is about 22 m and its width about 130 cm. Six square holes for wooden pillars at intervals of approximately 170 cm were found 280 cm west along the *sufa*. In 2014, the courtyard of the fortress was excavated and on the eastern side of the courtyard center a tree root was found, which may suggest that a tree might have existed inside the fortress. And from Nearby, to the west of the tree root, there was a slope gently rising towards the remains of the large buildings that were excavated later in 2015.



Figure 4. The *sufa* along the eastern wall (by photo Alisher Begmatov).

During the campaigns of 2013-2015, we excavated four corner towers of the fortress. The shapes of the towers were oval, but slightly different from one another, perhaps due to damage. In the fire layer of the south-eastern tower, a horde of Sogdian coins was found.

The discovery of a large building (Trenches 6 and 7 mentioned below) with wall paintings from the fire layer is one of the most significant finds. The building, as well as other structures and materials in the fire layer are quite well preserved. Although the wall paintings are damaged due to the fire, they provide us with valuable information about colors and decorative ornaments, and may also assist us to understand the principle governing the construction of the inner fortress.

The building consists of a platform with evenly distributed wooden pillars; some of the square burned wooden bases of approximately 45 cm each side remained. During 2015-2016, the Japanese-Uzbek expedition excavated trenches 6 and 7 and identified 12 square holes in total. Since we had noticed a few square holes in earlier excavations in the western part of the big building, we estimated that 18 wooden pillars were built to support the roof of the building. The size of this large building is 22 m in length and about 11 m in width. We also noted the presence of two entrances (altogether three entrances, including the one excavated in 2013) to rooms on the north-eastern side. The central room stands directly opposite the entrance into the fortress and is reached by a gently rising slope approximately 180 cm from where the courtyard begins. This central room perhaps is the key to completely understanding the function of the citadel; it will be excavated in the season.

3. DIGITAL SURVEY OF KAFIR KALA FORTRESS

As previously mentioned, the Japanese-Uzbek expedition has so far made efforts toward the digital documentation of Kafir Kala fortress. We have employed different technologies to obtain the most accurate data. We first conducted a topographical survey of the fortress and its surrounding areas with the use of Total Station and GPS, and generated a Digital Elevation Model from the topographic data (fig. 5). It clearly shows the characteristics of the shape of the fortress.

We scanned all the excavated areas (trenches) and structures on the fortress with the 3D laser scanner. A Faro Focus 3D scanner was mainly used in this work (fig. 6). This 3D laser scanner is nowadays widely used in Archaeology and Cultural Heritage; it enabled us to efficiently create accurate 3D models of the objects. This scanner is lightweight and small and its portability is a great advantage in conducting surveys on the upper parts of the fortress, where we need to climb a steep hill every time we work.

Using the software "Faro scene," we processed the scans and generated 3D models. At this step, the ortho-images were also derived and brought into a GIS environment. All the models of the investigated area were overlapped and visualized in the GIS environment (fig. 7). Clearly, the use of GIS is also quite significant in terms of the data management. Along with the 3D laser scanning documentation, we have recorded x, y, and z coordinates of all the excavated objects with Total Station since we began the excavations on the site Kafir Kala, and taken numerous photographs in the survey process.

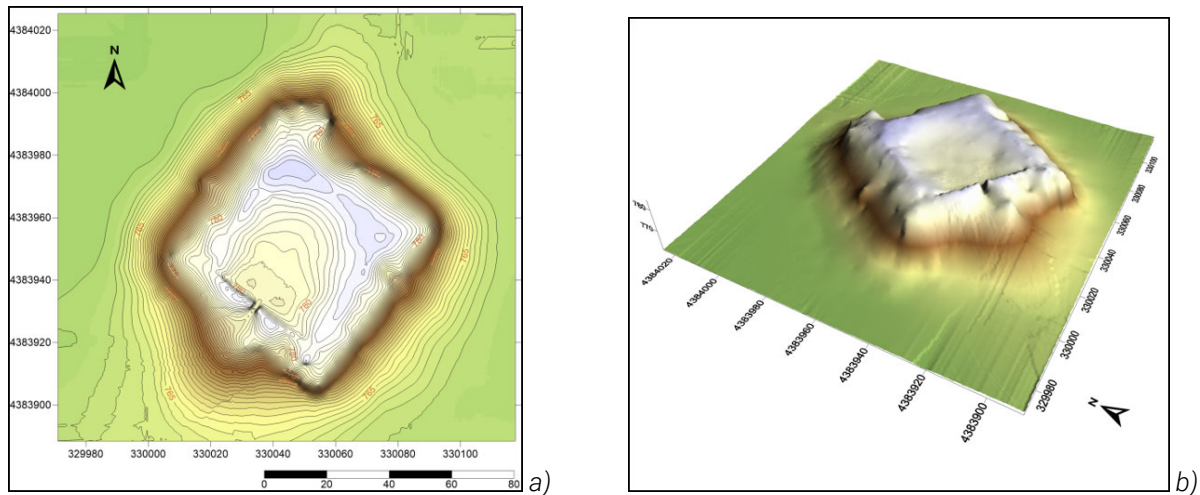


Figure 5. Digital Elevation Model of the fortress. (A): Top view (B): Bird's eye view.



Figure 6. Faro Focus 3D laser scanner (photo by Tomoyuki Usami).

One of the most important issues is, therefore, how we should manage such a huge quantity of data. We have tackled this with the use of GIS: we put all the data obtained during the fieldwork into GIS-database with a single coordinate system and organized them. Particular attention is here drawn to the digital survey process of trenches 6 and 7 (fig. 7), where the large building with paintings was discovered during 2015-2016. The first step is planning the positions of the 3D laser scanner. As stated above, the building consists of a platform with evenly distributed wooden pillars, with some of the square burned wooden bases, approximately 90 cm on each side, remaining. The presence of entrances was also identified. We carefully made a decision on the placement of the scanner in

order to fully and accurately scan such complex structures (fig. 8). Then we acquired 12 scans and 8 scans in trench no. 6 and no. 7 respectively. Next, processing of the scans was performed with the Faro scene software (Fig. 9), and finally the models were made. Ortho-images were at the same time derived and imported into the GIS environment (fig. 10). In short, the productions were positive: for instance, a platform of building with evenly distributed wooden pillars and the square burned wooden bases, as well as the fire layer, were clearly described. This survey process no doubt has helped to develop our understanding on the construction principal of the fortress.

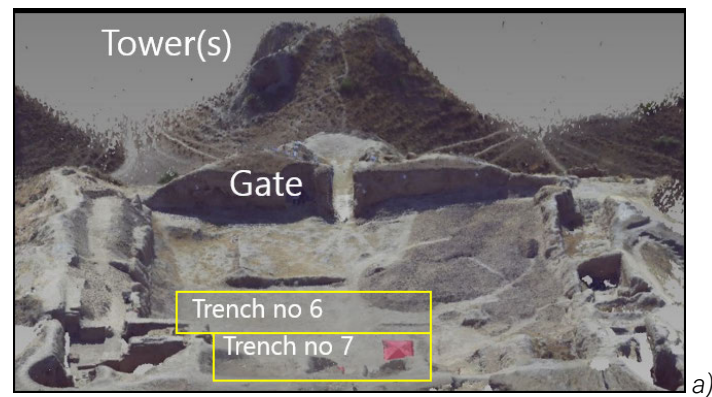


Figure 7. View of the citadel with ortho-images. A. from the north-east. B. from the top

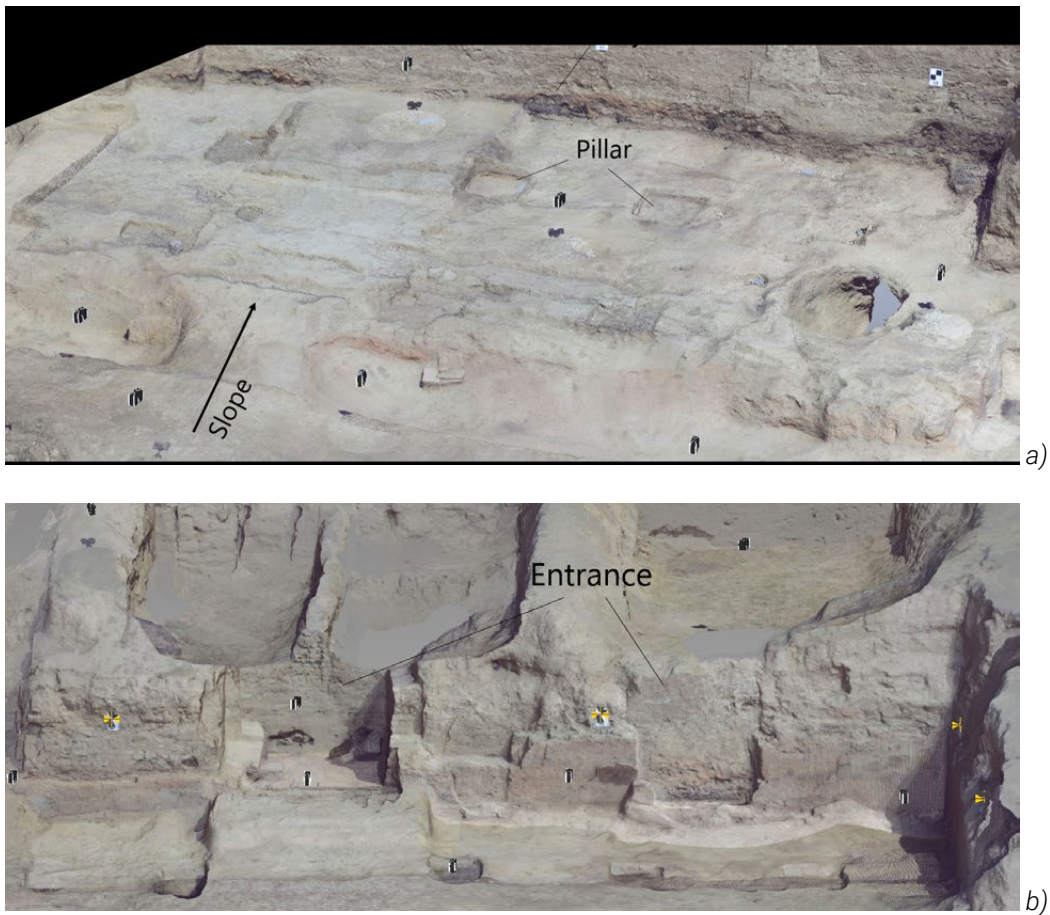


Figure 8. Trenches 6 and 7 with the positions of scanners. (A): trench 6 (from the south). (B) trench 7 (from the south-west).

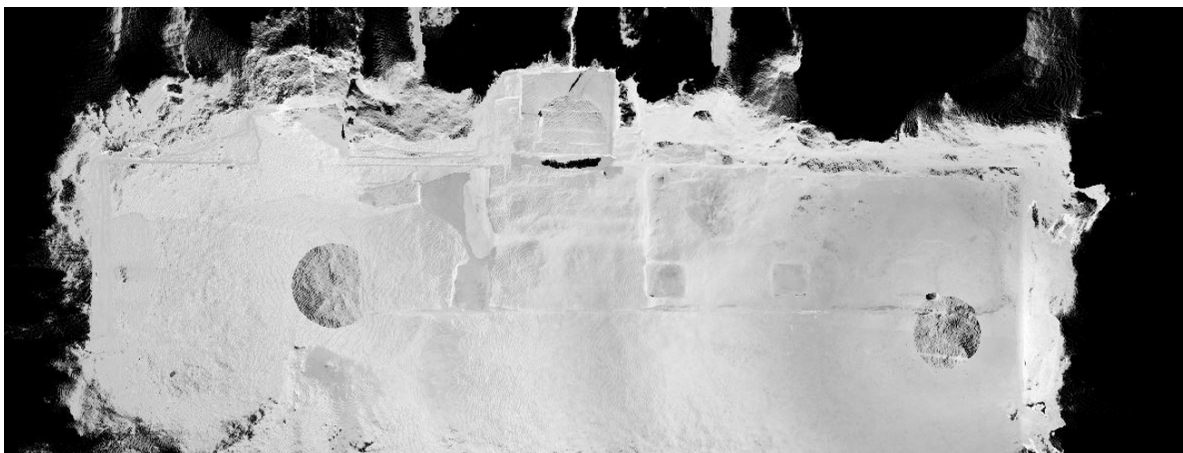


Figure 9. Screenshot of the point cloud (trench 7 as an example).



Figure 10. The image of trench 7.

4. RESULTS OF THE INVESTIGATIONS AND FUTURE WORK

This article demonstrates the results of the excavations by the Japanese-Uzbek expedition at Kafir Kala and the efforts of the digital survey, with a special focus on the large building with paintings discovered at the fortress area.

Kafir Kala, which is well known for the discovery of unique sealings, has been continually excavated and accurately documented with the use of 3D laser scanning technology. 3D measurement techniques are quite helpful to capture the complexity of the building and other structures that are difficult to describe in detail using the traditional survey method.

Although the investigations of our project are still in progress, we have gradually developed our discussion on the planning and arrangement of the inner fortress before the fire occurred. We have identified the gate, the *sufas* along the east and west walls, the courtyard in the center, the slope that leads to the entrance with burned brick-tiles, square holes with carbonized wooden bases of pillars, and walls and corridors surrounding the fortress as well as corner towers on four corners of the fortress. The building with paintings, which occupies the north-eastern part of the fortress, is no doubt a key point.

It is difficult to infer the exact function of the fortress at this point. However, as a future work, we will continue the excavations and documentation on the remaining part of the citadel, and that will allow us to develop our understanding. We assume that the room with entrances connected to trench 7 possibly keeps an important secret of the fortress, which may lead us to discover the actual function – a castle or a temple.

5. ACKNOWLEDGEMENTS

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