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A newly discovered walled enclosure of the Mongol Empire period in the Orkhon Valley, Mongolia

Abstract. For the first time, a Mongol-era walled enclosure was discovered on the right, eastern bank of the Orkhon in Arkhangai aimag. Its documentation was carried out with a fixed-wing eBee X drone. The design of the settlement, comparative examples and artifacts are briefly described. It was only used during the 13th/14th century CE and testifies to the intensive development of the Orkhon Valley during the Mongol Empire.

Keywords: *Mongol Empire, Remote Sensing, Orkhon Valley, Settlement, Chinese pottery*

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Орхоны хөндийд шинээр олдсон Монголын эзэнт гүрний үед холбогдох нэгэн хэрэмт суурин /турь/

Товчлол. Архангай аймгийн Өгийнуур сумын нутаг Орхоны голын зүүн эрэгт монголын эзэнт гүрний үед холбогдох нэгэн хэрэмт суурин /турь/-г анхлан илрүүлэн оллоо. Тухайн дурсгалын баримтжуулалтыг сүүлийн үеийн агаар, зайнаас тандан судлалд нэвтэрч буй далавчит “eBee-X” дроноор гүйцэтгэв. Тус өгүүлэлд уг хэрэмт суурины /турийн/ ерөнхий хэлбэр хийгээд олдвор эд өлгийн зүйл зэргийг харьцуулан товч дүгнэлт хийв.

Энэхүү турь нь бидний судалгаагаар 13-14-р зууны үед холбогдох бөгөөд Монголын эзэнт гүрний үед Орхоны хөндийн хотжилтын эрчимтэй хөгжлийг харуулах нэгэн гэрч баримт болох юм хэмээн үзэж байна.

Түлхүүр үг. Монголын эзэнт гүрэн, Зайнаас тандан судлал, Орхоны хөндий, Хот суурин, Хятад гаралтай ваар, шаазан

Introduction

In August 2023, we started a new interdisciplinary project that aims to study the landscape around Karakorum, environmental changes caused by the city's foundation and the enormous increase in population, as well as the population density in the Middle Orkhon Valley. After several pedestrian surveys in the immediate and wider surroundings of Karakorum have already yielded very good results on site density (Bemmann et al. 2022), we have explored the region between Doityn Balgas, Ögödei's spring palace, and Ogiinuur sum according to the same scheme.

A team led by researchers from the Institute of Archaeology, Mongolian Academy of Sciences, and University of Bonn conducted an intensive, systematic pedestrian survey in Ogiinuur sum, Arkhangai aimag, from 22 August until 22 September 2023. In addition, we drove to some places that had been identified as possible settlement sites by a review of the latest freely available satellite images. One of them is a walled enclosure on the right side of the Orkhon on the inundation free terrace (Fig. 1). Apart from Khöshöö Tsaidam and its surroundings, research so far concentrated almost exclusively on the left, western side of the Orkhon valley. Since the Orkhon expedition led by Radloff (1892), the right, eastern side of the valley with the Khögshin Orkhon has led a shadowy existence. The inter-stream region has received even less attention, probably due to its poor accessibility by modern means of transportation. However, analyses of aerial photographs show that there are also ramparts from various epochs and destroyed Buddhist monasteries here (Gantogtokh et al. 2021; Bemmann et al. 2011).

Mapping a new walled enclosure

The newly discovered site is located 3.2 km southeast of Ogiinuur sum center in a shallow depression, 950 m away from the current main branch of the Orkhon River (coordinates 47°38'47.02"N, 102°35'12.00"E) (Fig. 2). An older, usually water-bearing branch of the river is only 175 m away. We searched the site with the internal code MOR-961 for datable artifacts and surveyed it with a drone. We used a fixed-wing eBee X drone produced by the company Sensefly. The drone was equipped with a specialized S.O.D.A. 3D camera designed for creating digital elevation models (DEM) through photogrammetry.

The autonomous flight was pre-planned using the software eMotion, guiding the drone through a predetermined route. During this flight, the camera systematically captured a total of 281 high-resolution photos, each boasting 20 megapixels. Operating at an approximate altitude of 100 meters, the photos achieved a Ground Sample Distance (GSD) of up to

2.30 cm. Due to the use of GNSS technology (Global Navigation Satellite System), the images were geotagged during the flight with an accuracy of 3 cm (without ground control point), so that the products subsequently generated from the images are automatically georeferenced.

Next, the captured photos were processed to generate a DEM using Agisoft Metashape (formerly known as Agisoft PhotoScan). This DEM was then transformed into a hillshade for enhanced visualization. The software of choice for creating the hillshade was Relief Visualization Toolbox (RVT). Given that the contours of MOR-961 closely matched the terrain, a vertical exaggeration factor of 8 was applied during hillshade generation to ensure optimal visibility of structures. The resulting hillshade boasted a resolution of 5.3 cm, which highly qualifies the model for identifying archaeological features. The rectangular 85 m long and 45 m wide wall and the platforms are only faintly visible in the terrain, but stand out clearly in the hillshade (Fig. 2). The dimensions of the northern platform are approx. 26 x 22 m, the southern one has a side length of approx. 22 m.

The latter were apparently not built in rammed earth technique, but the existing soil was raised. To the north of the larger podium, several stone slabs lie in a row in the ground, without their immediate function being obvious. The two pedestals are connected by a narrow causeway, which is so faint that it is only visible in the hillshade when a certain angle is chosen. We used here a solar azimuth angle of 315°. The site is oriented almost exactly N-S and thus fits perfectly into the preferred Mongolian orientation not only of buildings but also of graves (Erdenebat 2009). An entrance situation is probably not recognizable due to the extremely flat preservation of the ramparts. A schematic drawing presents our preliminary interpretation of the structure (Fig. 3).

North of MOR-961, a group of small mounds measuring two to four meters in diameter is clearly visible in the Hillshade (Fig. 2). These are not anthropogenic structures, but shrubs of the species *Achnatherum splendens* (Trin) Nevski (mn. "Гялгар Дэрс") (Tungalag 2023). The depression south of the enclosure is a modern sand pit.

The range of ceramics collected is similar to that from contemporaneous permanent settlements and campsites of the Mongol Empire. Cizhou, large brown glazed storage vessels dominate, but high quality wares such as blue and white porcelain and celadon are absent (Valenstein 1989) (Fig. 4). The majority of the collected specimens stem from such glazed wares, only one sherd represents the locally produced, gray unglazed ware, which is usually encountered in far higher quantities. Taken together with sherds from potentially locally produced coarse glazed storage

vessels, local wares only make up one fifth of the assemblage, while two thirds stem from Chinese kilns (northern Cizhou- and Henan-type wares, egg-white or Qingbai ware from Jingdezhen, Jiangxi province). Although wares produced in the imperial kilns from Jingdezhen are missing, the preponderance of glazed wares is still noteworthy, if it is not due to higher obtrusiveness of such wares – and therefore they are more likely to be picked up – in the field (Banning et al. 2017). No roof tiles appeared, which can be interpreted to mean that no prominent building such as an important temple or residence stood here.

Results

It is the first known architectural complex from the Mongol Empire period east of the Orkhon in the inter-stream region; its shape is also unusual. Residences tend to have a roughly square ground plan like Èrchüü Khot Turi, Khövsgöl аймаг, (Ochir et al. 2019) or Khanzat, Khentii аймаг (Tsogtbaatar et al. 2019). Long rectangular walled enclosures with two podiums are searched for in vain in both the Khar Khul Khaany Balgas and Karakorum urban sites (Bemmann et al. 2022; Reichert et al. 2022). Only at Sarlag Tolgoin Kherem, located 5 km south-southwest, we were able to survey a rectangular structure already in 2009 (Bemmann under review; Gantogtokh et al. 2021). It is embedded in the non-nucleated settlement Sarlag Tolgoin Suurin. However, the 115 x 60 m long rectangular walled enclosure of Sarlag is somewhat larger and more complex in construction, has annexes, and also yielded fragments of roof tiles indicating that more prominent buildings stood there. Its ramparts and platforms are also preserved higher.

The newly discovered walled enclosure significantly enriches our knowledge of the settlement of the middle Orkhon Valley and shows how important it is to explore a landscape on a large scale in order to get an idea of settlement density and space use. Only the systematic pedestrian surveys carried out in the last few years provide an impressive demonstration of the dense and diverse settlement network during the Mongol empire. Moreover, this site underscores the significance of employing drones equipped with high-resolution cameras for the purpose of generating DEMs. Relying solely on low resolution satellite imagery would have made it considerably more challenging to gain a comprehensive understanding of the site's structural details.

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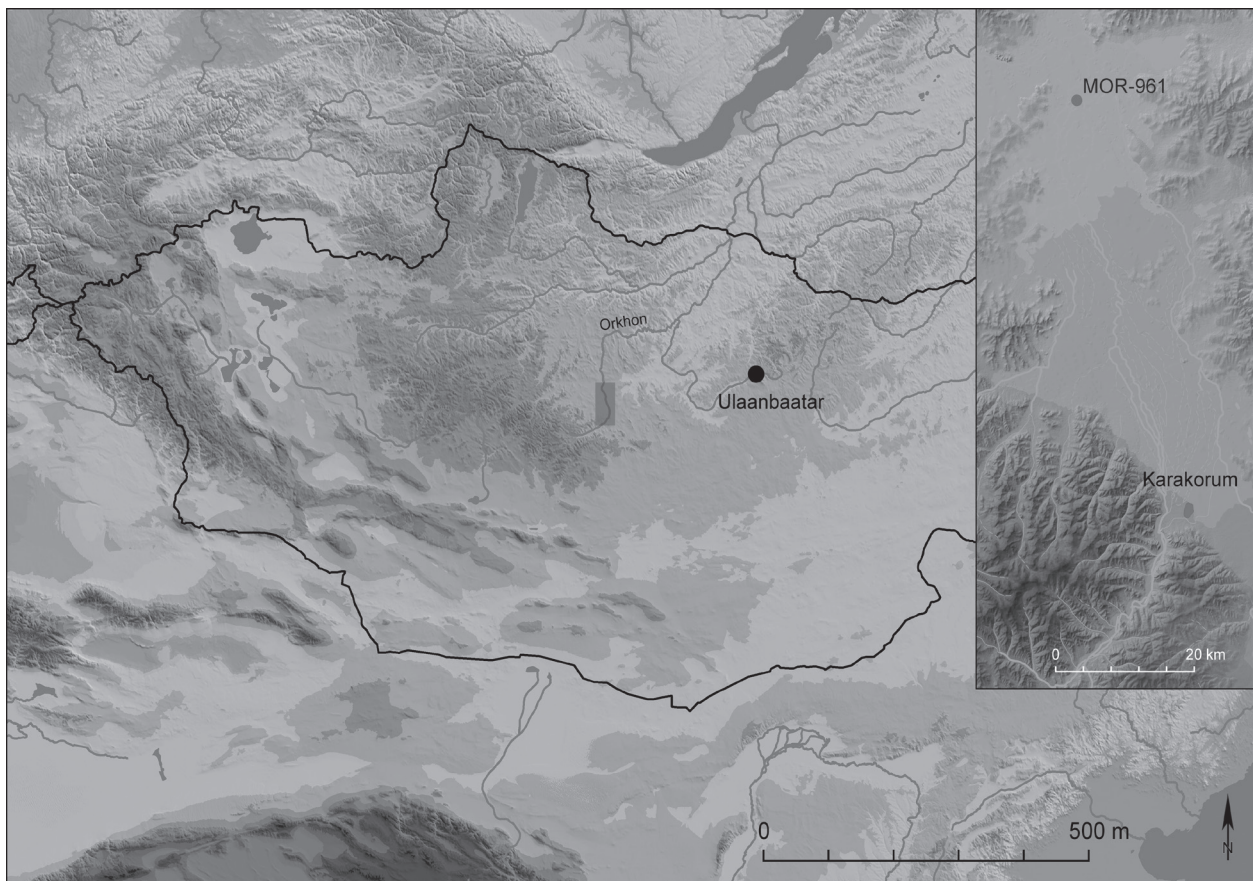


Fig. 1. Map of Mongolia with an inserted map of the Middle Orkhon Valley with MOR-961 (Susanne Reichert).



Fig. 2. Hillshade of MOR-961, using a vertical exaggeration factor 8 (Peter Heimermann).

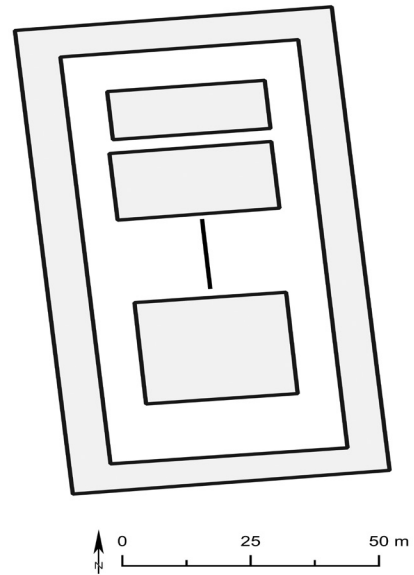


Fig. 3. Schematic drawing of the walled enclosure MOR-961 (Peter Heimermann).

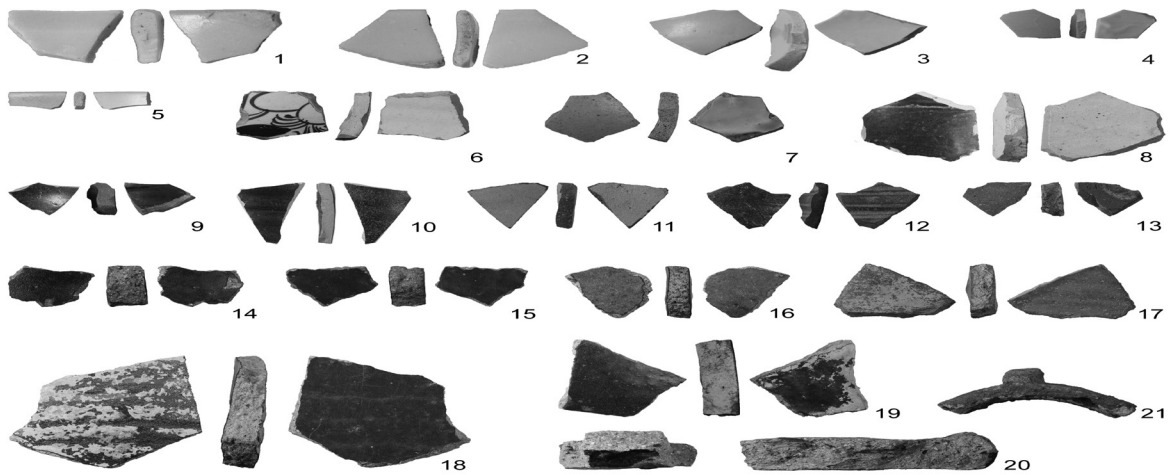


Fig. 4. Selection of finds from MOR-961: 1–4 egg-white glazed ceramics, 5–7 Cizhou-type glazed ceramics, 8–9 Henan-type glazed ceramics, 10–13 various undetermined glazed ceramics, 14–16, 18–20 coarse, dark brown/black/olive glazed ceramics from storage vessels, 17 gray unglazed ceramics, 21 fragment of iron wheel bushing (scale 1:3) (Susanne Reichert, Leonie Becker, Elena Schmidt).