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GEOPHYSICAL AND ARCHAEOLOGICAL SURVEY OF THE HILLFORT OF ZILGI AND THE BARROW CEMETERY OF BESLAN (NORTH OSSETIA)

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Abstract: The article is devoted to new methodological techniques in the study of widely known sites of the early stage of Alanic culture of the Central Ciscaucasia — Zilgi hillfort and Beslan kurgan catacomb burial ground (RNO — Alania). The use of satellite images, low-altitude aerial photography, photogrammetry and magnetometric survey made it possible to obtain fundamentally new information about these well-studied sites and to specify their topographic and planigraphic features in the shortest time with minimal destructions. The excavations carried out in two areas of the Beslan necropolis helped to considerably refine its chronological framework, trace the development of the necropolis from the Zilgi hillfort to the southeastern periphery and identify the area of the most recent graves dating from the middle of the 7th century AD, which were made near the eastern border of unfortified settlement of Zilgi. The non-destructive survey methodology tested by the team has wide prospects for the study of Alanic culture sites of the Central Caucasus, especially at its early stage.

Keywords: North Caucasus, Alanic culture, "earthen hillforts", barrow catacomb burials, photogrammetry, Remote Sensing data, magnetometric survey

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АРХЕОЛОГО-ГЕОФИЗИЧЕСКОЕ ИССЛЕДОВАНИЕ ЗИЛЬГИНСКОГО ГОРОДИЩА И БЕСЛАНСКОГО КУРГАННОГО КАТАКОМБНОГО МОГИЛЬНИКА В СЕВЕРНОЙ ОСЕТИИ

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Резюме: Статья посвящена новым методическим приемам в исследовании широко известных памятников раннего этапа аланской культуры Центрального Предкавказья — Зильгинского городища и Бесланского курганного катакомбного могильника, расположенных в Республике Северная Осетия — Алания. Использование космоснимков, низковысотной аэрофотосъемки, фотограмметрии и магнитометрического обследования дало возможность в кратчайшие сроки с минимальными площадными вскрытиями получить принципиально новую информацию об этих хорошо исследованных археологических памятниках и существенно уточнить их топографические и планиграфические особенности. Небольшие по площади раскопки на Бесланском некрополе позволили существенно расширить прежние (с 1-й половины III по финал IV в. н.э.) представления о времени его использования, проследить тенденцию развития некрополя от городища в восточном и юго-восточном направлении, а также выявить свидетельства повторного использования его могильного пространства рядом с городищем в середине VII в. н.э. Нам представляется, что аналогичные в методическом отношении работы имеют широкие перспективы при исследовании поселенческих и погребальных памятников северокавказских алан, особенно на раннем этапе их существования в Центральном Предкавказье.

Ключевые слова: Северный Кавказ, аланская культура, «земляные городища», курганные катакомбные могильники, фотограмметрия, данные дистанционного зондирования, магнитометрическое обследование

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Introduction

This article is devoted to some results of our comprehensive study of the largest early Alanic sites of the 2nd — 4th centuries AD in the Central Ciscaucasia — the hillfort of Zilgi and adjoining barrow catacomb cemetery of Beslan. The history of the study of these sites [Kravtsova, 2020] spans several decades, and large-scale excavations have made them a reference point for the study of antiquities associated with the Alanic tribes of the North Caucasus in the 1st millennium AD.

The Zilgi fortified settlement is one of the largest so-called "earthen hillforts" in the region. According to present views, the area occupied by several "residential hills" arranged in semicircles around the so-called "citadel" is 1.5 square kilometers [Arzhantseva, Deopik, 1989: 76]. It is difficult to estimate the size of the unfortified settlement with our knowledge. According to V. A. Kuznetsov's observations, it spreads across the area of the fortified settlement at least 100–150 m to the east and south-east of the settlement [Kuznetsov, 1986: 79]. Our collection of surface material showed its distribution about 400 m to the south-east of the extreme boundary of fortified hills, which was visible on the surface (Hill II according to the plan drawn up in 1981 by V. A. Kuznetsov [1986: Fig. 2]). V. A. Kuznetsov [1986: 88] suggested the existence of non-fortified settlement also in the south side of the hillfort, the dimensions of which are presently unknown, because the area is completely destroyed with buildings. Reconnaissance by N. I. Gidzhrati during protection and rescue work in the area of the highway

reconstruction to Mozdok in autumn 2020, revealed the existence of an open settlement in the north-western side of the Zilgi hillfort (personal information of N. I. Gidzhrati). This area is now completely built up by the farmsteads of Zilgi village, and special field surveys are required to determine its extent. However, even at a very rough estimate, the surface material can be found in the northwest direction, at a distance of more than 200 meters from the bottom of the fortified slope of the settlement.

The Beslan kurgan catacomb cemetery has been studied for over thirty years. From 1988 to 2012, the Beslan team of the Institute of History and Archaeology of RNO — Alania, headed by F.S. Dzutsev, has carried out archaeological field investigations. The protection and rescue work was connected with the clay quarry that served two brickyards and destroyed the site, which required the clearing of an area of about 1 hectare annually for archaeological excavations [Dzutsev, Malashev, 2015: 9]. Every year, for 25 seasons, the expedition excavated dozens of burial mounds containing catacomb graves of the early stage of the Alanic culture.

Excavations of the Beslan catacomb burial mound were also carried out in 2011 during the reconstruction of the federal road M-29 "Kavkaz" [Dzhanaev, 2012; Malashev et al., 2015]. The North Ossetia expedition of the IA RAS excavated a one-hectare burial area, where 66 burial complexes were studied, as well as a number of ritual objects. Most of the tombs belong to the early stage of the Alanic culture, and might be dated to the 1st half of the 3rd century AD. There are 20 kurgan graves marked with ditches, 22 burials without traces of any mound of earth, and two ditches containing no burials. The group of complexes dating from the 2nd century BC to the 1st century AD includes eight inlet burials in Bronze Age barrows. One burial belongs to the Early Scythian period, 15 burials belong to the Middle Bronze Age and are connected with the Catacomb culture.

More than 870 burial complexes of the Alanic culture of the 3rd century through the end of the 4th century AD, more than 20 tombs of the Late Catacomb Culture, a complex of the Early Scythian time and about 10 tombs of the 2nd century BC — 1st century AD have been studied so far [Dzutsev, Malashev, 2015: 10]. However, as it was said above, most of the studied burials of the necropolis originate from a single site and are dated narrowly around the middle of the 3rd century AD.

Analysis of Remote Sensing Data

It should be noted that the fortified size of the hillfort considered by the researchers is not limited to the area currently visible on the surface. Analysis of satellite images and aerial photographs of the Zilgi hillfort made in different years provides a similar conclusion. Thus, the archival aerial photo of 1980s clearly shows a semicircular ditch outlining the residential hillfort V from the south-eastern and southern sides (Fig. 1.-*1*). The southeastern sector of the ditch is completely leveled by modern plowing and can be traced on some open source satellite images, for example, Bing-Maps. An image taken on 3 April 2017 by the WorldView-3 Earth observation satellite with a spatial resolution of 35 cm per image pixel gives a good idea of the structure (Fig. 2).

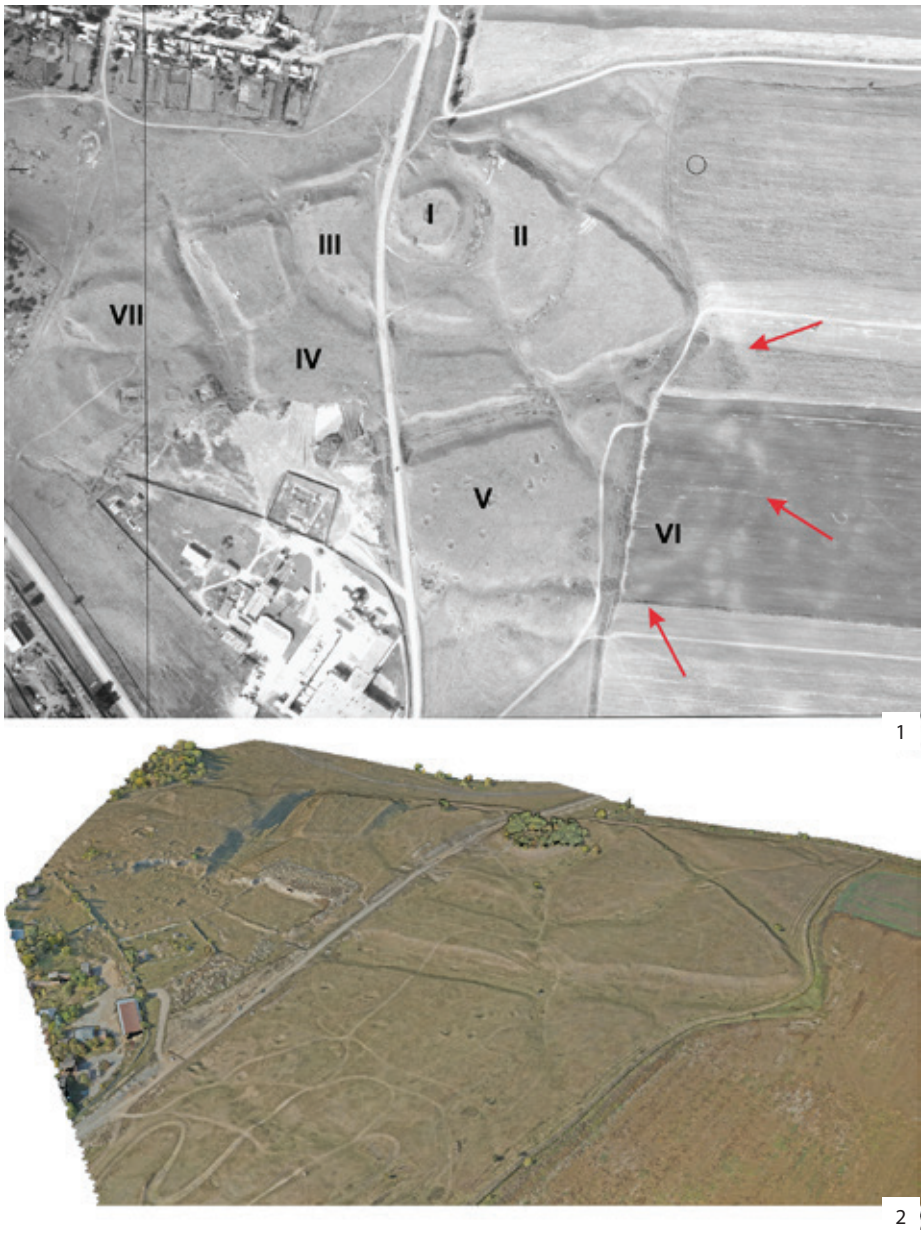

Fig. 1. 1 — view of Zilgi hillfort on the aerial photo of 1980-ties. Plowed outer ditch of the settlement is shown with red arrows; 2 — photogrammetric 3D-model of the hillfort of Zilgi based on the low-altitude aerial survey of 2020. View from the south

Рис. 1. 1 — вид Зильгинского городища на аэрофотоснимке 1980-х гг. Красными стрелками показан распаханный внешний ров городища; 2 — трехмерная модель Зильгинского городища, построенная методом фотограмметрии по результатам низковысотной аэрофотосъемки 2020 г. Вид с юга

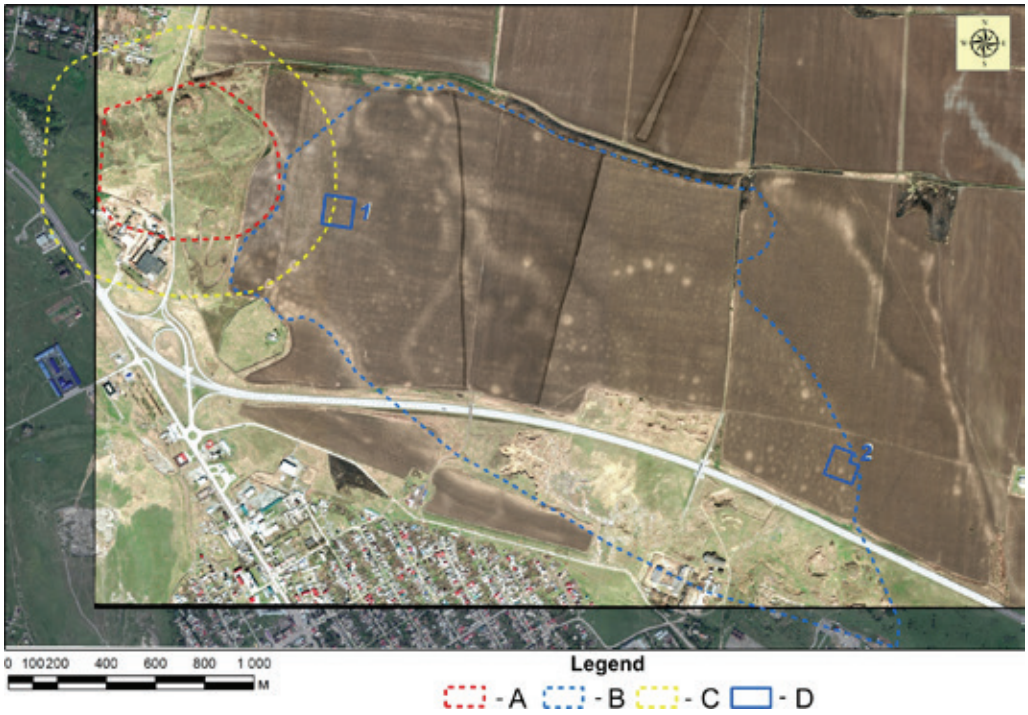

Fig. 2. Hillfort of Zilgi and the Beslan catacomb burial mound cemetery on the WorldView-3 satellite image (April 3, 2017). Symbols: A — boundaries of the hillfort; B — boundaries of the burial mound; C — assumed boundaries of the settlement; D — areas of geophysical survey

Рис. 2. Зильгинское городище и Бесланский курганный катакомбный могильник на космоснимке космического аппарата WorldView-3 (снимок 3 апреля 2017 г.). Условные обозначения: A — границы городища; B — границы могильника; C — предполагаемые границы посада; D — участки геофизического обследования

Different quantitative assessments of the Zilgi hillfort area can be found in the publications. For example, V. A. Kuznetsov defined its area as 1 sq. km [Kuznetsov, 1986: 74]. I. A. Arzhantseva's publication estimates the area of the fortified part of the settlement as 1.5 sq. km [Arzhantseva, Deopik, 1989: 76]. Analysis of remote sensing data, which we performed with the help of GIS, helps to understand how far these ideas are consistent with reality (Fig. 2). The calculation of the area of the fortified settlement gives much more modest results than it is usually assumed. Thus, the area of the fortified part of the hillfort in the ArcGIS 10.5 program based on the external contour of the ditch visible in the above-mentioned WorldView-3 image shows an approximate estimate of 38.5 ha, which is 0.385 sq. km. The visible area of the fortified hills of the hillfort, including the south-western part destroyed by the brickyard pit, is about 19 hectares (0.19 square kilometers). If we assume that the unfortified settlement was at a distance of 230 meters from outermost ditches of the fortified settlement (the distance of the settlement's border was traced in the course of our works, which will be described below), then the total area of the settlement is about one square kilometer (Fig. 2). Of course, we cannot say

that, on the one hand, all this vast area was developed by the inhabitants of Zilgi settlement in ancient times, and, on the other hand, that the area of the settlement did not extend further than the indicated distance of 230 m.

However, the fortified settlement of Zilgi is one of the largest earthworks of the early Alanic culture, comparable in fortified area to the Staro-Lesken (0.4 sq km), Brut (0.38 sq km) and Alkhan-Kala (0.3 sq km). Most of the "earthen hillforts" of that time are vastly inferior to those of Zilgi. For example, the Kievskoe hillfort near Mozdok, which is rather large, covers about 6 ha [Korobov, 2020: 23–28]. We would point out that these conclusions are preliminary, and a more detailed study of topographical and planning features of early Alanic "earthen hillforts" has yet to be made.

The Zilgi hillfort is of particular importance also because of the huge catacomb burial mound cemetery of Beslan, which is adjacent to it from the east and southeast. The area of this necropolis was estimated by its researchers at 7 sq. km, assuming that the number of mounds there could be as many as 35,000 [Dzutsev, Malashev, 2015: 56, 58]. The analysis of the WorldView-3 satellite image allows us to correct these assumptions as well (Fig. 2). This image is unique, as it was made at a time when virtually the entire territory of the Beslan cemetery was under ploughing, with no agricultural crops, which makes it impossible to recognize mounds reduced in the course of agrarian activities. As a result, we have a unique opportunity to estimate the boundaries of this site, at least to the north and east, and to calculate the maximum density of barrows per unit area. The spatial ultra-high resolution of the satellite image (35 cm per image pixel) allows us to do this (Fig. 2).

The clay quarry of the Beslan brickworks has heavily damaged the southern edge of the catacomb burial ground, but no barrow mounds can be traced in the ploughed areas south of the highway on the northwestern edge of Beslan town. They are also absent in the fields to the north of the country roads running eastwards along the edge of the promontory on which the settlement and the burial ground are located (Fig. 2). The eastern edge of the burial ground can be read perfectly by the high concentration of barrow mounds, which run in a semicircle along the ancient stream bed (?), now completely levelled by agricultural work. The most difficult is the definition of the western boundary of the burial ground, which adjoins closely the unfortified settlement of the Zilgi hillfort and, as our work in 2020 has shown, partially overlaps it. Here the barrow accumulations are bounded by a natural gully on the southwestern edge of the burial ground (now also leveled), which adjoins the tracking station of Beslan airport. The western edge of the necropolis, on the other hand, has no clear boundaries. There are several large mounds, adjoining the ploughed ditch from the southeastern side of the settlement. Two of them can be easily seen on the modern surface north of the tracking station. The small fully ploughed mounds of the Beslan catacomb cemetery adjoin these large mounds closely on the eastern side (Fig. 2).

An assessment of the Beslan cemetery area from the WorldView-3 satellite image yielded the following results. The total area of the necropolis within the boundaries outlined in Fig. 2 was about 324 ha (3.24 sq km). This is half as much as the calculations of the area of the site given in the literature [Dzutsev, Malashev, 2015: 58]. Nevertheless, the necropolis does not cease to look grandiose: its maximum length along the axis from northwest to southeast is 3 km, and its width in the middle part reaches 1.4 km.

We can try to calculate the maximum number of barrows that can be located in this area, based on the visually estimated number on the satellite image. If we take as a basis the place of their highest concentration in the eastern part of the necropolis, then according to the analysis of the satellite image there are from 15 to 25 mounds per hectare. Thus, taking as an estimated area of the burial ground about 300 hectares, we receive from 4500 to 7500 mounds in their maximum concentration. The results of excavations in 2011 [Dzhanaev, 2012; Malashev et al., 2015] allow us to estimate the density of burials in the necropolis more accurately. Calculations show that, on average, there are approximately 45 burial mounds and moundless burial complexes per hectare. At the same time, the density of burials near the settlement and in the greater part of the burial ground is higher than in its periphery. On the whole, the necropolis is one of the foremost necropolises of the early Alanic culture and could contain at least 13500 burials. A large burial mound cemetery of Kievskiy-I, adjacent to the above mentioned hillfort from the south, according to the recently conducted topographic survey, has an area of 2.4 sq. km and counts 1050 mounds, visible on the surface and on the space images [Kim, 2017: Fig. 232]. The results of the 2019 excavations [Malashev et al., 2020] at its periphery give a density of about 10 mounds per ha. Areas closer to the settlement should give a markedly higher density.

3D-modelling with help of photogrammetry

Modern approaches in the field survey provide a detailed overview of the topography of the Zilgi hillfort, especially the creation of its three-dimensional image by photogrammetry (Fig. 1.-*2*). This technology widespread in recent years has become an excellent tool in non-destructive archaeological survey [Zaitseva, 2014; Shubert, 2016]. The work to create a detailed three-dimensional photogrammetric model of the Zilgi fortress was carried out by the staff of the Laboratory of Digital Archaeology of the Centre for Ancient and Oriental Archaeology of the National Research University Higher School of Economics and the Laboratory of Remote Sensing and Spatial Data Analysis (RSSDA[1]) under the supervision of Yu. Svoysky in autumn 2020. The aerial survey was was made on 10–11 October 2020. A total of 12 operational flights were carried out (11 for the planned survey and one for the perspective survey). The flights were substantially complicated by the proximity of the Beslan airport glide path, due to which the flight altitude in the area of the ancient settlement was limited to 60 m, while the central and eastern parts of the Beslan burial ground were in the glide path area, completely closed for UAV flights. The low altitude considerably slowed down the survey and hindered further data processing.

A DJI Phantom 4 PRO unmanned aerial vehicle (UAV) was used with a DJI FC6310 camera with a full-frame 5464×3640 pixels (19.89 Mpix) sensor and lens with a focal length of 8.8 mm (24 mm equivalent), equipped with a non-standard onboard Emlid Reach M+ single-frequency GNSS receiver. The survey was performed in automatic piloting mode with parallel flight lines set in the meridional direction. The permanent operating altitude with terrain contouring was 56 m, the estimated image resolution was 1.45 cm/pixel, and the flight speed was 5 m/s. In order to create three-dimensional model of the fortress we used 2619 images with longitudinal overlap of 70% and cross-overlap of 60%.

[1] https://rssda.su/

As a result of this large-scale work we got a detailed topographical model of the whole area of the ancient settlement of Zilgi with very high spatial resolution (Fig. 1.-*2*), which is still to be analyzed.

Results of geophysical prospection

The field research of the Beslan kurgan catacomb burial ground in the 2020 season took place at two areas located in the immediate vicinity of the outermost ditches of the Zilgi hillfort (Survey Area 1) and at the maximum distance from them, on the eastern edge of the necropolis (Survey Area 2) (Fig. 2). The choice of the section was made to test the hypothesis repeatedly expressed by one of the authors about the expansion of the kurgan area of the early Alanic culture from the hillforts over the time. Furthermore, we want to test the consequent reuse of the areas adjacent to the hillforts during the Early Middle Ages [Gabuev, Malashev, 2009: 143; Korobov, Malashev, Fassbinder, 2020: 456]. We assumed that in Survey Area 1 we could excavate both the earliest and the latest catacomb burials of the Beslan burial ground, whereas Survey Area 2 would contain the catacombs marking the end of its planned development.

The team developed a number of methodological techniques for identifying and locating barrow catacombs using archival aerial photography and free-access satellite imagery, as well as subsequent magnetometer surveys of the areas to be excavated. The burial mounds, almost completely ploughed in Soviet times, are nevertheless revealed as lightened spots on aerial images (Fig. 2). Subsequent geophysical survey of clusters of these spots allows the identification of burial ditches, as well as catacomb graves, due to magnetic enhancement and magnetic enrichment of humus filled recessed ditch structures and the flowing soil in robbing manholes in the entrance pits of catacombs [Fassbinder, Stanjek, Vali, 1990; Fassbinder, 2015]. This technique was used in the study of the burial mound cemetery of Levopodkumsky 1 in the northern part of the Kislovodsk Basin [Korobov, Malashev, Fassbinder, 2014] and the section of the kurgan cemetery of Kievskiy I [Korobov, Malashev, Fassbinder, 2020].

Based on the results of interpretation of the super-resolution satellite image from the WorldView-3 satellite, two areas of this vast necropolis were outlined — in the immediate vicinity of the Zilgi fortified settlement and at a distance of 2.7 km east-southeast of it (Fig. 2). The next step in the complex work was a magnetometer survey carried out in May 2019 in a cooperation with the Ludwig Maximilians-University of Munich (J. Fassbinder) at the areas to be excavated. Magnetic Survey Area 1 had dimensions of 120×120 m (nine geophysical survey squares with dimensions of 40×40 m) (Fig. 3.-*1*). To achieve the highest possible sensitivity combined with the maximum speed of prospection, we set up our Geometrics G858 cesium magnetometer in a so-called "duo-sensor" configuration. The profile spacing was 0.5 m and the sampling rate was 10 measurements per second. This helps us to obtain the best and most exact interpolation of data to 25×25 cm spacing. At that time, we correct the slight linear diurnal variations of the geomagnetic field by means of a reduction filter, calculate a mean value of a profile, respectively of all data from the 40×40 m grid and subtract this value from the survey data. This survey technique and the instrument's characteristics make it possible to achieve both high sensitivity (up to ±10 pT) total field measurements and high speed and provides us with a clear picture of the underground features. The visualization as a grey-scale image (by 256 grey-scales) allows to trace even the smallest anomalies (< 0.1 nT). The application of

a high-pass filter removes (if necessary) the deeper, mainly geological features and provides supplementary information on the type of the anomalies. After this procedure, the results were displayed by a second magnetogram image [Fassbinder, 2017].

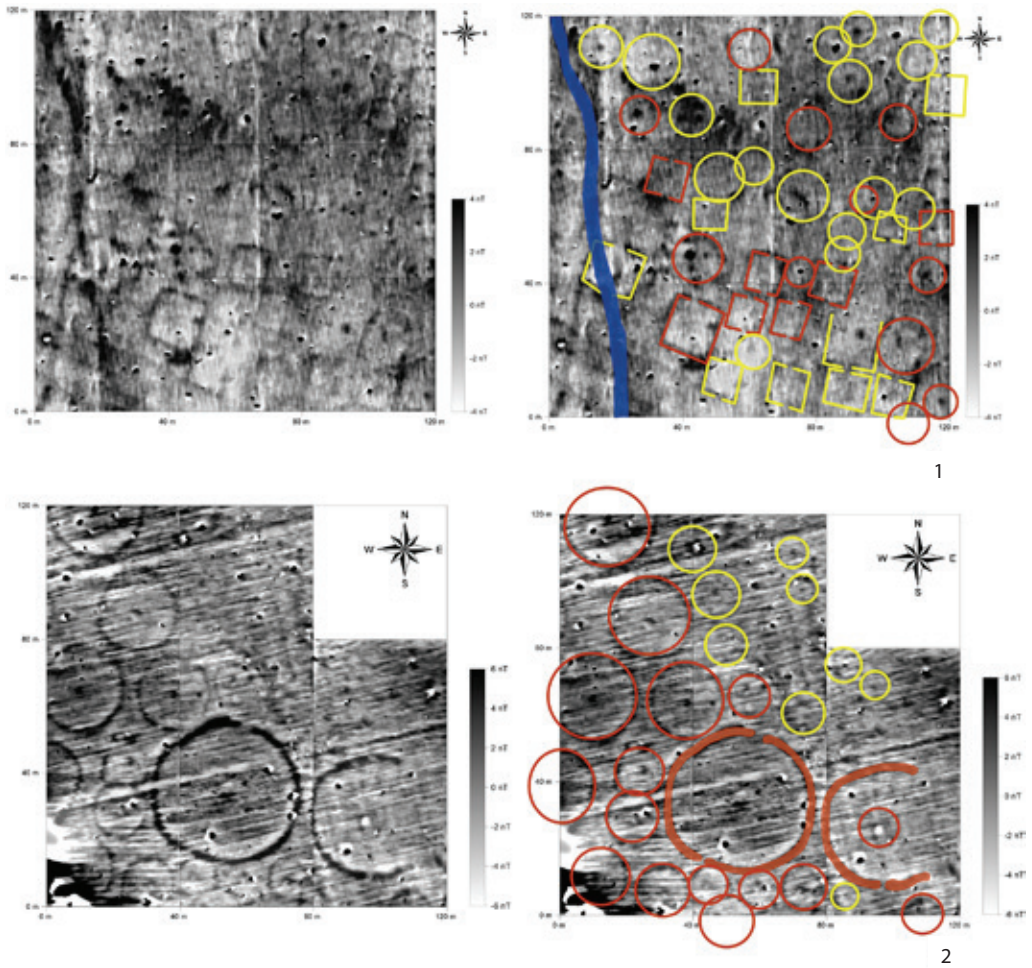

Fig. 3. Results of the magnetic survey of the Beslan catacomb burial mound cemetery (left) and their interpretation (right): 1 — Survey Area 1; 2 — Survey Area 2
Рис. 3. Результаты магнитометрического обследования Бесланского курганного катакомбного могильника (слева) и их интерпретация (справа): 1 — участок 1; 2 — участок 2

The magnetogram although dominated by deep ploughing furrows reveals a multitude of mounds surrounded by square and circular ditches. The mounds are virtually invisible on the surface because of years of ploughing, which has taken place annually to the present day. Some elevations of ploughed embankments can be seen in oblique low-altitude aerial photography under favorable illumination.

The boundaries of the barrow mounds appear on the magnetometer survey as linear, square and circular positive anomalies corresponding to the more humus-laden filling of the ditches surrounded the mounds. As a rule, the anomalies do not have sharp boundaries, their edges are blurred and the contrast is low. In the center of the square and rounded ditches, a brighter spot is usually present, corresponding to the humus-laden filling of robbing manholes let into the entrance pits of catacomb burials in ancient times (Fig. 3.-*1: left*). Some ditches have higher contrast and clearer boundaries on the cited magnetogram, while others are barely discernible. In total no fewer than eighteen mounds with clear boundaries were identified in Survey Area 1, all within the magnetometer survey area, of which seven were square in shape and eleven were circular (Fig. 3.-*1: right*; marked in red). A further ten square-shaped and sixteen circular ditches are only vague recognizable (Fig. 3.-*1: right*; marked in yellow). Two ploughed mounds surrounded by square ditches were selected for archaeological excavation, bearing the numbers 876 and 877; to the north of the square ditch of barrow 877 was a circular ditch of barrow 878, which was difficult to identify on the magnetogram (Fig. 3.-*1*). In the western part of the survey area we detected a ditch running from north to south. Obviously, this ditch marks the boundary to the Alanic settlement of Zilgi in the west and delimits the necropolis of Beslan in the east.

Survey Area 2, on the eastern periphery of the necropolis, is extremely in danger of erosion. On the other hand, it was characterized by a high contrast between the mainland soil and the filling of the mound ditches. As a result, embankments can be identified here with a high degree of probability. An area of 120×120 m sides we surveyed here, one of the nine geophysical survey squares was excluded from the work because it extended beyond the boundaries of the necropolis and across the road on the northeastern side (Fig. 2). In addition, the southwestern square was partially disturbed by a large magnetic anomaly due to the proximity of a gas pipeline (Fig. 3.-*2*). The remainder of the approximately 1.28 ha magnetometer survey area identifies at least 18 ploughed mounds bounded by circular ditches (Fig. 3.-*2: right*; marked in red), including two large mounds with ditches 35–40 m in diameter, located in the lower part of the survey area. One of these, the largest in size, can also be seen on the surface; the other mounds are completely ploughed up and show no external features.

Four of the 18 ditches extend beyond the Survey Area 2, the rest fall entirely within it. In addition, some nine other ditches, mostly in the northeastern part of the surveyed area (Fig. 3.-*2: right*; marked in yellow), are presumably recognizable. They are of small size, with diameters of about 10 m, and their contrast is weak. The two largest barrows are extraordinary not only because of their size. One of them is enclosed by a wide ditch, which show clearly two earthen bridges — oppositely one in the south, the other in the north. Only a semicircular ditch followed by an earthen bridge in the south and an appendix of ca 10 m encloses the other one. In the center of this semicircle, the barrow pit shows up as a negative (white) magnetic anomaly. Two barrows with circular ditches, 20–22 m in diameter, have been selected for excavation (874 and 875).

Beside all of the clearly detectable burials we find a multitude of further (burial) pits, indicating that they were made without any enclosure ditch and/or this enclosure was already eroded and therefore not anymore detectable by our measurements.

Results of archaeological excavations

At present, a complete publication of the results of the excavations of barrows 874–878 of Beslan catacomb cemetery is being prepared. In this paper we present these results in the briefest form.

The mounds of all investigated burials were completely ploughed up and were not traced on the surface. Their structure, recorded in the profiles, is homogeneous in all the cases: a layer of buried soil (grey-brown humus loam with carbonate inclusions, 50–75 cm thick) lies under an arable layer of black humus loam with a thickness of 30–40 cm. The lower profiles of ditch fillings, trapezoidal in cross-section, were recorded in the barrows of the mounds. Their depth from the level of arable layer was from 75 cm up to 1,3 m. The width of the upper part was 50 to 75 cm, and the width of the ditches at the bottom part was 20 to 40 cm. The ditches of all the mounds, apart from the kur. 878, were filled with black-brown humus loam with inclusions of mainland clay and carbonate inclusions. The ditch fill of kur. 878 was notable for the absence of these inclusions.

The diameter of the ditches varied as follows. Mounds 874 and 875 were surrounded by circular ditches, with diameters of 22–24 m along the outer edges. On the northeast and southwest sides, the ditches had bridges about 2.0 m width (Fig. 4.-*1*). Mounds 876 and 877 had square-shaped ditches, measuring 15.5–16.5 m and 12–12.5 m on the outer contour respectively. The bridges located on the north-northeast and south-southwest sides were significantly smaller in width, ranging from 0.5 m to 1.2 m. The ditch of kur. 878 circular in shape is only partially preserved. Its reconstructed diameter along the outer contour is 9.5 m, and the width of the bridge preserved on the south-west side is 1.5 m.

The barrow mounds mainly contained one central burial in T-shaped catacomb. The catacombs of barrows 874 and 875 had considerable depth of entrance pits (up to 4 m), which had been heavily destroyed by robberies in antiquity. The entrance pits were rectangular in shape, 2.95 m long and 1.4–1.6 m width at the clearing level; oriented in a northeast — southwest line. They had steps made along the long northern wall. The chamber entrances have not survived — looters had heavily widened them. The chambers situated on the northeastern side, and were rectangular, with dimensions of 2.2–2.4×1.0–1.5 m and about 2.0 m high. The vaults have not survived, but they appear to have been raised from the entrance and were lancet-shaped (Fig. 4.-*2*).

The funerary inventory preserved after the robbery was found mainly in the chamber fill, in a displaced state. In the catacomb of kur. 874 bronze buckles (Fig. 5.-*3*), a belt tip, fragments of an iron knife and an iron object were found. Inventory of the chamber 875 consists of numerous fragments of an iron sword or dagger, a silver buckle with a shield (Fig. 5.-*8*), an iron buckle, a knife, as well as a bronze and silver ring with clips (Figs. 5.-*4–5*). There were also the finds of pottery from this catacomb — a grey clay bowl with a bent inside rim, as well as a thin-walled narrow-necked light clay jug with a broken handle, the chipped point of which has been ground away for further use (Fig. 5.-*1*). This jug is of Transcaucasian origin and was probably of great value to its owners. The upper profiling of this vessel is similar to that of a vessel found in the Zilgi hillfort [Arzhantseva, Deopik, Malashev, 2000: 242, Fig. 18], and also finds analogies in materials from the Georgian Zhinvali cemetery dated from the 3rd — beginning the 4th cc. AD [Ramishvili, 1983: table LXIII; LXV.-283]. The silver and

bronze buckles and rings with clips, found here, are characteristic of the third quarter of the 4th century AD.

Fig. 4. 1 — Kur. 874, view from the north to the circular ditch and entrance pit of the catacomb; 2 — axonometric view of catacombs 874, based on the results of three-dimensional photogrammetric modeling

Рис. 4. 1 — вид с севера на пятно кольцевого ровика и входной ямы катакомбы кургана 874 Бесланского могильника; 2 — аксонометрия катакомбы 874, построенная по результатам трехмерного моделирования методом фотограмметрии

Fig. 5. Findings from the Beslan catacomb burials: 1, 4, 5, 8 – kur. 875; 2, 7, 9 – kur. 876, grave 1; 3 – kur. 874; 6 – kur. 876, grave 2. 1, 2 – pottery; 3, 4, 6 – bronze; 5, 7, 8 – silver; 9 – bronze, gilding

Рис. 5. Находки из захоронений Бесланского курганного катакомбного могильника: 1, 4, 5, 8 – кур. 875; 2, 7, 9 – кур. 876, п. 1; 3 – кур. 874; 6 – кур. 876, п. 2. 1, 2 – керамика; 3, 4, 6 – бронза; 5, 7, 8 – серебро; 9 – бронза, позолота

Catacombs of kur. 876 and 877 excavated at Survey Area 1 near Zilgi settlement were very different from the above-mentioned ones. Their entrance pits, oriented from north-northeast to south-southwest, were longer and narrower. Their shape was trapezoidal, extending to the north-northeast wall; they measured 2.3–2.7 m long and 0.5–0.7 m width at the clearing level. At the south-southwest (opposite) wall of the entrance pits, steps were made half of its width, arranged in a staggered pattern. The depth of the entrance pits was up to 2.5 m in front of the chamber. The chambers themselves were oval, with a hemispherical vault at the top, 2.2–2.3 m × 1.6 m, and 1.0–1.1 m high.

The inventory left by the robbers was also found among the filling in the chambers. In cat. 876, it included a large black-lined jug with a closed spout and an ornament in the form of shaded triangles, made by narrow broken lines, as well as a belt of impressions of Z-shaped stamps (Fig. 5.-*2*), a mug with zoomorphic decoration on the upper edge of the handle, an iron knife, small glass beads, a cornelian bead, fragments of stamped bronze and silver plaques (Fig. 5.-*7*) and a fragmented gilded pseudo-buckle (Fig. 5.-*9*). In cat. 877 fragments of an iron buckle and a bronze earring with gilding were found.

Mound 876 also contained a peripheral burial of a 4–5 years old girl (?), made in a podboj grave. The dimensions at the level of the cleanup of the entrance pit were trapezoidal, 1.4 m × 0.5–0.6 m, and 0.5 m deep. The western wall contained the entrance of 0.9m width and 12 cm high to oval-shaped chamber measuring 1.2 m × 0.4 m and 0.3 m high. The entrance was closed with large pieces of clay. At the bottom of the niche the skeleton of a child lay in an elongated position on its back, with its head facing north-north-east. Its head was turned to the right side. The skull was artificially deformed, in S. Yu. Friesen's opinion, a deformation typical of the Early Alanic craniological series, with a roll in the region of the *bregma* and a postbregma depression. A small pot was on the left side of the head and a large bronze chain was on the neck (Fig. 5.-*6*), apparently connected with the outermost links by a leather cord, which has decayed.

This burial has no precisely dated material. However, it is synchronous with the central burial in the catacomb 876 and is made under the same mound, surrounded by a square ditch. All these burials can be dated about to the middle of the 7th century AD according to the remains of a belt set with pseudo-buckle and stamped plaques in heraldic style, found in cat. 876. The black-clad jug from the main burial of kur. 876 has an analogy among the finds from the Kur. 18 of the burial mound cemetery of Brut 2, the complex of which dates to the end of the 6th or the first third of the 7th cc. [Gabuev, Malashev, 2009: 120–121, 127–129, 141, Fig. 93.-14].

Thus, the burials studied at Survey Area 1, in barrows with square ditches, are the latest of all burials known to date in the Beslan catacomb burial ground. Our excavations confirm the existence of life in the Zilgi hillfort in the 7th century AD, which had been suggested earlier due to the finds of pottery and fibulae in the stratum of the settlement [Arzhantseva, Deopik, Malashev, 2000: 244, Fig. 16] discussed by I.O. Gavritukhin [2007].

A square ditch of kur. 877 cut a circular ditch of an earlier catacomb burial made in kur. 878. Sections of its outline in the southern and western part were preserved; the northeastern sector could not be traced. The central part of the space enclosed by a ditch was occupied by a catacomb burial. Its entrance pit had a pronounced trapezoidal shape. It was oriented from north-east to south-west, 2.05 m long and 1.6 m width at the northeast wall of the chamber,

and 0.7 m width at the south-west opposite wall. The depth of the entrance pit at the chamber entrance from the level of the sweep was 1.25 m. Several steps were made in the south-western corner and along the width of the back wall. The chamber had an oval shape, with dimensions of 2.0 m × 1.15 m and a height of 0.9 m. The vault was hemispherical, descending from the entrance to the front wall.

Some bones of a buried adult were preserved in the chamber, which had been robbed in antiquity. Judging by the position of the long leg bones preserved *in situ*, the deceased lay stretched out on his back with his head to the south-east, to the right of the chamber entrance. Extant funerary equipment included an iron awl, a buckle and a knife, as well as a grey-clay bowl with a curved rim. Unfortunately, the found inventory does not allow to establish the precise date of this burial. However, judging by the construction of the catacomb, it is dated no later than the beginning of the 3rd century AD and belongs to the earliest catacomb burials of Beslan necropolis known to date.

A rather interesting detail revealed in the course of our work at Survey Area 1 of the Beslan burial ground during the 2020 season. It was the discovery of household pits belonging to the unfortified settlement of the Zilgi hillfort. Three of the pits were found in the inner space of the burial area, enclosed by a ditch of kur. 876 and next to it. Pit 1 was excavated in the south-southwest corner of the barrow area, pit 2 was located near the eastern edge of the ditch from the inner side; pit 3 was located northwest of the northern bridge, on the outer side of the ditch. Preserved depth of pits 1 and 2 from clearing level was 0,7–0,9 m, diameter at clearing level was 1,6–1,7 m, bottom diameter was 1,9–2,0 m. They were filled with loose grey-brown ashy loam, which was denser and darker in colour towards the bottom and near the walls. Numerous fragments of pottery vessels (about 500), burned clay and animal bones were found in the pits. Pit 3 was preserved only in the bottom part, to a depth of no more than 15 cm; there were large fragments of a tare vessel (pithos) at the bottom.

It is interesting to note the rather sparse arrangement of the pits described, and also the fact that no similar objects were found in the area surrounded by the ditch of the neighbouring northeastern kur. 877. The cultural layer was not stratigraphically recorded in the profiles of the excavated barrows, although materials such as fragments of pottery and animal bones were present in the arable layer. Therefore, we can state that our work has established the periphery of the open settlement of the Zilgi hillfort on the east side at the time of its maximum expansion. This boundary was approximately 230 m to the east of the ditch line fencing off Hill V from the east and 400 m to the southeast of southeastern corner of Hill II according to the plan of V.A. Kuznetsov dating to 1981 (Fig. 1.-*1*; 2).

Conclusions

To sum up, the use of non-destructive methods based on remote sensing data analysis, three-dimensional modelling by photogrammetry, magnetometric survey and limited area excavations allow us to obtain fundamentally new information even about such well-known archaeological site as the Zilgi hillfort and the Beslan burial ground in the shortest time. For the first time, we have been able to specify the area of these sites and their boundaries, and trace their spatial features. Small-scale excavations at the Beslan necropolis allowed to expand considerably the ideas about the time of its use (from the first half of the 3rd century AD to the end of the 4th century AD), trace the tendency of its development from the ancient

settlement towards the east and southeast, and find evidence that its burial space near the open settlement was used again in the middle of the 7th century AD. We believe that works similar in methodological respects have broad prospects for the study of the settlements and burial sites of North Caucasian Alans, especially at the early stage of their existence in the Central Caucasus.

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