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Case report

OSL dates for the ancient geometric earthworks of Kazakhstan

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ABSTRACT

Large-scale earthworks ranging from 90 m to over 400 m in length, recently discovered in northern Kazakhstan, have come to be commonly named as the "Geoglyphs of Turgai". These monuments mainly have been found in northern Kazakhstan within the Turgai deflection. These geometrical earthworks of the Turgai have been serendipitously identified through the analysis of satellite imagery. In the past few years over 60 such geometrical earthworks have been identified; however only 30 of these have been checked and confirmed by archeologists after visiting the sites. Most of these geometric earthworks consist of earthen mounds arranged in lines, rings, crosses, and square with diagonal lines. In this paper we present the first dating results from these geometric earthworks, which affiliate the earliest stages of this phenomenon to the Early Iron Age period (ca. 800 B.C.). This chronological context provides a starting platform for further interpretation of these monuments, concentrating on the reasoning behind their construction and the building of an understanding concerning the complexity of the steppe populations who undertook such forms of construction.

1. Introduction

The Eurasian steppe is a vast zone of grassland stretching from Hungary to China. The populations that have inhabited this land for millennia have played a great role in the history of the peoples living on both ends of the steppe. These steppe inhabitants not only mediated in the existence of the Prehistoric and Historic "Silk Road", but also changed the course of development of both western and eastern civilizations (e.g. Keegan, 2004). Representations of these central Asian pastoral populations are often conveyed through images of fierce and free nomads organized on the principals of pre-state kinship societies in clans and tribes (Saunders, 2001; Sneath, 2007), which have been characterized as relatively egalitarian in nature (Chang, 2012). Some historians often reproduce ancient stereotypes of nomadic populations as aggressive, politically unsophisticated warriors, a threat to other civilizations from peoples who did not bear any civilization of their own, while others argue that those nomads were quintessentially political, organizationally novel, in possession of complex regional polities, aristocratic power, and state-like processes of administration (Honeychurch, 2014; Kim, 2013; Maenchen-Helfen, 1973). The geometric earthworks of northern Kazakhstan, that require immense construction affords and work force concentration, may hold a piece of the puzzle to comprehending the mechanisms of organization and complexity within past steppe societies.

Human-made geometric earthworks have been identified across the world, and vary widely in construction type and size. They are usually constructed of stonework, cut into the landscape in order to expose bedrock or soils of varying color, or constructed from earthen mounds or ramparts. In many cases such geometrical designs are referred to as 'geoglyphs'. The term "geoglyph", however, is often used to describe geometric earthworks that were intended as artwork, rather than constructed as functional objects (e.g. Bahn, 1998; von Werlhof, 1987). Due to the unknown reasoning behind the construction of the objects discovered in Kazakhstan to date, we prefer to use the term "geometric earthworks" to refer to these objects in lieu of the earlier terminology of 'geoglyphs'.

In this paper, the first review of recently identified geometric earthworks within the Turgai deflection of northern Kazakhstan is presented. One of the major contributions of this paper is the presentation of the first dating results from these geometrical earthworks, providing both some insight into the origins of this phenomenon and a platform for further research.

2. Background

2.1. Geographical setting

All of the geometric earthworks discovered to date lie within the Turgai steppe region of northern Kazakhstan (Kostanai Oblast), distributed within an approximate 285,600 km^2 area of the so-called Turgai deflection (Zakharov, 1971). To date, around 60 geometrical earthworks

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in total have been identified, concentrated in the southern territory of the Turgai steppe. This is a vast territory, with the regional capital of Kostanai being the largest city. The main academic center in this region is Kostanai University, including a Department of Archaeology; the Turgai steppe region falls into the jurisdiction of this academic body. The densest cluster of geometric earthworks is located in the southern regions of the deflection, around 400 km south of Kostanai, not far from the Arkalyk city (Fig. 1). These facts are important to keep in mind when trying to gain a sense of the size and remoteness of the region, and as to why satellite images have acted as a very useful tool in the search for such archeological sites.

The vegetation of the southern Turgai steppe is dominated by *Stipa lessingiana* grass, constituting the major source of local cattle fodder (Zatkanbaev, 1960). The landscape of the Turgai steppe is relatively flat and homogenous, cut by deep ravines formed by melting snow. The sediment type around the geometrical earthworks can be characterized as mainly Miocene Lake clays mixed with silt size particles. The climate in this region is continental, renown for extreme fluctuations in temperatures with deeply cold winters and very hot summers. The lowest recorded winter temperature in the region is −45.7 °C, while the highest recorded summer temperature is 41.6 °C (Boboedova, 1971). The average precipitation in the Turgai is 266.7 mm a year (climatebase.ru).

2.2. Description of the geometric earthworks

The geometric earthworks within the Turgai region have been serendipitously discovered through analysis of openly accessible satellite images. In total, 33 of these geometric earthworks have undergone a preliminary field survey by archeologists, while only four of them to date have received a detailed study including thorough surveys to establish their overall size, the size of the individual mounds, and in some cases excavations of the mounds. The coordinates of the 33 surveyed geometric earthworks are mapped in Fig. 1, while the four that have undergone detailed survey are described in greater detail in this paper. It was chosen not to indicate the position of other 30

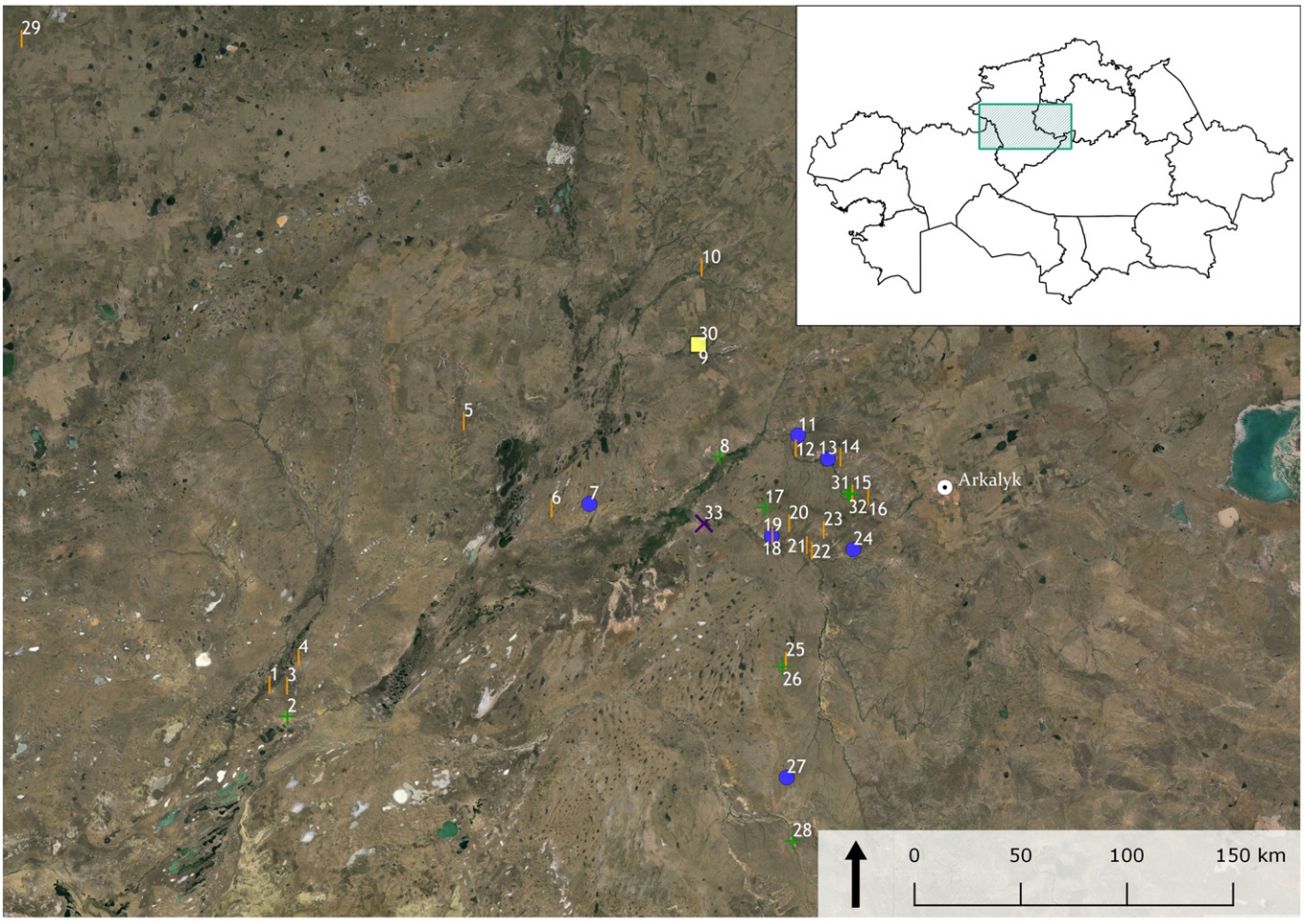

Fig. 1. The distribution of geometrical earthworks in the Turgai steppe, Kazakhstan.