LATE PLEISTOCENE AND EARLY HOLOCENE USES OF BASALTIC GLASS IN PRIMORYE, FAR EAST RUSSIA: A NEW PERSPECTIVE BASED ON SITES NEAR THE SOURCES

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ABSTRACT

Basaltic glass artefacts are common at many sites dating from the Late Pleistocene-Early Holocene in the Primorye region of Far East Russia. Sourcing by various geochemical techniques indicates that the vast majority are derived from outcrops in the nearby Shkotovo Plateau. This raises the problem of where and how the large quantities of basaltic glass were acquired: e.g. through trade, embedded procurement, or direct access to outcrops. A recent survey has located 10 new sites (Tigrovy 1-10) on river terraces near these basaltic glass sources. Study of the material can provide information about which form of procurement was used in the past. Some of the sites are proposed as primary 'quarries,' whereas others are hypothesised as temporary camps or longer term base camps. Our preliminary conclusion is that the sites located near the sources are linked to distant settlement sites, possibly as part of seasonal movements between the forest and the river valleys.

UNDERSTANDING BASALTIC GLASS DISTRIBUTION

A joint Russian-Australian project is investigating systems of ancient basaltic glass exchange in the Primorye region of Far East of Russia. In the course of several field seasons, the multi-national team has assessed the geological sources of basaltic glass in terms of each of their properties for the manufacture of prehistoric stone tools from this region and has collected samples for geochemical characterisation (Doelman *et al.* 2004; in press). One of the aims of the project is to answer questions about when, how and why basaltic glass was procured and transported from the geological sources to sites and to trace changes in the exchange character and directions, beginning in the Upper Paleolithic and ending with the Bronze Age.

An area of the Shkotovo plateau within the upper reaches of the Ilistaya River and its tributaries was chosen for study because the most important sources of basaltic glass for ancient people in Primorye are located there (Figure 1). The team has located both primary outcrops and secondary sources consisting of concentrations of pebbles and rounded cobbles within stream and river channels and terraces. The cobbles range in size up to 20 cm in diameter. The glass varies in colour and includes black, dark-blue, and gray hues. The basaltic glass has strong lustre, conchoidal fracture, and sharp edges.

Figure 1. Location of the study area in central Primorye, Far East Russia

Based on recent fieldwork, including several excavations by staff from the Institute of History, Archaeology and Ethnography of the Peoples of the Far East, artifacts made from basaltic glass from the Shkotovo plateau have been found at many sites, some of which are shown in Figure 2: e.g. Molodezhnaya-1; Novovarvarovka-1; Sheklyaevo-6; Tikhorechnoye-1; and Risovoye-1 (Kononenko and Kluyev 1998; Kluyev 2002, 2005; Pantyukhina 2006a, 2006b). Geochemical characterization studies by

Figure 2. Archaeological sites in the Shkotovo Plateau where basaltic glass artifacts have been found.

Figure 3. Primary outcrop of basaltic glass, Sukhoi stream.

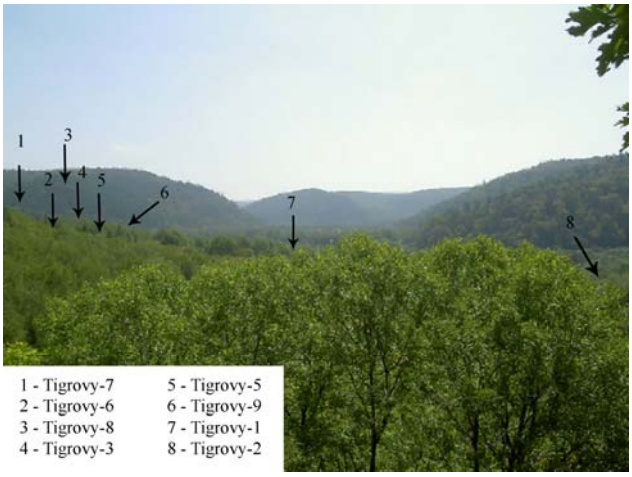

Figure 4. Location and setting of the Tigrovy sites.

Russian/American and Russian/Australian teams have demonstrated that the basaltic glass at these sites is derived from the Shkotovo geological sources (Kuzmin *et al.* 1999; 2002; Kuzmin and Popov 2000; Shackley *et al.* 1996; Doelman *et al.* in press). Moreover, Popov and his colleagues have shown Shkotovo basaltic glass was been distributed beyond the Primorye to such sites as Osinovaya Rechka-10 and Novotroitskoye-10, which are in the lower reaches of the Amur River. The straight line distance between these sites and sources is as much as 660 km (Popov *et al.* 2006:101) demonstrating that basaltic glass was transported over exceptionally long distances.

BASALTIC GLASS SOURCES

Survey by the Russian/Australian team has located a wide range of potential sources of basaltic glass (Doelman *et al* 2004; in press). One primary outcrop is located 3.8-4 km to the south of the confluence of the Ilistaya and Pravaya Ilistaya Rivers while another extensive set of outcrops is less than 0.4 km in the same direction (Figure 3). Due to the action of natural erosional processes (weathering, wash-out), chunks of basaltic glass, often still adhering to basaltic cobbles, break away from the outcrops and fall into the channel of Pravaya Ilistaya River where they form high concentrations of nodules. The stream then carries them away to the main watercourse, the Ilistaya River. The main movement of basaltic glass occurs, most likely, during the autumn and spring floods and typhoons characteristic of Primorye, at times when the water level and flux force are especially high. At other periods, the Pravaya Ilistaya River is shallow or even restricted to pools. The basaltic glass pebbles gradually separate from their matrix as they are transported downstream. Eventually, the Ilistaya Rivers delivers very small, rare pebbles down to its mouth at the Khanka Lake (Figure 2).

SURVEY RESULTS

Systematic archaeological survey has been conducted in the upper reaches of the Ilistaya River near the sources of basaltic glass. River terraces of different elevations, slopes and the tops of hills were thoroughly investigated by foot survey and shovel pitting. Ten new sites associated with the production of basaltic glass artifacts were discovered (Figure 4). The sites, named Tigrovy-1 to Tigrovy-10, are located in the immediate vicinity of the primary basaltic glass sources (Figure 5). As part of the survey only preliminary exploratory investigations were conducted. These included surface collections and small test pits. The results, nevertheless, enable a preliminary assessment of how these sites relate to the distribution of basaltic glass outside the source region.

The richness of the cultural layers in terms of the abundance of basaltic glass is noteworthy. For example, we water sieved a volume of 0.3 m^3 of soil excavated from the lower part of the whitish loamy soil which represents the cultural layer at the Tigrovy-6 site and recovered 231 flakes and microflakes. In addition, the archaeological material confined to the whitish-brown loamy soil at the Tigrovy-8 site, which we suspect is a primary quarry, was represented by a dense mass of 'broken glass', which was 5-7 cm thick.

Artefactual remains

At all sites, the majority of the archaeological material is represented by lithic debitage derived from the production of stone artefacts (Figure 6). Only two small fragments of ceramics were found at the site of Tigrovy-2, but they are not diagnostic enough to be related to cultural assemblages known from elsewhere. For the most part (up to 96%), the raw material was volcanic glass derived from water-rolled stream pebbles which represent the full range of black, dark-blue, and gray colours of basaltic glass. Owing to the fact that the sources of raw material were nearby, a wide range of shapes and sizes of partially rounded nodules is represented in the flaking debris. These provided an excellent range of choice for ancient knappers.

The remainder of the raw material (about 4%) at the archaeological sites of Tigrovy-1 - Tigrovy-10 is comprised of flints and siliceous tuffs of different colors. These have probably been transported to the sites from outside the local region.

The character of the debitage and the almost total absence of finished tools (either whole or broken) at all sites (except for a biface fragment, two end-scrapers and a scraper plane from the Tigrovy-2 site) suggests that these locations were predominantly used for the early stage of stone tool production; implements were only made for temporary use while the group was camped near the source of raw materials. Noteworthy is the presence of a large quantity of basaltic glass waste which is characteristic of bipolar techniques of working that are associated with Upper Paleolithic technologies elsewhere in the region.

The lithic technology at the Tigrovy-1 - Tigrovy-10 sites takes on special significance because the presence of the microblade technique has been noted at Paleolithic sites in the region, such as Novovarvarovka-1, Sheklyayevo-6, Kornilovka-1 - 2, Risovoye-1 (Kononenko and Kluyev 1998; Pantyukhina 2006b; Kluyev and Sleptsov 2001), but the initial stages of reduction of basaltic glass nodules are not found at these sites. The hypothesis that basaltic glass pebbles were collected and primary stages of stone tool production took place on the river terraces in the immediate proximity of the sites has been negated by studies of the river cobbles. A meticulous examination of the Arsenyevka River and its tributaries by us showed that the quantity and sizes of raw materials in the channel deposits exclude the possibility of tool production at these locations. This means that the only accessible source of the high-quality basaltic glasses suitable for manufacture of large implements or their blanks is the zone of the Shkotovo plateau near the confluence of the Ilistaya and Pravaya Ilistaya Rivers where cobbles have not traveled very far from the primary basaltic glass sources. In this regard, the Tigrovy-10 site, which appears to be a temporary (transit) camp site dated to the Upper Paleolithic is very significant. The site it is located well away from the

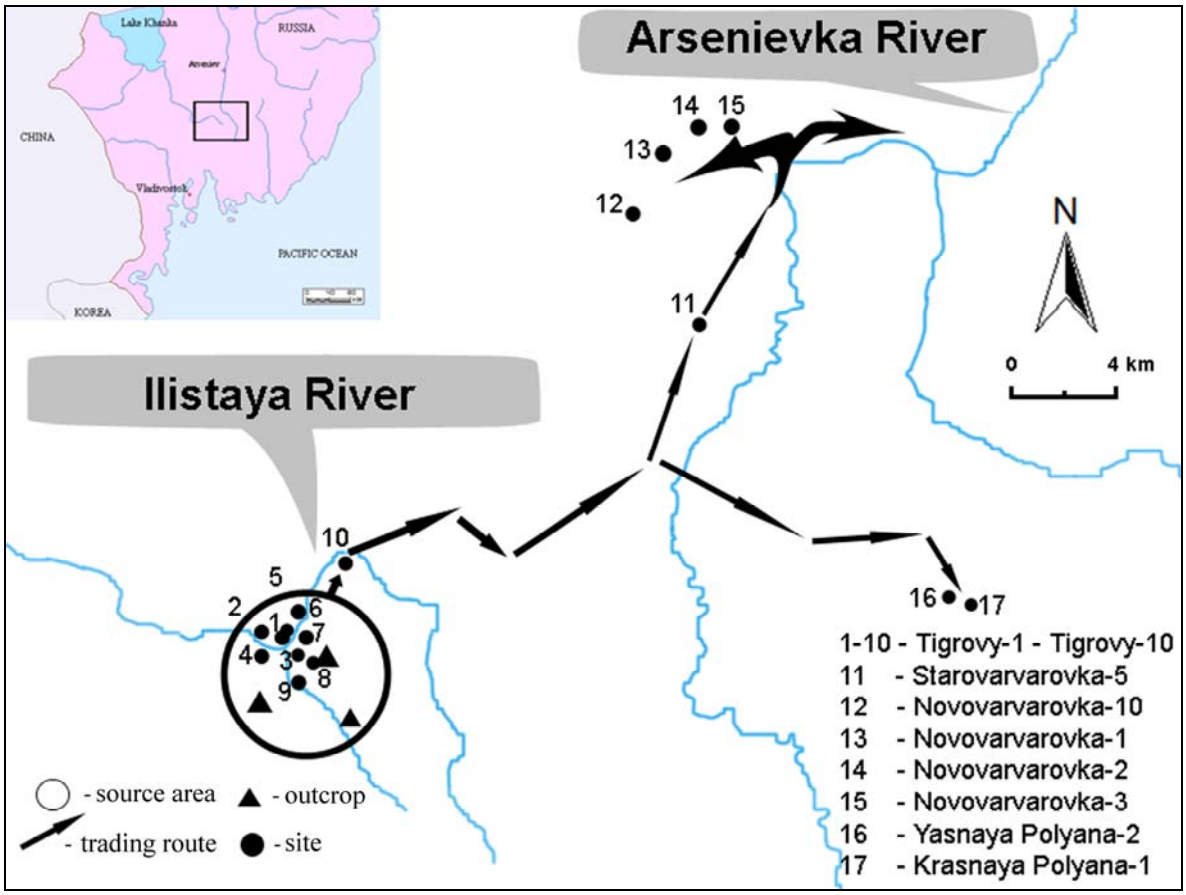

Figure 5. Location of archaeological sites and basaltic glass outcrops.

Figure 6. Basaltic glass artifacts: (1) hammerstone, (2) retouched flake, (3) biface, (4, 5) endscrapers, (6) perforator, (7-11) flakes. (1, 2) Tigrovy-1; (3-6) Tigrovy-2; (7-9) Tigrovy-3; (10-11) Tigrovy-4.

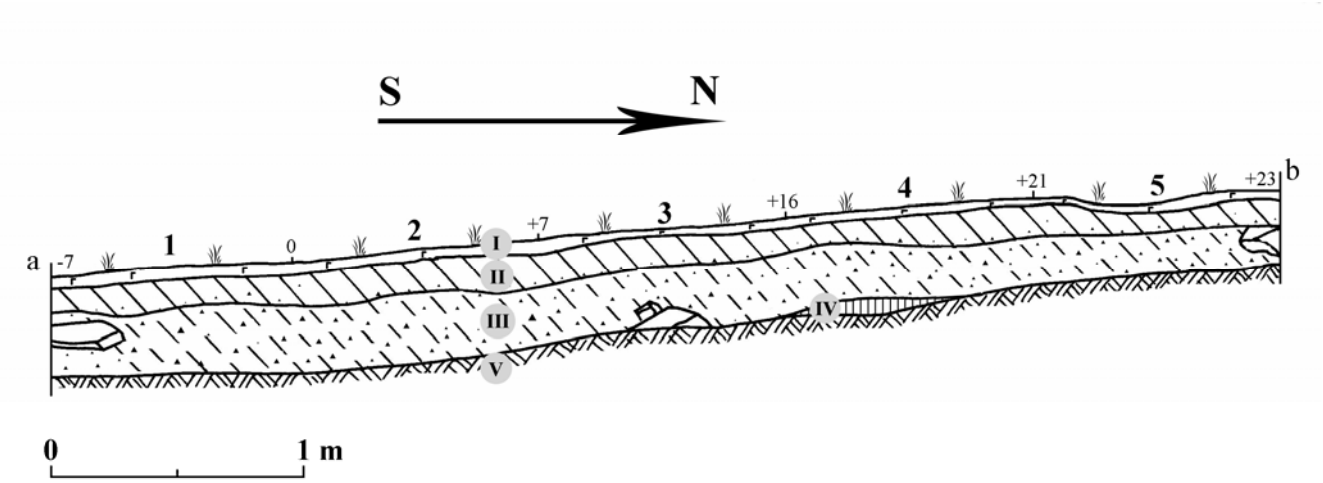

Figure 7. Stratigraphic section at the Tigrovy-2 site.

sources of basaltic glass, but is within a pass through the mountains and on a convenient route for transporting basaltic glass from the source area into the large river valley where the Upper Paleolithic sites, which have a wide range of completed artefact types, are found.

Dating

The Tigrovy-1-10 sites are situated within a relatively small area within a single river basin. On the whole, the terraces within the Ilistaya River basin have all been formed by alluvial-colluvial processes. Most likely, the structure of the basic stratigraphy present at all the sites examined is due to the operation of the same processes of soil formation on the same substrate present at all locations.

The section presented in Figure 7 of the stratigraphy at the Tigrovy-2 site is typical of the stratigraphy found at all the other Tigrovy sites.The uppermost layer is a turf 4-8 cm in thickness (Layer I). It is underlaid by a loam 30-40 cm thick which contains the cultural remains. The color of the loam varies from grey-brown (weakly humified) in the upper horizon (Layer II) to light-brown in the lower one (Layer III). The loam contains angular fragments of basalt and coarse eroded material which increase in proportion to the loamy component towards the base of the layer. In places, the lower loam horizon comes in contact with a deep-brown humus stratum 1.5-10 cm thick which is characterized by increased viscosity (Layer IV). The bedrock consists of heavy clay which has a greyish-yellow colour with a whitish tint and has a high concentration of angular rocky fragments and debris (Layer V).

The main distribution of cultural material in most of the sites occurs in the lighter loamy soil levels (Layer III) hypothesized to represent the beginning of active use of basaltic glass raw materials in the Late Pleistocene-Early Holocene period. At the Tigrovy-7 and Tigrovy-8 sites, however, a portion of the finds extend into the overlying (ie more recent) layers of brown soil which is related to the Holocene period (Layers I, II), suggesting that their use at a more recent time period cannot be ruled out.

The question of the precise dates of the new sites needs further research incorporating radiocarbon dating of samples obtained by careful excavation from well-defined archaeological contexts.

CONCLUSIONS

Taking into consideration the location and spatial distribution of the Tigrovy-1-10 sites, character of the lithic artefacts, richness of the cultural layers, stratigraphic distribution of the artifacts, one can propose that some of these new sites were used as primary ‘quarries’ for basaltic glass, whereas others were temporary camps or longer term base camps. A summary of our suggested functions for the sites is presented in Table 1 (next page). Our preliminary conclusion is that the Tigrovy sites located near the sources are linked to distant settlement sites in the Arsenyvka river and beyond, possibly as part of seasonal movements between the forest and the river valleys.

More detailed investigations of the Tigrovy-1-Tigrovy-10 sites, now in progress, will allow us to shed more light upon the procurement and manufacture of basaltic glass within the region and also to offer insights into the nature of seasonal mobility patterns and transregional exchange of raw materials.

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Table 1 Archaeological results from the Tigrovy sites

Site Name	Excavation	No. artifacts	Artefact types	Site Type
Tigrovy-1	test pit	28	tools, amorphous cores, worked flakes, debitage	base camp (workshop)
Tigrovy-2	test pit, trench	275	tool blanks, bifaces, burins, end scrapers, hammer stones, microblades, debitage	base camp (workshop)
Tigrovy-3	test pit	49	debitage	temporary camp
Tigrovy-4	test pit	11	debitage	temporary camp
Tigrovy-5	test pit	142	debitage	temporary camp
Tigrovy-6	test pit	503	microblades, debitage	temporary camp (workshop)
Tigrovy-7	test pit	59	debitage	temporary camp
Tigrovy-8	test pit	268	preforms, debitage	quarry (workshop)
Tigrovy-9	cleaning, test pit	28	debitage	temporary camp
Tigrovy-10	test pit	3	debitage	temporary camp