GEOARCHAEOLOGY OF PREHISTORIC CULTURAL COMPLEXES IN THE RUSSIAN FAR EAST: RECENT PROGRESS AND PROBLEMS

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ABSTRACT

A summary of the results of geoarchaeological research from the 1950s onwards in the Russian Far East is presented. The main issues include the palaeoenvironments and chronology of prehistoric complexes (Palaeolithic and Neolithic stages), and more specific questions involving the emergence of pottery production, maritime adaptation, agriculture, obsidian raw material exchange, and problems related to the geoarchaeology of the region.

INTRODUCTION

The Russian Far East is a large region in Northeast Asia covering the Pacific drainage basin within modern Russia, bordering Northeast China (Manchuria), Hokkaido Island (Japan), and northernmost North Korea. The area under consideration consists of Primorye (Maritime) Province in the south; the Amur River basin in the north divided into three parts, the upper, middle, and lower streams; Sakhalin Island; and the Kurile Islands (Fig. 1). This part of Asia is characterized by a combination of mountain ranges, lowlands and plains. The northern portion is covered with shallow permafrost. Several warm and cold currents affect the local climate in coastal areas. The main geographic features of the Russian Far East are a monsoon climate, modern volcanic activity, and vegetation and mammal faunas that consist of a mixture of Siberian and East Asian elements (Kuzmin 2006a:13–15).

Archaeological research in the Russian Far East has been conducted most actively since the 1950s, with the results published mostly in Russian (e.g. Okladnikov and Derevianko 1973; Andreeva 2005), and with some English translations (e.g. Okladnikov 1965; Derevianko 1994). Recently, two comprehensive volumes containing updated knowledge on the prehistoric archaeology and human palaeoenvironments of the Russian Far East were released (Zhushchikhovskaya 2005; Nelson *et al.* 2006). In this paper, a résumé of geoarchaeological studies of the Palaeolithic and Neolithic cultural complexes in the Russian Far East is presented. This is based on the author's original results (Kuzmin 1992, 1995, 1997a, 1997b, 2001, 2002, 2003a, 2005, 2006a; Kuzmin *et al.* 1998a, 2004), and a summary of other investigations. The major topics covered in this paper include chronology and environments of the prehistoric complexes, and different aspects of palaeoeconomy and human subsistence. These include plant gathering and terrestrial hunting, freshwater fishing, maritime adaptation and marine resource exploitation, obsidian raw material acquisition and exchange patterns, pottery emergence, and the beginnings of agriculture.

METHODS AND MATERIALS

For geoarchaeological studies of prehistoric sites in the Russian Far East, the following methods were used:

a) geomorphologic and stratigraphic observations;
b) palynological analysis of cultural layers;
c) radiocarbon dating of different organic materials (wood charcoal, seeds and fruit of terrestrial plants, marine shells, terrestrial animal and human bones, charred food attached to potsherds, and organic temper in pottery matrixes), using both conventional liquid scintillation counting (LSC) and accelerator mass spectrometry (AMS) techniques;
d) thermoluminescence dating of pottery;
e) zooarchaeological and archaeobotanical data;
f) stable isotope ($\delta^{13}C$, $\delta^{15}N$) analysis of human bone collagen; and
g) instrumental neutron activation (NAA) and X-ray fluorescence (XRF) analyses of obsidian artefacts and rocks (Kuzmin 2005).

In total, about 50 major archaeological sites belonging to the Palaeolithic and Neolithic stages in the prehistory of the Russian Far East were sampled. In addition, data obtained and published by other researchers have been summarized (Kuzmin 2005, 2006a). It should be noted that in the Russian Far East, as well as in other parts of East Asia, the definition of the Neolithic stage implies the presence of well-developed pottery vessels (e.g. Kuzmin 2006b), rather than the existence of agriculture and sedentism.

RESULTS

Palaeoenvironments and chronology of the prehistoric complexes

Based on palaeogeographical information obtained for the Russian Far East (see summaries: Kuzmin 2005, 2006a:16–17), it is possible to establish the main envi-

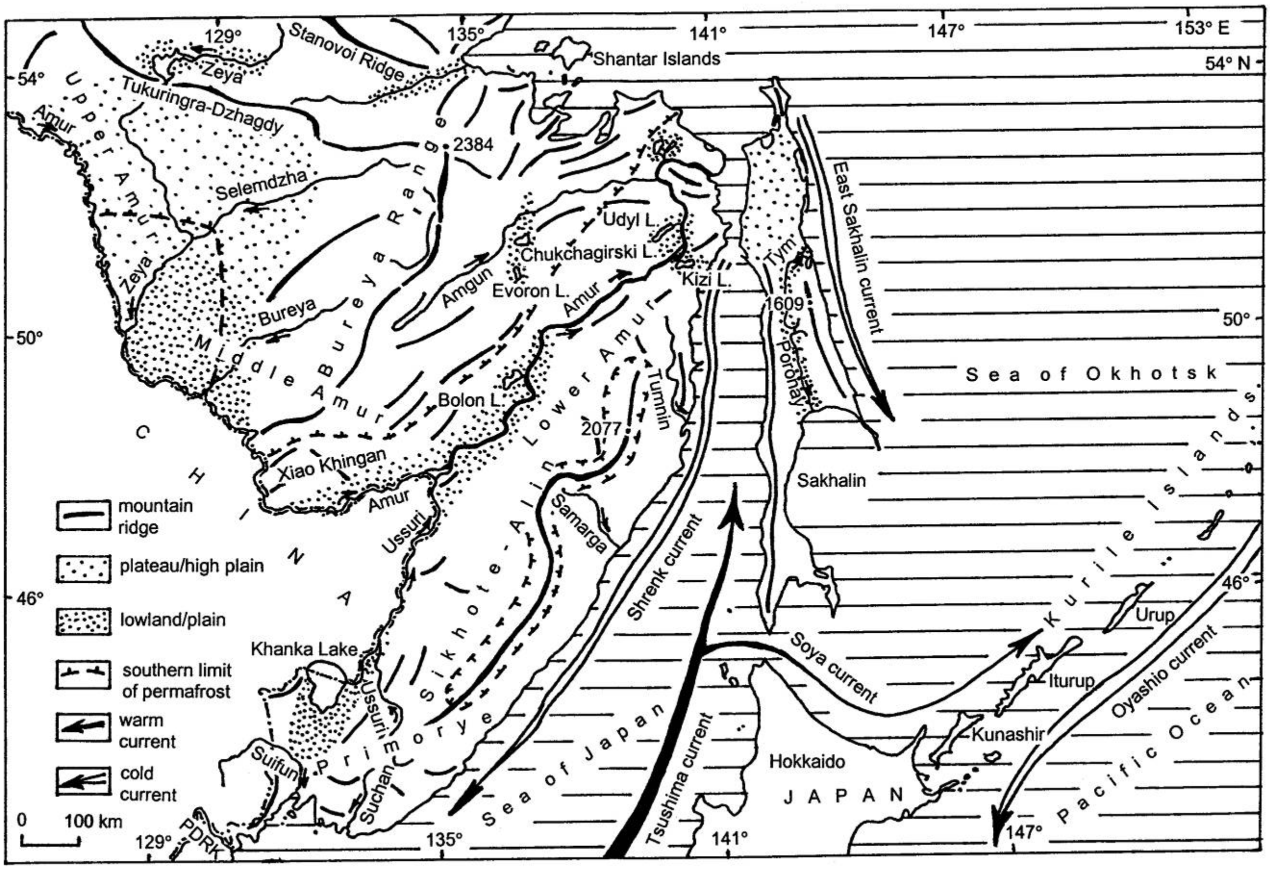

Fig. 1. Main geographic features of the Russian Far East (after Kuzmin 2006a, modified).

ronmental and chronological parameters for the Palaeolithic and Neolithic complexes. As for Palaeolithic sites, in Primorye the majority correspond to the late Upper Palaeolithic (Ustinovka cultural complex; see Derevianko and Tabarev 2006:44–50), and are dated to after ca. 20,000 radiocarbon years ago (hereafter – BP). They existed in cool coniferous forests and forest tundra environments at ca. 20,000–15,000 BP, and light birch forests with an admixture of broad leaved species at ca. 15,000–10,000 BP (Kuzmin 1996; Kuzmin 2006a:35–40). Two geoarchaeologically-studied sites, Osinovka and Geographic Society Cave (Derevianko and Tabarev 2006:43–44), correspond to the late Middle and early Upper Palaeolithic respectively, and the latter site is ^{14}C-dated to ca. 40,000–30,000 BP (Kuzmin 2006a:20). These sites existed in favourable environments of coniferous and broad leaved forests with abundant animal and plant resources.

In the Amur River basin, the earliest geoarchaeologically-studied Palaeolithic site of Khodulikha 2 is ^{14}C-dated to ca. 22,500 BP (lower cultural layer; Kuzmin *et al.* 2005). During the Last Glacial Maximum (hereafter – LGM), the Ust-Ulma 1 site of the Selemdzha cultural complex (Derevianko 1998; Derevianko *et al.* 2006: 55–73) existed under quite severe climatic conditions, indicated by the presence of permafrost as ice-wedge pseudomorphoses. Later on, the Malye Kuruktachi 2 site in the Bureya River basin was occupied, and vegetation around it at ca. 14,000–10,500 BP was changing from forest tundra and light birch forests to birch-larch forests with an admixture of broad leaved species. On Sakhalin Island, the single well-excavated Upper Palaeolithic site of Ogonki 5 (Vasilevsky 2006) existed at ca. 19,400–17,800 BP in an environment of light fir-spruce forests, generally corresponding to the LGM.

The Neolithic (i.e., pottery-bearing) cultural complexes emerged in the Russian Far East remarkably early, at ca. 13,200–12,400 BP in the Amur River basin (Kuzmin 2005, 2006b). This manifests the Palaeolithic–Neolithic transition, which happened in other parts of the region later: in Primorye at ca. 10,700 BP (Kuzmin 2005), and on Sakhalin presumably at ca. 9000–7500 BP (Kuzmin *et al.* 2004). Thus, this transition took place in the Russian Far East gradually, between ca. 13,000 and 8000 BP (Fig. 2).

As a whole, different Neolithic complexes are known in the Russian Far East for most of the Holocene, ca. 10,000–3000 BP (Fig. 2; see details in Kuzmin 2006a: 18–35). Climatic conditions were quite favourable, with maximal warm and wet environments in the Atlantic period, ca. 8000–5000 BP, and this corresponds to the Rudnaya, Boisman, Malyshevo and Yuzhno-Sakhalinsk cultures, and perhaps to the Novopetrovka complex (Fig. 2). The end of the Neolithic stage and the beginning of the

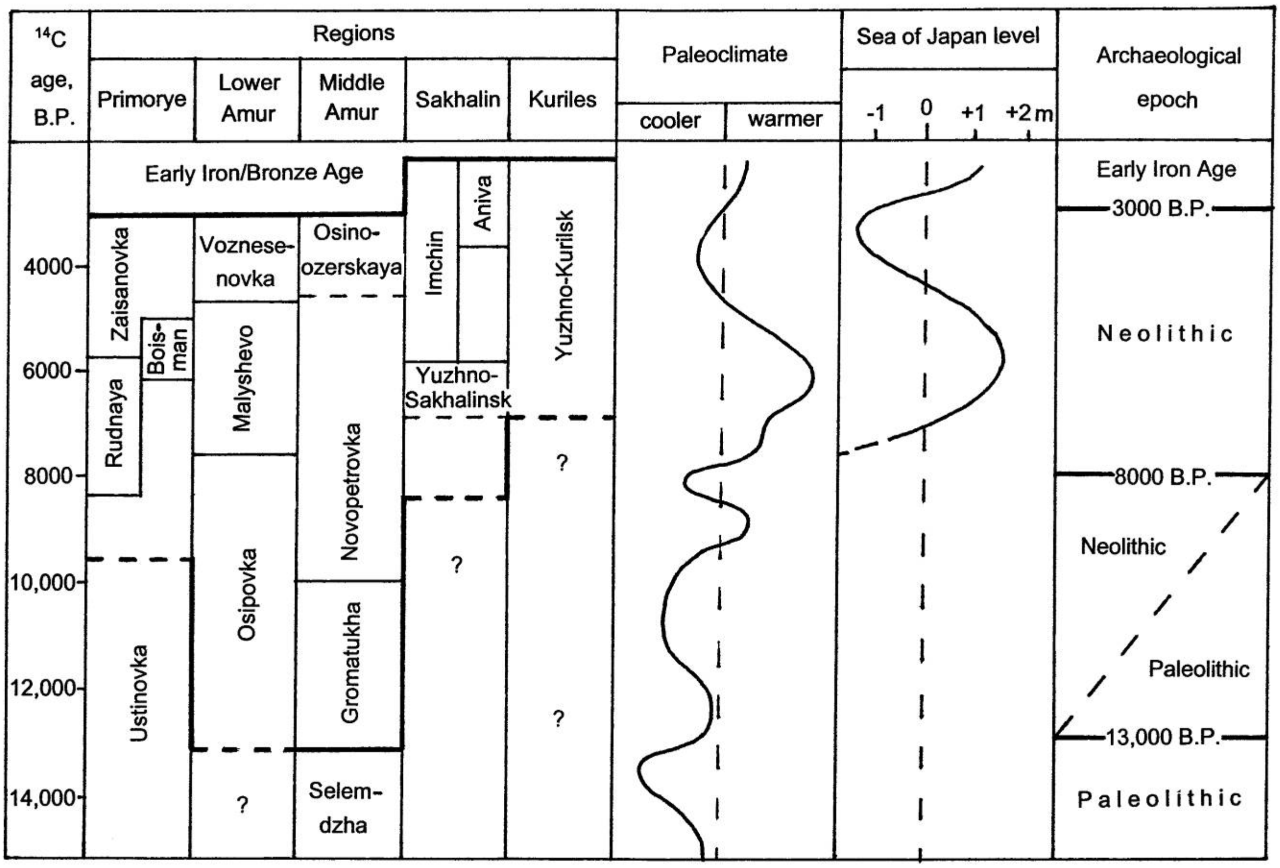

Fig. 2. Palaeoenvironments and chronology of Neolithic cultural complexes in the Russian Far East (after Kuzmin 2005, 2006a).

Early Iron/Bronze Age, sometimes combined under the single term 'Palaeometal', in the continental part of the Russian Far East may have been established at ca. 3300–3000 BP, and in insular territories at ca. 2000–1800 BP (Fig. 2).

Timing and environment of pottery emergence

The origin of pottery-making is one of the most important issues in East Asian archaeology, especially since the discovery of very old Neolithic complexes in southern China and the Russian Far East (see reviews in Kuzmin 2003b, 2006b). Extensive geoarchaeological research at Initial Neolithic sites in the Amur River basin—Gasya, Khummi, Goncharka 1 and Gromatukha, belonging to the Osipovka and Gromatukha cultural complexes (Fig. 2)—allowed us to establish the beginning of pottery production in the Late Glacial period, ca. 13,200–12,400 BP (Kuzmin 2006b; Nesterov *et al.* 2006). At that time, the environmental background of the Amur River valley was represented mainly by coniferous and light larch-pine forests, with a gradual appearance of broad leaved species toward the Pleistocene–Holocene transition at ca. 10,000 BP (Klimin *et al.* 2004).

The appearance in Late Glacial times of broad leaved tree species with nuts, such as the Manchurian nut tree (*Corylus mandshurica*), might have triggered the development of pottery-making because these nuts had to be leached of poisonous compounds in water containers. It has also been suggested that the emergence of pottery was closely related to an increase in riverine fish exploitation along the Amur and its tributaries, especially salmon procurement for fat extraction (e.g. Medvedev 1995). Although no fish bones are reported from Initial Neolithic sites in the Amur River region, the presence of net sinkers at the Gasya and Khummi sites (Kuzmin, in press) allows us to suggest that fishing was already practiced by humans in the Late Glacial, beginning at ca. 13,000 BP. More work, such as the identification of lipids in pottery, could make it possible to find out which fish species (salmon?) were processed (e.g. Craig *et al.* 2007).

Palaeodiet and the emergence of maritime adaptations

Throughout the Palaeolithic and Neolithic of the Russian Far East, the hunting of terrestrial animals was a major economic activity. The main species exploited were deer (red, roe and sika), wild boar, bear (brown and black), raccoon-like dog, and badger (Kuzmin 1997b). Fishing in the inland lakes of Primorye at ca. 5700–3500 BP concentrated on snakehead, Amur catfish and various carps (Kuzmin 1997b). Sea fishers of the Neolithic in Primorye (ca. 5700–3700 BP) were catching mainly mullet, Far Eastern dace, Saffron cod, Pacific herring, rockfishes, flatfishes and salmonids.

The main plant species exploited were Korean pine, Amur cork tree, wild apple, wild grape, hazel, Manchurian walnut and Mongolian oak (Andreeva 1991; Vostretsov 1998; Komoto and Obata 2005; Kuzmin 2005).

As for the use of marine foods, the earliest traces in the Russian Far East are in the Boisman cultural complex of the Early Neolithic in southern Primorye, ca. 5800–5000 BP (Fig. 2). Faunal remains of sea mammals (spotted seal and Steller's sea lion), fish and birds (Besednov 1998; Alekseeva *et al.* 1999), as well as marine mollusc shells from a midden, show that people were actively using sea resources at this time. Also, at the Chertovy Vorota site in central Primorye (Rudnaya cultural complex), ^{14}C-dated to ca. 6800–5900 BP on animal bones and charcoal, salmonid bones, bone harpoons and ornaments of marine mollusc shells were also excavated (see Kuzmin, in press). The gathering of marine molluscs in the Neolithic was practiced mainly in the Boisman culture (Popov *et al.* 1997), and sometimes in the following Zaisanovka complex (ca. 4500 BP) (Vostretsov *et al.* 2002; Kuzmin 2005).

The study of δ^{13}C and δ^{15}N ratios in human bone collagen has become one of the most reliable methods of determinating the content of prehistoric diet in the last few decades. However, in the Russian Far East, due to high soil acidity, human remains survive only in very specific conditions, such as limestone caves and shell middens. None are known for the Palaeolithic, and only two burial grounds in central and southern Primorye, Chertovy Vorota and Boisman 2, belong to the Neolithic. Stable isotope study has shown that in the Chertovy Vorota burials about 25% of protein consumed at ca. 7000–6900 BP was from marine sources, most probably salmon. At the Boisman 2 site (ca. 5800–5400 BP), about 80% of the protein came from sea organisms, mostly seals (Kuzmin *et al.* 2002a). This shows unequivocally that by at least ca. 7000 BP people in the Russian Far East began to use marine resources (such as anadromous salmonid species), and that by ca. 5800 BP the procurement of marine mammals was widely practiced in southern Primorye.

Recently, the date of earliest maritime adaptation has become a controversial issue in the prehistoric geoarchaeology of the Russian Far East. By using indirect data such as artefact typology, Tabarev (2004) suggests that maritime adaptation existed on the Pacific coast of Northeast Asia (Russian Far East, Japan, and Korea) in the Upper Palaeolithic, at least ca. 15,000–14,000 BP. However, it is striking that, for example, in the Upper Palaeolithic of Japan no traces of marine food consumption have ever been found (e.g. Aikens and Higuchi 1982; Barnes 1999). There are no reliable data about marine mollusc gathering in Korea prior to ca. 6300 BP (e.g. Nelson 1993; Choe and Bale 2002), or about salmon fishing in the Russian Far East before ca. 7000 BP (see above). The earliest finds of wooden boats in Northeast Asia are from the Early Neolithic of southern China and Early Jomon of Japan, dated to ca. 7000–5300 BP (Aikens and Higuchi 1982; Kobayashi 2004; Jiang and Liu 2005). My opinion, therefore, is that there is currently insufficient evidence to establish the beginning of sea transport in Northeast Asia as early as the end of the Pleistocene.

The beginnings of agriculture

Until the late 1990s, the timing of the appearance of agriculture in the Russian Far East remained obscure. ^{14}C dates from cultural layers with direct evidence for prehistoric agriculture (Kuzmin *et al.* 1998b), along with a re-evaluation of published data (Kuzmin *et al.* 1994:363), testify that the beginning of millet agriculture in southern Primorye dates to the later Zaisanovka cultural complex (Late Neolithic, Fig. 2), ca. 4200–3700 BP.

Subsequently, new data from the Zaisanovka complex has made it possible to extend the earliest millet cultivation in Primorye back to ca. 4600 and possibly 4800 BP (Kuzmin 2005). According to archaeobotanical studies, broomcorn millet (*Panicum miliaceum*) and foxtail (*Setaria italica*), and also beefsteak plant (*Perilla frutescens*), were cultivated in southern Primorye in the Late Neolithic, ca. 4800–4600 BP (Sergusheva 2007a, 2008). Cultivation of millet continued into the later stage of the Zaisanovka cultural complex, in Zaisanovka 7 (ca. 4500–4400 BP) and Zaisanovka 1 (ca. 4000 BP) (Sergusheva 2007b), and at Rettikhovka-Geologicheskaya (ca. 3400–3300 BP) (Sergusheva 2006).

However, the presence of cultigens at Zaisanovka 7 and 1 has been doubted (Vostretsov and Sergusheva 2006; Sergusheva 2008); it is stated that the imprint of 'millet-like seed' similar to broomcorn millet was found on the bottom of a pottery vessel at Zaisanovka 7, and abundant seeds of wild cereal (barnyard grass, *Echinochloa crus-galli*), which might have been cultivated, were identified at Zaisanovka 1. This makes it necessary to continue archaeobotanical research in southern Primorye.

The problem with establishing when agriculture first appeared in the Russian Far East is related to the ambiguous association of ^{14}C-dated charcoal from cultural layers and millet seeds from the same components. Often ^{14}C dates from the same cultural layer can span a range of several hundred years. Sergusheva and Kluyev (2006) reported the first direct AMS ^{14}C date on millet seeds from the Late Neolithic cultural component (No. 5) at the Novoselische 4 site, as 3015 ± 50 BP (TKa-13847). Charcoal ^{14}C dates previously obtained from this layer are ca. 3800–3750 BP (Kuzmin *et al.* 1998b). It is possible that the seeds were from the overlying Bronze Age component No. 3 with a charcoal ^{14}C date of ca. 3000 BP (Kuzmin *et al.* 1998b), but it is also clear that more direct AMS ^{14}C dating of millet seeds is required in order to establish securely the time frame of the earliest plant cultivation, as it was recently done in the neighbouring Korean Peninsula and Northern China (Crawford and Lee 2003; Lee *et al.* 2007). Recently, Sergusheva (2008) reported another direct AMS ^{14}C date of ca. 3840 BP on millet seeds from the floor of a Zaisanovka dwelling at the Novoselische 4 site. This shows that at least some millet from the Late Neolithic component of this site survives *in situ*.

Vostretsov (2007) and Sergusheva (2007b) have assumed the existence of agriculture in southern Primorye at ca. 5400–5200 BP, based on the cultural similarity at the

Krounovka 1 site between the lower Zaisanovka layer dated to this age and the upper Zaisanovka component dated to ca. 4800–4600 BP. However, remains of actual cultigens only occur in the upper layer, not the lower (Y.E. Vostretsov, pers. comm., May 2007).

Obsidian provenance

Extensive studies of obsidian geochemistry from geological sources and prehistoric cultural complexes, conducted in the Russian Far East under the author's leadership since 1992, have brought to light evidence of the use of 'local' and 'remote' sources of obsidian in Primorye, these being the Basaltic Plateau in southern Primorye and the Paektusan Volcano on the modern North Korean–Chinese border (see review: Kuzmin 2006c). The earliest use of local obsidian in Primorye is dated to ca. 15,000–10,000 BP, involving transport up to about 200 km as the crow flies). Volcanic glass from the remote Paektusan source was also brought to Primorye at least ca. 10,000 BP, over a distance of up to 700 km (Kuzmin *et al.* 2002b) (Fig. 3).

On Sakhalin Island, long-distance obsidian exchange with neighbouring Hokkaido Island has been securely established (Kuzmin and Glascock 2007). At ca. 19,000–18,000 BP, obsidian from sources in northeastern Hokkaido was transported to southern Sakhalin, over straight line distances of about 250–300 km. At about 10,000 BP, Hokkaido obsidian reached the northern tip of Sakhalin, travelling a distance of about 1000 km.

Recent data on obsidian provenance in the Amur River basin (Popov *et al.* 2006) has shown that at least three sources were used in prehistory:

a) a 'local' source in the middle course of the Amur River, namely the Obluchie Plateau (distance to sites is from 50 km to 800 km);
b) the Basaltic Plateau in Primorye (moved over distances of 550–600 km); and
c) an unknown source somewhere in the northern part of the Sikhote-Alin Mountains, east of the lower course of the Amur River.

The data available as of mid-2007 for obsidian sources in the Russian Far East and neighbouring countries are presented in Figure 3. At least three major exchange networks existed in the prehistory of Northeast Asia, centered on the following sources: a) Basaltic Plateau; b) Paektusan Volcano; and c) Shirataki–Oketo (Hokkaido Island). Among them, Paektusan and Shirataki–Oketo are especially noteworthy; distances between prehistoric sites and these sources are up to 1000 km. It is evident that the Paektusan source played a major role in obsidian acquisition by ancient populations of the Korean Peninsula, the southern part of the Russian Far East, and most probably Northeastern China. It is possible now to establish the emergence of long-distance exchange of Paektusan obsidian at ca. 25,000–24,000 BP on the Korean Peninsula (Popov *et al.* 2005; Kim *et al.* 2007) (Fig. 3). The Shirataki–Oketo sources supplied people who lived on Hokkaido and Sakhalin islands, since at least 19,000 BP.

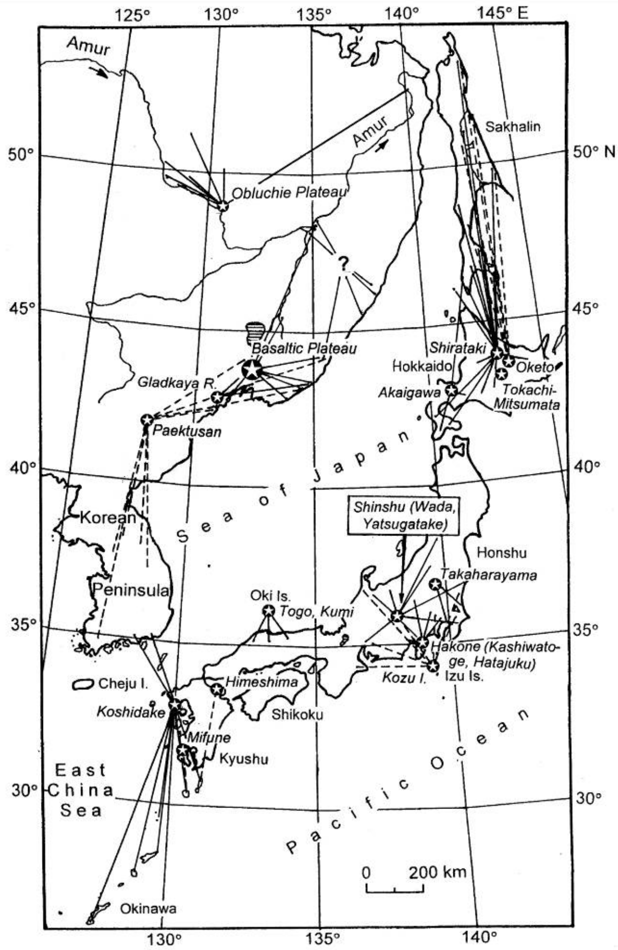

Fig. 3. Obsidian exchange networks in Northeast Asia (after Kuzmin 2006c, with additions).

CONCLUSIONS

The available geoarchaeological data on the Stone Age complexes of the Russian Far East constitute a sound basis for future research. As major directions, refinement of chronological and environmental data for a better understanding of prehistory are urgent tasks. The emergences of pottery making, maritime adaptations and agriculture are of especial importance. The temporal-spatial correlation of prehistoric complexes in the Russian Far East with adjacent regions of Northeast and East Asia will allow determination of the main patterns of human adaptation at the end of the Pleistocene and during the Holocene.

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Abbreviations: RAN – Russian Academy of Sciences; SO RAN – Sibirskoe Otdelenie Rossiiskoi Akademii Nauk (Siberian Branch of the Russian Academy of Sciences); DVO RAN – Dalnevostochnoe Otdelenie Rossiiskoi Akademii Nauk (Far Eastern Branch of the Russian Academy of Sciences).

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