Quaternary International 365 (2015) 114–134

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Supra-regional correlations of the most ancient paleosols and Paleolithic layers of Kostenki-Borschevo region (Russian Plain)

Galina M. Levkovskaya [a, *], Lyudmila S. Shumilovskikh [b, c, d, **], Mikhail V. Anikovich [a], Nadezhda I. Platonova [a], John F. Hoffecker [e], Sergey N. Lisitsyn [a], Genrietta A. Pospelova [f], Irina E. Kuzmina [g], Aleksander F. Sanko [h]

[a] Institute for the History of the Material Culture, Russian Academy of Sciences, Dvortsovaya Embankment 20, 191186 St., Petersburg, Russia
[b] Mediterranean Institute of Marine and Terrestrial Biodiversity and Ecology, IMBE UMR CNRS 7263, Europôle Méditerranéen de l'Arbois, 13545 Aix-en-Provence, France
[c] Laboratory of Biogeochemical and of Remote Methods of Monitoring Environmental, National Research Tomsk State University, Russia
[d] Department of Palynology and Climate Dynamics, Georg-August-University of Göttingen, Wilhelm-Weber-Str. 2a, 37073 Göttingen, Germany
[e] Institute of Arctic and Alpine Research, University of Colorado, Campus Box 450, Boulder, CO 80309-0450, USA
[f] Schmidt Institute of Physics of the Earth of the Russian Academy of Sciences, Gruzinskaya str. 10-1, 123995 Moscow, Russia
[g] Zoological Institute of Russian Academy of Sciences, University Embankment 1, 199034 Saint Petersburg, Russia
[h] Belarusian State University, Leningradskaya Street 16, 220030 Minsk, Belarus

ARTICLE INFO

Article history:
Available online 10 February 2015

Keywords:
Paleosol
Paleolithic
Palynology
Isotope scale
Correlation
Interstadials

ABSTRACT

The archaeological site Kostenki12, located on the Middle Don River, provides a key stratigraphic profile for regional paleopedological, paleoenvironmental, geological and cultural sequences, containing the oldest known cultural layers of the region (layer V – Paleolithic, layer IV – Upper Paleolithic, layer III – Kostenki-Strelets culture early phase) dating to the early part of MIS3, or, in chronometric terms, to 54–42 ka. Kostenki12 complements Kostenki14 (Markina Gora), which is a key profile for the interval 42–27 ka. The new data from Kostenki12 show that the East European Upper Paleolithic began ~45 ka. The stratigraphy exhibits similarities to that of Borschevo5. The Kostenki12 pollen diagram is correlated with: 1) other pollen diagrams from Kostenki-Borschevo region; 2) the most detailed climatostratigraphical scale of the Russian Plain Late Pleistocene; 3) $^{16}O/^{18}O$ Greenland GISP2 scale; 4) $^{13}C/^{14}C$ record from stalagmite at Villars Cave (France), as well as with pollen records (5–7) from: 5) Lake Monticchio (Italy), 6) southern Black Sea (M72/5-25-GC1) and 7) Glinde and Moershoofd (northern Germany). The results of the supra-regional paleoenvironmental correlations demonstrate that the lowest Paleolithic layer V and paleosol D, characterized by elm dominance, correlate to the second half of the optimum of the Glinde interstadial at 51–48 ka, corresponding to DO 14. The earliest Upper Paleolithic layer IV and paleosol B, characterized by coexistence of elm forests and wet meadows, began to form during the second part of the Moershoofd interstadial optimum at 46–44 ka, correlating with DO 12. Paleosol A and layer III (Kostenki-Strelets culture) began to form after the abrupt end of the Moershoofd interstadial ~43.5 ka, during unstable conditions, according to pollen and paleozoological data (steppe with horse dominance and later spruce forest tundra with reindeer dominance in paleozoological complex). These correlations provide more accurate dating of the Paleolithic layers and paleosols at Kostenki-Borschevo, suggesting that previously reported radiocarbon dates on units below CI tephra layer are too young, but that the OSL chronology is generally accurate.

1. Introduction

The Kostenki-Borschevo region of the Russian Plain contains a concentration of nearly 30 buried Upper Paleolithic sites, 10 of which are multilayered. It is located in the modern forest-steppe zone on the Middle Don River basin near Voronezh (Fig. 1) and represents a key study area for the Eurasian Upper Paleolithic.

* Corresponding author. Institute for the History of the Material Culture, Russian Academy of Sciences, Dvortsovaya Embankment 20, 191186 St. Petersburg, Russia.
** Corresponding author. Mediterranean Institute of Marine and Terrestrial Biodiversity and Ecology, IMBE UMR CNRS 7263, Europôle Méditerranéen de l'Arbois, 13545 Aix-en-Provence, France.
E-mail addresses: ggstepanova@yandex.ru (G.M. Levkovskaya), lyudmila.shumilovskikh@imbe.fr, shumilovskikh@yahoo.com (L.S. Shumilovskikh), niplaton@gmail.com (N.I. Platonova), John.Hoffecker@colorado.edu (J.F. Hoffecker), serglis@rambler.ru (S.N. Lisitsyn), pospelova@ifz.ru (G.A. Pospelova), urzus@zin.ru (I.E. Kuzmina), sankoaf@tut.by (A.F. Sanko).

http://dx.doi.org/10.1016/j.quaint.2014.11.043
1040-6182/

Paleolithic cultures existed in the region during 53–12 ka, allowing study of various archaeological cultures of Eurasia in the context of the long regional paleoenvironmental dynamics and correlation of the specific archeological complexes with supra-regional paleoenvironmental events. In the Kostenki region, there are some archeological sites dated to more than 40 ka (Praslov and Rogachev, 1982; Anikovich, 2004, 2006; Anikovich et al., 2004, 2005, 2007a, 2007b, 2008, 2012; Hoffecker et al., 2005, 2008, 2010; Holliday et al., 2006, 2007; Levkovskaya et al., 2005; Lisitsyn, 2006; Sedov et al., 2010a,b; Sinitsyn, 2006, 2012, 2013, 2014; Sinitsyn et al., 2013; Pietsch et al., 2014). For example, some layers at Kostenki1 and Kostenki12 (excavated by A.N. Rogachev and M.V. Anikovich), Kostenki14 and Kostenki17 (excavated by A.N. Rogachev, P.I. Boriskovskiy, and A.A. Sinitsyn), and Borschevo5 (excavated by S.A. Lisitsyn) (Fig. 1) were formed before the Laschamp excursion of about 41 ka (Guillou et al., 2004; Nowaczyk et al., 2012) and the CI eruption in Italy of about 40 ka (Melekeszev et al., 1984; De Vivo et al., 2001; Fedele et al., 2003; Pyle et al., 2006; Douka et al., 2010).

New Paleolithic layers (V, IV, III) and paleosols (D, C, B and A) were discovered by M.V. Anikovich at Kostenki12 site under the sediments with CI/Y5 tephra and Laschamp excursion during the excavations in 1999–2004 (Figs. 2 and 3). They represent the oldest known Paleolithic layers and associated paleosols of Kostenki-Borschevo region (Anikovich et al., 2005, 2007a,b, 2008; Hoffecker, 2005; Levkovskaya et al., 2005), some analogs of which are found in the region only at the Borschevo5 site (Fig. 3). However, the exact age of their formation is uncertain because of discrepancies of 2000–10,000 years (Table 1) between the OSL (Anikovich et al., 2005, 2007a,b, 2008; Forman, 2006; Hoffecker et al., 2006, 2008) and the radiocarbon dates (Anikovich et al., 2005; Housley et al., 2006). New multidisciplinary approaches were used in order to ascertain the age of these layers (Anikovich et al., 2005; Levkovskaya et al., 2005; Pospelova et al., 2005; Hoffecker et al., 2006, 2008, 2010; Holliday et al., 2006, 2007). The pollen data from the Kostenki12 sediments below Laschamp geomagnetic excursion and CI/Y5 tephra correlated well with OSL chronology and global paleoenvironmental events based on well-dated pollen and stable isotope records (Levkovskaya et al., 2005). The new well-dated pollen record M72/5-25-GC1 from the neighbouring Black Sea (Shumilovskikh et al., 2012, 2014; Shumilovskikh and Levkovskaya, 2013) permits identification of the new paleoenvironmental markers for supra-regional

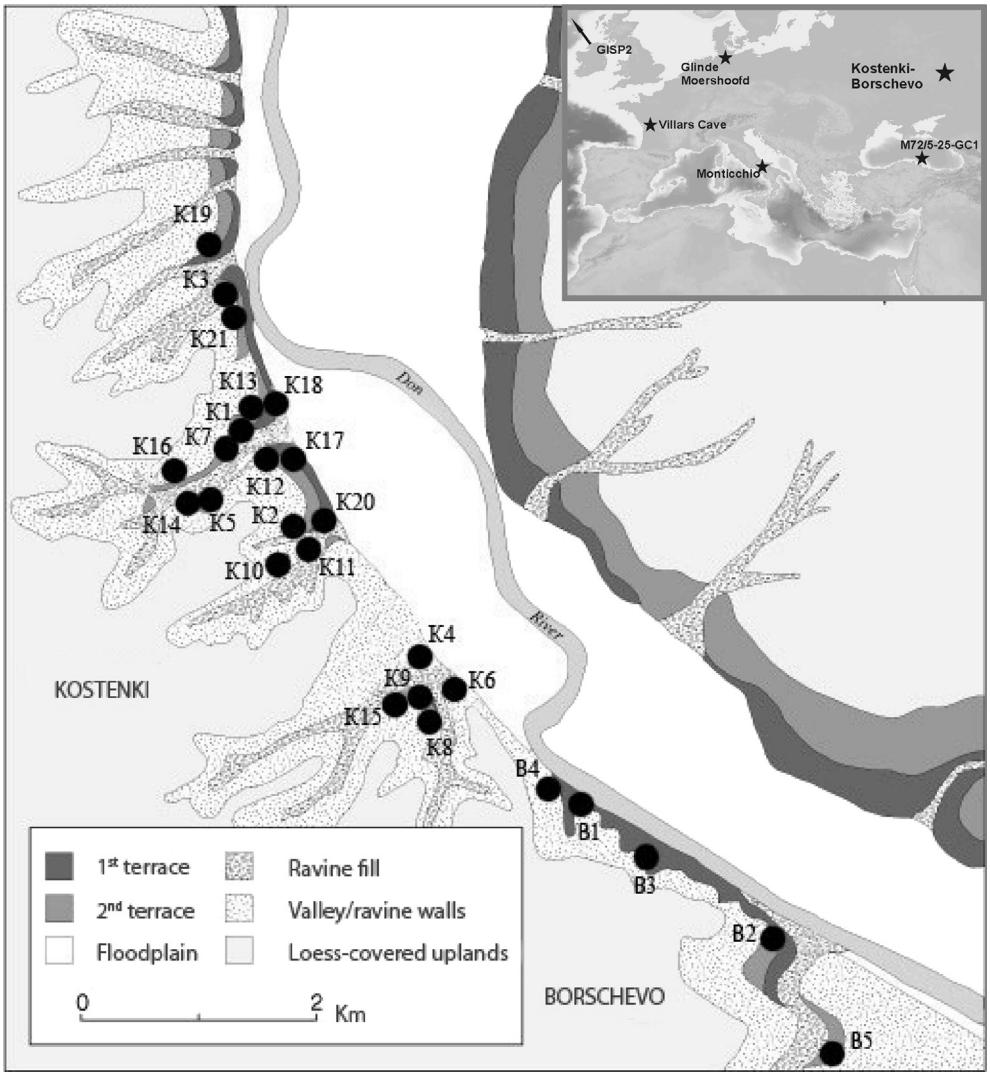

Fig. 1. Map of Kostenki with location of all archeological sites (based on Anikovich et al., 2007a,b). Inset: location of Kostenki12 and records used for supra-regional correlations, discussed in the text.