Clim. Past, 6, 31–48, 2010
www.clim-past.net/6/31/2010/

Climate of the Past

Climate in continental interior Asia during the longest interglacial of the past 500 000 years: the new MIS 11 records from Lake Baikal, SE Siberia

A. A. Prokopenko[1], E. V. Bezrukova[2], G. K. Khursevich[3], E. P. Solotchina[4], M. I. Kuzmin[2], and P. E. Tarasov[5]

[1]Department of Earth and Ocean Sciences, University of South Carolina, Columbia, SC, USA
[2]Institute of Geochemistry, Siberian Branch of Russian Academy of Sciences, Irkutsk, Russia
[3]Department of Botany, M. Tank State Pedagogical University, Minsk, Belarus
[4]Institute of Geology and Mineralogy, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia
[5]Freie Universität Berlin, Geological Sciences, Palaeontology Section, Berlin, Germany

Received: 2 June 2009 – Published in Clim. Past Discuss.: 17 July 2009
Revised: 3 December 2009 – Accepted: 14 December 2009 – Published: 20 January 2010

Abstract. A synthesis of paleoclimate responses from Lake Baikal during the MIS 11 interglacial is presented based on proxy records from two drill sites 245 km apart. BDP-99 is located in vicinity of the delta of the major Baikal tributary, whereas the BDP-96 site represents hemipelagic setting distant from riverine influence. The comparison of thicknesses of interglacial intervals in these contrasting depositional settings confirms the extended ca. 33-kyr duration of the MIS 11 interglacial. The new BDP-99 diatom biostratigraphic record matches that of the BDP-96-2 holostratotype and thus allows establishing establishes robust correlation between the records on the same orbitally-tuned timescale.

The first detailed MIS 11 palynological record from the BDP-99 drill core indicates the dominance of boreal conifer (taiga) forest vegetation in the Baikal region throughout the MIS 11 interglacial, since at least 424 ka till ca. 396 ka. The interval ca. 420–405 ka stands out as a "conifer optimum" with abundant *Abies sibirica*, indicative of climate significantly warmer and less continental than today. The closest Baikal analog to this type of vegetation in the history of the current Holocene interglacial is at ca. 9–7 ka. The warm conifer phase lasted for ca. 15 kyr during MIS 11 interrupted by two millennial-scale cooling episodes at ca. 411–410 and 405–404 ka. Reconstructed annual precipitation of 450–550 mm/yr during the MIS 11 interglacial is by ca. 100 mm higher than during the Holocene; regional climate was less continental with warmer mean temperatures both in summer and in winter.

At both drill sites, the two-peak structure of the MIS 11 diatom abundance profiles reflects the orbital signature of precession in the interglacial paleoclimate record of continental Eurasia. MIS 11 interglacial was characterized by the sustained high level of primary production and accumulation of autochthonous organic matter at both study sites. The responses of paleoclimate-sensitive indices in the mineralogy of the MIS 11 sediments in BDP-96-2 are consistent with those during the Holocene. Illitization of secondary clay minerals in the Baikal watershed was an important process, but it appears to have been subdued during the first half of the MIS 11, apparently due to elevated humidity and muted seasonality of regional climate.

Correspondence to: A. A. Prokopenko
(sasha@geol.sc.edu)

1 Past interglacials as potential analogs to modern and future climates

The ability to predict future changes in global climate is essential for policymaking today and for human well-being in future, it relies on the ability to successfully model climatic conditions known to have existed in the past. Instrumental and even historic records of past climates do not extend beyond the very late portion of the current Holocene interglacial, which lasted since ca. 11.7 ka. To gain a better understanding of the climate of earlier periods, different geologic archives are studied for paleoclimate proxy records.

The dominant paradigm in paleoclimate research recognizes cyclic changes of global climate as a combined effect of the Earth's orbital configuration (Milankovitch forcing) and internal feedback mechanisms. Thus, the current interglacial is not unique in the sense that more or less similar