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Vegetation and climate dynamics during the Holocene and Eemian interglacials derived from Lake Baikal pollen records

Pavel Tarasov [a,*], Elena Bezrukova [b,c], Eugene Karabanov [c,d], Takeshi Nakagawa [e], Mayke Wagner [f], Natalia Kulagina [g], Polina Letunova [b,c], Anna Abzaeva [b,c], Wojciech Granoszewski [h], Frank Riedel [a]

[a] Free University of Berlin, Institute of Geological Sciences, Palaeontology Department, Maltesers tr. 74-100, Building D, Berlin 12249, Germany
[b] Institute of Archaeology and Ethnography, Siberian Branch Russian Academy of Sciences, Acad. Lavrentiev avenue, 17, Novosibirsk 630090, Russia
[c] Institute of Geochemistry, Siberian Branch Russian Academy of Sciences, Favorsky Street 1a, Irkutsk 664033, Russia
[d] Chevron, Energy Technology Company, Earth Science Technology Department, Houston, TX, 77002, USA
[e] Department of Geography, University of Newcastle upon Tyne, Newcastle upon Tyne, NE1 7RU, UK
[f] Department of Eurasian Archaeology, German Archaeological Institute, House 2, Im Dol 2-6, Berlin 14195, Germany
[g] Institute of Earth Crust, Siberian Branch Russian Academy of Sciences, Lermontova Street 128, Irkutsk 664033, Russia
[h] Polish Geological Institute, Carpathian Branch, Skrzatow 1, Krakow, 31-560, Poland

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Abstract

The last interglacial (LI) and Holocene changes in annual precipitation (P_{ann}), the mean temperature of the warmest (T_w) and coldest (T_c) month and the moisture index (α) were reconstructed from continuous pollen records from Lake Baikal. The Holocene core (52°31′N, 106°09′E) presented in this study was recovered from a depth of 355 m in the 25-km wide underwater Buguldeika saddle separating the southern sub-basin of Lake Baikal from its central sub-basin. The biome reconstruction shows that tundra and steppe biomes have highest scores during ca. 15,000–13,300 cal. years B.P. and that taiga becomes a dominant vegetation type after ca. 13,300 cal. years B.P. Our quantitative reconstruction indicates an onset of relatively warm and wet conditions soon after ca. 10,000 cal. years B.P. The warmest and wettest climate with $T_w \sim 16$ °C, $P_{ann} \sim 480$ mm and $\alpha \sim 0.9$–1 has been reconstructed for ca. 9000–7000 cal. years B.P. In the Lake Baikal region this interval is characterized by the appearance and spread of hunter communities (Kitoi culture). Consistently a hiatus in the regional archaeological record (4900–4200 years B.C. or 6850–6150 cal. years B.P.) coincides with the interval of a major climate deterioration which followed the 'climatic optimum'. An attempt to find a relationship between the archaeological record and a spread of steppe and meadow communities in the Lake Baikal region demonstrates that despite a long habitation of the area the human impact on vegetation was local rather than regional and likely did not affect the pollen record from Lake Baikal. The reconstructed peaks in the steppe biome scores during the last 9000 years are consistent with short (one to five hundred year) episodes of weak Pacific (summer) monsoon supporting our interpretation that the Holocene vegetation changes around Lake Baikal are associated with large-scale circulation processes controlling regional water balance rather than with human activities. Thus, our study proves the suitability of Lake Baikal pollen data for the reconstruction of natural vegetation and climate dynamics through the whole period from the onset of the LI to the present. Comparison of the recent and the last interglacial suggests that the Holocene 'climatic optimum' was less pronounced (e.g. lower summer and winter temperatures and annual precipitation sums) than that of the LI. On the other hand, pollen records demonstrate that the Holocene

* Corresponding author. Tel.: +49 30 83870280; fax: +49 30 83870745.
E-mail address: paveltarasov@mail.ru (P. Tarasov).

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