



# Vegetation dynamics around Lake Baikal since the middle Holocene reconstructed from the pollen and botanical composition analyses of peat sediments: Implications for paleoclimatic and archeological research

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## ARTICLE INFO

### Article history:

Available online 23 October 2012

## ABSTRACT

The present paper summarizes the current evidence of natural changes in the forest and forest-steppe areas of the Lake Baikal Region (LBR) since ca. 7 cal ka BP, covering the period from the late Neolithic to the present time. To reconstruct local to small-regional scale vegetation changes and their probable causes during this period, pollen content and peat botanical composition were analyzed from three radiocarbon-dated peat sections, located near Lake Baikal. For better understanding of the local and regional environmental history and climate variability during the middle and late Holocene, the results are compared with published environmental records from lacustrine and mire sediments from the LBR and from elsewhere. The comparison confirms the earlier interpretations that the middle and late Holocene vegetation dynamics in the LBR was primarily driven by natural forcing and likely was associated with large-scale circulation processes controlling the regional water balance rather than with human activities. Some synchronous changes in environmental and archeological data likely point to a possible causal link between past climate changes and the cultural history of the region. The Kuchelga (53°00′57″N, 106°44′49″E), Ochkovoe (51°26′05″N, 104°38′57″E) and Cheremushka (52°45′09″N, 108°05′50″E) peat records represent three different climatic regions around Lake Baikal and demonstrate that the environments and vegetation of the drier western coast were more sensitive to the climate oscillations of the middle and late Holocene in comparison to the more humid areas east, and particularly south of Baikal. Therefore, it could be expected that environmental impact on early human societies was strongest in the arid region to the west of Lake Baikal. To test this hypothesis, however, accurately dated multi-proxy records of the Holocene climate and environments from this so far poorly studied region are absolutely necessary.

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## 1. Introduction

Since the introduction of pollen analysis by Lennart von Post in 1916 pollen data became an important proxy frequently used for reconstruction of the late Quaternary vegetation, climate change and human activities. A better understanding of the regional climate and vegetation dynamics and their driving mechanisms is important for improving climate predictability and properly attributing ongoing climate changes to human-induced and/or

natural forcing (e.g. Ruddiman, 2003; Wanner et al., 2008; Kleinen et al., 2011). So far, most studies on climate and vegetation dynamics in the Lake Baikal Region (LBR) have been focused on the late Pleistocene and Holocene intervals with special attention to the late glacial–early Holocene transition and early–mid-Holocene climatic optimum (Takahara et al., 2000; Bezrukova et al., 2005a, 2010; Demske et al., 2005; Tarasov et al., 2005, 2007, 2009; Shichi et al., 2007, 2009). The majority of pollen and other proxy records used to interpret past climate and environments have been obtained from lake sedimentary archives. However, the LBR is also rich in peatlands, which are considered as high potential natural archives providing sensitive records of vegetation and climate changes with decadal to centennial precision (e.g. Barber et al.,

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