Late Quaternary Environmental and Climate Variability in Central Asia: Multiproxy Records from Lake Sediments

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Sediments from great and small lakes represent unique natural archives preserving the footprints of the past and present life of the lakes themselves as well as trends of environmental events occurred during the time of the sediment accumulation.

Lake Baikal and Lake Hovsgol represent the oldest and deepest ancient lakes and that ones which are most distant from oceans. The basins of both lakes have never been glaciated and thus the sedimentary records are locally potentially uninterrupted at least since the Miocene-Pliocene. So far the sediments of Lake Baikal have been used to reconstruct climate change and environmental change respectively of the Upper Pliocene and the Quaternary of northern Central Asia. Here on the one hand we present pollen data from several Siberian lakes sediments which document the changing vegetation and thus the changing climate since the Pliocene and on the other hand we attempt to interconnect certain events in order to figure out possible triggers for evolutionary processes within the aquatic - terrestrial ecosystems.

Our pollen data confirm strong palaeoenvironmental changes in northern Central Asia about 2.8 Ma years ago in connection with the onset of global cooling. The changes led to the extinction of a subtropical terrestrial flora and to the invasion of a boreal one. The decrease in the mean annual temperature was about 6-8 °C. The mountain ridges around Baikal were elevated enough that glaciers could develop. Baikal became ice covered during winter which was never the case since the lake had started to form during the Paleogene. The length of the ice cover period however varied with the climate dynamics during the Quaternary. The atmospheric precipitation sum dropped from ca. 1000 mm to ca. 500 mm regarding the interglacial phase and to 200 mm regarding the glacial phases, however with a periodically increased winter atmospheric precipitation potentially affecting the ice transparency and thus the primary production. The effects of the substantial climate change on the lake system will be discussed in respect of processes such as weathering and sedimentation which e.g. have influence on the trophic status and water transparency. During the glaciation maxima the climate became dryer. The water inflow decreased, lakel level dropped to same degree and shallower parts of Baikal became exposed. The littoral fauna and flora was particularly affected. Examples from diatoms will be given.

Some emphasis will be put on the Pleistocene epoch during which at least nineteen major climatic and thus environmental events occurred (consistent with MIS chronology) with which Baikal-Hovsgol biota had to cope. It is proposed that permanent reorganization of habitats took place particularly within the upper 30-40 meters water depth, those lake areas in which most benthic species live.

This work was supported by the Russian Foundation for Basic research: projects NN 06-05-64671, and by the Integration project of SB RAS, N 6.10.