Geophysical Research Abstracts, Vol. 8, 01053, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01053

Sediment accumulation rate, annual rhythms and geochemistry of bottom sediments from Lake Shira (Khakas) as a tool for paleoecological reconstructions

M. Fedorin (1,4,5), E. Vologina (2), A. Tolomeev (3)

(1) Limnological Institute SB RAS (Irkutsk, Russia), mikeph@mail.ru; (2) Institute of the Earth's Crust (Irkutsk, Russia); (3) Institute of Biophysics SB RAS (Krasnoyarsk, Russia); (4) Novosibirsk State University (Novosibirsk, Russia); (5) Institute of Geophysics SB RAS (Novosibirsk, Russia)

Saline lakes of Siberia are of the particular interest for researchers, both due to economical/medical potential and for fundamental science. Many latest researches have been focused on lakes' bottom sediments; these sediments store records of environmental changes of the past, which partly occurred due to climatic shifts. 'Internal-drainage' lakes' and their levels are usually very sensitive to moisture/temperature variations through precipitation/evaporation changes. Respective changes in lake's bioproductivity and in mineralogy and geochemistry of these sediments are responsible for clear climate signals in them.

Lakes' bottom archives have been actively studied during last decade.

Largest Asian lakes, Baikal and Khubsugul, store million-years records of paleogeographic and paleoclimatic changes in the central continent, but temporal resolution of these records is worse than a few decades. Other lakes' sediments are younger (Teletskoye, Chany and many other), sediment accumulation rates are usually higher, but different dating techniques give a few order of magnitude differences in age. Thus the problem of correct timescale is of the primary importance. Additionally, there is a lack of lakes with annually varved sediments in Asia.

Lake Shira is internal-drainage lake, situated within central part of Asia, on the north of Chebako-Balakhtin depression. The age of the depression itself is Devonian; uppermost (Quaternary) layer of non-consolidated lake bottom sediment is up to ten meters (and sometimes greater). Lake water salinity is ca. 20 g/l; its mineralization is SO4-

/Cl-, K+-Na+ and Mg+. Natural water balance is driven by river feed (river Son) as well as by rain input, by evaporation and by underground hydrology. Climate of the region is drastic continental, arid. Lake bottom sediments are organic/terrigenous silts, hydrosulphuric (HS) mud is very extensive; its source is zooplankton (it is abundant during warm season).

We collected eight cores of Shira bottom sediments in July, 2005 through north-south transect, at the depths of 10-15 m, i.e. around HS-oxygenation boundary (which lies at ca. 12 m according to black/gray silt change). As found after opening the cores, the black silts get actively oxidized in air and there color is changed to light-brown, probably due to sulphide/sulphate oxidation. The black silt turned out to be non-homogenous: it is layered itself, we describe rhythms with thickness of about 0.xx to a few millimeters. Sediment accumulation rate was independently estimated through Cs-137 and Pb-210 gamma-activity measurements of sampled sediments at Ge-well setup (in United Institute of Geology, Geophysics and Mineralogy of the Siberian Branch of Russian Academy of Science). Sediment accumulation rate estimated is ca. 1-2 mm/year. Thus the visually identified layers may be the varves. They may occur due to change in inter-seasonal abundance of plankton and in terrigenous material supply from the catchment basin into lake. This finding may provide very detailed timescale for the sediments.

In order to more reliably identify the ‘varves’ and to estimate climatic trends we scaned non-destructed fragments of the cores under sharp ($<$0.2 mm) synchrotron beam with simultaneous XRF measurements of some elements from K-U range. This research gives rise to recovering local paleoclimatic trends and the respective geological and geochemical processes in lake ecosystem during a few centuries.

The research was partly fulfilled within the program of development of geological training grounds of Novosibirsk State University, supported by grant # 3H-370-05 from Ministry of Education and Science of Russian Federation.