Sobolev Institute of Geology and Mineralogy SB RAS (IGM SB RAS)
Trofimuk Institute of Petroleum Geology and Geophysics SB RAS (IPGG SB RAS)
Novosibirsk State University (NSU)

X INTERNATIONAL SIBERIAN EARLY CAREER GEOSCIENTISTS CONFERENCE

13-17 June 2022, Novosibirsk

PROCEEDINGS OF THE CONFERENCE

MINERALOGY
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Section MINERALOGY

MINERAL COMPOSITION OF SABAKTY LAKE SEDIMENTS

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Abstract. In this study, we present lithology, mineralogy and scanning electron microscopy observations along a 294 cm sediment profile of the Lake Sabakty, with the objectives of understanding the geochemical processes and improving the paleohydrological and paleoecological information during the late Pleistocene and Holocene of the South Ural.

Key words: mineral composition, lake sediments, Holocene

Lake Sabakty (53°36'55" N; 58°39'22" E) located in the Bashkortostan republic; the length is ~2.3 km, width is ~1.0 km, average depth is 2.8 м; maximum depth is 6.0 m, the basin area is 9.0 km² [1-3]. The core No. 4 was selected for a detailed laboratory study based on the primary lithological description and the results of seismoacoustic studies [4]. The sediment was sliced at 2.0 cm thick samples. According to the radiocarbon dating, the age of the lake is ~22.5 thousand years [5].

The result of particle size analysis is presenting that the content of clay fraction in the sediment varies in the range 1.37-16.41 %, silt fraction are dominant at 33.24%-76.3%, sand - 12.02-65.39 %.

According to X-ray diffraction analysis (Fig. 1), the mineral composition is characterized by the predominance of terrigenous minerals (detrital quartz, microcline, mica, chlorite, mixed-layer clay minerals). Authigenic minerals include carbonates (calcite, dolomite), framboidal pyrite. Biogenic silica (cristobalite, tridymite) from diatom shells and stomatocysts are recorded throughout the sediment section. Scanning electron microscopy revealed the presence of framboidal pyrite, detrital and biogenic quartz in lacustrine sediments.

Fig. 1 shows, the authigenic component is inferior to the allothigenic component in content. However, in terms of variations along the section, it differs in a noticeably more differentiated behavior (especially carbonates).

The values of allothigenic component vary between 20.90%-61.14%, values of quartz ranges from 14.00% to37.94%. The quartz content curve is similar to the amplitude of the allothigenic dominant, but with contrasting behavior at some points (since part of the crystalline quartz, together with amorphous silica (cristobalite + tridymite), is involved in the composition of diatoms and stomatocysts).

The carbonate component changes from 1.79 % to 52.12 %. The precipitation of calcite-dolomite carbonates is determined by factors: Ca/Mg-ratio in water, total carbonate alkalinity, salinity, pH value, temperature and organic productivity of the reservoir [6].

The content of pyrite changes from 1.18 % to 6.94 %. The formation of framboidal pyrite is associated with the recrystallization of amorphous Fe monosulfides, which appeared in the early diagenesis. The content of biogenic quartz increases up to section from 2.55 % to 25.70 %, indicating an increase in algae activity.

The comparison of the values variations of particle size analysis and mineralogical composition made it possible to reveal the features of climatic and other environmental changes on the studied lacustrine sediments.

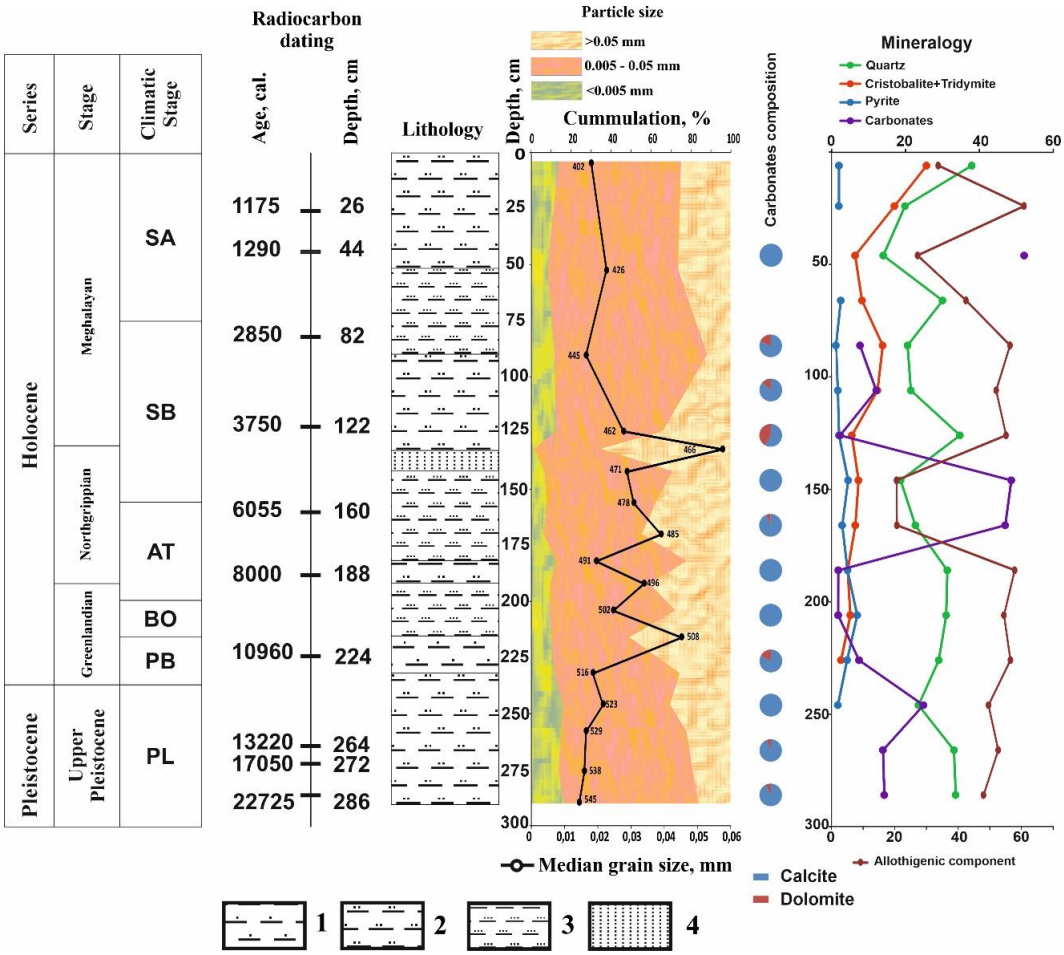

Figure 1 – Results of particle size and mineralogical analysis of Lake Sabakty sediments. Legend: 1 – clayey silt, 2 - silt, 3 – sandy silt, 4 - silty sand

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