of environmental change reconstructed from several lacustrine records shows great similarity with the previous study. The maximal spread of the boreal forest (taiga) communities is associated with higher-than-present July and January temperatures and precipitation, reconstructed at ~10.5–7 kyr BP (Tarasov et al., 2009). A noticeable increase in *Pinus sylvestris* pollen recorded after ~7 kyr BP reflects the spread of Scots pine in the Lake Baikal region (Demske et. al., 2005; Bezrukova et al., 2011), in line with the onset of drier and colder (similar to present) climate.

The relatively high temporal resolution and reliable AMS-based age models of several lacustrine pollen, diatom, geochemical records enable their comparison with the reference palaeoclimatic archives representing North Atlantic (e.g. Svensson et al., 2008) and North Pacific regions (Yuan et al., 2004). This comparison suggests that the reconstructed shifts in late Pleistocene–Holocene vegetation and environments in the Lake Baikal Region could have been controlled by the major factors controlling NH climate.

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THE CHEMICAL COMPOSITION OF SEDIMENTS AS A CRITERION FOR ASSESSING THE STATE OF LAKES IN THE HUMID ZONE (ON THE EXAMPLE OF THE KARELIAN LAKES)

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An assessment of the condition of the reservoir is a difficult task. Most often it is solved on the basis of a multidisciplinary approach, which includes a set of physical, hydrological, chemical, and biological criteria. Bottom sediments are natural archives, storing information about the evolution of the lake throughout its history. The possibilities of using the characteristics of sediment as criteria for assessing the state of the lakes to date remain insufficiently studied.

Karelian Lakes in the course of their existence passed a number of successive stages of development: from accumulators of mineral terrigenous material during the Pleistocene period (conditions of the nival climate), to the development of Holocene aquatic ecosystems producing organic matter (humid climate conditions).The speed of development of lake ecosystems depends both on the local features of the watersheds (geomorphology, rock composition, soils, vegetation, economic activities, etc.) and the reservoirs themselves (morphology of the basin, hydrological regime, chemical composition of water, biological characteristics). It should be noted that the bottom sediments of the deep zone, where the accumulation of matter occurred continuously, most fully reflect the global and local changes in the natural and climatic conditions, the geological features of the catchment area and the impact of human economic activity.

The complex of criterial characteristics of bottom sediments proposed by the authors is based on taking into account the main factors influencing the formation of precipitation. The chemical characteristics of precipitation (type of lacustrine accumulation) common to all lakes in the region are determined by the controlling influence of the climate and the composition of the rocks of the eastern slope of the Baltic Shield. Local catchment conditions and differences in anthropogenic load are responsible for the individual chemical characteristics of bottom sediments in each reservoir. Under humid climate conditions in the lakes of Karelia, silicon, humus (organic matter) and iron make up the bulk of the matter of present bottom sediments, which is a sufficient basis for incorporating the accumulation of silicon, organic matter and iron in the system of general estimation of sedimentation and as criteria determining the state of the lake. On the basis of these three characteristics of the chemical composition, the modern sedimentogenesis of the lakes in the region has been typified. Basically in the lakes of Karelia a mixed type of sedimentation is observed: Fe-Si-humus, Fe-humus-Si, or humus-Fe-Si. Sometimes there are small lakes, which can be attributed to a monotype: a humus, Si and Fe type of accumulation. Carbonate sediments, lying under the Holocene layer, are found in small lakes in the northern part of Karelia. Their accumulation was associated with the arid climate of the arctic desert. At present, in the conditions of humid climate, silicon and Si-humus sediments are deposited in these lakes.

Bottom sediments are a complex open nonequilibrium colloid-dispersed system into which the suspended matter of water continuously enters and in which various processes (physical, chemical, biological) take place. The physical and physicochemical parameters of the sediments, such as density, moisture, specific weight, porosity, pH, Eh, describe the state of the medium in which the sedimented matter is transformed. Geochemical characteristics of the environment are considered as criteria for assessing the state of the reservoir by bottom sediments, as it allows to judge the conditions, the general tendency and intensity of diagenetic processes. (Belkina, 2003, 2005, 2011, 2015, 2017).

An important characteristic of the general background of sedimentation, which makes it possible to divide lakes according to the principle of accumulation of matter, is the ratio of the mineral and organic parts in the bottom sediments. This indicator allows us to judge with some approximation the degree of influence of terrigenous and biological factors in the total pool of material arriving to the bottom. Classical indicators giving this information are loss on ignition (550 ° C) (LOI), and ash content (900 ° C) (A). Lakes where the LOI: A <0.45 refers to the mineral type of accumulation. In lakes where the ratio LOI: A> 0.65 in bottom sediments is observed accumulation of organic matter. Lakes, where the ratio of the ratio of LOI: A varies from 0.45 to 0.65 refer to water bodies with a mixed type of accumulation.

The composition of the organic matter of the bottom sediments is extremely diverse (proteins, simple and complex carbohydrates, amino acids, ethers, phenols, aldehydes, ketones, etc.), which makes it difficult to study these systems. Most of the organic matter is made up of natural polymers of irregular composition (humic substances), which justifies the use of generalized characteristics for describing the entire aggregate of organic substances. The most important of these are the elemental composition (C, N, O, P, H, S) of the organic substance and the various ratios of these elements, the oxygen equivalent (the amount of oxygen required to oxidize the unit mass of dry ashless organic matter), COD and BOD, the degree of oxidation and the electrochemical valence of carbon, humic and fulvic acids. The trophic status of the reservoir can be estimated by the pigment composition of the bottom sediments.

The study of the geochemical history of the reservoir is carried out on the basis of a chemostratigraphic analysis of the bottom sediment sections. The dynamics of the main components and the physicochemical characteristics of the medium are studied. To the above characteristics, proposed for use in the system of criterial assessment of the state of the reservoir along the bottom sediments, it is necessary to add trace elements that play an important role in the life of organisms: elements of the electrolyte background (Na, K, Ca, Mg, Cl), as well as other biometals (Zn , Cu, Mn, Ni, Mo, Co). The analysis of the distribution of elements in the section (morphology and synchronism of variations) provides information on the process of sedimentogenesis in the past and its changes in the catchment area and in the lake.

Over the past 100 years of civilization development, the influence of the anthropogenic factor on processes occurring in lakes has increased many times. Geochemical indicators of economic activity in bottom sediments are the chemical elements actively used by man and synthesized compounds. Observations of contamination of bottom sediments are an integral part of monitoring of water bodies in the developed countries of the world. The choice of pollutants primarily depends on the characteristics of the industrial and agricultural complex of the territory.

The main industries in the structure of the economy of Karelia are forestry, pulp and paper and mining. Pollutants, degree and mechanism of influence on water bodies of various types of economic activity are different. Consider the possible environmental risks of each of the industries.

The development of the forestry sector (deforestation) causes erosion of the soil cover as a result of weathering, which increases the eolian and terrigenous streams of matter entering the reservoirs. Deforestation also affects the water balance of the catchment area: evaporation increases and, accordingly, the volume of water flow to the lake decreases. As a result, the inflow into the pool of substances in a dissolved form decreases. Increasing the turbidity of water and reducing the level of the lake can contribute to the development of eutrophication processes, for example, overgrowing of a reservoir. The consequences of the changes will be traced in changes in the micro- and macro-composition of the terrigenous material.

Mining, namely quarrying (mining of non-metallic materials) significantly increases the flow of terrigenous matter into water systems, as a result of which the turbidity of the water rises, and mineral sediments accumulate in the bottom sediments. High rates of sedimentation contribute to burial of detritus in bottom sediments, which can have a positive effect on the lake ecosystem (slowing of eutrophication). But at the same time, the burial of unoxidized organic matter favors the development of anaerobic processes, changes in the mineral part of the sediments and the introduction of toxic gases (methane, hydrogen sulphide, etc.) and soluble mineral elements forms back into the water.

One of the consequences of the development of agriculture is the increase in terrigenous demolition in the reservoir, as well as in the case of deforestation and mining by the quarry method. It should be specially noted that the introduction of fertilizers coming into the lake from the fields causes an increase in the productivity of the lake, which consequently accelerates the accumulation of matter in the bottom sediments (especially N and P) and, in general, the degradation of the lake as an element of the landscape. The intake of pesticides used in agriculture can be dangerous for hydrobionts.

It should be noted that any populated areas, and especially large cities - are powerful sources of pollutants, accumulation of which occurs in bottom sediments (oil products, heavy metals).

Bottom sediments are inextricably linked with other components of the aquatic ecosystem (water, higher aquatic vegetation, benthos, periphyton). An increase in the flow of matter into the reservoir leads to changes in the chemical composition of the water, the biological and hydrological characteristics of the lake, the physicochemical conditions of sedimentation, the chemical composition of the bottom sediments, and the diagenesis of the sediment. The result of the changes is an increase in the risk of secondary pollution of the reservoir, the danger of migration of pollutants along food chains of living organisms, the end point of which can be a human.

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DIATOMS IN THE THANATOCOENOSIS OF THE LAKE ZAPOVEDNOYE (EVENKIYA)

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Diatoms are one of the main proxies of the lake condition in the past. In this work we present the first data on the composition and quantitative distribution of diatoms species from the bottom sediments of the lake Zapovednoe (Evenkiya).

Lake Zapovednoe (60° 31'N, 101° 43'E) is a freshwater lake located at the Verkhnyaya Lakura River in the Tunguska Nature Reserve, about 60 km from the settlement Vanavara. The lake is about 500 m in diameter, a round form and a depth about 47 m. Sampling was carried out in March 2015 from the ice in the central part of the lake with a gravity corer with removable plastic pipes with a diameter of 90 mm (UWITEC, Austria). Data on the distribution of ^{137}Cs and ^{210}Pb isotopes at the depth of the cores were used for preliminary dating of the upper layers (Darin, Kalugin, unpublished. Sub-samples were processed using 30% hydrogen peroxide and analyzed for diatoms by light microscopy (Bolobanschikova et al., 2015).