

Fig. 2. Fragment of acoustic profile\_1 with the most complete stratigraphic sequence

The study of the most complete column of bottom sediments will allow us to reconstruct the region climate over the past several thousand years. A comparison of the data set for several lakes in the region makes it possible to create a detailed model of climate change.

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## COSMIC DUST AND MICROMETEORITES IN LAKE SEDIMENTS

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Well known, that a lot of extraterrestrial matter rich the Earth surface every day. Such material can be find in different geological objects [1, 2]. Investigations of different types of sediments proofs the idea about quantity variations of cosmic dust in time. It can be caused by different reasons such us different concentrations of dust in universe, by impact events and etc. Seasonal sedimentation and possibility of precise age determination of sediments make lakes one of the best archives for studying Holocene. Sediments are composed of grains of different genesis: authigenic grains formed in the lake or brought into it by water flows and wind, grains of cosmic and volcanic origin, dust from the other continents, grains of biological and anthropogenic origin and so on. This study concentrates on investigations of cosmic dust. Many of these particles have the same composition as terrestrial matter; however, we can separate the cosmic components from the terrestrial components using their unique magnetic properties such as Curie temperature ( $T_c$ ) and using scanning electron microscope (SEM) for determination elemental (mineralogical) composition and surface morphology. Several lakes were sampled during summer field works. Cores length usually 5-6 meters which cover last 11 Ka.

Differential thermomagnetic analysis was carried out for tracing magnetic minerals according their Curie temperature. Measurements were carried out on Curie express balance. the temperature dependence of induced magnetization in air at a heating rate of 100 °C/min up to a maximum temperature

of 800°C. were measured in a constant magnetic field - 400 mT. We have got thermomagnetic curves of the first and second heating. Hysteresis properties were determined by a J-coercivity spectrometer for each sample a modified hysteresis loop, backfield curve, acquisition curve of isothermal remanent magnetization, and a viscous IRM decay spectrum. Each measurement set is obtained in a single run from zero field up to 1.5 T and back to -1.5 T [3]. Magnetic separation of samples was made by using permanent magnet. Firstly 3-6 grams of the sample were added to distilled water. Then the magnet in the rubber case fell into the vessel and mixing was going on. The material that adhered to the magnet was dispersed in an ultrasonic bath to separate the stacked particles and again the procedure with the magnet was repeated. The morphology and elemental composition of magnetic separates studied using scanning electron microscopy “Merlin” Carl Zeiss equipped with an energy-dispersive spectrometer “Aztec X-Max” Oxford Instruments. Surface morphology was investigated at an accelerating voltage of 5 keV on SE mode (secondary electrons). Elemental analysis was carried out at an accelerating voltage of 20 keV with AsB mode.

According to results of thermomagnetic analysis data samples with decrease of magnetization around 720 °C were chosen for magnetic separation. This temperature indicates presence of iron with impurities, because Curie temperature of pure iron is 770 °C.

SEM results show a wide range of various types of particles from terrestrial magnetite to Fe-Ni alloys. SEM results show presence of magnetite spherules in each sample, iron sulphide spherules, detrital material (magnetite, titanomagnetite, hematite), iron with impurities (Figure 1).

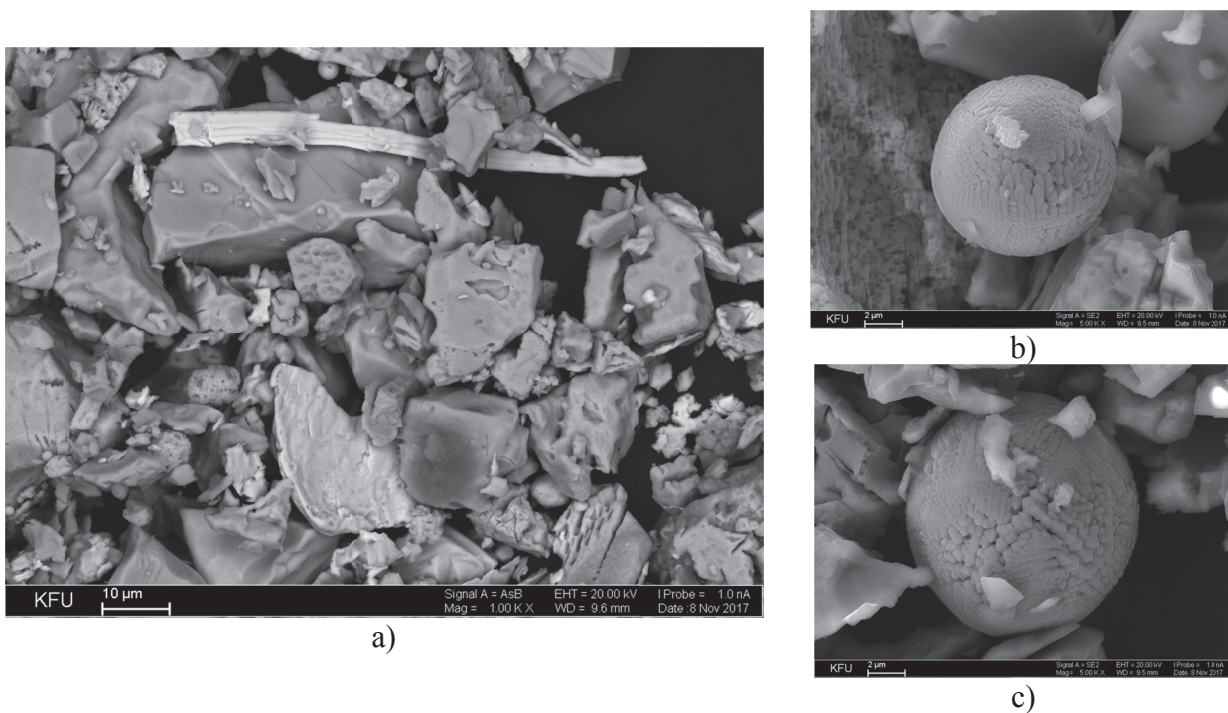


Fig. 1. Electronic images of sample 1141,  
a) – magnetic fraction overview; b), c) – micrometeorites of Fe, O composition

Microscopic investigations showed wide spread of micrometeorites in all studied samples. Shape of particles from round to egg-shape. Size of particles varies from 5 to 30 microns. Almost all microparticles have specific wavy surface. Finding differences in extraterrestrial matter in time would be helpful for understanding changes in material falling to the Earth’s surface.

It is shown that lake sediments can be good archives of extraterrestrial matter. Based on the results of the thermomagnetic analysis, samples were sampled for the investigation using an electron microscope. TMA can serve as the first stage of the rejection of samples, which greatly simplifies the work, since it is impossible to view all the samples on the SEM.

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### THE STUDY OF PRESENT POLYGONAL PONDS OF ARCTIC ECOSYSTEMS (YAKUTIA) IN PALAEO-LIMNOLOGY

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**Abstract.** Polygonal ponds common in the North-East of Yakutia are poorly understood and represent interest in limnology and nature management. The comprehensive study of polygonal water was held in July 2017 at the monitoring plot area of Kytalyk Allaykhovskiy district of Yakutia (Indigirka river valley).

Study area, objects and methods.

The study area was located on the right bank of the Berelekh River (70°83'12.1"N., 147°48'29.9"E, altitude above sea level of 11 m) 28 km northwest of the settlement Chokurdakh (Fig.1). The study ponds were divided by location into two prevailing types of landscape – edoma and alas. In the fieldwork were measured morphometric and hydrochemical parameters of water and samples of a surface layer (0-1 cm.) The field material was collected using conventional methods with a standard set of accessories and equipment [1, 2]. Selected samples were preserved and stored at ~+4°C.

In General the studied reservoirs are shallow with a maximum depth of 0.6 m. and transparency to the bottom. The average water temperature during the study period did not exceed 10.4°C; pH varies from 3.6 to 7.8 with an average of 6.4 (neutral). Water is characterized by low mineralization and a high concentration of oxygen in the surface layer of water (to 11,18 mg/l). Data at the level of intraspecific taxa were used to determine the ecological characteristics of diatoms because the varieties of one species have different environmental indicators. Identified the relationship of diatoms to the conditions of the habitat, salinities, active reaction of the environment and geographical distribution [3, 4]. Ratio of algae to water salinity determined using the scale of globnet R. W. Kolbe [5]. The detected diatoms were separated into freshwaters and oligohalines (indifferents, halophobes, halophiles) and mesogalobic or saltwater groups. To determine the ratio of diatoms to the active reaction of water (pH) was used the scale Of F. Hustedt [4]. In the composition of the diatom flora was a dedicated group: Alkaliphile occurring at pH = 7, with optimum distribution at pH > 7, alkalibionts preferred water only with pH > 7; neutrophils develop at acidic and alkaline water; acidophiles with a predominant development at pH < 7; aticidobionts - pH < 7, preferably 5.5 and below.

Results.

Diatoms in the preparations were determined before the species, variety and form. According to the results of the study of diatomic flora of the surface layer were identified 91 species of Bacillariophyceae's class relating to 21 genera, 19 families and 11 orders. The highest quantity of species recorded in generas: *Eunotia* (26) и *Pinnularia* (13). Similar taxonomic structure of composition with the predominance of these genera typical for standing waters with occasionally changing hydrological regime. High species diversity (up to 33 species) noted in ponds of alas at a high level. The list of mass forms consists of 26 species. Of these dominates *Tabellaria flocculosa*