Short communication

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Late Holocene sediments in the profound abyss of Southern Lake Baikal

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ABSTRACT. Here we present new data of bottom sediments, which were collected in March 2018 in the deep water of Southern Baikal. The deposits consist of pelagic mud, intercalated by three turbidites. The uppermost 2 cm of the core are formed by the light layer of a diatomite, consisting mainly of valves of *Synedra acus* (up to 219 million cells / g). We attribute the increased content of this diatom species in the upper part of the core to warmer climatic conditions.

Keywords: Lake Baikal, sedimentation, pelagic mud, turbidites, magnetic susceptibility, diatoms.

1. Introduction

The purpose of the research is to study recent sedimentation in Lake Baikal in a rapidly changing climate. For this undisturbed sediments, accumulated under calm conditions in areas with relatively high sedimentation rates are most suitable. In particular, the surface sediments of the Southern Baikal Basin meet these requirements.

2. Material and methods

The core BAIK18-1 (length 59 cm) was taken in Southern Baikal offshore the Baikal NEUTRINO Telescope Station (Cape Ivanovsky, 106 KM of the Circum-Baikal Railroad) 51°46.076' N; 104°24.948' E. The sampling was carried out from the ice at a water depth of 1366 m with an UWITEC Corer in March 2018. The core was cut, photographed and lithologically described with smear-slide examination. Magnetic susceptibility was measured and diatom analysis was performed within intervals of 1 cm throughout the core.

3. Results and discussion

A light diatomite layer is observed in the uppermost 2 cm of the core (Fig. 1A). Below this layer an oxidized brown to brown-black layer between 2 and 4.5 cm is developed at the top of pelagic biogenic terrigenous mud, intercalated by turbidites. This succession is characteristic for deposits of the deep-water basins of Lake Baikal (Vologina and Sturm, 2009; Sturm et al., 2016). Turbidites were found at 18–22.5 cm, 35.5–38 cm and 49–59 cm (Fig. 1A). They are characterized by darker color, coarser grain size, the presence of terrestrial plant debris, an increased admixture of mica particles and an upwards grading texture. The gradation is clearly manifested between 35.5 and 38 cm. The base of the turbidite is formed by sand grading to silt with slight admixtures of clay.

Sedimentation rates of 0.036 cm/year can be taken from dating results of core BAIK00-1, which was recovered within the immediate vicinity of core BAIK18-1 (Sturm et al., 2016), with the three turbidites deposited during the years 1030 AD, 1310 AD and 1670 AD.

Magnetic susceptibility (MS) varies along the core BAIK18-1. Minimum values are noted in the uppermost layer of diatomite (–14.8 · 10^{-6} SI units). In pelagic biogenic-terrigenous mud MS does not exceed 56 · 10^{-6} SI units. In turbidite layers, this value is generally increased. Maximum MS is recorded at a depth 38 cm (148 · 10^{-6} SI units) and are confined to the base of the turbidite (Fig. 1A).

The content of microfossils in the core BAIK18-1 varies greatly (Fig. 1B). Planktonic diatoms dominate with 16.7–307 million valves per gram of dry sediment (mln valves/g). The number of benthic species is 0.24–3.13 mln valves/g, chrysophyte cysts 22.3–61 million specimens per gram of dry sediment (mln specimens/g), sponge spicules 0.01–0.32 mln specimens/g and pollen grains 0.02–0.32 mln specimens/g. The diatom composition is dominated by *Aulacoseira baicalensis* (Wislouch) Simonsen (0.42–

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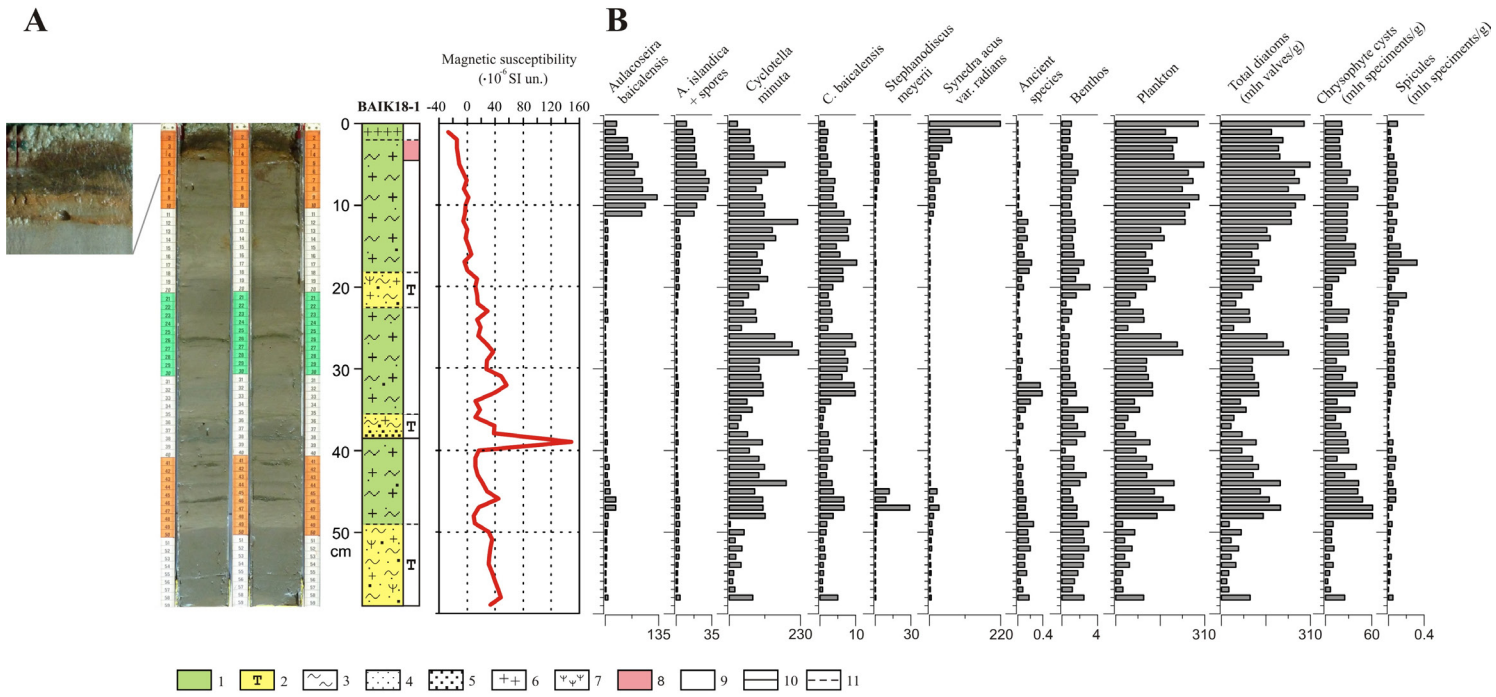

Fig.1. A. Photo, lithology and magnetic susceptibility of core BAIK18-1. Legend of lithology: 1 – pelagic mud; 2 – turbidite; 3 – clay, 4 – silt, 5 – sand, 6 – diatoms, 7 – land plant remains; 8 – oxidized sediment, 9 – O_2-reduced sediment; 10 – distinct boundaries between layers, 11 – indistinct boundaries between layers. B. Distribution of diatom assemblages in core BAIK18-1.

45.13 %); *A. islandica* (O.Müller) Simonsen with spores (0.2–13.4 %); *Cyclotella minuta* (Skvortzov) Antipova (12.4–95.8 %); *Cyclotella baicalensis* Skvortzov et Meyer (0.81–7.94 %); *Synedra acus* subsp. *radians* (Kützing) Skabitsch. (0.04–76.02 %); *Stephanodiscus meyeri* Genkal et Popovskaya (0.01–14.1 %). This composition indicates the Late Holocene formation of the studied deposits. Also present are redeposited ancient diatoms (0.01–0.39 mln valves/g). They are represented by *Stephanodiscus* Ehrenberg, *Cyclotella* (Kützing) Brébisson, *Aulacoseira* Thwaites, *Tertiarius* Håkansson et Khursevich, *Stephanopsis* Khursevich et Fedenya and are characteristic for Pliocene-Pleistocene sediments of Lake Baikal (Kuzmin et al., 2009). Reduced numbers of diatoms and a slight increase of benthic species are observed within turbidite layers (Fig. 1B).

In the uppermost light layer, a peak of *Synedra acus* was observed (up to 219 mln valves/g). The content of this species of diatoms is still quite large (up to 39 mln valves/g) down to a depth of 3 cm (Fig. 1B). The dominance of the *Synedra* in recent sediments can be attributed to warmer climatic conditions during their formation. This conclusion is confirmed by results of a drilling core BDP-96 from the underwater Akademicheskii Ridge of Lake Baikal. There peaks of Synedra are confined to warm isotopic stages (Khursevich et al., 2001). Recently it was established that due to global warming there has been an increase of *Synedra* and a decrease in endemic species of diatoms in the bottom sediments and within the water column of Southern Baikal (Roberts et al., 2018; Vologina et al., 2019; Bondarenko et al., 2020). Our new data confirm this conclusion.

4. Conclusions

The main types of bottom sediments collected at a depth of 1366 m in the Southern Basin of Lake Baikal are pelagic mud and turbidites. They differ in color, granulometry, magnetic susceptibility, composition of diatoms, etc. The increased content of the diatom species *Synedra ac*us within recent deposits is probably a consequence of global climate warming.

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