TRACES OF HIGH SEISMIC ACTIVITY IN THE UPPERMOST SEDIMENTS OF LAKE BAIKAL, SIBERIA

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ABSTRACT. Sedimentation in Lake Baikal is significantly affected by continuous seismic activity in the Baikal Rift Zone. Our study shows that historical earthquakes, as well as recent seismic events, considerably influenced sedimentation in this deep tectonic basin. Here we present some of the results of extensive international research activities during the period of 1996–2019. To identify traces of seismic events in the uppermost sediments (<1.5 m), short cores were recovered from many coring stations throughout the entire lake. Based on lithological descriptions, measurements of magnetic susceptibility, and concentration of inorganic and organic components, we identified earthquake indicators in the sediment cores. Impacts of historical earthquakes were traced within South Baikal (near the Sharyzhalgai Station and the Station 106-km of the Circum-Baikal railway, hereafter CBR) and Proval Bay (near the Selenga River delta).

KEYWORDS: Lake Baikal; sedimentation; earthquake; bottom sediments; sedimentation rate; pelagic mud; turbidites; oxidized layers

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СЛЕДЫ ВЫСОКОЙ СЕЙСМИЧЕСКОЙ АКТИВНОСТИ В ПОВЕРХНОСТНЫХ ОТЛОЖЕНИЯХ ОЗЕРА БАЙКАЛ, СИБИРЬ

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АННОТАЦИЯ. Осадконакопление в озере Байкал происходит на фоне постоянной сейсмической активности Байкальской рифтовой зоны. Современные и исторические землетрясения оказывают значительное влияние на формирование донных отложений в этом глубоком тектоническом бассейне. В статье представлены результаты международных исследований за период 1996–2019 гг. Для обнаружения следов сейсмических событий в самых верхних слоях отложений (<1.5 м) были отобраны короткие керны по всему озеру. Приведены карты с точками отбора кернов и сейсмичностью озера. Литологический состав, данные измерения магнитной восприимчивости, оценка органических и неорганических компонентов осадков позволяют определить индикаторы землетрясений в донных отложениях озера. Следы исторических землетрясений были обнаружены в пределах Южной котловины Байкала (районы станций Шарыжалгай и 106-й км Кругобайкальской железной дороги) и в заливе Провал рядом с дельтой р. Селенги.

КЛЮЧЕВЫЕ СЛОВА: озеро Байкал; осадконакопление; землетрясение; донные отложения; скорость осадконакопления; пелагический ил; турбидиты; окисленные слои

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1. INTRODUCTION

Lake Baikal is considered a unique lacustrine ocean. This 650 km long, 80 km wide and 1637 m deep water body is located within the Baikal rift zone, one of the most hazardous seismic regions of Russia. The Baikal depression diverges at a rate of 1.25 to 2.3 mm yr\(^{-1}\) [Ashurkov et al., 2011]. On average, almost 8–10 thousand earthquakes are recorded annually in the Baikal region and Transbaikalia [Mel’nikova et al., 2010]. Actually, sedimentation in Lake Baikal takes place under conditions of high seismic activity.

Several interdisciplinary international and Russian research projects have been carried out in the lake, including INTAS, BICER, GEOPASS, EU-Project CONTINENT, RFBR, Baikal Neutrino Project, etc. Our study aimed to search for traces of recent and historical earthquakes within the lake sediments. Here we present a summary of the research results and new data on the uppermost sediments of Lake Baikal and discuss the role of seismic activity during sedimentation.

2. MATERIAL AND METHODS

Sediment cores were recovered by two different gravity corers (EAWAG-63/S and UWITEC-corers), which ensured the undisturbed recovery of the uppermost, water-rich sediments. Both corers used plastic tubes of 6.3 cm \(\Phi\). Coring activities were carried out from three research vessels (R/Vs Vereshchagin, Titov, and Geolog). In winter, sampling was performed from the ice cover of Lake Baikal. Altogether 246 short cores (maximum length of 1.5 m) were taken from various areas of the lake (Fig. 1; Appendix 1). After recovery, the cores were cut, photographed, lithologically described by using smear-slides and sampled at 0.5 cm and 1 cm intervals for subsequent analyses. Magnetic susceptibility was measured with a BARTINGTON® MS2E Surface Scanning Sensor (resolution of 1 cm). Detailed descriptions, the determination of biogenic silica (\(SiO_2_{bio}\)), organic carbon (\(C_{org}\)), total nitrogen (\(N_{tot}\)), diatom analyses, granulometry and mineralogy are given in other publications [Lees et al., 1998; Vologina et al., 2003, 2007, 2010, 2012; Ohlendorf, Sturm, 2008; Vologina, Sturm, 2009; Sturm et al., 2016].

Dating of cores was carried out by \(^{210}\)Pb and \(^{32}\)Si measurements [Morgenstern et al., 2013; Sturm et al., 2016].

3. SEISMICITY OF THE BAIKAL BASIN

The Lake Baikal basin is the central link of the Baikal rift zone, which is characterized by a very high level of seismic activity. Out of the total number of seismic events recorded in this region, almost 17 % occur in the lake area (according to the Baikal Branch of FRC "Geophysical Survey of RAS"). The earthquake hypocenters are mostly located in a depth range of 10 to 20 km [Radziminovich, 2010]. The overwhelming majority of earthquake focal mechanisms in the lake basin represent normal faulting [Mel’nikova et al., 2010].

The epicentral field of the Baikal basin is highly non-uniform. Most of the earthquake epicenters are concentrated within the South and Middle Baikal areas, while the seismic activity of North Baikal is significantly lower (Fig. 2). Apparently, such a distribution of epicenters reflects the geological structure and history of the depression. According to N.A. Logachev, the Lake Baikal basin consists...
of two comparable sedimentation basins, the southern and northern ones (South Baikal and North Baikal, respectively), which are separated by a structural ridge (Olkhon Island – Academician Ridge) [Logachev, 2000]. South Baikal is characterized by greater tectonic fragmentation and longer evolution [Logachev, 2003].

The seismic potential of the Baikal basin reaches a magnitude (M) of up to 7.5 [Ulomov, 2014], as estimated from the data on the Tsagan earthquake of January 12, 1862, which was the strongest seismic event within the Baikal basin during the historical observation period before 1901. Its magnitude was 7.5(±0.3); the shaking intensity in the epicentral area was estimated as degree X (MSK-64 scale) [Kondorskaya, Shebalin, 1982; Golenetskii, 1996]. During the 20th century, no events similar to the Tsagan earthquake occurred in the Lake Baikal basin. In the instrumental
Fig. 2. Seismicity of the Lake Baikal basin (M≥5.0 earthquakes) according to historical and instrumental data. Epicenters of historical earthquakes (white circles) after [Kondorskaya, Shebalin, 1982]; epicenters of instrumentally recorded earthquakes (red circles) – Baikal Branch of FRC “Geophysical Survey of RAS”. Stars (in circles) – epicenters of earthquakes that might have influenced sedimentation processes in the lake basin. Inset – epicenters of the Tsetserleg (July 9, 1905) and Bolnai (July 23, 1905) earthquakes. The digital elevation model uses the Shuttle Radar Topography Mission (SRTM) data [Jarvis et al., 2008]; the shadow relief map of Lake Baikal after [De Batist et al., 2002].

Рис. 2. Сейсмичность впадины озера Байкал (землетрясения с магнитудой M≥5.0) по историческим и инструментальным данным. Эпицентры исторических землетрясений (белые кружки) показаны согласно [Kondorskaya, Shebalin, 1982]; эпицентры инструментально зарегистрированных землетрясений (красные кружки) приведены по данным Байкальского филиала ФИЦ ЕГС РАН. Звездочками в кружках обозначены эпицентры землетрясений, которые могли оказать влияние на процессы осадконакопления в впадине озера. На врезке показано местоположение эпицентров Цэцэрлэгского (9 июля 1905 г.) и Болнайского (23 июля 1905 г.) землетрясений. Цифровая модель рельефа построена по данным SRTM [Jarvis et al., 2008]; карта теневого рельефа впадины оз. Байкал – по данным [De Batist et al., 2002].
registration period (after 1901), the strongest seismic events in the study area were the Middle Baikal earthquake of August 29, 1959 (Mw=6.8) [Solonenko, Treskov, 1960; Kondorskaya, Shebalin, 1982] and the Kultuk earthquake of August 27, 2008 (Mw=6.3) [Mel’nikova et al., 2012].

It is remarkable that two of the strongest earthquakes in the Baikal basin (Tsagan and Middle Baikal events) were recorded within or close to the Selenga Delta. The epicenters of several less strong seismic events were also located in the same area on March 3, 1871 (M=6.3), January 12, 1885 (M=6.7) and November 26, 1903 (M=6.7) [Kondorskaya, Shebalin, 1982]. In this regard, it is important that the area of the Selenga Delta is considered a center of the formation and development of the Baikal rift zone [Logachev, 2003]. We also note that strong seismic events similar to the Tsagan earthquake (M=7.5) should be considered as separate key episodes of the development of the Baikal basin [Shchetnikov et al., 2012].

Seismic activity has significant effects on the formation of lake sediments. Strong M≥5 earthquakes can cause shaking intensity of degree VI–VII and higher within the near-epicentral area. According to macroseismic intensity scales, such as MM, MSK-64, EMS or ESI-2007, high-intensity seismic shakes may provoke noticeable effects on natural environment. In particular, intensive shaking can induce displacements of sediments along sub-aerial mountain slopes, as well as trigger massive underwater landslides and turbidity currents with high densities in comparison to the ambient lake water [El-Robrini et al., 1985; Beck et al., 1996; Schnellmann et al., 2002; Nomade et al., 2005; Michetti et al., 2007; Vandekerkhove et al., 2020]. Such quake-triggered suspension flows cause the formation of large turbidite layers. Thus, turbidites can serve as possible markers of severe historical and prehistoric earthquakes [Inouchi et al., 1996; Goldfinger et al., 2003; Monecke et al., 2004; Fanetti et al., 2008; Goldfinger, 2011; Gutiérrez-Pastor et al., 2013; Stockhecke et al., 2014]. However, turbidites can also be formed as a result of other catastrophic events, such as torrential flows of large rivers during exceptionally large flood events, or due to collapsing of oversteeped delta fronts [Sturm, Matter, 1978; Sturm et al., 1995; Vandekerkhove et al., 2020]. This should be taken into account when interpreting individual turbidites and reconstructing events that are responsible for their formation.

### 4. RESULTS AND DISCUSSION

Sediment distribution within the Lake Baikal area is largely determined by the basin relief (i.e. bottom morphology) and by the large tributaries. In turn, the basin relief results from the regional tectonic activity. Sedimentation rates (SR) differ in different areas of the lake (Fig. 3), with the highest values within river deltas and delta-fan sites near the mouths of the large tributaries, lower values at the basin plains, and minimal values at underwater ridges and steep coastal slopes [Vologina, Sturm, 2009; Sturm et al., 2016].

Using sedimentological results reported by our team [Sturm et al., 1998, 1999, 2016; Vologina et al., 2003, 2007, 2010, 2012; Vologina, Sturm, 2009] and other researchers [Goldyrev, 1975; Karabanov, 1999], made it possible to regionalize the composition and distribution of Baikal sediments and to identify six different depositional areas within the lake (Fig. 3):

1. Deep-water zones of the profundal basins with periodical occurrences of turbidites intercalated to pelagic mud;
2. Littoral zones along the E-shore of North Baikal and along the SE-shore of South Baikal with biogenic-terrestrial mud formed under mainly calm depositional conditions without turbidites;
3. Underwater ridges (rises) with fine-grained mud accumulated under calm deposition conditions at a very low sedimentation rate (SR), which overlays Late Pleistocene clay;
4. Delta areas and delta-fan sites near the mouths of the large rivers, where the sediments consist mainly of coarser and more terrigenous material and show a higher SR;
5. Strait Maloe More (water depth from few meters to 210 m in its northern part) with poorly sorted terrigenous material and abundant sand;
6. A fault zone bordering Cape Zavorotny with small tectonic sub-basins along the western side of North Baikal (water depth <500 m) with disturbed sediment accumulation [Hus et al., 2006; Matton, Klerkx, 1995].

The sediments of Lake Baikal are oxidized at the water-sediment interface in all areas (Fig. 3). The oxidized deposits are brown, reddish and black. The oxidized layers significantly vary in thickness (TOL) in different parts of the lake due to a number of factors, including sedimentation rates, types and contents of the buried organic matter, bottom topography, oxygen contents in bottom waters, etc. [Mizadrontsev, 1982; Martin et al., 1998; Granina et al., 2000; Vologina et al., 2003; Och et al., 2012]. TOL is maximal at the underwater ridges, has lower values in the deep-water basins, and is minimal in the sediments of Maloe More, estuarine and near the river delta areas [Vologina et al., 2003]. Fig. 4, a shows photographs of the upper part of cores as TOL examples from different areas of the lake (see Fig. 1; Appendix 1). The differences in TOL values are striking. At the underwater ridge in the southern part of North Baikal (Continent Ridge) TOL=21.5 cm in core BAIK02-4A at a water depth of 390 m, whereas in South Baikal in core BAIK01-34C at a water depth of 1340 m TOL=3.7 cm (Fig. 4, a).

#### 4.1. Probable trace of a recent earthquake

An oxidized layer is absent in core BAIK11-10 recovered on July 26, 2011 at a water depth of 660 m in Middle Baikal (Fig. 4, b). We assume that this layer might have been removed by shaking due to the relatively strong earthquake (Mw=5.3) of July 16, 2011, which epicenter was located in the Turka basin outside the lake (Table 1) [Mel’nikova et al., 2013]. The shaking intensity in the epicentral area reached degree VII (MSK-64 scale), while the shaking intensity within the coastal zone of the lake reached degree VI [Gileva et al., 2017]. Such a seismic effect might have been sufficient
Fig. 3. Map showing the distribution of Holocene sediments and sediment sections for different areas of Lake Baikal (modified after [Vologina, Sturm, 2009]).

Map (a): 1 – deep-water plains; 2 – littoral zones; 3 – underwater ridges; 4 – delta (fan) areas near the mouths of large rivers; 5 – Strait Maloe More; 6 – tectonic basin of Cape Zavorotny. Numbers (bold) – recent sedimentation rates, mm/year (*[Bangs et al., 2000];
4.2. Traces of historical earthquakes

Deep-water plain of South Baikal. In 1912, seismic activity increased in South Baikal, which is evidenced by several relatively strong earthquakes [Kondorskaya, Shebalin, 1982] and almost 40 small local quakes recorded by the Irkutsk Seismic Station during that year [Minchikovskii, 1914]. Some of these seismic events probably provoked the release of a large volume of methane gas into the lake water and the atmosphere near the Sharyzhalgai Station. Local residents described that in August 1912, “water columns several meters high” were observed at Lake Baikal, and this phenomenon was reported in the regional press [Radziminovich et al., 2010; Vologina et al., 2012].

The strongest earthquake of 1912 was registered on May 22 (Mw=5.3). Its epicenter was located at the SW-end of the lake (Table 1). We discovered traces of that earthquake in core BAIK10-5 taken at a water depth of 1300 m in the vicinity of the Sharyzhalgai Station. This core contains pelagic biogenic terrigenous mud intercalated by several turbidites. In the upper part of the core, two oxidized layers of brown and brown-black colours are observed at 0–1 cm and 8.7–11.4 cm (Fig. 5). These two layers are separated by a dark grey, silty-clayey material with low magnetic susceptibility (about 50 ∙ 10^{-6} SI units [Vologina et al., 2012]), which contains a significant amount of terrestrial plant debris, a reduced number of planktonic diatoms, and an increased amount of benthic, ancient diatoms [Vologina et al., 2012]. Considering the low content of SiO₂biog and the higher concentrations of C₉₋₁₁, it as a turbidite that buried the oxidized layer at the core depth of 8.7–11.4 cm (Fig. 5). Obviously,
this turbidite is a result of the above-mentioned earthquake of May 22, 1912. It could be dated by $^{210}$Pb measurements, which yield a recent sedimentation rate of 0.01 cm-year$^{-1}$ near the Sharyzhalgai Station [Vologina et al., 2012].

Core BAIK00-1 (Fig. 6) was taken at a water depth of 1366 m near the Baikal Neutrino Telescope Station (Cape Ivanovsky, Station 106-km of CBR) approximately 32 km to the east from the Sharyzhalgai Station (Station 138-km of CBR). Bottom sediments are represented by interbedded biogenic terrigenous mud and turbidites (Fig. 6). Four turbidites are observed at 14.5–19.0 cm, 32.5–35.5 cm, 48.8–57.5 cm, and 79.0–108.5 cm of the core [Sturm et al., 2016]. The turbidites are clearly visible and marked by their darker colour, upward grading from sand to silt and clay, and a higher...

### Table 1. Parameters of earthquakes that may have influenced sedimentation processes in Lake Baikal

| Earthquake | Date          | Coordinates | Magnitude | Area          | Reference                        |
|------------|---------------|-------------|-----------|---------------|----------------------------------|
| Tsagan     | January 12, 1862 | 52.50       | MLH 7.5   | Middle Baikal | [Golenetskii, 1996]              |
| Tsetserleg | July 9, 1905   | 49.50       | Mw 8.0    | Mongolia      | [Kondorskaya, Shebalin, 1982; Schlupp, Cisternas, 2007] |
| Bolnay     | July 23, 1905  | 49.30       | Mw 8.3–8.5| Mongolia      | [Kondorskaya, Shebalin, 1982; Schlupp, Cisternas, 2007] |
|            | May 22, 1912   | 51.70       | Mw 5.3    | South Baikal  | [Kondorskaya, Shebalin, 1982]    |
| Turka      | July 16, 2011  | 52.88       | Mw 5.3    | Middle Baikal | [Gileva et al., 2017]            |

Note. MLH – earthquake magnitude estimated from surface waves; Mw – moment magnitude estimated from earthquake seismic moment. The magnitudes of historical earthquakes in the Baikal region are determined from macroseismic data and considered equivalent to magnitude MLH [Kondorskaya, Shebalin, 1982].

Примечание. M$_{\text{MLH}}$ – магнитуда по поверхностным волнам; M$_{\text{Mw}}$ – моментная магнитуда, рассчитанная по сейсмическому моменту землетрясения. Магнитуды исторических землетрясений Прибайкалья рассчитаны по макросейсмическим данным и могут рассматриваться как эквивалент магнитуды M$_{\text{MLH}}$ [Kondorskaya, Shebalin, 1982].

![Fig. 5. Deep-water core BAIK10-5: photo, lithology data, and contents of Si$_{\text{bio}}$, N$_{\text{tot}}$, C$_{\text{org}}$ (after [Vologina et al., 2012]).](https://www.gt-crust.ru)
amount of terrestrial plant remains. The turbidites are also characterized by minimal values of biogenic components (\(\text{SiO}_2\) biog., \(C_{\text{org}}\), and \(N_{\text{tot}}\)) (Fig. 6). We obtained for the first time results of \(^{32}\text{Si}\) isotope dating of the bottom sediments of Lake Baikal and determined the ages of the last three turbidites as follows: 1030 AD, 1310 AD, and 1670 AD. Events that triggered the formation of these turbidites occurred at intervals of 280 and 360 years, respectively [Morgenstern et al., 2013; Sturm et al., 2016]. Presently, we do not have sufficient data to attribute the formation of these turbidites to any individual earthquake. Nonetheless, the \(^{32}\text{Si}\) dating provides a possibility to search for traces of specific earthquakes in Lake Baikal sediments. The available data show that the sedimentation rate during the formation of the upper 5 cm of core BAIK00-1 was 0.063 cm\(\cdot\)year\(^{-1}\) per year; for the interval 5–40 cm, it was 0.036 cm\(\cdot\)year\(^{-1}\) [Morgenstern et al., 2013]. Two oxidized layers are observed in this core at 0–2 cm and 6–8 cm, respectively (Fig. 6). A buried oxidized layer at the depth of 6–8 cm can indicate an increase in the sedimentation rate after its formation. This core was taken in 2000; the age of the upper 6 cm of this core is approximately 95 years, which means that the oxidized layer was buried around 1905.

The above-mentioned increase in the sedimentation rate could be due to the catastrophic Tannu-Ola seismic events with epicenters in the northwestern Mongolia: the Tsutserleg earthquake of July 9, 1905 (\(M_w=8.0\)), and the Bolnay earthquake of July 23, 1905 (\(M_w=8.3\)) [Kondorskaya, Shebalin, 1982; Schlupp, Cisternas, 2007]. Despite a large epicentral distance (more than 600 km), the shaking intensity in the settlements of the South Baikal region reached a degree of VI–VII. According to the published data, the earthquakes were distinctly manifested in the surrounding environment. In particular, the earthquakes had a significant impact on the water body of Lake Baikal, causing visible short-term fluctuations of the lake water level. According to A.V. Voznesensky (head of the Irkutsk Seismic Station in 1901–1917), waves were observed on the water surfaces of Lake Baikal and other lakes, as well as in rivers of the Baikal region during the Tsutserleg earthquake: "... A rare wave phenomenon on Lake Baikal and in a number of rivers is of particular interest... At the Baklanii railway siding, the wave formed during the earthquake reached 1/5 of sazhen (~42 cm), according to instrumental observations, and the same wave passed all over Lake Baikal and was noticeable even in Dagary, where its height was about 50 mm" [Voznesensky, 1905] (note: Dagary – a village at the NE-termination of Lake Baikal).

The impacts of the Bolnay earthquake of July 23, 1905 at the Baikal Station of CBR were described in the local newspaper "Eastern Review": "... at the time of the earthquake, the water rapidly dropped by one foot, which is why almost all the cables from steamboats and other ships at the pier were broke off" [Earthquake..., 1905]. The Permanent Central Seismic Commission reported that near the Kultuk village located at the southern termination of the lake, "... a phenomenon similar to low tide was observed on Lake Baikal" [Bulletin..., 1907].

Fig. 6. Deep-water core BAIK00-1: photo, lithology data, and contents of \(\text{SiO}_2\) biog, \(N_{\text{tot}}\), \(C_{\text{org}}\) ([Sturm et al., 2016]). Legend – see Fig. 5.

Рис. 6. Фотография колонки, литологическое строение разреза и содержания \(\text{SiO}_2\) biog, \(N_{\text{tot}}\) и \(C_{\text{org}}\) в донных осадках керна BAIK00-1 согласно [Sturm et al., 2016]. Условные обозначения – см. рис. 5.
Thus, it can be concluded that even a distant earthquake is capable to cause significant fluctuations on the water body of Lake Baikal and to trigger turbidity currents on underwater slopes of the lake basin. Seismic events can also lead to a sudden increase of sedimentation rates and to the burial of an oxidized layer, as shown by core BAIK00-1 (Fig. 6). However, the large distance to the epicenter of the May 22, 1912 earthquake did prevent the formation of a pronounced turbidite layer, but the event could still trigger an increase in the sedimentation rate, which is determined by direct $^{29}$Si dating [Morgenstern et al., 2013].

**Proval Bay.** Proval Bay represents an excellent natural example of the relief-forming role of strong earthquakes. It resulted from the catastrophic Tsagan earthquake that occurred in the northern part of the Selenga River delta on January 12, 1862 (December 31, 1861 in the old-style calendar). Its estimated magnitude $M$ was 7.5, and the shaking intensity at the epicenter area reached degree $X$ (MSK-64 scale) [Kondorskaya, Shebalin, 1982; Golenetskii, 1996]. This earthquake caused the subsidence of a tectonic block and the sinking of almost 5 m of a land area of more than 200 km$^2$ into Lake Baikal [Sgibnev, 1864; Shchetnikov et al., 2012]. Consequently, sedimentation conditions in a significant part of the Selenga delta were drastically changed. As the change in the relief is precisely dated, Proval Bay is a perfect reference site for further studies of sedimentation processes in the delta of the largest tributary of Lake Baikal. The sediments in the Proval Bay area are represented by sand, silty clay, and clayish silt. Terrigenous material prevails and consists of clastogenic mineral grains and terrestrial plant debris (wood fragments, plant branches, etc.). Oxidized sediments are dark brown, and TOL varies from 1.5 to 4 cm. The $O_2$-reduced sediments are olive black and brownish black. Sedimentation rates in different parts of Proval Bay vary in a range of 0.232–1.070 cm·year$^{-1}$ and depend directly on the supply of material from the Selenga River [Tulokhonov et al., 2006; Vologina et al., 2010]. In the NE part of the bay, a peat-like layer is observed in core BAIK05-14 (interval 34–55 cm, Fig. 7). In this layer, the number of diatoms increases sharply. Epiphytic periphyton dominates (up to 89 %), among which dominating species are *Staurosirella pinnata* (47–52 %), *Pseudostaurosira breviiata* (13 %), and *Ps. binodis* (11 %). This suggests accumulation of the sediments in a shallow (few meters) pond, overgrown with higher aquatic vegetation. According to the diatom analysis data and $^{210}$Pb dating results, the peat-like layer represents the former deposits of the eutrophic Lake Beloe that existed in the Tsagan steppe before the earthquake of 1862 [Vologina et al., 2010]. Concentrations of SiO$_2$bio, C$_{org}$ and N$_{tot}$ are at a maximum in this layer (Fig. 7). Within the SW part of the bay, the deposition of turbidites is established, probably as a result of flood events of the Selenga River [Vologina et al., 2010].

**5. CONCLUSION**

The study of 246 short gravity cores from different parts of Lake Baikal resulted in the discovery of traces of recent and historical earthquakes in the sediments. A turbidite caused by the earthquake of 1912 has been discovered in a core from South Baikal, which was taken at the water depth >1300 m near the Sharyzhalgai CBR Station. For the first time, three individual turbidites were dated in the sediment core taken at the water depth of 1366 m near the Baikal Neutrino Telescope Station (Ivanovskii Cape, Station 106-km...
of CBR). Based on the analysis, we conclude that these three turbidites formed in 1030 AD, 1310 AD, and 1670 AD (i.e. with intervals of 280 and 360 years). The buried oxidized layer in this core may be due to an increase in the sedimentation rate as a result of the Tannu-Ola earthquakes of 1905 or, possibly, the earthquake of 1912. Another trace of recent seismic activity has been determined by the loss of the uppermost layers of sediments, as observed in the sediments of Middle Baikal, which were affected by the July 16, 2011 earthquake (epicenter in the Turka basin).

The most spectacular example of a huge deterioration of the natural relief results from a strong earthquake is Proval Bay, which appeared after the catastrophic earthquake of 1862, when an area of 200 km² of the Tsagan steppe disappeared in Lake Baikal. In the NE part of this newly formed bay, the peat-like layer at the 34–55 cm core interval represents the former deposits of the eutrophic Lake Beloe that existed in the Tsagan steppe before the earthquake of 1862.

Thus, the sediments of Lake Baikal contain detailed traces of seismic activities within the lake itself and give evidence of seismic events that occurred even at far distances from Lake Baikal.

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7. CONFLICT OF INTEREST

The authors confirm that there are no conflicts of interest.

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### Table 1. List of core samples from the Lake Baikal area (1996–2019)

| Core number | Coordinates | Water depth, m | Core length, cm | Sampling area               |
|-------------|-------------|----------------|-----------------|----------------------------|
| BAIK96-42   | 51.85389, 104.79083 | 100 | 35.4 | South Baikal             |
| BAIK96-43   | 51.70500, 105.00667 | 1450 | 76  | South Baikal             |
| BAIK96-45   | 51.70194, 105.03194 | 1420 | 63  | South Baikal             |
| BAIK96-46   | 53.3139, 107.21472 | 150 | 32  | Maloe More               |
| BAIK96-47   | 53.3139, 107.42194 | 130 | 86  | Maloe More               |
| BAIK96-48   | 53.28483, 107.34767 | 125 | 32  | Maloe More               |
| BAIK96-53   | 53.32472, 107.42083 | 125 | 29  | Maloe More               |
| BAIK96-54   | 53.33222, 107.43722 | 140 | 91  | Maloe More               |
| BAIK96-55   | 53.41333, 107.61167 | 230 | 36.5| Maloe More               |
| BAIK96-56   | 53.51472, 107.74583 | 515 | 51.5| Akademichesky Ridge     |
| BAIK96-57   | 53.59556, 107.87472 | 565 | 76.5| Akademichesky Ridge     |
| BAIK96-58   | 53.61694, 108.29389 | 280 | 66  | Akademichesky Ridge     |
| BAIK96-61   | 53.61750, 108.30028 | 280 | 28.5| Akademichesky Ridge     |
| BAIK96-64   | 53.75167, 108.45944 | 250 | 94  | Akademichesky Ridge     |
| BAIK96-65   | 53.75361, 108.46306 | 250 | 84.4| Akademichesky Ridge     |
| BAIK96-67   | 53.75194, 108.46222 | 250 | 24  | Akademichesky Ridge     |
| BAIK96-69   | 53.77722, 108.11472 | 891 | 32  | North Baikal            |
| BAIK96-70   | 53.77722, 108.40028 | 910 | 40  | North Baikal            |
| BAIK96-71   | 54.21556, 108.52778 | 915 | 60  | Cape Zavorotny, North Baikal |
| BAIK96-72   | 54.23111, 108.46667 | 485 | 59.8| Cape Zavorotny, North Baikal |
| BAIK96-73   | 54.26056, 108.50222 | 535 | 96.3| Cape Zavorotny, North Baikal |
| BAIK96-74   | 54.26000, 108.50167 | 535 | 102 | Cape Zavorotny, North Baikal |
| BAIK96-75   | 54.26083, 108.50194 | 540 | 106 | Cape Zavorotny, North Baikal |
| BAIK96-77   | 54.22472, 108.62972 | 920 | 98.8| Cape Zavorotny, North Baikal |
| BAIK96-78   | 54.23944, 108.80917 | 910 | 61.5| Cape Zavorotny, North Baikal |
| BAIK96-79   | 54.25583, 109.06361 | 850 | 78  | Cape Zavorotny, North Baikal |
| BAIK96-80   | 54.27667, 109.29972 | 345 | 82.8| Cape Zavorotny, North Baikal |
| BAIK96-82   | 54.54722, 109.35917 | 565 | 48.8| North Baikal            |
| BAIK96-83   | 54.55167, 109.20556 | 805 | 86.3| North Baikal            |
| BAIK96-84   | 54.55056, 109.03750 | 915 | 78  | North Baikal            |
| BAIK96-85   | 54.55408, 108.86033 | 915 | 83  | North Baikal            |
| BAIK96-86   | 54.54970, 108.72980 | 885 | 61.6| North Baikal            |
| BAIK96-88   | 55.61333, 109.63333 | 590 | 82  | North Baikal            |
| BAIK96-89   | 55.38750, 109.75667 | 590 | 50.6| North Baikal            |
| BAIK96-92   | 55.44500, 109.50361 | 770 | 81  | North Baikal            |
| BAIK96-94   | 55.50222, 109.22889 | 300 | 84.3| North Baikal            |
| BAIK96-96   | 55.54417, 109.32472 | 300 | 89.8| North Baikal            |
| BAIK96-98   | 55.58722, 109.41361 | 310 | 117 | North Baikal            |
| BAIK96-100  | 55.22778, 109.44722 | 820 | 56.6| North Baikal            |
| BAIK96-101  | 55.04870, 109.36833 | 830 | 70  | North Baikal            |
| BAIK96-102  | 54.85437, 109.26872 | 895 | 85.8| North Baikal            |
| BAIK96-105  | 54.21667, 108.57361 | 940 | 90.4| Cape Zavorotny, North Baikal |
| BAIK96-106  | 54.23056, 108.47444 | 480 | 119.6| Cape Zavorotny, North Baikal |
| BAIK96-107  | 54.20444, 108.47083 | 480 | 131.9| Cape Zavorotny, North Baikal |
### Table 1.

| Core number | Coordinates | Water depth, m | Core length, cm | Sampling area                  |
|-------------|-------------|----------------|----------------|-------------------------------|
| BAIK96-109  | 53.87389 109.16361 | 595            | 65.3            | North Baikal                 |
| BAIK97-01   | 51.60390 104.95947 | 576            | 59              | South Baikal                 |
| BAIK97-02   | 51.64667 104.97500 | 1120           | 82              | South Baikal                 |
| BAIK97-03   | 51.68667 105.00000 | 1434           | 49.7            | South Baikal                 |
| BAIK97-04   | 51.68667 104.94167 | 1410           | 55.5            | South Baikal                 |
| BAIK97-05   | 51.67444 104.87000 | 1200           | 52.1            | South Baikal                 |
| BAIK97-06   | 51.65000 104.73528 | 1070           | 15.4            | South Baikal                 |
| BAIK97-07   | 51.71111 104.95028 | 1430           | 29.2            | South Baikal                 |
| BAIK97-08   | 51.75806 104.91556 | 1410           | 33.7            | South Baikal                 |
| BAIK97-09   | 51.70333 105.08500 | 1430           | 41.7            | South Baikal                 |
| BAIK97-10   | 51.73333 105.17500 | 1435           | 46.9            | South Baikal                 |
| BAIK97-11   | 51.75028 105.23500 | 1436           | 34.8            | South Baikal                 |
| BAIK97-12   | 52.99111 107.46750 | 1580           | 65.5            | Middle Baikal                |
| BAIK97-13   | 53.18667 107.81028 | 1630           | 97.2            | Middle Baikal                |
| BAIK97-14   | 53.52000 108.25417 | 530            | 86.3            | Akademichesky Ridge          |
| BAIK97-15   | 53.59167 108.22000 | 340            | 107.5           | Akademichesky Ridge          |
| BAIK97-16   | 53.59168 108.22002 | 325            | 95              | Akademichesky Ridge          |
| BAIK97-17   | 53.66667 108.18333 | 480            | 47.3            | Akademichesky Ridge          |
| BAIK97-18   | 53.58000 108.06667 | 540            | 95.2            | Akademichesky Ridge          |
| BAIK97-19   | 53.52550 108.09583 | 335            | 56              | Akademichesky Ridge          |
| BAIK97-20   | 53.45250 108.12500 | 515            | 96.8            | Akademichesky Ridge          |
| BAIK97-21   | 53.41083 108.02667 | 490            | 80.5            | Akademichesky Ridge          |
| BAIK97-22   | 53.48333 108.00833 | 360            | 73.3            | Akademichesky Ridge          |
| BAIK97-23   | 53.55000 108.00000 | 515            | 95.7            | Akademichesky Ridge          |
| BAIK97-24   | 54.28167 108.66833 | 905            | 88.5            | Cape Zavorotny, North Baikal |
| BAIK97-25   | 54.34944 109.31667 | 580            | 86.5            | Cape Zavorotny, North Baikal |
| BAIK97-26   | 54.33306 109.12000 | 730            | 43.5            | Cape Zavorotny, North Baikal |
| BAIK97-27   | 54.30750 108.89472 | 830            | 62.5            | Cape Zavorotny, North Baikal |
| BAIK97-28   | 53.40300 107.72083 | 20             | 5.5             | Maloe More                   |
| BAIK97-29   | 53.31667 107.59000 | 50             | 5.7             | Maloe More                   |
| BAIK97-32   | 52.89333 107.3417 | 1420           | 84.5            | Middle Baikal                |
| BAIK97-33   | 52.79417 107.11833 | 1455           | 65              | Middle Baikal                |
| BAIK97-34   | 52.69250 107.20722 | 1340           | 98.5            | Middle Baikal                |
| BAIK97-35   | 52.64139 107.24417 | 963            | 23.4            | Middle Baikal                |
| BAIK97-36   | 51.80667 104.90056 | 1500           | 83.8            | South Baikal                 |
| BAIK97-37   | 51.76775 104.41638 | 1366           | 108.5           | South Baikal                 |
| BAIK97-38   | 51.72550 104.41647 | 1408           | 48.5            | South Baikal                 |
| BAIK97-39   | 51.68882 104.38573 | 1380           | 78.3            | South Baikal                 |
| BAIK97-40   | 51.63478 104.39817 | 1295           | 96.5            | South Baikal                 |
| BAIK97-41   | 51.59883 104.40695 | 1140           | 29.2 (29.4)     | South Baikal                 |
| BAIK97-42   | 51.56260 104.46063 | 990            | 10.4            | South Baikal                 |
| BAIK97-43   | 51.53527 104.41187 | 719            | 42              | South Baikal                 |
| BAIK97-44   | 51.51667 104.41667 | 803            | 104             | South Baikal                 |
| BAIK97-45   | 52.08833 105.84667 | 180            | 94.1 (94.5)     | Posolskaya Bank, South Baikal|
| BAIK97-46   | 52.07833 105.88333 | 66             | 88              | Posolskaya Bank, South Baikal|
| Core number | Coordinates | Water depth, m | Core length, cm | Sampling area |
|-------------|-------------|---------------|----------------|--------------|
| BAIK00-12   | 52.07222 105.88333 | 405 | 81.2 | Posolskaya Bank, South Baikal |
| BAIK00-13   | 52.04333 105.92667 | 700 | 98.2 | Posolskaya Bank, South Baikal |
| BAIK00-14   | 52.12944 105.90000 | 364 | 89.5 | Posolskaya Bank, South Baikal |
| BAIK00-15   | 52.00000 105.93630 | 1200 | 107.8 | South Baikal |
| BAIK00-16   | 51.90000 105.86667 | 1328 | 85.5 | South Baikal |
| BAIK00-17   | 51.83333 105.54147 | 1450 | 56.4 | South Baikal |
| BAIK00-18   | 51.77944 105.37639 | 1500 | 74.2 | South Baikal |
| BAIK00-19   | 51.52861 104.94056 | 31 | 64.2 (64.7) | South Baikal |
| BAIK00-20   | 51.52861 104.94050 | 11 | 22.3 (23.3) | South Baikal |
| BAIK00-21   | 51.60164 104.93183 | 660 | 94.5 | South Baikal |
| BAIK00-22   | 51.64078 104.89431 | 1200 | 97.7 | South Baikal |
| BAIK00-23   | 51.59386 104.85097 | 700 | 112.3 | South Baikal |
| BAIK00-26   | 51.73856 104.61706 | 1430 | 45.3 | South Baikal |
| BAIK00-27   | 51.68786 103.76931 | 340 | 112.5 | South Baikal |
| BAIK00-29   | 51.67328 103.94214 | 868 | 87.7 | South Baikal |
| BAIK00-31   | 51.74119 104.75117 | 1430 | 36.9 | South Baikal |
| BAIK00-32   | 51.70731 105.02178 | 1436 | 76.9 | South Baikal |
| BAIK00-35A  | 54.47777 108.62323 | 898 | 84 | North Baikal |
| BAIK00-6    | 54.47003 108.75482 | 925 | 108.5 | North Baikal |
| BAIK00-7    | 54.46395 108.90553 | 933 | 101.2 | North Baikal |
| BAIK00-8C   | 54.45925 109.06433 | 904 | 112 | North Baikal |
| BAIK00-9B   | 54.45292 109.17333 | 875 | 125.5 | North Baikal |
| BAIK00-16   | 53.89098 108.85817 | 590 | 127 | Continent Ridge, North Baikal* |
| BAIK00-17   | 53.92627 108.90813 | 402 | 129 | Continent Ridge, North Baikal |
| BAIK00-19C  | 53.95393 108.91340 | 389 | 135.5 | Continent Ridge, North Baikal |
| BAIK00-21   | 53.96390 108.93590 | 414 | 141.5 | Continent Ridge, North Baikal |
| BAIK00-22   | 53.96628 108.92217 | 399 | 136 | Continent Ridge, North Baikal |
| BAIK00-24   | 53.94367 108.90480 | 364 | 153.3 | Continent Ridge, North Baikal |
| BAIK00-25   | 53.92015 108.87442 | 368 | 31.3 | Continent Ridge, North Baikal |
| BAIK00-26   | 53.92588 108.88132 | 353 | 126 | Continent Ridge, North Baikal |
| BAIK00-27A  | 53.73635 108.27950 | 400 | 88 | Academichesky Ridge |
| BAIK00-28A  | 52.08643 105.85788 | 157 | 114 | Posolskaya Bank, South Baikal |
| BAIK00-29M  | 52.07768 105.85755 | 128 | 58.7 | Posolskaya Bank, South Baikal |
| BAIK00-33   | 52.09027 105.83840 | 194 | 75.1 | Posolskaya Bank, South Baikal |
| BAIK00-34C  | 51.56870 104.85452 | 628 | 67.5 | South Baikal |
| BAIK00-35B  | 51.60138 104.91173 | 728 | 63.5 | South Baikal |
| BAIK00-36A  | 51.70780 105.02207 | 1491 | 66.7 | South Baikal |
| BAIK02-1    | 51.61388 104.74748 | 1190 | 47 | South Baikal |
| BAIK02-3B   | 51.71087 105.02318 | 1490 | 52 | South Baikal |
| BAIK02-4A   | 53.95467 108.91613 | 390 | 21.3 | Continent Ridge, North Baikal |
| BAIK02-5B   | 54.08613 108.99882 | 800 | 39 | North Baikal |
| BAIK02-6A   | 54.46493 109.07152 | 905 | 28.7 | North Baikal |
| Core number | Coordinates | Water depth, m | Core length, cm | Sampling area          |
|-------------|-------------|----------------|----------------|------------------------|
| BAIK02-7A   | 54.00790    | 108.94515      | 502            | 84.8                   | North Baikal           |
| BAIK02-8    | 53.98828    | 108.93832      | 442            | 75                     | North Baikal           |
| BAIK02-10   | 53.95295    | 109.00433      | 618            | 71.5                   | Continent Ridge, North Baikal |
| BAIK02-11   | 53.95373    | 108.95178      | 463            | 89.5                   | Continent Ridge, North Baikal |
| BAIK02-12   | 53.92693    | 108.95608      | 529            | 89.2                   | Continent Ridge, North Baikal |
| BAIK02-13B  | 53.43467    | 108.72345      | 157            | 70                     | Barguzinsky Bay        |
| BAIK02-14   | 53.96552    | 108.79877      | 850            | 41.5                   | Continent Ridge, North Baikal |
| BAIK02-15   | 53.92143    | 108.81625      | 630            | 80.3                   | Continent Ridge, North Baikal |
| BAIK02-16   | 53.96277    | 108.85810      | 650            | 71.5                   | Continent Ridge, North Baikal |
| BAIK02-17   | 53.90910    | 108.85848      | 380            | 83.3                   | Continent Ridge, North Baikal |
| BAIK03-2    | 53.18383    | 107.79422      | 1700           | 63.3                   | Middle Baikal          |
| BAIK03-3    | 53.93753    | 108.86722      | 447            | 91                     | Continent Ridge, North Baikal |
| BAIK03-6    | 53.93552    | 108.89900      | 367            | 80                     | Continent Ridge, North Baikal |
| BAIK03-8    | 53.95527    | 108.92855      | 406            | 81.5                   | Continent Ridge, North Baikal |
| BAIK03-12   | 53.97132    | 108.91272      | 411            | 60.3                   | Continent Ridge, North Baikal |
| BAIK03-14   | 53.96977    | 108.96032      | 442            | 81.3                   | Continent Ridge, North Baikal |
| BAIK03-15   | 54.08317    | 109.00643      | 785            | 45                     | Continent Ridge, North Baikal |
| BAIK03-18   | 53.89652    | 108.86775      | 570            | 75.5                   | Continent Ridge, North Baikal |
| BAIK03-19   | 53.90945    | 108.87125      | 450            | 88.3                   | Continent Ridge, North Baikal |
| BAIK03-22   | 53.33362    | 107.43737      | 158            | 73.8                   | Maloe More              |
| BAIK03-26   | 51.79910    | 105.48635      | 1500           | 64                     | South Baikal           |
| BAIK03-27   | 51.60560    | 104.91140      | 721            | 77                     | South Baikal           |
| BAIK04-2    | 53.59572    | 107.96242      | 258            | 94                     | Akademichesky Ridge    |
| BAIK04-4    | 52.48355    | 106.09525      | 386            | 75.4                   | Buguldeika Ridge       |
| BAIK05-4    | 52.36505    | 106.77527      | 2.5            | 94.3                   | Proval Bay              |
| BAIK05-5    | 52.35343    | 106.74990      | 2.5            | 73.8                   | Proval Bay              |
| BAIK05-9    | 52.34238    | 106.7223       | 2              | 99.5                   | Proval Bay              |
| BAIK05-10   | 52.38230    | 106.78772      | 3.84           | 98                     | Proval Bay              |
| BAIK05-11   | 52.38230    | 106.78772      | 3.84           | 102                    | Proval Bay              |
| BAIK05-13   | 52.39967    | 106.75100      | 4.1            | 98.5                   | Proval Bay              |
| BAIK05-14   | 52.42138    | 106.81568      | 4.73           | 97                     | Proval Bay              |
| BAIK08-1    | 51.78977    | 104.41488      | 550            | 76                     | South Baikal           |
| BAIK08-2    | 51.76795    | 104.43118      | 1360           | 41.9                   | South Baikal           |
| BAIK09-4    | 51.76782    | 104.43108      | 1367           | 45.8                   | South Baikal           |
| BAIK10-1    | 51.78977    | 104.41488      | 550            | 82.5                   | South Baikal           |
| BAIK10-3    | 51.78977    | 104.41488      | 550            | 72.2                   | South Baikal           |
| BAIK10-4    | 51.78977    | 104.41488      | 550            | 82                     | South Baikal           |
| BAIK10-5    | 51.71717    | 103.97620      | 1300           | 49                     | South Baikal           |
| BAIK10-6    | 51.73058    | 103.97355      | 1250           | 51.3                   | South Baikal           |
| BAIK10-7    | 51.76000    | 105.02500      | 1597           | 33 (34)                | South Baikal           |
| BAIK10-8    | 53.61500    | 108.02194      | 490            | 29.5                   | Akademichesky Ridge    |
| BAIK10-8/I  | 53.61500    | 108.02194      | 492            | 20.6 (21.4)            | Akademichesky Ridge    |
| BAIK10-9    | 53.46688    | 107.69788      | 420            | 57.5                   | Maloe More              |
| BAIK10-10   | 53.47383    | 107.71055      | 435            | 77.8                   | Maloe More              |
| BAIK10-11   | 53.70361    | 108.23945      | 383            | 18.8                   | Akademichesky Ridge    |

Table 1. (continued)
Таблица 1. (продолжение)
Table 1. (continued)

| Core number | Coordinates | Water depth, m | Core length, cm | Sampling area |
|-------------|-------------|----------------|-----------------|---------------|
| BAIK10-11.1 | 53.70361    | 108.23945      | 383             | 25.3          | Akademichesky Ridge |
| BAIK10-12   | 54.12880    | 108.33848      | 280             | 56.6          | Cape Zavorotny, North Baikal |
| BAIK10-13   | 54.16750    | 108.41267      | 350             | 71.5          | Cape Zavorotny, North Baikal |
| BAIK10-14   | 54.24658    | 108.45422      | 485             | 54            | Cape Zavorotny, North Baikal |
| BAIK10-15   | 54.45528    | 109.06472      | 900             | 57.2          | North Baikal |
| BAIK10-18   | 54.45658    | 109.05708      | 900             | 47            | North Baikal |
| BAIK10-19.1 | 54.23805    | 108.80440      | 925             | 44.8          | North Baikal |
| BAIK10-20   | 52.87622    | 107.17822      | 1492            | 68.2          | Middle Baikal |
| BAIK10-21   | 52.89107    | 107.15567      | 1450            | 56            | Middle Baikal |
| BAIK10-22   | 52.88610    | 107.17140      | 1475            | 55.3          | Middle Baikal |
| BAIK10-25   | 51.67680    | 103.87158      | 1220            | 35.2 (36.5)   | South Baikal |
| BAIK10-26   | 51.67638    | 103.86993      | 1372            | 39.6          | South Baikal |
| BAIK10-27   | 51.68106    | 103.86263      | 1240            | 34            | South Baikal |
| BAIK10-28   | 51.67725    | 103.86235      | 1200            | 36            | South Baikal |
| BAIK10-29   | 51.67725    | 103.87218      | 1230            | 39.9          | South Baikal |
| BAIK10-30   | 51.67776    | 103.86683      | 1214            | 40.4          | South Baikal |
| BAIK10-31   | 51.67980    | 103.86978      | 1385            | 38.5          | South Baikal |
| BAIK10-32   | 51.67867    | 103.86645      | 1399            | 34.3          | South Baikal |
| BAIK11-3    | 52.56273    | 106.36597      | 945             | 46.7          | Middle Baikal |
| BAIK11-4    | 52.58702    | 106.40280      | 1076            | 67.7          | Middle Baikal |
| BAIK11-6    | 52.61187    | 106.39748      | 1045            | 58.7          | Middle Baikal |
| BAIK11-7    | 52.60825    | 106.45970      | 1110            | 53.8          | Middle Baikal |
| BAIK11-9    | 52.99607    | 108.04603      | 660             | 19.7          | Middle Baikal |
| BAIK11-10   | 52.99577    | 108.04395      | 660             | 68.9          | Middle Baikal |
| BAIK11-11   | 52.44245    | 106.05030      | 449             | 64.3          | Buguldeika Ridge |
| BAIK11-12   | 52.45145    | 106.01930      | 490             | 65            | Buguldeika Ridge |
| BAIK12-1    | 51.71711    | 103.97635      | 1300            | 38.5          | South Baikal |
| BAIK12-2    | 51.69955    | 103.97663      | 1300            | 49.1          | South Baikal |
| BAIK12-3    | 51.70987    | 103.95000      | 1300            | 39.3          | South Baikal |
| BAIK13-1A   | 51.76789    | 104.41631      | 1360            | 49.3          | South Baikal |
| BAIK13-2    | 51.74006    | 104.37164      | 1360            | 34.5          | South Baikal |
| BAIK13-3    | 51.71458    | 104.32931      | 1360            | 33.9          | South Baikal |
| BAIK13-4C   | 51.69272    | 104.30003      | 1360            | 38.3          | South Baikal |
| BAIK13-5A   | 51.65053    | 104.27411      | 1350            | 43.4          | South Baikal |
| BAIK13-6A   | 51.76764    | 104.41617      | 1360            | 78.1          | South Baikal |
| BAIK13-7B   | 51.56853    | 104.52861      | 1080            | 47.2          | South Baikal |
| BAIK13-10B  | 52.18528    | 106.09389      | 66              | 54            | South Baikal |
| BAIK13-11A  | 52.45000    | 106.12556      | 345             | 63.3          | Buguldeika Ridge |
| BAIK13-14B  | 53.35055    | 107.49808      | 200             | 29 (30)       | Maloe More |
| BAIK13-15B  | 53.38783    | 107.58910      | 220             | 29.8 (30.5)   | Maloe More |
| BAIK13-16A  | 53.87389    | 109.16361      | 650             | 58.4          | Chivyrkyi Bay |
| BAIK13-18C  | 54.78953    | 109.24083      | 910             | 64.7          | North Baikal |
| BAIK13-19A  | 55.64939    | 109.78269      | 460             | 71            | North Baikal |
| BAIK13-20B  | 52.29539    | 106.13389      | 40              | 10.3 (11)     | Area near the Selenga river delta, South Baikal |
| BAIK13-21C  | 52.22539    | 106.10431      | 76              | 43.5 (44.5)   | Area near the Selenga river delta, South Baikal |
Table 1. (continued)

| Core number | Coordinates | Water depth, m | Core length, cm | Sampling area                      |
|-------------|-------------|----------------|-----------------|-----------------------------------|
| BAIK14-2    | 51.70523    | 105.01030      | 1400            | 53 (54) South Baikal              |
| BAIK14-3    | 51.77765    | 105.37457      | 1420            | 50.5 (51) South Baikal            |
| BAIK14-4    | 52.77600    | 107.61502      | 930             | 43 (45) Middle Baikal             |
| BAIK14-5    | 53.62473    | 108.12560      | 370             | 37 (38) Akademichesky Ridge       |
| BAIK14-6    | 54.45098    | 109.06720      | 860             | 25 (26) North Baikal              |
| BAIK14-7    | 55.71857    | 109.62233      | 480             | 25 (25.5) North Baikal            |
| BAIK14-8    | 54.61957    | 109.11612      | 784             | 49.7 North Baikal                 |
| BAIK14-9    | 53.19308    | 107.80582      | 1680            | 44.3 Middle Baikal                |
| BAIK14-10   | 52.88260    | 107.17037      | 1385            | 42 (43) Middle Baikal             |
| BAIK15-1    | 51.638172   | 104.671785     | 1235            | 1.8 (2) South Baikal              |
| BAIK15-2    | 51.639445   | 104.673812     | 1246            | 29.2 South Baikal                 |
| BAIK15-3    | 51.605492   | 104.734305     | 1078            | 18.5 (20) South Baikal            |
| BAIK16-1    | 51.563800   | 104.230100     | 859             | 13.8 South Baikal                 |
| BAIK16-2    | 51.654933   | 104.421750     | 1307            | 16.7 (17.5) South Baikal          |
| BAIK16-3    | 51.778550   | 105.367067     | 1433            | 38 (39) South Baikal              |
| BAIK16-4    | 51.972150   | 105.350100     | 477             | 34 (34.5) South Baikal            |
| BAIK16-5    | 52.030300   | 105.955233     | 712             | 42 Posolskaya Bank, South Baikal  |
| BAIK16-6    | 53.524433   | 108.397483     | 1520            | 41 (42) Middle Baikal             |
| BAIK16-7    | 53.600683   | 108.168633     | 455             | 35 (36) Akademichesky Ridge       |
| BAIK17-1    | 51.767950   | 104.431183     | 1366            | 69 South Baikal                   |
| BAIK18-1    | 51.767933   | 104.415800     | 1366            | 59 South Baikal                   |
| BAIK19-1    | 51.767933   | 104.415800     | 1366            | 73.3 South Baikal                 |

Note. *Continent Ridge is the term used in international literature to designate the northeastern extension of the subaquatic Akademichesky Ridge in the southern part of North Baikal. This term refers to the EU-Project CONTINENT that included bottom sediment sampling in this area and comprehensive analysis of the sediments.*

Примечание. «Continent Ridge» – возвышенность в южной части Северного Байкала. Отбор и всестороннее исследование донных осадков из этого района были выполнены в рамках международного проекта «Континент». По этой причине в международной литературе данный район Байкала обозначается как «Continent Ridge».