

ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ
Қ. И. Сәтпаев атындағы Қазақ ұлттық техникалық зерттеу университеті

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН
Казакский национальный исследовательский
технический университет им. К. И. Сатпаева

NEWS

OF THE ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
Kazakh national research technical university
named after K. I. Satpayev

ГЕОЛОГИЯ ЖӘНЕ ТЕХНИКАЛЫҚ ҒЫЛЫМДАР СЕРИЯСЫ



СЕРИЯ ГЕОЛОГИИ И ТЕХНИЧЕСКИХ НАУК



SERIES OF GEOLOGY AND TECHNICAL SCIENCES

4 (430)

ШІЛДЕ – ТАМЫЗ 2018 ж.
ИЮЛЬ – АВГУСТ 2018 г.
JULY – AUGUST 2018

ЖУРНАЛ 1940 ЖЫЛДАН ШЫҒА БАСТАҒАН
ЖУРНАЛ ИЗДАЕТСЯ С 1940 г.
THE JOURNAL WAS FOUNDED IN 1940.

ЖЫЛЫНА 6 РЕТ ШЫҒАДЫ
ВЫХОДИТ 6 РАЗ В ГОД
PUBLISHED 6 TIMES A YEAR

NAS RK is pleased to announce that News of NAS RK. Series of geology and technical sciences scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of News of NAS RK. Series of geology and technical sciences in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential content of geology and engineering sciences to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді геология және техникалық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия геологии и технических наук» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Известия НАН РК. Серия геологии и технических наук в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по геологии и техническим наукам для нашего сообщества.

Б а с р е д а к т о р ы

э. ғ. д., профессор, ҚР ҰҒА академигі

И.К. Бейсембетов

Бас редакторының орынбасары

Жолтаев Г.Ж. проф., геол.-мин. ғ. докторы

Р е д а к ц и я а л қ а с ы:

Абаканов Т.Д. проф. (Қазақстан)
Абишева З.С. проф., академик (Қазақстан)
Агабеков В.Е. академик (Беларусь)
Алиев Т. проф., академик (Әзірбайжан)
Бакиров А.Б. проф., (Қырғыстан)
Беспәев Х.А. проф. (Қазақстан)
Бишимбаев В.К. проф., академик (Қазақстан)
Буктуков Н.С. проф., академик (Қазақстан)
Булат А.Ф. проф., академик (Украина)
Ганиев И.Н. проф., академик (Тәжікстан)
Грэвис Р.М. проф. (АҚШ)
Ерғалиев Г.К. проф., академик (Қазақстан)
Жуков Н.М. проф. (Қазақстан)
Кенжалиев Б.К. проф. (Қазақстан)
Қожахметов С.М. проф., академик (Қазақстан)
Конторович А.Э. проф., академик (Ресей)
Курскеев А.К. проф., академик (Қазақстан)
Курчавов А.М. проф., (Ресей)
Медеу А.Р. проф., академик (Қазақстан)
Мұхамеджанов М.А. проф., корр.-мүшесі (Қазақстан)
Нигматова С.А. проф. (Қазақстан)
Оздоев С.М. проф., академик (Қазақстан)
Постолатий В. проф., академик (Молдова)
Ракишев Б.Р. проф., академик (Қазақстан)
Сейтов Н.С. проф., корр.-мүшесі (Қазақстан)
Сейтмуратова Э.Ю. проф., корр.-мүшесі (Қазақстан)
Степанец В.Г. проф., (Германия)
Хамфери Дж.Д. проф. (АҚШ)
Штейнер М. проф. (Германия)

«ҚР ҰҒА Хабарлары. Геология мен техникалық ғылымдар сериясы».

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.).

Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 30.04.2010 ж. берілген №10892-Ж мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Мерзімділігі: жылына 6 рет.

Тиражы: 300 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
<http://nauka-nanrk.kz/geology-technical.kz>

© Қазақстан Республикасының Ұлттық ғылым академиясы, 2018

Редакцияның Қазақстан, 050010, Алматы қ., Қабанбай батыра көш., 69а.

мекенжайы: Қ. И. Сәтбаев атындағы геология ғылымдар институты, 334 бөлме. Тел.: 291-59-38.

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

Г л а в н ы й р е д а к т о р
д. э. н., профессор, академик НАН РК

И. К. Бейсембетов

Заместитель главного редактора

Жолтаев Г.Ж. проф., доктор геол.-мин. наук

Р е д а к ц и о н н а я к о л л е г и я:

Абаканов Т.Д. проф. (Казахстан)
Абишева З.С. проф., академик (Казахстан)
Агабеков В.Е. академик (Беларусь)
Алиев Т. проф., академик (Азербайджан)
Бакиров А.Б. проф., (Кыргызстан)
Беспаяев Х.А. проф. (Казахстан)
Бишимбаев В.К. проф., академик (Казахстан)
Буктуков Н.С. проф., академик (Казахстан)
Булат А.Ф. проф., академик (Украина)
Ганиев И.Н. проф., академик (Таджикистан)
Грэвис Р.М. проф. (США)
Ергалиев Г.К. проф., академик (Казахстан)
Жуков Н.М. проф. (Казахстан)
Кенжалиев Б.К. проф. (Казахстан)
Кожаметов С.М. проф., академик (Казахстан)
Конторович А.Э. проф., академик (Россия)
Курскеев А.К. проф., академик (Казахстан)
Курчавов А.М. проф., (Россия)
Медеу А.Р. проф., академик (Казахстан)
Мухамеджанов М.А. проф., чл.-корр. (Казахстан)
Нигматова С.А. проф. (Казахстан)
Оздоев С.М. проф., академик (Казахстан)
Постолатий В. проф., академик (Молдова)
Ракишев Б.Р. проф., академик (Казахстан)
Сейтов Н.С. проф., чл.-корр. (Казахстан)
Сейтмуратова Э.Ю. проф., чл.-корр. (Казахстан)
Степанец В.Г. проф., (Германия)
Хамфери Дж.Д. проф. (США)
Штейнер М. проф. (Германия)

«Известия НАН РК. Серия геологии и технических наук».

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан (г. Алматы)

Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан №10892-Ж, выданное 30.04.2010 г.

Периодичность: 6 раз в год

Тираж: 300 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел.: 272-13-19, 272-13-18,
<http://nauka-nanrk.kz/geology-technical.kz>

© Национальная академия наук Республики Казахстан, 2018

Адрес редакции: Казахстан, 050010, г. Алматы, ул. Кабанбай батыра, 69а.

Институт геологических наук им. К. И. Сатпаева, комната 334. Тел.: 291-59-38.

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

E d i t o r i n c h i e f

doctor of Economics, professor, academician of NAS RK

I. K. Beisembetov

Deputy editor in chief

Zholtayev G.Zh. prof., dr. geol-min. sc.

E d i t o r i a l b o a r d:

Abakanov T.D. prof. (Kazakhstan)
Abisheva Z.S. prof., academician (Kazakhstan)
Agabekov V.Ye. academician (Belarus)
Aliyev T. prof., academician (Azerbaijan)
Bakirov A.B. prof., (Kyrgyzstan)
Bespayev Kh.A. prof. (Kazakhstan)
Bishimbayev V.K. prof., academician (Kazakhstan)
Buktukov N.S. prof., academician (Kazakhstan)
Bulat A.F. prof., academician (Ukraine)
Ganiyev I.N. prof., academician (Tadjikistan)
Gravis R.M. prof. (USA)
Yergaliev G.K. prof., academician (Kazakhstan)
Zhukov N.M. prof. (Kazakhstan)
Kenzhaliyev B.K. prof. (Kazakhstan)
Kozhakhmetov S.M. prof., academician (Kazakhstan)
Kontorovich A.Ye. prof., academician (Russia)
Kurskeyev A.K. prof., academician (Kazakhstan)
Kurchavov A.M. prof., (Russia)
Medeu A.R. prof., academician (Kazakhstan)
Muhamedzhanov M.A. prof., corr. member. (Kazakhstan)
Nigmatova S.A. prof. (Kazakhstan)
Ozdoev S.M. prof., academician (Kazakhstan)
Postolatii V. prof., academician (Moldova)
Rakishev B.R. prof., academician (Kazakhstan)
Seitov N.S. prof., corr. member. (Kazakhstan)
Seitmuratova Ye.U. prof., corr. member. (Kazakhstan)
Stepanets V.G. prof., (Germany)
Humphery G.D. prof. (USA)
Steiner M. prof. (Germany)

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)

The certificate of registration of a periodic printed publication in the Committee of information and archives of the Ministry of culture and information of the Republic of Kazakhstan N 10892-Ж, issued 30.04.2010

Periodicity: 6 times a year

Circulation: 300 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
<http://nauka-nanrk.kz/geology-technical.kz>

© National Academy of Sciences of the Republic of Kazakhstan, 2018

Editorial address: Institute of Geological Sciences named after K.I. Satpayev
69a, Kabanbai batyr str., of. 334, Almaty, 050010, Kazakhstan, tel.: 291-59-38.

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF GEOLOGY AND TECHNICAL SCIENCES

ISSN 2224-5278

Volume 3, Number 430 (2018), 69 – 73

UDC 577.472

A. A. Ismailova¹, A. K. Zhamangara², S. K. Sagnayeva²,
G. D. Kaziyeva², A. I. Abakumov³, S. Ya. Park³

¹S. Seifullin Kazakh Agrotechnical University, Astana, Kazakhstan,

²L. N. Gumilyov Eurasian National University, Astana, Kazakhstan,

³Institute of Automation and Control Processes, FEB RAS, Vladivostok, Russia.

E-mail: a.ismailova@mail.ru, kashagankizi@mail.ru, sagnaeva_tar@mail.ru, gulya_kz@mail.ru,
abakumov@iacp.dvo.ru, park@iacp.dvo.ru

TECHNOLOGIES OF INFORMATION MONITORING BIOGENS LAKES OF KAZAKHSTAN

Abstract. Data on mineral substances on basis of nitrogen and phosphorus for the years 2007-2013 were analyzed based on statistics. Dynamic characteristics and seasonal features of changes were identified in the concentrations of substances. Seasonal factor plays a substantial role in changing nutrient concentrations. In the averaged year dynamics of substances concentrations are more diverse in the spring and early summer compared with the second half of the year. Spring effects may be related to the intensive development of phytoplankton. Autumn is also an outbreak of phytoplankton biomass, which can affect the concentrations of ammonium and phosphorus. In general, the concentration of phosphorus compounds is more stable, which may favorably affect the life of phytoplankton species which are fond of phosphorus.

Keywords: hydrobiology, hydrochemistry, trend, statistical analysis, correlation matrix, classification of lakes.

Introduction. Hydrobiological studies of the reservoirs of Kazakhstan (lakes Ashykol and Kumkol, Burabai and Ulken Shabakty, the Ural River, etc.) were carried out by a number of scientists: Khusainova N. [1], Akbaeva L., Zhamangar A. [2], Maikanov B. [3], Burlibaev M. [4], Zaitsev V.F. [5] and others.

Nitrogen and phosphorus have basic value for an aquatic ecosystem functioning. They provide phytoplankton with food during photosynthesis and play an important role in the ecosystem of the reservoir. Phytoplankton is indicator of aquatic ecosystem state. We investigate a dynamics of nitrogen and phosphorus contents in two lakes of important recreational area of Kazakhstan [6].

Thanks to the enrichment of nutrients in water bodies, the productivity of not only phytoplankton increases, but also the productivity of aquatic communities, including fish, which is considered an economically advantageous process. However, in many cases spontaneous anthropogenic enrichment of reservoirs with primary nutrients occurs on a scale that overloads the water body as an ecosystem with biogens. As a result, there is a very rapid development of phytoplankton («flowering» of water), the decomposition of which leads to the release of hydrogen sulphide or other toxic substances. This leads to the death of the animal population of water

Lake Burabai and lake Ulken Shabakty are located in Shchuchinsk-Borovoye resort area. This area has great recreational and tourist value. At the same time, the ecological status of the region is quite complicated. Pollution exceeding maximum permissible concentration (MPC) is captured in a village Borovoye. Major complexes of recreation institutions, fixed on the coast lakes Burabai, Ulken Shabakty and extends along the highways. As a result of irretrievable water intake for industrial and drinking and sanitary needs, plowing on the slopes, deforestation in the catchment area pollutants and organic substances are washed away, which increases the processes of lake siltation [7].

Study of mineral substances on base nitrogen and phosphorus allows to identify patterns of condition and dynamics of hydrobiological indicators. This leads to an assessment of the environmental condition of the reservoir [8].

Materials and methods. Lake Burabai - located within Kokshetau Highland, at the eastern foot of Kokshe, north of Lake Shchuchye. Area of water surface is approximately 11 square kilometers. The average depth of the lake is 3.4 m, maximum depth is observed in the north and makes up to 7 m. Water surface of the lake is mostly open, only the western and north-western coasts covered with reeds and rushes.

Lake Ulken Shabakty - the largest lake among Burabai group which is located 16.5 km to the north of Schuchinks. Water surface area is about 23 square kilometers. The average depth of the lake is 11.1 m, maximum - 33.3 m. The lake is open without aquatic vegetation, which is explained by the presence of the great depths [9].

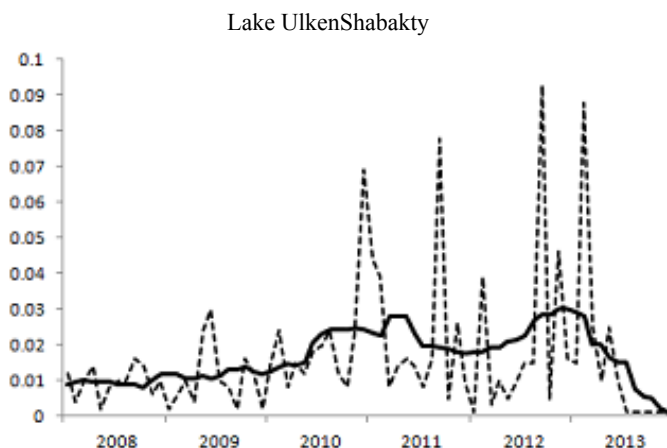
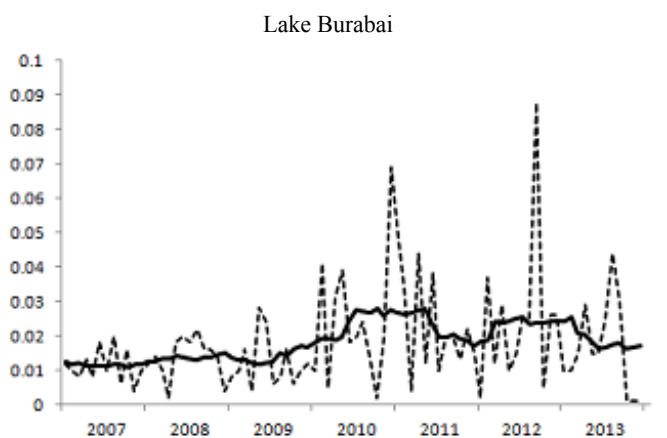
By the degree of pollution, the Lakes Burabai and Ulken Shabakty can be currently classified as between "clean" and "moderately polluted". All indicators of the lakes belonged to the "pure" in 2009 year, and in subsequent years, such parameters as dissolved oxygen, ammonia nitrogen and pH indicate some water pollution..

Results and discussion. The nitrogen is presented the nitrite compounds, nitrates and ammonium salts. Under phosphorus we mean the total phosphorus. These substances on basis nitrogen and phosphorus we mean here as mineral substances. We have data from 2007 to 2013 years for Lake Burabai and from 2008 to 2013 years for Lake Ulken Shabakty [10].

Trend analysis of mineral substances with averaging of 12 months (figure) show an increasing of pollutions in 2010 - 2011 years. These trends show interannual variability for concentration of mineral substances. The concentrations of all substances have bigger values in second half of time period. This fact is shown that the pollution in both lakes increased in this period. But the seasonal fluctuations are large enough compared to the interannual variability. Seasonal factor plays a significant role in changing

Trends(solid lines) of concentrations of total phosphorus on basis data of measures (dashed lines).

On vertical axis is the concentration of substance in mg/l, on horizontal axes years are specified



mineral substances concentrations too. Trend analysis showed that seasonal oscillations of concentrations of substances are sufficiently large.

Data on phosphorus load presented in figure show that in 2007-2008 lakes were close to oligotrophic and in 2012-2013 have already approached the mesotrophic reservoirs. Currently, according to the classification of the content of total phosphorus, both lakes relate to mesosaprobic type [11-14].

The application of methods of statistical processing of environmental research results makes it possible to obtain quantitative characteristics of the distribution of organisms that are suitable for comparison, to carry out the very procedure of comparison, and to establish the dependence between the individual variables characterizing the habitat [15].

Statistical data analysis was begun from test of the hypothesis about lognormal distribution for data. The presence of the lognormal distribution provides to use traditional criteria Student, Pearson, Fisher, etc. to analyze the data in a logarithmic scale. Data from all four substances are tested on the lognormal distribution for each lake. [16]. We use Pearson criterion for this test. Nitrate, ammonia and phosphorus have lognormal distribution with significance level 0.05. Nitrite has this distribution for Lake Ulken Shabakty but it has not for Lake Burabai.

In the averaged year dynamics of substances concentrations are more diverse in the spring and early summer compared with the second half of the year, although "outbursts" do happen in the ammonium and phosphorus in the fall and early winter. Spring effects may be associated with the arrival of melt water and intensive development of phytoplankton. Flashes also occur in autumn in the phytoplankton biomass, which can affect the concentrations of ammonium and phosphorus.

Data which are not included in the confidence intervals were allocated. When data were reanalyzed it is revealed that there are indicators, the absolute values of which lie outside the boundaries of the confidence intervals. The proportion of such points varies from 0.083 to 0.286. These deviations do not have any natural character of manifestations; that is they do not depend on the season or on the reservoir in which they are recorded. Number of such points is almost always within 20%. In our view, this indicates a satisfactory quality of data collection and a good reliability.

The correlation matrix for substances concentrations
the lakes Burabai (above the main diagonal) and Ulken Shabakty (below the main diagonal)

	Nitrite nitrogen	Nitrate nitrogen	Ammonia nitrogen	Total phosphorus
Nitrite nitrogen	1.000	0.465	0.072	0.233
Nitrate nitrogen	0.154	1.000	0.216	0.137
Ammonia nitrogen	0.116	0.157	1.000	-0.123
Total phosphorus	0.134	0.236	0.204	1.000

Rigid links between the concentrations of substances in each lake are not separately identified, substances behave relatively independently. Only nitrates and nitrites of Burabai lake have significant connections (table). This may mean that their delivery to the lake and phytoplankton consumption are not synchronized, that is substances come from various sources and converted with independent to each other speeds.

The obtained results on trends indicate that seasonal variations are large enough compared to the interannual. Seasonal factor plays a substantial role in changing nutrient concentrations. Testing for normal distribution of the substance concentration logarithms shows that the lake Burabai "lives" mainly due to natural factors or many small artificial factors. In the lake Ulken Shabakty there are probably artificial sources of nitrites and nitrates, "concealing" lognormal distribution patterns.

In the averaged year dynamics of substances concentrations are more diverse in the spring and early summer compared with the second half of the year, although there are "outbursts" in the ammonium and phosphorus which occur in the fall and early winter. Spring effects may be related to the intensive development of phytoplankton. Autumn is also an outbreak of phytoplankton biomass, which can affect the concentrations of ammonium and phosphorus. In general, the concentration of phosphorus compounds is more stable, which may favorably affect the life of phytoplankton species which are fond of phosphorus [17, 18].

Refilling the database on lakes would enhance data processing, including statistical data processing. It is anticipated that there is a possibility of using a dynamic mathematical model for the joint analysis of hydrobiological and hydrochemical information [19-21]. These models give us the possibility for analysis of functioning of aquatic ecosystems in seas and lakes.

Acknowledgments. The research is made according to “Memorandum of Understanding between Federal State Autonomic Educational Institution of Higher Professional Education “Far Eastern Federal University” (Vladivostok, Russian Federation) and L.N. Gumilyov Eurasian National University (Astana, Republic of Kazakhstan). October 02, 2014”.

REFERENCES

- [1] Khusainova N.Z. Biological foundations of fisheries in the reservoirs of Central Asia and Kazakhstan. Alma-Ata: Nauka, **1966**, 98-100. (In Russ.)
- [2] Akbaeva L.H., Kobetayeva N.K., Zhamangar A.K., Akhmetova S.B., Makhanbetova A.K. Bulletin of Science of the Kazakh Agrotechnical University. S. Seifullin, **2014**, 5, 65-74. (In Russ.)
- [3] Maikanov B.S., Syzdykov K.N., Aubakirova G.A. Agrarian Science to Agriculture: Materials of International Scientific and Practical Conference. Barnaul: Altai State Agrarian University, **2008**. Book 2, 423-427 (In Russ.)
- [4] Burlibaev M.Zh., Murtazin E.Zh. Biogenic substances in the main watercourses of Kazakhstan. Almaty: Kaganat, **2003**. 723 p. (In Russ.)
- [5] Zaitsev V.F., Zaitsev V.F., Obukhova O.V., Sariev B.T. Bulletin of the Astrakhan State Technical University. Series: Fishery, **2009**, 1, 54-57 (In Russ.)
- [6] Silkin V.A., Abakumov A.I., Pautova L.A., Pakhomova S.V., Lifanchuk A.V. Aquatic Ecology, **2016**, 50(2), 221-234 (in Eng.)
- [7] Ismayilova A.A., Zhamankar A.K., Akbaeva L.Kh., Adamov A.A., Abakumov A.I., Tulegenov Sh.A., Muratov R.M. Bulletin of KazNU named Al-Farabi. Biological series, **2013**, 3/2 (59), 503-507 (In Russ.)
- [8] Savenko V.S., Savenko A.V. Geochemistry of phosphorus in the global hydrological cycle. M.: GEOS, **2007**. 248 p. (In Russ.)
- [9] Aytkazhy Kazbekov. Burabai on the eve of the 21st century. Astana, **1998**, 238 p. (In Russ.)
- [10] Newsletter on a state of environment in Shchuchinsk-Borovoye resort area. For 2008 - 2013 year, Kazakhstan, **2013**. (In Russ.)
- [11] Tretyakov V.Yu., Shelutko V., Seleznev D.E. Bulletin of St. Petersburg University. Series 7. Geology. Geography, **2015**, 3, 118-128. (In Russ.)
- [12] Vollenweider R.A. The scientific basis of lake and stream eutrophication, with particular reference to phosphorus and nitrogen as eutrophication factor. Tech. Rep. OECD, Paris, **1968**, 27, 1-83 (In Eng.)
- [13] Datsenko Yu.S. Eutrophication of aquatic basins. Hydrological and hydrochemical aspects, Moscow State Univ., Geographical Depart. M.: GEOS, **2007**. 251 p. (In Russ.)
- [14] Shitikov V.K., Rosenberg G.S., Zinchenko T.D. Quantitative hydroecology: methods of system identification. Togliatti: IEVB RAS, **2003**. 463 p. (In Russ.)
- [15] Schweitzer G.E., Black S.C. Environmental science & technology, **1985**, 19 (11), 1026-1030. (in Eng.)
- [16] Vasilyeva L.A. Statistical methods in biology, medicine and. Agriculture, Novosibirsk: Institute of Cytology and Genetics, Siberian Branch of the RAS, **2007**, 124 p. (In Russ.)
- [17] Butterwick C., Heaney S.I., Talling J.F. Brit Phycol J., **1982**, 17(1), 69-79. (in Eng.)
- [18] Nicholls K.H., Dillon P.J. Int. Revue ges. Hydrobiol., 1978, 63(2), 141-154 (in Eng.)
- [19] Abakumov A.I., Pak S.Ya., Simonov A.S. Informatics and Control Systems, **2011**, 1 (27), 17-26. (in Eng.)
- [20] Abakumov A., Ismailova A., Adamov A. Information. An International Interdisciplinary Journal, **2014**, 17(1), 209-218 (in Eng.)
- [21] Blenckner T. Hydrobiologia, **2008**, 599, 177-182. (in Eng.)

А. А. Исмаилова¹, А. К. Жамангара², С. К. Сагнаева², Г. Д. Казиева², А. И. Абакумов³, С. Я. Пак³

¹С. Сейфуллин атындағы Қазақ агротехникалық университеті, Астана, Қазақстан,

²Л. Н. Гумилев атындағы Еуразия ұлттық университеті, Астана, Қазақстан

³Автоматтандыру және басқару процестері институты РГА ҚШБ, Владивосток, Ресей

ҚАЗАҚСТАН КӨЛДЕРІНДЕГІ БИОГЕНДЕРДІҢ АҚПАРАТТЫҚ МОНИТОРИНГ ТЕХНОЛОГИЯЛАРЫ

Аннотация. Статистикалық деректер бойынша 2007-2013 жылдарға арналған азот пен фосфорға негізделген минералды заттар туралы мәліметтер талданды. Өзгерістердің динамикалық сипаттамалары мен маусымдық ерекшеліктері заттардың шоғырлануында анықталды. Маусымдық фактор қоректік заттардың

концентрациясын өзгертуде маңызды рөл атқарады. Орташа жылда заттардың шоғырлану динамикасы көктемде және жаздың басында жылдың екінші жартысымен салыстырғанда әртүрлі. Көктем әсерлері фитопланктонның қарқынды дамуымен байланысты болуы мүмкін. Күздегі фитопланктон биомассасының жарқылы аммоний мен фосфордың концентрациясына әсер етуі мүмкін болып табылады. Жалпы, фосфор қосылыстарының концентрациясы әлдеқайда тұрақты, бұл фосфорды жақсы көретін фитопланктон түрлерінің өміріне жағымды әсер етуі мүмкін.

Түйін сөздер: гидробиология, гидрохимия, тренд, статистикалық талдау, корреляциялық матрица, көлдердің жіктелуі.

А. А. Исмаилова¹, А. К. Жамангара², С. К. Сагнаева², Г. Д. Казиева², А. И. Абакумов³, С. Я. Пак³

¹Казахский агротехнический университет имени С. Сейфуллина, Астана, Казакстан,

²Евразийский национальный университет им. Л. Н. Гумилева, Астана, Казакстан,

³Институт автоматизации и процессов управления ДВО РАН, Владивосток, Россия

ТЕХНОЛОГИИ ИНФОРМАЦИОННОГО МОНИТОРИНГА БИОГЕНОВ ОЗЕР КАЗАХСТАНА

Аннотация. Данные по минеральным веществам на основе азота и фосфора на 2007-2013 годы были проанализированы на основе статистики. Динамические характеристики и сезонные особенности изменений были выявлены в концентрациях веществ. Сезонный фактор играет существенную роль в изменении концентрации питательных веществ. В усредненном году динамика концентраций веществ более разнообразна весной и в начале лета по сравнению со второй половиной года. Весенние эффекты могут быть связаны с интенсивным развитием фитопланктона. Осень также является вспышкой биомассы фитопланктона, которая может влиять на концентрации аммония и фосфора. В общем, концентрация соединений фосфора более стабильна, что может благоприятно влиять на жизнь видов фитопланктона, которые любят фосфор.

Ключевые слова: гидробиология, гидрохимия, тренд, статистический анализ, корреляционная матрица, классификация озер.

Information about authors:

Ismailova A. A. – PhD doctor in specialty 6D070300 - "Information systems", head of the department "Information systems", Kazakh agrotechnical university named S. Seifullin, e-mail: a.ismailova@mail.ru

Zhamangar A. K. – Candidate of Biological Sciences, Associate Professor of the Department of Management and Engineering in the field of environmental protection ENU named L. N. Gumilev, e-mail: kashagankizi@mail.ru

Sagnayeva S. K. – Candidate of Physical and Mathematical Sciences, Associate Professor of Information Systems Department, ENU named L. N. Gumilyov, e-mail: sagnaeva_tar@mail.ru

Kaziyeva G. D. – doctoral student of the third year of the specialty 6D070300 - "Information systems" ENU named L.N. Gumilev, e-mail: gulya_kz@mail.ru

Abakumov A. I. – Doctor of Physics and Mathematics, Full Professor, Head of the Laboratory of Mathematical Modeling of Biophysical Processes, Institute of Automation and Control Processes, FEB RAS, e-mail: abakumov@iacp.dvo.ru

Pak S. Ya. – Candidate of Technical Sciences, Junior Researcher, Laboratory of Mathematical Modeling of Biophysical Processes, Institute of Automation and Control Processes, FEB RAS, e-mail: park@iacp.dvo.ru

**Publication Ethics and Publication Malpractice
in the journals of the National Academy of Sciences of the Republic of Kazakhstan**

For information on Ethics in publishing and Ethical guidelines for journal publication see <http://www.elsevier.com/publishingethics> and <http://www.elsevier.com/journal-authors/ethics>.

Submission of an article to the National Academy of Sciences of the Republic of Kazakhstan implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see <http://www.elsevier.com/postingpolicy>), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The National Academy of Sciences of the Republic of Kazakhstan follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics.org/files/u2/New_Code.pdf). To verify originality, your article may be checked by the Cross Check originality detection service <http://www.elsevier.com/editors/plagdetect>.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the National Academy of Sciences of the Republic of Kazakhstan.

The Editorial Board of the National Academy of Sciences of the Republic of Kazakhstan will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайте:

www.nauka-nanrk.kz

ISSN 2518-170X (Online), ISSN 2224-5278 (Print)

<http://geolog-technical.kz/index.php/kz/>

Верстка Д. Н. Калкабековой

Подписано в печать 30.07.2018.

Формат 70x881/8. Бумага офсетная. Печать – ризограф.

13,4 п.л. Тираж 300. Заказ 4.