

Permafrost researchs report of Russia 2014

Geocryological monitoring in undisturbed condition was continued. The 2014-results were submitted in the GTN-P Database. The 298 observatories contain several boreholes or soil temperature measurements. The 61 CALM-sites present different landscape condition.

Earth Cryosphere Institute (Earth Cryosphere Institute, Siberian Branch, Russian Academy of Science (ECI SB RAS))

Earth Cryosphere Institute publishes the journal “Earth’s Cryosphere” (“Kriosfera Zemli”: <http://www.izdatgeo.ru>). The results of the most fundamental and advanced investigations, important results on the programs of the Earth Cryosphere Institute (ECI SB RAS) and of the many others Institutes and organizations specializing on permafrost/cryosphere researches are presented in the journal “Earth’s Cryosphere” (“Kriosfera Zemli”). The abstracts of the most interesting papers are submitted for the consideration of readers.

1. F.E. Are (N.1-2014) *Earth Cryosphere Institute SB RAS, 625000, Tyumen, P/O box 1230, Russia, xilefera@gmail.com*

THERMAL ASPECTS OF N.A. TSYTOVICH PRINCIPLE OF WATER AND ICE EQUILIBRIUM STATE IN FROZEN GROUND

The applicability of the Stephen problem solutions for permafrost dynamics modeling is discussed using N.A. Tsytovich principle of water and ice equilibrium state in frozen grounds. The main external impacts controlling equilibrium, relationships between equilibrium dynamics and thermal processes in ground, possibilities of mathematical modeling of permafrost dynamics are reviewed. The dynamics of equilibrium state in saline ground is discussed using results of permafrost investigations on Yamal Peninsula and Laptev Sea shelf. It is revealed that the cryopeg temperature in equilibrium state is equal to its initial freezing point, the ice-bonded permafrost may contain cryopeg and preserve permeability, the cryopeg boundary may not coincide with the phase boundary. Free-salined permafrost on the shelf flooded by the sea undergoes fast salinization and physicochemical thawing at negative temperature. The thawing is accompanied by temperature lowering due to latent heat absorption. The ice content in salined permafrost on shelf is changing in space gradually without a clear phase boundary. It is revealed that solutions of Stephen problem are unacceptable for shelf permafrost modeling.

2. S.M. Fotiev (N.2-2014) *Earth Cryosphere Institute SB RAS, 625000, Tyumen, P/O box 1230, Russia; kriozem@gmail.com*

MASSIVE ICE BEDS IN THE MARRESALE POLAR STATION AREA (WESTERN COAST OF THE YAMAL PENINSULA)

When studying the data and materials on massive ground ice bodies in the outcrops of MarreSale Cape, we focused our scientific interests primarily on the analysis of the salt-ionic composition and mineralization of ice masses composing the lower massive ice bed in the frozen saline marine sediments, and of the upper massive ice bed, sitting in the stratum of the frozen nonsaline continental deposits. The identity of salt-ionic composition of ice masses in the upper and lower parts of the massive ice beds, as well as the kinship of the hydrochemical characteristics of massive ice beds and lake-waters have been ascertained upon comparing the mineralization and chemical composition of massive ice beds and natural waters. The research results and findings are listed that:

1) both the upper and lower massive ice bed were fed by lake-waters; 2) the formation of the lower massive ice bed in the frozen saline marine sediments proceeded with out seawater input; 3) the lower massive ice bed accumulation commenced and was taking place already in the permafrost, long after the marine regression was completed.

3. A.G. Skvortsov, M.R. Sadurtdinov, A.M. Tsarev (N.2-2014) *Earth Cryosphere Institute SB RAS, 625000, Tyumen, P/O box 1230, Russia; agskvortsov@mail.ru*

SEISMIC CRITERIA FOR IDENTIFYING FROZEN SOIL

Unfrozen and frozen soils of sand to clay grain sizes can be discriminated using seismic criteria, especially Poisson's ratio. According to the available published evidence and experimental results collected for years in the areas of Arctic West Siberia and European North, Poisson's ratios (μ) in the range 0.45–0.46 mark the boundary between frozen and unfrozen states of water-saturated soils. The values $\mu > 0.46$ and $\mu < 0.45$ correspond, respectively, to unfrozen and frozen soils, irrespective of their composition, temperature and salinity. Poisson's ratio is thus an additional permafrost proxy and an effective tool of geocryological studies.

4. V.N. Konischev*, V.V. Rogov*, V.N. Golubev*, S.A. Sokratov*, I.V. Tokarev (N.3-2014)**
**Lomonosov Moscow State University, Department of Geography Bld.1, Leninskie Gory, Moscow 119991, Russia; rogovvic@mail.ru*

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EXPERIMENTAL STUDY OF THE ISOTOPIC FRACTIONATION OF WATER IN THE PROCESS OF ICE SEGREGATION

The paper presents the results of the laboratory research of the isotopic composition of water and ice in dispersed soils. It has been established that isotopic fractionation occurs during soil – water interactions, water migration and ice formation during freezing, depending on the chemical composition of soil and freezing conditions.

5. Yu.B. Badu (N.3-2014) *Lomonosov Moscow State University, Department of Geography, Leninskie Gory, 1 Moscow 119991 Russia; yubadu@mail.ru*

THE INFLUENCE OF GAS-BEARING STRUCTURES ON THE CRYOGENIC STRATA THICKNESS IN YAMAL AREA

Cryogenic strata of the north of West Siberia is regarded as a unified cryogenic formation of the Middle and Late Neopleistocene and Holocene formed in the aftermath of the of transgression–regression rhythmic events in the polar basin in the course of cyclic changes in the harsh climate. With reliance on the current data, our research findings have given some insights into the permafrost developing in the subaerial and submarine environments, and into the gas accumulation affecting the cryogenic strata thickness in the section and within the extent of the gas-bearing structures.

6. D.A. Petrakov*, I.I. Lavrientiev, N.V. Kovalenko*, R.A. Usabaliev*** (N.3-2014)**
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ICE THICKNESS, VOLUME AND CURRENT CHANGES OF THE SARY-TOR GLACIER AREA (AK-SHYIRAK MASSIF, INNER TIAN SHAN)

In the paper we present and discuss results of radio-echo sounding and ice thickness modeling of Sary-Tor Glacier (Ak-Shyirak massif, Inner Tian Shan). Ability for correct assessment of regional glacier volume in Tian Shan is limited due to the small amount of direct ice thickness measurement data. 17 km of ice thickness measurements tracks were done on 18–20 May, 2013 using monopulse VIRT-6 GPR with central frequency 20 MHz. Maximum measured ice thickness was 159 m, whereas average thickness was 51 m. Detailed ice thickness and bedrock topography maps were compiled for Sary-Tor. The glacier volume was defined as $(0.126 \pm 0.001) \text{ km}^3$. In addition, ice

volume was calculated using the Glab-Top model calibrated by direct data and volume-area scaling. Both approaches could be used to determine the ice volume of the Sary-Tor glacier with high accuracy. The Sary-Tor glacier area shrinkage rate in 2003–2012 slightly decreased compared to 1977–2003.

7. V.P. Melnikov (N.4-2014) *Earth Cryosphere Institute, SB RAS, 625000, Tyumen, Malygina str., 86, Russia; melnikov@ikz.ru; Tyumen State Oil and Gas University, 625000, Tyumen, Volodarskogo str., 38, Russia*

ON THE CREATION OF THE INTEGRAL IMAGE OF CRYOSPHERE

The concepts of the demand to widen the cryosphere science are described and some directions of the improvement of its existing image are determined. The necessity of interdisciplinary approach in the study of cryosphere and the deepening of the theoretical-methodological bases of cryology as well as the increase of its role in the solution of fundamental sciences dealing with life and Earth are revealed. The application of systematic approach to the problems of the origin and evolution of cosmic bodies and origin of life is substantiated.

8. Yu. K.Vasil'chuk, N.A.Budantseva, A.C.Vasil'chuk, K.Yoshikawa*, Ye.Ye.Podbornyy, Ju.N.Chizhova (N.4-2014) *Lomonosov Moscow State University, Russia 119991, Moscow, Leninskie Gory, 1, vasilch@geol.msu.ru & vasilch_geo@mail.ru***

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ISOTOPE COMPOSITION OF PINGO ICE CORE AT EVOYAKHA RIVER VALLEY, NORTH-WEST SIBERIA

Ice core of Pestsovoye pingo in the Evoyakha River valley in North-West Siberia has been studied. Thickness of the pingo ice is more than 15 m. The $\delta^{18}\text{O}$ value of the pingo ice varies from -11.6 to -15.8‰ , δD from -93.2 to -123.0‰ . Comparison with isotope data of ice core of Weather pingo (Alaska) has been carried out. In Weather pingo ice $\delta^{18}\text{O}$ values range from -15.5 to -22‰ , δD values change from -132 to -170‰ . Both isotope profiles of pingo ice are contrasting and arcuate-shaped as a result of isotope fractionation during freezing of sub-pingo waters in closed system. Fractionation leads to isotopic contrast of ice: by 4-6‰ of $\delta^{18}\text{O}$ and by 20-25‰ of δD values. Radiocarbon dating of the covering peat at Pestsovoye pingo have evidenced that the heaving had occurred at two stages. At the first stage the heaving began about 5 kyr BP in distal part of the mound. At the second stage about 2.5 kyr BP the heaving recommenced actively in the central part of the pingo. The heaving rate was very high – more than 2-3 cm per year. As a result a pingo of 17 m high has been formed.

9. L.N.Kritsuk, V.A.Dubrovin, N.V.Yastreba (N.4-2014) *lnkritsuk@mail.ru*

RESULTS OF COMPLEX STUDYING THE KARA SEA SHORE DYNAMICS IN THE AREA OF THE METEOROLOGICAL STATION MARRE-SALE USING THE GIS-TECHNOLOGIES

The results of 44-year integrated observations of the Kara Sea shore dynamics in the area of the VSEGINGEO Marre-Sale Station have been presented. The multi-year on-land registration of the sea shoreline retreat to the distance of 4.5 km in combination with detailed drilling of the shore zone and with the use of remote research methods have enabled the authors to reveal the basic regularities in the manifestation and dynamics of destructive and accumulative processes within this area. The use of GIS-technologies have allowed to obtain for the first time the objective qualitative data about the shoreline retreat and bottom areas of the shore cliffs (average and interval values) both for the total period of observation and particular periods.

The real state of the shoreline in the station area and its dynamics are clearly registered by large-scaled aerial photos and video-images taken in different years.

Data of the remote sounding of the Earth (RSE) in the station area demonstrate the active manifestation of the geodynamic processes in the Marre-Yakha river mouths.

10. E.V. Severskiy*, V.V. Olenchenko, A.P. Gorbunov* (N.4-2014)**

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INFLUENCE OF LOCAL FACTORS ON THE STRUCTURE OF PERMAFROST, ZHOSALYKEZEN PASS (NORTH TIEN SHAN)

The results of studies of mountain permafrost of Alpine type by the methods of thermometry and geoelectrical survey are presented. The influence of natural and anthropogenic local factors on the structure of permafrost is demonstrated using the geoelectric models. Such factors include the exposition of the slope, the tectonics, the warming and cooling effects of the foundations of buildings. Changing slope exposure is expressed on geoelectric models by the decreasing of resistivity of high-resistance horizon, the violation of its continuity and the decreasing of its thickness. In the area of faults the discontinuous or island character of high-resistance horizon (permafrost) is observed. During the seismic events the temperature of rocks increases here up to the positive values. According to geophysical data, the formation of taliks occurs in the basis of deformed buildings, in the places of accumulation of snow at snow barriers and under the sites with asphalt covering.

BY THE WAY:

1. Federal service for Hydrometeorology and environmental monitoring (ROSHYDROMET) is preparing for press at the end of 2014 **SECOND_ASSESSMENT REPORT ON CLIMATE CHANGE AND ITS CONSEQUENCES IN RUSSIAN FEDERATION**. The chapter 4.3.

«Permafrost» has been prepared by the scientists of Earth Cryosphere Institute, Siberian Branch, Russian Academy of Science (ECI SB RAS) - G.V. Malkova (chief author), M.O. Leibman, D.S. Drozdov, A.V. Khomutov, A.A. Gubarkov, A.B. Sherstukov.

2. The UNIQUE CRATER was discovered in June 2014 by video taken from a helicopter crossing Yamal 30 kilometers away from the Bovanenkovskoye gas field in West Siberia, Russia.

Since the hole was spotted, there were a number of short visits to the crater for reconnaissance, geophysical studies, sampling. After the first visit on July 16 it became clear that the crater about 25 m in diameter and more than 50 meters deep was formed due to natural reasons connected to high gas content in Yamal permafrost and its cataclysmic emission. No traces of human activity in the vicinity of the crater were found. After examining remote-sensing data along with some detailed on-spot observations, the date of the crater's formation was estimated to have been in the late fall of 2013. No high background radiation and no traces of extremely high temperatures, which would point to a gas explosion or an extraterrestrial object such as a meteorite were observed.

It is highly probable that such landforms will be generated in the future in suitable geological and permafrost conditions. The origin of this crater is attributed to the increased ground temperature and amount of unfrozen water in the permafrost, and the release of gas out of porous deposits and ground ice. Similar temperature anomalies may increase in number in the future decades, presenting risks for human activities in the region.

Further studies including sampling of the frozen walls, drilling in the vicinity of the crater and geophysical studies are planned. High-resolution imagery will be helpful in mapping the risks of recurrence of such a phenomenon in Central Yamal and elsewhere in the areas with high gas content in permafrost.

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<http://mpi.ysn.ru/index.php/en/>

1. Publications

Theoretical, experimental and field investigations carried out by MPI researchers resulted in 280 publications, including three monographs, four brochures, one map, and three patents. The monographs include:

Anisimova N.P. and Pavlova N.A. 2014. Hydrogeochemical Studies of Permafrost in Central Yakutia. Novosibirsk: Geo Academic Publishers [in Russian].

Neradovskii L.G. 2014. Estimating the Thermal State of Russian Permafrost by Electromagnetic Sounding Methods. Moscow: Nauchnoe obozrenie, 333 pp. [In Russian]

Shepelev V.V. 2014. Suprapermafrost Water in the Cryolithozone. China Water Power Press, 110 pp. [in Chinese]

2. Main research results

1) A mathematical model was developed simulating coastal and nearshore permafrost conditions in the eastern sector of the Russian Arctic over the last 4 ky (Fig. 1). The model, based on observations of thermo-abrasional coastal retreat along the Arctic seas, as well as on drilling data from the Laptev Sea shelf obtained in 2003-2014, helps facilitate a better understanding of the dynamics of subsea permafrost boundaries in the Arctic shelf (PI: Dr. Mikhail Grigoriev and Dr. Sergey Razumov).

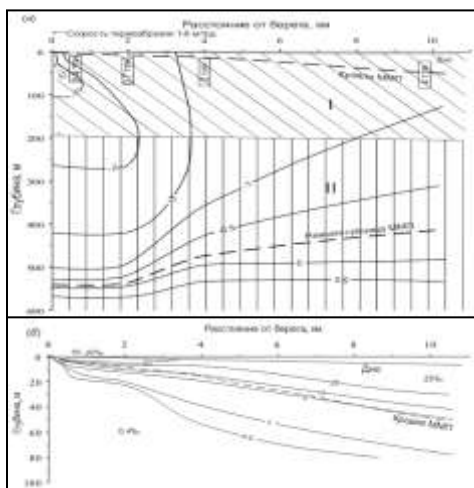


Fig. 1. Sediment temperature, °C (a) and salinity, ‰ (b) in the Laptev Sea nearshore permafrost in an eroding coastline area. I – Quaternary sands, sandy silts and clayey silts; II – Neogene clayey silts and clays. TJIH in graph (a) indicates the estimated time of permafrost submergence (kya) for various distances from the present coastline.

Related publication: Razumov S.O., Spektor V.B., and Grigoriev M.N., 2014. Model of the post-Cenozoic Evolution of the Cryolithozone of the Shelf of the Western Part of the Laptev Sea. *Oceanology* 54(5), 637-649.

2) The Late Holocene glacial-cryogenic complexes, as well as the recent glacial deposits in the Suntar-Khayata Range, eastern Yakutia, were studied. The isotopic composition of ice in the glacial-cryogenic complexes suggests the monsoon moisture origin from the Okhotsk Sea, casting doubt on the prevailing hypothesis that the westerly and Arctic transport of air masses played a primary role during the Late Pleistocene and Holocene (PI: Dr. Aleksey Galanin) (Fig. 2).

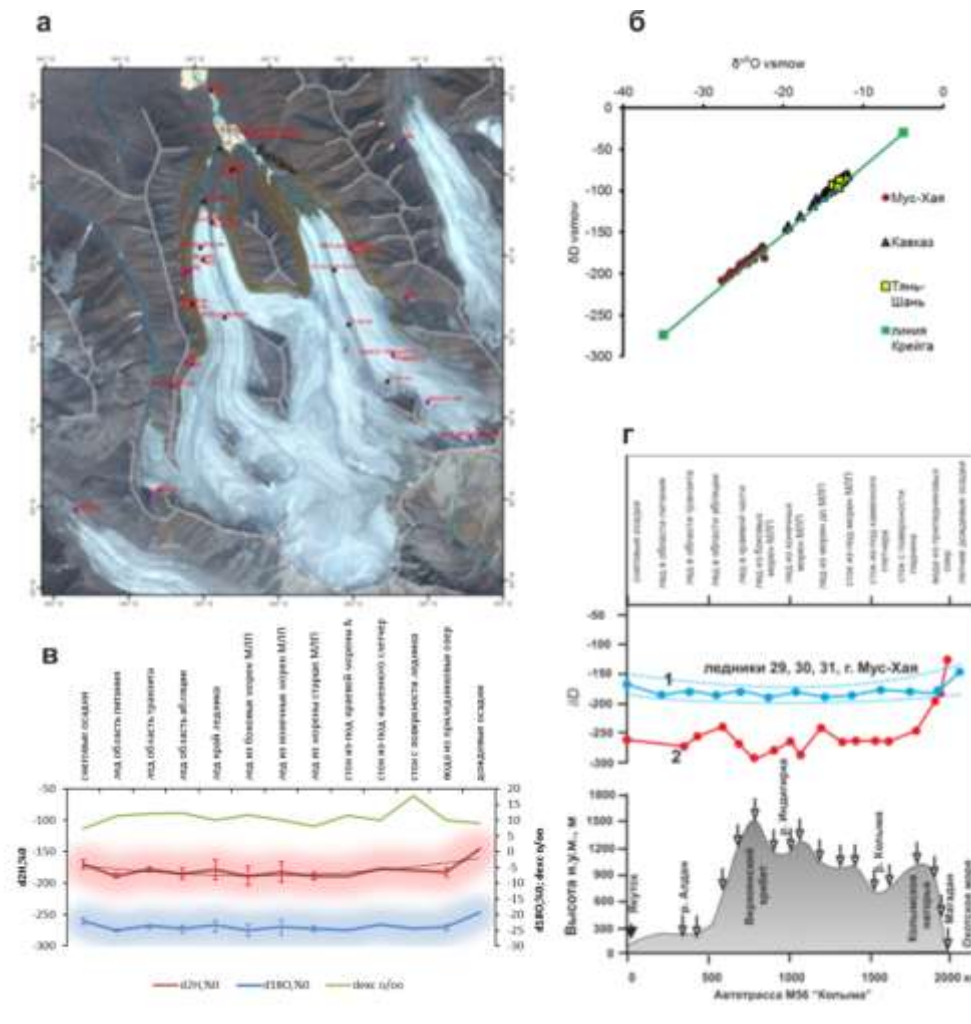
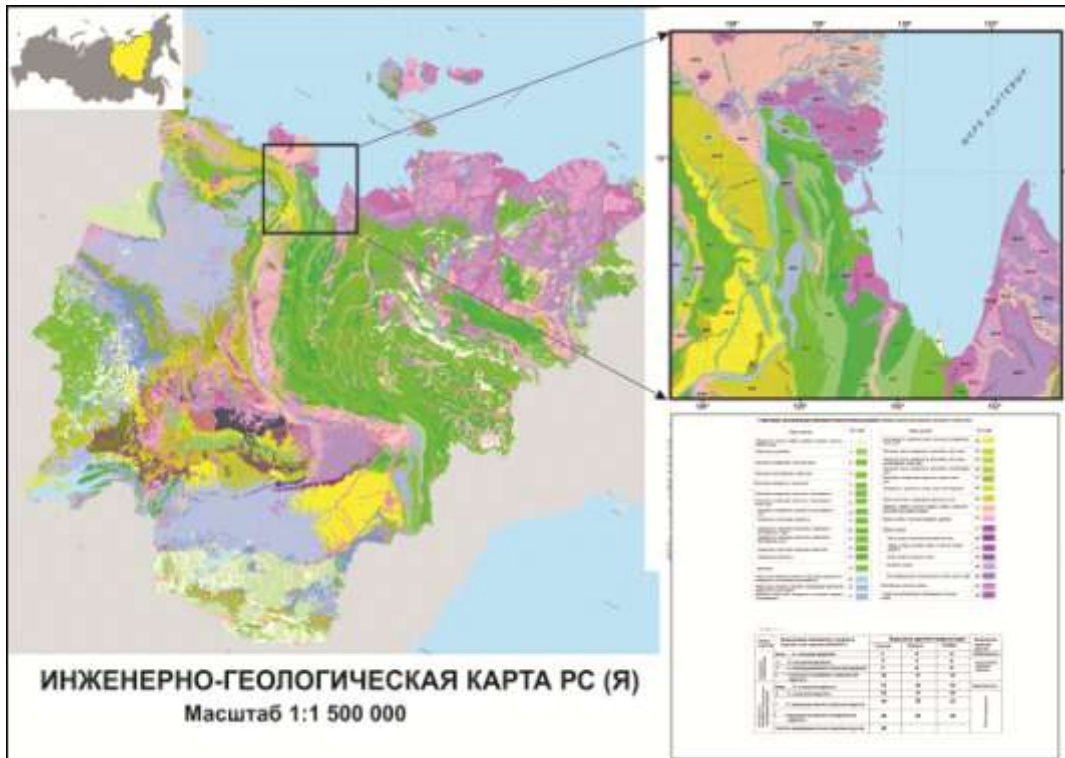


Fig. 2. Generalized characteristics of the isotopic composition ($\delta^{18}\text{O}$ and $\delta^2\text{H}$) of different modern and fossil ice types (60 samples) from the glacial-cryogenic complex at Mt. Mus-Khaya, Suntar-Khayata Range. a – location of sampling sites; б - $\delta^{18}\text{O}$ and δD ratio in ice of the Mt. Mus-Khaya glacial-cryogenic complex and other regions at the Craig equilibrium line; в - variations in the isotopic composition of the Mt. Mus-Khaya glacial-cryogenic complex in samples of different types; г – comparison of deuterium content in samples of various types from the Mt. Mus-Khaya glacial-cryogenic complex, Suntar-Khayata Range with changes in deuterium content in snow along the Yakutsk-Magadan transect [Kurita et al., 2005]: 1 – Mt. Mus-Khaya; 2 – Yakutsk-Magadan transect.

Related publication: Galanin A.A., Lytkin V.M., Fedorov A.N., Kadota T. 2014. Age and extent of the last glacial maximum in the Suntar-Khayata Range based on lichenometry and Schmidt Hammer Test. *Earth Cryosphere* XVIII(2), 72-82.

3) An engineering-geological map of the Republic of Sakha/Yakutia was compiled at a scale of 1:1,500,000-scale (edited by L.N. Kovalev and R.V. Zhang, compiled by V.B. Spektor, Ya.I. Torgovkin, A.A. Shestakova, V.V. Spektor, L.D. Ivanova and B.M. Kozmin). The map, first in its kind for the region, provides a scientific foundation for planning of economic development, construction of large engineering projects, and environmental protection in the vast Arctic region of Russia. The map shows geological, geocryological, hydrogeological and seismic conditions, as well as geotechnical hazards



Related publication: Spektor, V.B., Torgovkin, Ya.I., Shestakova, A.A., Spektor, V.V., Ivanova, L.D., Kozmin, B.M., 2014. Engineering Geological Map of the Sakha (Yakutia) Republic. *Sciences in Cold and Arid Regions* 6 (5), 484-493.

4). As part of its basic fundamental research theme, the Institute conducted investigations on seven projects funded by grants from the Russian Foundation for Basic Research, three integrated projects, and several contracts totaling over 35 mln. rubles. The latter mainly included geocryological site investigations in various areas of the East Siberian permafrost region, as well as determinations of physical, mechanical and chemical properties of soils for large engineering projects.

5). An important event for geocryology in 2014 was the 10th International Symposium on Permafrost Engineering held from 22-24 August 2014 in Harbin, China under the theme “Challenge and Adaption of Permafrost Engineering to a Changing Climate”. This symposium, co-organized by MPI, brought together about 300 researchers from six countries (Russia, China, USA, Canada, Japan, and Turkey), including 21 delegates from MPI. The symposium stressed that understanding the thermal state of permafrost and the development of worldwide standards for permafrost monitoring in a changing climate remain the priority tasks for engineering geocryology. Papers submitted to the symposium were published in special issues of the journals, *Sciences in Cold and Arid Regions* (Volume 6 Issue 4 August 2014 and Volume 6 Issue 5 October 2014), *Journal of Engineering of Heilongjiang University* (Volume 5 No. 3 September 2014) and *Journal of Glaciology and Geocryology* (Volume 36 No. 4 August 2014). The next, 11th symposium on permafrost engineering was decided to be held in 2017 in Magadan, Russia.



MPI delegation at the 10th International Symposium on Permafrost Engineering.

MPI researchers took part in several international conferences in Potsdam and Hamburg (Germany), San-Francisco and New Orleans (USA), Frascati (Italy), Brest (France), and Brussels (Belgium).

In all, MPI researchers participated in 25 international, 13 national and 11 regional conferences.

Cryolithology and Glaciology Department, Geographical Faculty, Lomonosov Moscow State University

In 2014 Department of Cryolithology and Glaciology undertaken fundamental research on the impact of the cryospheric objects change on environment and society.

The department developed several conceptual rules for assessment and prediction of cryo-ecological conditions under development of cryolithozone in terms of (a) landscape resistance to negative cryogenic processes, (b) type and (c) intensity the technogenic load (Monography: Tumel' N., Zotova L. Geocology of Cryolithozone: textbook. – Moscow, Faculty of Geography, MSU, 2014, 244 p.). Researchers formulated definitions and methods of assessment; detected main lithocryogenic and biotic factors of landscape resistance to cryogenic processes in different environmental conditions; provided a procedure of their comparison in order to calculate integral indexes with further ranking by sensitivity to development, and to make GIS-maps then.

Researchers made the “Map of the ground ice of the cryolithozone of Russia”, in which they successfully linked distribution of various means of ice with tectonic development of the Russian Arctic (Bulletin of the MSU, 2014; Geography, Environment..., 2014).

The department continued monitoring of the active layer dynamics on two sites – near Talnakh (south of the Taymir peninsula) and in Lorino (settlement on Chukotka). The monitoring was started in 2004 under the International program CALM - Circumpolar Active Layer Monitoring. Last measurement reflects the reaction of frozen ground to relatively cold, but rainy summer 2014: this year around Talnakh mean depth of thaw increased by 20%. It is 20% bigger then measured in extremely hot (but abnormally dry!) summer 2013.

Using calculations and field observations, we assessed the efficiency of different managerial strategies for thermal regime of frozen foundations in built-up areas. It is found, that the most

conventional and popular way to decrease temperature – arrangement of cold ventilated cellars – is not comprehensive in regions with continental climate and scarce snow cover (e.g. Yakutia, inner areas of Magadan region, etc.). The department analyzed permafrost temperature change in dependence of density, structure and (it is critical) – the age of housing. In the areas of “old” development, regional peculiarities form significant differences in temperature trends (examples – centers of Dudinka, Salekhard, Khatanga, etc.). In general, degradation prevails. Temperature decrease can be measured due to a strong anthropogenic salinization, but it is not increasing bearing capacity of refrigerated foundations – as adfreezing force declines (EUCOP, 2014).

In the changing climate and cryosphere 62 million square kilometers are covered by ice, seasonal and perennial snow cover. Some years this square varies, as well as it changes through the cycle of seasons (Ivanov M., Glaciological symposium “The role of snow and ice in people's lives”, The World Snow Forum, Novosibirsk, 2014).

The department studied differences and similarities in formation of “alpine” and “siberian” types of glaciers. First established, that they have no qualitative differences, existing differences (the role of infiltrationcongelation ice in their composition) have quantitative nature.

In July 2014 in Igarka and Norilsk region were held regular International field student’s courses on permafrost, which was attended by younglings from Russia, USA, Great Britain, Germany and Norway (courses are conducted by docent of Lomonosov Moscow State University Valery Grebenets and professor of The George Washington University Dmitry Streletsky).

Geocryology Department, Geology Faculty, Lomonosov Moscow State University

Geocryology department of Moscow University has finished its long-term work on a new thermal computer software for 3D permafrost forecast. First version of the digital permafrost map of Russian Federation (scale 1: 2 500 000) was done. The department was involved in projects related study of the offshore permafrost in Laptev and Kara sea. Geophysics was applied to estimate permafrost table and depth in the Arctic basin. Investigations on gas hydrates in Western Siberian permafrost were continued, and new data has been received for its distribution. as well as the gas content for offshore marine frozen deposits in the Eastern Arctic. A study the thermal mode, soils thermal properties and mechanisms of coastal erosion in the Baydara Bay (Kara sea coast) was done including coastal soil temperatures, thermal conductivity and other soil properties. A role of snow fields in the thermal erosion has been shown. Phase and salts concentration equilibrium was studied in Yamal peninsula permafrost in a range of temperatures. Deformations of thawing icy clay soils were investigated in laboratory conditions for Western Siberian marine and alluvial deposits. A number of case studies in permafrost regions with oil and gas companies were also done. A master program specializing in permafrost studies in English has been open in 2014 in the department for the foreign students.

Institute of Physicochemical and Biological Problems in Soil Science, RAS (Soil Cryology Laboratory)

1. For the first time with using the method of amplification of 16S rRNA genes with specific to the Archaea domain PCR primers, and the analysis of the clone libraries we have obtained knowlege about archaeal community of permafrost of Holocene and Pleistocene age of coastal oases of Antarctica. The phylotypes are mainly presented with the genera related to methanogens: Methanosarcina, Methanobrevibacter, Methanogenium, Methanolobus and Methanoculleus and

Methanomicrobia. (*related publication*: E. S. Karaevskaya, L. S. Demchenko, N. E. Demidov, E. M. Rivkina, S. A. Bulat, and D. A. Gilichinsky. 2014. Archaeal Diversity in Permafrost Deposits of Bunge Hills Oasis and King George Island (Antarctica) According to the 16S rRNA Gene Sequencing // *Microbiology*, Vol. 83, No. 4, pp. 379–387.)

2. For the first time in collaboration with French colleagues the giant virus, named Pithovirus sibericum, was isolated from a 34,000-year-old Siberian permafrost. Thus, the first time it was shown that in ancient permafrost sediments along with representatives of prokaryotes and eukaryotes, which we have described earlier, survived the giant viruses. (*related publication*: Legendre Matthieu, Julia Bartoli, Lyubov Shmakova, Sandra Jeudy, Karine Labadie, Annie Adrait, Magali Lescot, Olivier Poirot, Lionel Bertaux, Christophe Bruley, Yohann Couté, Elizaveta Rivkina, Chantal Abergel, and Jean-Michel Claverie. 2014. Thirty-thousand-year-old distant relative of giant icosahedral DNA viruses with a pandoravirus morphology: *PNAS*, 111 (11), p. 4274–4277.)

Mining-Geological Joint-Stock Company MIREKO

MIREKO company continues 30-45-year permafrost monitoring covering several main landscapes of European North of Russia. The main result of observations in 2014 – preservation of long-term trend of permafrost degradation. The lowering of level of underground waters, resulted from 21-year mine drainage, irregularly affects primary hypsometrical level of permafrost roof and foot. Degradation and progression of permafrost are observed depending to the thickness of technogenic aeration zone. The observations will be continued. **Please see below top priorities in permafrost research that we suggested.**

1. “Approbation of methodology of middling-term forecast of permafrost parameter The our methodology provides for the possibility of forecast of permafrost temperature, appearance and increasing thickness of closed taliks, thermokarst subsidence and cryogenic heaving of sediments for the nearest 15-20 years. The methodology was received by Customer – «Rosnedra», and then it was published in «Prospecting and Protection of Mineral Resources» Journal, No 7, 2009; its developments and details were reported at the Third European Conference on Permafrost. Longyearbyen, Svalbard, Norway. «Permafrost Monitoring in Northwestern Russia and a Methodology of the mid-Range Projections of Its Past and Future Degradation in Natural Conditions». N.Oberman, I.Derevyanko, V.Romanovsky, H.Vanhala, P.Lintinen.

Considering the practical importance of such forecasts for stable functioning of industrial and civil buildings in the permafrost area, we think that the evaluation of forecast accuracy and improving it, if necessary, is very timely. Such an evaluation compares the forecasted values of parameters with their actual field measurements. To perform this task we have all necessary conditions: 2 acting and 4 preserved geocryologic stations located in six different landscapes and with long-term, 30-45 years, observation periods, and also appropriate personnel. MIREKO Mining Geological Company is ready to solve this task.

2. “Evaluation of dynamics of icings of moderate and south type in the Urals and their There are more than 200 large and extra-large icings in Polar and Subpolar Urals. In the very beginning of 1980s they were observed by inspection, and some of them – by stationary observations (company MIREKO). Modern observations by inspections in some typical icings in low- and midmountains will allow to see their dynamics, connection with climate changes and to forecast their development in future.

3. Permafrost map of Pechora-Ural region, scale 1:1500000. The permafrost of European North is the most vulnerable in comparison to the Western Siberia, Yakutia to the influence of climate change, and also – of oil-gas, mining industries, due to specific climate, permafrost and hydrogeological conditions. Recently a lot of new permafrost information was accumulated. All this motivates to renew the existing permafrost maps. The suggested map could be prepared in two sheets variant: Permafrost maps of 2016 and Forecast permafrost map as of 2030. MIREKO company with its more than 40-year experience of permafrost mapping of the region (including a number of published maps) can claim to perform this object.

Joint-Stock Company "Fundamentproekt"

JSC "Fundamentproekt" carried out complex research and elaborated the methodological principles and methods of the creation of new geotechnical cartographic models into structure of the GIS engineering geocryological and permafrost cartographic models. Creation of the geotechnical cartographic models is considered as a method of adaptation and practical using of a geocryological investigation for the design and construction in the Permafrost area and in complex environment.

Completed the set of laboratory researches of frozen grounds creep properties. The frozen grounds testing made by USA standard (ASTM 5520) and Russian standard (GOST 12248-2010). It can be set that a direct correlation of frozen grounds creep properties obtained with the methods of test processing by ASTM 5520 and by GOST 12248-2010 cannot be. But tests made by ASTM 5520 standards can be handled by GOST 12248-2010. In this case, creep frozen grounds properties close to those obtained in the tests made and handled according to GOST 12248 In this case, creep frozen grounds properties close to those obtained in the tests made and handled according to GOST 12248.

Sergeev Institute of Environmental Geoscience, RAS (Moscow)

Institute of Environmental Geoscience RAS has been continued the developing of ground thermal regime model with taking into account the seepage, ground variable salinity, gas-hydrate evolution, surficial heat exchange explicit budget and climate change. The model was applied for the shelf permafrost's distribution model.