

**RUSSIAN COMMITTEE OF THE UNESCO
INTERNATIONAL GEOSCIENCE AND GEOPARK PROGRAMME
ANNUAL REPORT ON IGCP ACTIVITIES FOR 2016**

This report informs on the Russia's activities in the IGCP projects in 2016.

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Projects with Russian co-leaders:

Project 587 Entity, Facies and Time – the Ediacaran (Vendian) Puzzle (2010-2015) (OET); -acad. M.A. Fedonkin, Director of the Geological Institute RAS, Moscow.

Project 592 Continental construction in Central Asia (2012-2015) (OET); I.Yu. Safonova, dr. , Institute of Geology and Mineralogy, Siberian Branch RAS, Novosibirsk.

Project 596 Climate Change and Biodiversity Patterns in the Mid-Paleozoic (2011-2015) (OET) , N.G. Izokh , dr. Institute of Petroleum Geology and Geophysics, Siberian Branch, RAS, Novosibirsk.

Project 609 Cretaceous Sea-Level Changes (2013-2017). S.O. Zorina, dr., Central Research Institute of Geology of Industrial Minerals , Kazan`

Project 610 From the Caspian to Mediterranean: Environmental Change and Human Response during the Quaternary (2013-2017). T.A. Yanina, dr., Moscow State University

Project 630 Permian-Triassic Climatic and Environmental Extremes and Biotic Response (2014-2018). Yuri D. Zakharov , dr., Far East Geological Institute, Far East Branch RAS, Vladivostok.

Project 653 The Onset of the Great Ordovician Biodiversification Event (2016-2020), O.T. Obut, dr. Institute of Petroleum Geology and Geophysics Siberian Branch RAS, Novosibirsk

Russian geoscientists are members of 14 IGCP projects, including 1 started in 2016: Nos.: 587, 589, 592, 596, 608, 609, 610, 628, 630, 632, 637, 640, 648, and **653**.

This report has been prepared on the basis of the information submitted by Russian members IGCP projects in response to the Committee's request for information on 'significant' developments in 2016.

Project 587 Entity, Facies and Time the Ediacaran (Vendian) Puzzle (2010-2014) (OET)

The report was presented by acad. M.A. Fedonkin, co-leader of the project (Geological Institute RAS, Moscow)

Main results of the research activities in 2016:

The results of many years of field work (2004-2015) in the southern Namibia are represented. The characteristics of sedimentation of Late Proterozoic deposits of Nama Group and taphonomy of Nama macroorganisms were studied. The search characteristics revealed in the course of work were contributed to the discovery of an assemblage of new abundant burials of macroorganisms in the typical countryside of Aar farm. The studying of the collected field data has significantly changed our understanding of the structure of some Nama forms, the environment of their habitat and burial. Based on the results of studying the field excursion to the Aar farm was prepared [1].

Exceptionally preserved specimens of *Ernietta* in a shallow-marine gutter cast from southern Namibia reveal that all previously figured specimens of this iconic Ediacaran megafossil are incomplete, representing only the base of a larger and more complex organism. The complete organism is interpreted as comprising a buried, sand-filled basal structure exhibiting the classical *Ernietta* morphology that passes distally into a previously unknown fan that was used for feeding and respiration in the overlying water column. Both basal structure and distal fan of *Ernietta* were composed of a double-layer palisade of tubular elements that have been extended from the base of the holdfast to the tip of the fan. This style of architecture, construction and function is unique to the Erniettomorpha, supporting the view that it represents an extinct Ediacaran clade in the early evolution of multi-cellular life [2].

Publications

1. Vickers-Rich P., Narbonne G., Hall M., Ivantsov A., Hoffmann K.-H., Elliott D., Trusler P., Fedonkin M., Kriesfeld L., Kaufman A.J., Smith J. Field conference Day 2 – Farm Aar / Vickers-Rich P. et al. The Nama Group, South Namibia. The End Game of the First Large, Complex Organisms on Earth, the Ediacarans [IGCP493/587]. 35th International Geological Congress, 2016 Pre-conference Field Guide, 21-25 August, Namibia, International Geological

Congress Guidebook with New Artworx, Cape Town, South Africa. 2016. P. 21-35.

2. Ivantsov A.Yu., Narbonne G.M., Trusler P.W., Greentree C., Vickers-Rich P. Elucidating *Ernietta*: Exceptional specimens from the Ediacaran of Namibia. *Lethaia*, 2016. V. 49. P. 540-554.

Project 592 Continental construction in Central Asia (2012-2015),

The report was submitted by I.Yu. Safonova (Institute of Geology and Mineralogy SB RAS, Novosibirsk);

Main results of research activities in 2016:

- identification of major epochs of juvenile mafic and granitoid magmatism and evaluation of juvenile and recycled crust segments in the western CAO (Russian-Kazakh-Chinese Altai, western and eastern Junggar, Kyrgyz-Chinese-Uzbek-Tajik Tianshan), southern CAO (central and southern Mongolia, Beishan orogen, Dunhuang block) and eastern CAO (Inner Mongolia, NE China), which showed that the early and late Palaeozoic were major period of juvenile crust formation whereas during the Middle Palaeozoic the crust was re-worked and eroded to a significant extent;

- the late Permian closure of the Paleo-Asian Ocean (PAO) was questioned in some regions of the CAO. Our results suggest that it could be closed much later in the southern and eastern CAO. However, several smaller PAO

branches, i.e. Between the North and South Orogens of Inner Mongolia, could have closed earlier, in Devonian time.

- based on both geological and isotope data, the Tienshan region could be a place of strong tectonic erosion of previously formed juvenile crust in Middle Palaeozoic time;

- mantle plumes contributed to the continental growth in the CAOB through Meso-Cenozoic intra-plate intra-continental volcanism (SE Kazakhstan, Kyrgyzstan, NW and East China, Transbaikalia in Russia and Mongolia) related to hydrous-carbonated plumes, which induce both mantle upwelling and surface transpression and rifting.

- PGE play important role in the formation of porphyry Cu-Mo deposits and porphyry-epithermal deposits;

- we proposed a new approach for recognizing P-type orogenic belts based on the presence of accretionary complexes, intra-oceanic arcs, oceanic plate stratigraphy units, and MORB-OIB derived blueschist belts;

- after the CAOB amalgamated in late Permian time, there have been three peaks of post-Permian deformations in the southern CAOB, which were induced by the Eurasia/Qiangtang (late Triassic-early Jurassic), Eurasia/Lhasa (early Cretaceous) and Eurasia/Karakorum (late Cretaceous-early Palaeogene) collisions, respectively;

- the evolution of the Irtysch Shear Zone (NW China) played an important role in the amalgamation of arc systems in the Central Asian Orogenic Belt and was accompanied by transpressional deformation, strain partitioning and fold superimposition. In the western CAO, the regime of transpression started in Permian time, after the Late Paleozoic closure of the Ob-Zaisan Ocean.

Publications

Russian scientists published 22 articles on the project problems.

Participation in conferences:

In 2016, IGCP#592 participated in organization of 6 scientific meetings, including Russia, (Novosibirsk, March, 28-31, 2016), Austria (Vienna, April, 17-22, 2016), South Africa (Cape Town, August 27-September 14, 2016), Kazakhstan (Oskemen, September 8-11, 2016), UK (London, October 27-28, 2016) India (Trivandrum). There were totally 198 participants from 37 countries.

Field work activities

IGCP#592 participants joined several **field work** missions in China, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, and Uzbekistan, totally 50 participants.

Field training courses, schools, and lectures for **young scientists** have been organized in China, Kazakhstan, Russia and India.

Project 596 Climate Change and Biodiversity Patterns in the Mid-Paleozoic (2011-2015).

The report was submitted by Dr. Izokh N.G., project co-leader (Institute of Petroleum Geology and Geophysics, Siberian Branch RAS, Novosibirsk)

The main results of research activities in 2016:

- new biostratigraphic data on the Middle Devonian brachiopods, conodonts, ammonoids and nautiloids from the Yukta Formation (Middle Devonian), Solyanay Sopka, Yuryung-Tumus Peninsula (Nordvik Bay, Laptev Sea, Arctica) were obtained. Predominant species within the brachiopod assemblage are *Desquamatia (Independatrypa) pesterevskensis* Rzon., *Isospinatrypa subspinosa subspinosa* (Lazutkin in Rzon.) and *Echinocoelia* cf. *denayensis* Jonson, *Emanuella pachyrincha* (Verneul), *Eumetabolotoechia limitaris* (Vanuxem), *Gypidula* cf. *subbrevirostris* Tyazheva. Another revealed species *Leiorhynchus taimyricus*, characteristic for the Yukta Formation, was previously described by D.V. Nalivkin (Nalivkin, 1936). The revealed brachiopod association is characteristic for the upper Eifelian-lower Givetian (kockelianus – hemiansatus conodont zones).

Ammonoids (goniatites) are represented by *Parodiceras* sp. aff. *P. magnosellaris* (Holzapfel), that allow to define the Agoniatites and Holzapfeloceras ammonite genozones in the bearing strata. The nautiloids *Alpenoceras* cf. *cruglovi* Kuzmin were known before only from the Givetian at the Novaya Zemlya.

The conodont association is represented by *Polygnathus linguiformis klapperi* Clausen, Leuteritz et Ziegler and *Icriodus stelcki* Chatterton that characterize the kockelianus Zone of the upper part of the Eifelian. Mentioned conodont association is widely distributed on the north of Siberian Platform (from Norilsk region to Nordvik Bay) and is the evidence of presence of marine basin on the shelf of the Siberian Platform during the Middle Devonian.

- isotope-geochemical analysis and conodont associations investigations were done in order to correlate the Lower Devonian sedimentary strata of the South West Siberia (Salair), the Zeravshan-Gissar Folded Area (Zinzilban Gorge, Uzbekistan) and the Spanish Perinea (section CP-I). Three global chemostratigraphic C-Isotope markers were revealed and aligned with conodont zones.

Publications

1. SHCHERBANENKO, T.A., IZOKH, N.G., SOBOLEV, E.S., YAZIKOV, A.Y., SENNIKOV, N.V., MARINOV, V.A., IGOLNIKOV, A.E., SYURIN, A.A. 2016. New biostratigraphic data about the age of the Yukta Fm of the Middle Devonian of the Salyanaya Sopka of the Yuryung-Tumus Peninsula (Nordvik Bay). In: Proceedings of LXII Session Paleontological Society of the Russian Academy of Sciences (April 4-8, 2016, St. Petersburg). St.-Pb.: Publishing House of VSEGEI, 198-200.

2. SHCHERBANENKO, T.A., YAZIKOV, A.Y., IZOKH, N.G., SOBOLEV, E.S., SENNIKOV, N.V. 2016. Faunal characteristics of the Middle Devonian Yukta Formation on the Yuryung-Tumus Peninsula (Nordvik Bay, coast of the Laptev Sea). In: Interekspo Geo-Siberia-2016: XII International conference “Subsurface management. Mining. New trends and techniques of prospecting, exploration, and exploitation of mineral resources. Geoecology” (Novosibirsk, April 18-22, 2016). – Novosibirsk: SGGGA, 1: 185-190. .

3. IZOKH, O.P., IZOKH, N.G. 2016. The use of isotope data in the correlation of lower Devonian deposits // In: General stratigraphic scale and methodological problems of development of regional stratigraphic scale of Russia. Materials the

Interdepartmental workshop. Saint Petersburg, 17-20 October 2016. - Saint Petersburg, Izdatel'stvo VSEGEI, p. 78-80.

Project 608 Asia-Pacific Cretaceous Ecosystems (2013-2017)

The report was presented by Kirillova G.L and Shurygin B.N. (Institute of Tectonics and Geophysics DVO RAS)

Main results of research activities in 2016:

- environmental changes in the Early Cretaceous basin in West Siberia were investigated based on marine and continental spore-pollen complexes;
- paleoenvironments and ecosystems from the Berriasian to Maestrichtian were explored in southeast of Russia, with a focus to geology and geochemistry of the Bureya basin;
- Jurassic-Cretaceous boundary was investigated in the Asian part of Russia.

Participation in conferences

1V International Symposium on Project N 608 (Russia, Novosibirsk, 15-20 of August, 2016)

The Symposium was attended by 70 scientists from 8 countries: Russia, India, Japan, China, Thailand, Mongolia, Kazakhstan, France. Russian participants of the symposium presented 11 reports.

Project 609 Cretaceous Sea-Level Changes (2013-2017).

The report was submitted by S.O Zorina (Research Institute of Geology and Industrial Minerals, Kazan) and Yu.D.Zakharov (Far East Geological Institute, DVO RAS, Vladivostok)

Main results of research activities in 2016:

- The quantitative sea-level curve in the eastern part of the East European Platform during the Early Cretaceous first compiled for this region is based on the results of analysis of the corresponding deposits and the bathymetric distribution of benthic foraminifers in their sections. This quantitative curve is correlated with the sea-level curve constructed for central areas of the East European Platform (Sahagian et al., 1996). According to Sahagian and coauthors (1996), the basin in the central part of the platform was as deep as 110 m, while in its eastern areas the depth amounted to 350 m. It is revealed that tectono-eustatic cycles defined previously in the central part of the platform and cycles (megasequences) in its eastern areas are asynchronous and are characterized by different orders. Such asynchrony is determined by the different tectonic trends in these regions during the Early Cretaceous;

- a detailed study of the mineral composition and microstructure of the black shales associated with OAE1a (Eastern Russian Platform), OAE1b (Middle Caspian), and the host rocks has been carried out using X-ray diffraction, scanning electron microscopic, and microprobe analyses. The results provide important constraints for depositional environments in the sedimentary basins. Black shales with pyrite framboids imply euxinic (sulfidic) conditions with increased organic matter preservation. Disintegrating framboids suggest partial or complete dissolution of the organic matter inside the framboids due to increasing water oxygenation. OAE1a on the Eastern Russian Platform is heterogeneous as it includes thin interbeds of concretionary coccolith limestones within the interval of bituminous shales, and correlates with the Lower Aptian *Rhagodiscus angustus* nannofossil zone. The coccolith limestones indicate short intermittent episodes of interrupted stagnation, rapid oxygenation, and

restoration of normal marine conditions. The presence of montmorillonite, albite, microcline, and diopside in the bituminous siltstones and in the host siltstones of OAE1a on the Eastern Russian Platform, as well as a high content of titanium in the black siltstones correlated with OAE1b in the Middle Caspian allow proposing significant input of pyroclastic material into the extant sea.

The undertaken studies have shown that the conclusions about depositional environments in the Russian Platform in the Late Cretaceous should necessarily take into account the influence of volcanic activity of different intensity, because the «disguised» pyroclastics compose the greater part of the Upper Cretaceous and almost all the Paleogene rocks in the Eastern Russian platform.

- Sr-isotope composition of aragonitic ammonoid shells (*Desmoceras*, *Cleoniceras*, *Eotetragonites*, *Douwelleiceras*) from the lower Albian of Madagascar has been investigated for the first time;

- provisional information on the O and C isotope data on late Barremian, Aptian and early Albian invertebrates from the Caucasus have been obtained .

Publications

1. Zorina, S.O. Sea-level and climatic controls on Aptian depositional environments of the Eastern Russian Platform. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 2016. Vol. 441. Part 3. P. 599–609.

2. [Sames B.](#), [Wagreich M.](#), [Wendler J.E.](#), [Haq B.U.](#), [Conrad C.P.](#), [Melinte-Dobrinescu M.C.](#), [Hu X.](#), [Wendler I.](#), [Wolfgring E.](#), [Yilmaz I.Ö.](#), [Zorina S.O.](#) Review: Short-term sea-level changes in a greenhouse world – a view from the Cretaceous. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 2016. Volume 441, Part 3, P. 393–411.

3. Zorina S.O. Early Cretaceous Sea Level Fluctuations in the Eastern Part of the East European Platform. *Doklady Earth Sciences*, 2016, Vol. 470, Part 2, pp. 1002–1005.

4. Zorina S. O., Pavlova O.V., Galiullin B.M., Morozov V.P., Eskin A.A. Euxinia as a dominant process during OAE1a (Early Aptian) on the Eastern Russian Platform and during OAE1b (Early Albian) in the Middle Caspian. *SCIENCE CHINA: Earth Sciences*. 2016. (In press)

5. Zakharov, Y.D., Tanabe, K., Shigeta, Y., Safronov, P.P., Smyshlyaeva, O.P., Dril, S. 2016a. Early Albian marine environments in Madagascar: An intergrated approach based on oxygen, carbon and strontium isotopic data. *Cretaceous Research* 58, 29-41.

6. Zakharov Y.D., Dril S.I., Shigeta Y., Popov A.M., Baraboshkin E.Y., Michailova I.A., Safronov P.P. New ammonoid aragonite $^{87}\text{Sr}/^{86}\text{Sr}$ records of Mesozoic environmental change // 35th IGC (27 Aug. -2 Sept. 2016, Cape Town, SAR), Cape Town, 2016, b-in press).

Participation in conferences

The 35th International Geological Congress (South Africa, Cape Town, 28.08-4.09.2016)

The following reports were presented:

1. Pavlova O.V., Zorina S.O., Kadirov I.I., Galiullin B.M., Morozov V.P. and Eskin A.A. “Depositional environments during OAE1a (Early Aptian) in the Eastern Russian Platform and during OAE1b (Early Albian) in the Middle Caspian: new data”.

2. Zakharov Y.D., Kakabadze M.V., Sharikadze M.Z., Smyshlyaeva O.P., Sobolev E.S., Safronov P.P. Late Barremian-early Albian climate of the northern middle latitudes: Stable O- and C-isotope evidence from brachiopods and molluscs of the Caucasus.

8th Russian Meeting “Cretaceous System of Russia and CIS countries: problems of stratigraphy and paleogeography (Russia, Simferopol, 26.09-3.10. 2016)

The following report was presented:

Zakharov, Yu.D., Kakabadze, M.V, Sharikadze M.Z., Smyshlyeva O.P., Sobolev E.S., Safronov P.P. 2016b. Preliminary data on the isotope composition of Aptian brachiopods and mollusks of the Caucasus. In: Baraboshkin E.Y. (Ed.), Cretaceous System of Russia and CIS countries: problems of stratigraphy and palaeogeography.

Project 610 From the Caspian to Mediterranean Environmental Change and Human Response during the Quaternary (2013-2017)

The report was submitted by T.A, Yanina (Moscow State University, Geographical Faculty).

Main results of research activities in 2016:

Field research was conducted in the Caspian region (the Middle and Lower Volga area, Kalmykia, Turkmenistan) and Black Sea (Taman' peninsula) region, and in the Manych depression. As a result, new materials on the evolution of environment in the Quaternary Period and on correlation of the paleo-events in the Caspian and Pontus were received. Now material is being studied by different methods. The core of two boreholls (up to 100 m depth) from the Northern Caspian Sea is studied by a complex method. New data on a structure of the Quaternary deposits are obtained. The detailed pollen records permitted reconstruction of the evolution of the vegetation and the climate in the Terek-Kuma Lowland during the Middle and Late Pleistocene. The palynostratigraphy, combined with new paleomagnetic data also allows specification of the position of the boundaries between stratigraphical units within the Brunhes and late Matuyama Chrons which are provisionally correlated with European established interglacial and glacial, interstadial and stadial stages and linked to global MIS events for the past ~1.0 Ma (Jaramillo subchron to the Holocene time).

Publications

1. Svitoch A.A., Badyukova E.N., Yanina T.A., Sheikhi B. Biostratigraphy of the Marine Holocene on the Iranian coasts of the Caspian Sea // *Quaternary International* . 2016. Vol. 409. Pp. 8-15.
2. Arslanov Kh A., Yanina T.A., Chepalyga A.L., Svitoch A.A., Makshaev R.R., Maksimov F.E., Chernov S.B., Tertychniy N.I., Starikova A.A. On the age of the Khvalynian deposits of the Caspian Sea coasts according to ^{14}C and $^{230}\text{Th}/^{234}\text{U}$ methods // *Quaternary International*, 2016 Vol. 409. Pp. 81-87.
3. Bolikhovskaya N.S., Faustov S.S., Markova A.K. Pleistocene climatic stratigraphy and environments of the Terek-Kuma Lowland (NW Caspian sea region) inferred from palynological, paleomagnetic and rodent records of the long Otkaznoye sediment sequence // *Quaternary International*, 2016, № 409. P. 16-32.
4. Svitoch A.A. Regressive Periods of the Great Caspian // *Water Resources*, 2016. Vol.43.No.2. Pp. 270–282.

Participation in conferences

Conference and field excursions on the IGCP 610 project “[From the Caspian to Mediterranean: Environmental Change and Human Response during the Quaternary](#)” is carried out in the Tbilisi on October 2-9. 80 people from 9 countries took part in the conference (Russia, Azerbaijan, Georgia, Iran, Canada, Israel, Romania, Turkey, Ukraine). Russian participants presented 25 reports.

Field work activities

Field research was conducted in the Caspian region (the Middle and Lower Volga area, Kalmykia, Turkmenistan) and Black Sea (Taman’ peninsula) region, and in the Manych depression.

Project 630 Permian-Triassic Climatic and Environmental Extremes and Biotic Response (2014-2018)

The report was presented by Yu.D.Zakharov (Far East Geological Institute FarEast Branch RAS, Vladivosto k)

Main results of research activities in 2016:

- A new zone (*Shimanskyites shimanskyi*), corresponding the uppermost part of the lower Olenek substage is proposed on the basis of data on the Kamenushka-1, Kamenushka-2 and Smolyaninovo sections in South Primorye. In contrast to upper Smithian sequences in the Central Himalayas (Spity, India), Salt Range (Pakistan) and some other regions, this zone, as well as the underlying *Anasibirites nevolini* Zone, is associated with high taxonomic diversity of ammonoids. New sata allow us to assert that favourable conditions for ammonoids in some marine basins were present during the middle-late Smithian, which is in conflict with the generally accepted opinion. The significant late-Smithian ecological crisis was apparently a short-term event, and the extreme warming at the Smithian-Spathian boundary transition seems to have been one of the main reasons for it;

- ten new ammonoid species (*Inyoceras singularis*, *Yvesgalleticeras proximus*, *Tirolites opiparus*, *Koninckitoides solus*, *Bajarunia magna*, *Albanites vulgaris*, *Nordophiceratoides praecox*, *Palaeophyllites admirandus*, *Kamenushkaites acutus*, and *Shimanskyites shimanskyi*) and two new ammonoid genera of the families Palaeophyllitidae (*Kamenushkaites*) and Xenoceltitidae (*Shimanskyites*) have been described on the basis of material from the Olenekian of the Kamenushka River basin - ammonoid- and brachiopod-bearing silty-clayey sediments of the lower-middle Olenekian Kamenushka Fm. in South Primorye, overlaying Induan submarine conglomerate (60 m), were investigated

in detail. As a result, four succession phases have been distinguished, reflecting a degree of diversity for the marine communities which existed at that time;

- a rare middle Anisian ichthyosaur *Tholodus* has been discovered in South Primorye (Archangelsky et al., 2016). Until recently, *Tholodus* has been known only from the Anisian of Western Europe. The record of *Tholodus* remains in the Karazin Formation of South Primorye significantly expands the range of these reptiles;

- new data on the P-T transition in the Setorym River basin (South Verkhoyansk region), represented by the upper Imtachan and lower Nekuchan formations, have been obtained.

Publications

1. Arkhangelsky, M.S., Zverkov, N.G., Zakharov, Y.D., Borisov, I.V., 2016. On the first reliable find of the genus *Tholodus* (Reptilia: Ichthyopterygia) in the Asian peripheral area of the Panthalassic Ocean. *Paleontologicheskii Zhurnal*, N 1, c. 73-81,
2. Biakov, A.S., Zakharov, Y.D., Horacek, M., Richoz, S., Kutygin, R.V., Ivanov, Y.Y., Kolesov, E.V., Konstantinov, A.G., Tuchkova, M.I., Mikhailitsyna, T.I., 2016. New data on the structure and age of the terminal Permian strata in the South Verkhoyansk region (Northeastern Asia). *Geologiya i Geofizika*, v. 57, N 2, p. 353-367.
3. Zakharov, Y.D., Smyshlyaeva, O.P., 2016. New middle Olenekian (Early Triassic) ammonoids of South Primorye. *Paleontologicheskii Zhurnal*, N 3, c. 21-28.
4. Zakharov, Y.D., Horacek, M., Smyshlyaeva, O.P., Popov, A.M., Bondarenko, L.G., Guravskaya, G.I., 2016. Early Olenekian ammonoids from the Kamenushka River basin, South Primorye and their environment. In: Barskov, I.S., Ivanov, A.V., Leonova, T.B., Nikolaeva, S.V. and

Yashkov, I.A. (Eds.), *Zolotoi vek rossijskoj malakologii (Golden age of Russian Malacology)*. Moscow-Saratov: Kuznitsa reklamy, p. 167-177.

5. Zakharov, Y.D., Horacek, M., Popov, A.M., Smyshlyaeva, O.P., (in press). Olenekian ammonoid and brachiopod succession of the Kamenushka River basin and their environmental conditions based on N- and C-isotope data from the Lower Triassic of South Primorye, Russian Far East // 35th Intern. Geol. Congress (27 Aug. -2 Sept. 2016, Cape Town, South Africa). Cape Town.

Field work activities:

1. *Otoceras*-bearing sediments of the Left Suol and Nikilkin Kluch section of the Setorym River basin, South Verkhoyansk area, have been investigated during field-work 2016. Samples for C and N isotope analyses have been taken from Changhsingian and lower Induan mudstones of the Left Suol section.

2. Samples for C isotope analysis have been taken from upper Olenekian mudstones of the Zhitkov section, South Primorye.

Project 637 Heritage Stone Designation (2015-2019)

The report was presented by V.V. Gavrilenko, dr., Herzen State Pedagogical University, S.-Petersburg

The main results of research activities in 2016

The most famous monuments of St. Petersburg and other Northern cities were made of granite rapakivi, which had been developed and actively conducted on the Karelian isthmus in southeastern Finland. Extensive use of natural stone in the construction of the capital cities St. Petersburg and Helsinki has created them magnificent, majestic appearance. In the world heritage list of UNESCO included the historic center of St. Petersburg together with the groups of

monuments of the suburbs, which used this type granites. Therefore, the authors propose to include this type of granites into the list of world heritage stones. In 2016, it was continued study of different granites, used in the creation of architectural monuments in St. Petersburg and developed in Karelia and Finland, as well as numerous other types of rocks used in the creation of the famous architectural ensembles. In connection with the problem of preservation of stone monuments in the urban environment also it was investigated the state changes of cultural heritage objects created using the rapakivi, granites to influence the destructive factors of the urban environment. It was examined the composition and origin of the granite pedestal of the famous "bronze horseman".

The materials obtained during the work are used when working with schoolchildren at the St. Petersburg Palace of youth creativity

Publications

1. Bulakh A. G. At the will of the mind and the senses (Two Cathedral Orthodox Cathedrals). St. Petersburg state University, SPb, 2016, 84 p.)
2. Bulach, A. G., Gavrilenko V. V., Panova E. G. Rapakivi granite in St. Petersburg: architecture of the mineralogical and petrographic observations// Vestnik St. Petersburg University. Ser.7. 2016. Vol.3. p. 40-53.
3. Gavrilenko V. V., Ermosh N. G. Natural and cultural stone heritage in further education students from St. Petersburg/Natural and cultural heritage: interdisciplinary research, conservation and development. A collective monograph on the materials of IV International scientific-practical conference, St. Petersburg, Herzen state pedagogical University. October 27-28, 2016.
4. Gavrilenko V. V., Romachevsky V. M. On the problem of preservation of monuments of stone architecture in the South-West of St. Petersburg region/ Natural and cultural heritage: interdisciplinary research, conservation and development. A collective monograph on the materials of IV International

scientific-practical conference, St. Petersburg, Herzen state pedagogical University. October 27-28, 2016 SPb: Publishing house 2016. P. 436-440.

5. Elena G. Panova, Dmitry Yu. Vlasov, Hannu Luodes, Alexey Vlasov D., Tatijana A. Popova and Marina S. Zelenskaya. Granite Weathering in Urban Environments//Biogenic—Abiogenic Interactions in Natural and Anthropogenic Systems. (Editors: Olga V. Frank-Kamenetskaya Elena G. Panova Dmitry Yu. Vlasov). Springer International Publishing, Switzerland, 2016, 543 p.

Project 648 Supercontinent Cycles and Global Geodynamics (2015-2019)

The report was presented by D.P. Gladkochub and T.V. Donskaya, (Institute of Earth Crust, Siberian Branch RAS, Irkutsk)

The main results of the research activities in 2016:

- the analysis of Proterozoic mafic magmatism was conducted in the Siberian craton which allows us distinguish following main pulses of mafic dyke emplacement: 1) 1860 – 1850 Ma mafic dykes are localized within the southern (Baikal uplift) and south-eastern (Aldan shield) parts of the Siberian craton. Their emplacement was controlled by post-collisional extension; 2) ca 1750 Ma dyke swarms occur at the southern (Baikal uplift), south-eastern (Aldan terrane) and northern (Anabar shield) margins of the craton and can be related to huge mantle plume activity; 3) 1500 – 1470 Ma mafic dyke swarms occur in the northern part of the Siberian craton (Anabar shield and Olenek uplift) only. These swarms can be united into a LIP linked to a mantle plume; 4) ca 1350 Ma mafic dyke swarm is exposed at the southern margin of the craton only. These dykes were generated during a plume-related Mesoproterozoic intra-continental extension; 5) ca 1000 Ma mafic intrusions of south-eastern Siberia are associated with formation of the passive continental margin along SE flank of the Siberian craton; 6) 740 – 715 Ma dyke swarms of the southern part of the Siberian craton correspond to the initial stages of rifting between Siberia and Laurentia in frame of Rodinia; 7) 650 – 630 Ma mafic dykes of the southern

parts of the Siberian craton were emplaced during an advanced stage of Rodinia breakup and development of the passive margins along southern Siberia.

Publications

1. Cawood, P.A., Strachan, R., Pisarevsky, S.A., Gladkochub, D.P., Murphy, J.B., 2016, Linking collisional and accretionary orogens during Rodinia assembly and breakup: Implications for models of supercontinent cycles. *Earth and Planetary Science Letters*, 449, 118-126

2. Ernst, R. E., Hamilton, M. A., Soderlund, U., Hanes, J. A., Gladkochub, D. P., Okrugin, A. V., Kolotilina, T., Mekhonoshin, A. S., Bleeker, W., LeCheminant, A. N., Buchan, K. L., Chamberlain, K. R., and Didenko, A. N., 2016, Long-lived connection between southern Siberia and northern Laurentia in the Proterozoic: *Nature Geoscience*, 9, 464-469.

3. Gladkochub, D.P., Donskaya, T.V., Mazukabzov, A.M., Pisarevsky, S.A., Ernst, R.E., Stenevich, A.M., 2016, The Mesoproterozoic mantle plume beneath the northern part of the Siberian craton. *Russian Geology and Geophysics*, 57, 672-686.

Participation in conferences **The 7th International Dyke Conference (IDC7), August 18 – 20, 2016, Beijing, China.** The following reports were presented:

1. D.P. Gladkochub, T.V. Donskaya, R.E. Ernst, S.A. Pisarevsky, M.T.D. Wingate, U. Söderlund. Proterozoic dyke swarms of the Siberian craton and their geodynamic implications

2. T.V. Donskaya, D.P. Gladkochub, R.E. Ernst, S.A. Pisarevsky, A.M. Mazukabzov, U. Söderlund, M.T.D. Wingate, M.A. Hamilton,

E.I.Demonterova. Age and geochemical characteristics of major mafic dyke swarms in the southern part of the Siberian craton

IGCP Committee's Activities in 2016

By the order of the Minister of Foreign Affairs of the Russian Federation S.V. Lavrov, on April 24, 2016 the Russian Federation Commission for UNESCO created the Russian Committee of the International Programme for geosciences and geoparks. The following scientists are appointed as co-chairmen:

Director of the Geological Institute RAS, Moscow
Academician M.A. Fedonkin to oversee the participation of Russian scientists in IGCP projects,
and

Director General of All-Russia Geological Institute, Sankt-Petersburg
O.V. Petrov to oversee the creation of UNESCO geoparks in Russia

During 2016 the Russian Committee maintained contacts with the Commission of the Russian Federation for UNESCO. There were also close interactions with Russian members of IGCP projects.

Mikhail A. Fedonkin

Academician

IGCP Projects, in which Russian scientists participated in 2016

Project 587 Entity, Facies, and Time – the Ediacaran (Vendian) Puzzle
(2010-2014) (OET);

Project 589 Development of the Asian Tethyan Realm (2012-2016);

Project 592 Continental construction in Central Asia (2012-2015) (OET);

Project 596 Climate Change and Biodiversity Patterns in the Mid-Paleozoic
(2011-2015);

Project 608 Asia-Pacific Cretaceous Ecosystems (2013-2017)

Project 609 Cretaceous Sea-Level Changes (2013-2017)

Project 610 From the Caspian to Mediterranean: Environmental Change and
Human Response during the Quaternary (2013-2017)

Project 628 The Gondwana Map Project (2013-2017)

Project 630 Permian-Triassic Climatic and Environmental Extremes and Biotic
Response (2014-2018)

Project 632 Continental Crises of the Jurassic (2014-2018)

Project 637 Heritage Stone Designation (2015-2019)

Project 640 S⁴LIDE (Significance of Modern and Ancient Submarine Slope LandSLIDEs) (2015-2020)

Project 648 Supercontinent Cycles and Global Geodynamics (2015-2019)

Project 653 The Onset of the Great Ordovician Biodiversification Event
(2016-2020)

