

## RUSSIAN NATIONAL COMMITTEE FOR IGCP

### ANNUAL REPORT ON IGCP-RELATED ACTIVITIES 2010

This report is on Russian activities during 2010 on the IGCP projects in which the Russia is participating.

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The current Committee's membership comprises twenty four members including the following Bureau members:

Mikhail A. Fedonkin (Chairman, Geological Institute, GIN RAS); Igor D. Ryabchikov (Vice Chairman, Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry, IGEM RAS); Galina V. Knoroz (Executive Secretary, Geological Institute, GIN RAS); Oleg A. Bogatikov (Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry , IGEM RAS); Eric M. Galimov (V.I. Vernadsky Institute of Geochemistry and Analytical Chemistry , GEOKHI RAS ); Alexander O. Gliko (Institute of Physics of the Earth, RAS); Yury G. Leonov (Geological Institute, GIN RAS); Felix P. Mitrofanov (Institute of Geology Kola SC RAS).

#### **Projects led by Russian scientists:**

**Project 514** Fluvial Palaeosystems: Evolution and Mineral Deposits (2005-2009,OET)  
A. Duk-Rodkin, Canada; Baohong Hou, Australia; Li Ziyang, China; Vladimir Dolgoplov, Kazakhstan, N. Patyk-Kara, Russia (leader of the project, passed away in October 2008).  
A.V.Lalomov, Russia (co-leader of the project during 2009-2010).

**Project 587** Entity, Faces and Time – the Ediacarian (Vendian) Puzzle.(2020-2014)  
Mikhail Fedonkin, Russia; Patricia Vickers-Rich, Australia; Jim Gehling, Australia; Guy Narbonne, Canada.

#### **Projects with Russian co-leaders:**

**Project 540** Gold-bearing hydrothermal fluids of orogenic deposits (2007-2011).  
P.S.Garafalo, Italy; J.R.Ridley, USA; Vsevolod Prokofiev, Russia.

**Project 543** Low-temperature thermochronology: applications and inter-laboratory calibration (2007-2011),  
Massimiliano Zattin, Italy; J.I.Garver, USA; Vitaliy A. Privalov, Ukraine; Alexei V. Soloviev, Russia; Cornalia Spiegel, Germany; Maarten de Wit, South Africa; Dewen Zheng, China.

**Project 555** Rapid Environmental/Climate Change in the Cretaceous Greenhouse World (2007-2010)  
Chengshan Wang, China; Robert Scott, USA; Hugh Jenkyns, UK; Michael Wagreich, Austria; William Hay, USA; Zakharov Y.D., Russia.

Russian geoscientists are members of 21 IGCP projects (including 9 on extended term) Nos.: 506, 507, 509, 510, 512, 514, 516, 521, 524, 526, 540, 543, 555, 559, 567, 571, 572, 574, 580, 581 and 587.

This report has been prepared from statements submitted by Russian IGCP members in response to Committee's request for information on 'significant' developments in 2010.

No reports were received from the national correspondent of the following projects: 506, 509, 510, 516, 524, 526 (these projects have an OET status); projects: 559, 571, 574, 581 and 587 (first year), indicating that there had been no significant developments in 2010.

### **Project 514 Fluvial Palaeosystems: Evolution and Mineral Deposits**

Report is submitted by A.V. Lalomov (Project co-leader).

This year the project has an OET status, but Russian participants (19 geoscientists) continued to be actively involved. As a result of their 2010 activities reported to the Committee were thirteen publications.

Below are just those ones published in English:

Berthault, G., Lalomov, A. Laboratory experiments on erosion of consolidated soils by high-speed water flow applied to paleochannels. The 18-th International Sedimentological Congress, Mendoza, Argentina, 2010, CD-version;

Chefranov R., Korkoshko A., Krupskaya V. Lithology features of placer-bearing Oligocene formations of West Siberia. The 18-th International Sedimentological Congress, Mendoza, Argentina, 2010, CD-version;

Lalomov A., Heavy mineral placers of fluvial-lacustrine Oligocene paleosystem of West Siberia plain. The 18-th International Sedimentological Congress, Mendoza, Argentina, 2010, CD-version;

Lalomov A., Grigorieva A., Development of technology of micropaleofacial analysis for optimization of geological exploration on Ti-Zr placer deposits. The 18-th International Sedimentological Congress, Mendoza, Argentina, 2010, CD-version;

Matsapulin V., Placer-formation of the northern frame of Alpine orogen of the Middle Miocene period in the East Caucasus (Daghestan). The 18-th International Sedimentological Congress, Mendoza, Argentina, 2010, CD-version;

Pechenkin I.G., Cenomanian paleo-valley of Central Kyzyl-Kum: peculiarities of the lithology and mineralization. The 18-th International Sedimentological Congress, Mendoza, Argentina, 2010, CD-version;

The following events were attended:

- XIV International Symposium on Geology of Placers and Weathered Rock Deposits (Novosibirsk, Russia), with IGCP-514 session "Fluvial Palaeo-Systems: Evolution and Mineral Deposits";
- The 18-th International Sedimentological Congress (Mendoza, Argentina), session TS10-3 Placer mineral deposits include reports on research of fluvial paleo-system deposits and discussion on the IGCP-514 project successor;
- Session on Mineral deposits of Paleochannels during the 10th International Congress for Applied Mineralogy (ICAM) (1-5 August 2011, Trondheim, Norway);

- The 28th IAS Meeting of Sedimentology, (6-8 July, 2011, Zaragoza, Spain).  
Web-site of the Project: [www.igem.ru/igcp514/](http://www.igem.ru/igcp514/)

### **Project 540 Gold-bearing hydrothermal fluids of orogenic deposits.**

Research results are submitted by V.Yu. Prokofiev (Project co-leader)

Taking into account that composition of mineral-forming fluids is a critical parameter for an identification of genesis of a mineral deposit, studied were fluid inclusions in quartz from 10 world class (productions + reserves more 100 t Au) and several ordinary gold deposits located in Lena (PR), Sayan-Yenisei (PR), Urals (Pz), Verkhoysk (Mz), Kolyma (Mz), Okhotsk-Chukotka volcano-plutonic belt (Mz) and Eastern Transbaikalian (Mz). Deposits under consideration are Sukhoi Log, Olimpiada, Sarylakh, Sentachan, Nezhdaninskoye, Maiskoye, Natalkinskoye, Berezovskoye, Kochkarskoye, Darasun. Some of them are located in the metasedimentary sequence, while others are intrusion-hosted deposits. Four main types of fluid inclusions are recognized in quartz at room temperature in orogenic (mesothermal) deposits from Lena (PR), Sayan-Yenisei (PR), Urals (Pz), Verkhoysk (Mz), Kolyma province. The data obtained indicate that the commercial ore bodies in orogenic (mesothermal) deposits studied were deposited from the  $H_2O+CO+NaCl\pm CH_4\pm N_2$  fluid with low- to moderate salinity. A mineral formation occurred at 100 to 450°C and 1 to 3 kbars. Dilute aqueous fluids recorded in the late gold-sulphosalts-bearing veins. Such a fluid regime is typical for orogenic gold deposits.

Compositionally contrasting fluids are responsible for a formation of gold deposits in the Darasun district (Transbaikalian). Brines with salinity 56.3–29.9 wt % NaCl- equiv. formed early metasomatites. Auriferous quartz -base metal-sulphosalt veins crystallized from aqueous fluids with salinity 22.2–0.4 wt % NaCl-equiv. Such fluids are characteristic for porphyry or “intrusion related” deposits. Dilute aqueous fluids with salinity of 9.2–0.4 wt % NaCl- equiv. formed epithermal gold deposits within Okhotsk–Chukotka volcanic belt and Transbaikalia.

The chemistry, REE patterns, and carbon and oxygen isotopic compositions of carbonates from ore veins of the Darasun deposit are discussed. In addition to the earlier described siderite, calcite, and carbonates of the dolomite–ankerite series, kutnahorite is identified. The REE sum and carbon and oxygen isotopic compositions reveal zonal distribution relative to the central granodiorite porphyry stock. The correlation between the carbon and oxygen isotopic compositions and REE sum reflects variations in the physicochemical formation conditions and composition of ore-forming fluid. The isotopic composition of fluid is calculated, and possible sources of its components are considered. Earlier established evidence for a magmatic source of ore-forming fluid and participation of meteoric water in ore formation is confirmed. Geochemical evidence for interaction of ore-forming fluid with host rocks is furnished. The relationships between the REE sum, on the one hand, and carbon and oxygen isotopic compositions of hydrothermal ore-forming fluid, on the other, are established.

Publications:

Prokofiev V.Yu., Garofalo P.S., Bortnikov N.S., Kovalenker V.A., Zorina L.D., Grichuk D.V., Selektor S.L., Fluid Inclusion Constraints on the Genesis of Gold in the Darasun District (Eastern Transbaikalia), Russia // *Economic Geology*. 2010. V. 5. № 2, P. 395-416;  
Prokofiev V.Yu., Bortnikov N.S., Kovalenker V.A., Vinokurov S.F., Zorina L.D., Chernova A.D., Kryazhev S.G., Krasnov A.N., Gorbacheva S.A. The Darasun Gold Deposit, Eastern Transbaikalian Region: Chemical Composition, REE Patterns, and Stable Carbon and Oxygen Isotopes of Carbonates from Ore Veins // *Geology of Ore Deposits*. 2010. V. 52. No. 2, P. 81–113;

Bortnikov N.S., Gamynin G.N., Vikent'eva O.V., Prokofiev V.Yu., Prokopiev A.V., Sarylakh and Sentachan Gold–Antimony Deposits, Sakha-Yakutia: A Case of Combined Mesothermal Gold–Quartz and Epithermal Stibnite Ores // *Geology of Ore Deposits*. 2010. V. 52. No. 5, P. 339–372;

Prokofyev V.Yu., Bortnikov N.S., Kovalenker V.A., Vinokurov S.F., Zorina L.D., Kryazhev S.G. The world-class vein gold-sulfide-quartz deposit at Darasun (Eastern Transbaykalia, Russia): chemical composition, REE, stable isotopes of O and C in ore vein carbonates // *Giant ore deposits Down-Under. Proceedings of the 13<sup>th</sup> Quadrennial IAGOD Symposium 2010*, Adelaide, South Australia, 6-9 April 2010. Adelaide, 2010, P. 243-244;

Bortnikov N.S., Prokofiev V.Yu., Crustal fluids formed world class gold deposits in different metallogenic provinces of Russia // *Acta mineralogica-petrographica, Abstract series*. 2010. V. 6. IMA2010. The 20th General Meeting of the International Mineralogical Association 21–27 August, 2010, Budapesht, Hungary, P.248;

Garofalo P.S., Fricker M., Günther D., Bersani D., Ridley J.R., Gibson J.L., Prokofiev V.Y., The physical-chemical properties of Au-bearing hydrothermal fluids from orogenic and intrusion-related deposits based on a record of multi-technique, fluid inclusion analytical data // *Acta mineralogica-petrographica, Abstract series*. 2010. V. 6. IMA2010. 20th General Meeting of the International Mineralogical Association 21–27 August, 2010. Budapesht, Hungary, P. 249;

Klubnikin G.K., Prokofiev V.Yu., Anikina E.Yu., Gamyarin G.N., Bortnikov N.S. Fluid regime during formation of deposits of the Mangazeyskoe ore field (Sakha-Yakutiya) // *ACROFI III and TBG XIV Abstracts Volume: Abstracts of III Biennial Conference of Asian Current Research on Fluid Inclusions (ACROFI III) and XIV International Conference on Thermobarogeochemistry (TBG XIV)*, Novosibirsk, 15-20 September, 2010 (Ed., V.V. Sharygin) / Russian Academy of Sciences, Siberian Branch, V.S. Sobolev Institute of Geology and Mineralogy. Novosibirsk: Publishing House of SB RAS, 2010, P. 92-93;

Prokofiev V.Yu., Baksheev I.A., Svintitsky I.L., Vlasov E.A., Nagornaya E.V., Microthermometric study of fluid inclusions from vein quartz of the the Uderei gold-antimony deposit, Krasnoyarsk territory, Russia // *ACROFI III and TBG XIV Abstracts Volume: Abstracts of III Biennial Conference of Asian Current Research on Fluid Inclusions (ACROFI III) and XIV International Conference on Thermobarogeochemistry (TBG XIV)*, Novosibirsk, 15-20 September, 2010 (Ed., V.V. Sharygin) / Russian Academy of Sciences, Siberian Branch, V.S. Sobolev Institute of Geology and Mineralogy. Novosibirsk: Publishing House of SB RAS, 2010. P. 180-181;

Prokofiev V.Yu., Bortnikov N.S., Kovalenker V.A., Zorina L.D., Prokofieva A.V., Origin and vertical fluid zoning of fluid-magmatic gold ore-forming systems of Eastern Transbaykalia (Russia) // *ACROFI III and TBG XIV Abstracts Volume: Abstracts of III Biennial Conference of Asian Current Research on Fluid Inclusions (ACROFI III) and XIV International Conference on Thermobarogeochemistry (TBG XIV)*, Novosibirsk, 15-20 September, 2010 (Ed., V.V. Sharygin) / Russian Academy of Sciences, Siberian Branch, V.S. Sobolev Institute of Geology and Mineralogy. Novosibirsk: Publishing House of SB RAS, 2010, P. 182-183;

Volkov A.V., Prokofiev V.Yu. Formation conditions and composition of ore-forming fluids in the Promezhutochnoe gold–silver deposit (Central Chukotka, Russia) // *ACROFI III and TBG XIV Abstracts Volume: Abstracts of III Biennial Conference of Asian Current Research on Fluid Inclusions (ACROFI III) and XIV International Conference on Thermobarogeochemistry (TBG XIV)*, Novosibirsk, 15-20 September, 2010 (Ed., V.V. Sharygin) / Russian Academy of Sciences, Siberian Branch, V.S. Sobolev Institute of Geology and Mineralogy. Novosibirsk: Publishing House of SB RAS, 2010. P. 258-259.

Meetings attended:

- IGCP project Business meeting during the 13<sup>th</sup> Quadrennial IAGOD Symposium 2010. Adelaide, South Australia, 6-9 April 2010;
- The 20th General Meeting of the International Mineralogical Association, 21–27 August, 2010. Budapest, Hungary, EG 51 Crustal fluids and gold Seminar. Bortnikov N.S. & Prokofiev V.Yu., Crustal fluids formed world class gold deposits in different metallogenic provinces of Russia; Garofalo P.S., Fricker M., Günther D., Bersani D., Ridley J.R., Gibson J.L. & Prokofiev V.Y. The physical-chemical properties of Au-bearing hydrothermal fluids from orogenic and intrusion-related deposits, based on a record of multi-technique fluid inclusion analytical data.
- **The 3rd Asian Current Research on Fluid Inclusions and 14th International Conference on Thermobarogeochemistry, 15-21 September 2010, Novosibirsk, Russia.**  
**IGCP540 seminar** (17 September 2010), “Compositions of fluids of orogenic gold deposits from state-of-art fluid inclusion microanalysis, and application to mineral exploration”. Pandalai H. S., Nevin C.G. Interpretation of the evolution of high- and low salinity aqueous fluid inclusions in shear-zone hosted orogenic gold deposits: a case-study of the Hutti gold deposit, Karnataka, India; Nevin C.G., Pandalai H.S. Hydrothermal fluids and vein-types in the orogenic gold-bearing Hutti Maski greenstone belt, Karnataka, India; Sun X.M., Wei H.X., Zhai W., Shi G.Y., Liang Y.H., Mo R.W., Ai G.P., Han M.X., Zhang X.G., Lv Y.P., Yi J.Z. Ore-forming fluid geochemistry and metallogenic mechanism of Bangbu large-scale orogenic gold deposit in Southern Tibet, China; Timkina A.L. T-P-X formation conditions of stockwork type auriferous giant deposits Muruntau (Uzbekistan) and Vasilkovskoe (Kazakhstan); Volkov A.V., Prokofiev V.Yu. Formation conditions and composition of ore-forming fluids in the Promezhutochnoe gold–silver deposit (Central Chukotka, Russia); Prokofiev V.Yu., Bortnikov N.S., Kovalenker V.A., Zorina L.D., Prokofieva A.V. Origin and vertical fluid zoning of fluid-magmatic gold ore-forming systems of Eastern Transbaykalia (Russia); Lambrecht G., Diamond, L.W. Fluid mixing and boiling during latest stage orogenic gold mineralization at Brusson, NW Italian Alps; Wei H.X., Sun X.M., Zhai W., Yi J.Z., Han M.X., Shi G.Y., Zhou F. Fluid inclusions and H-O isotopes of Guqiong Ag-Au polymetallic deposit in Southern Tibet, China; Klubnikin G.K., Prokofiev V.Yu., Anikina E.Yu., Gamyandin G.N., Bortnikov N.S., Fluid regime during formation of deposits of the Mangazeyskoe ore field (Sakha-Yakutiya); Klyukin Yu.I., Murzin V.V. Fluid regime of formation of quartz-veined of deposit Byngi (Urals) containing the gold-tellurium mineralization.

### **Project 543 Low-temperature thermochronology: applications and inter-laboratory calibration**

Presented results are reported by A.V.Soloviev (Project co-leader)

During 2010 the investigations were carried out in two directions: the development of the thermochronological method and observation of the new thermochronological data for different regions of the Russia. The methodological research was related complex analysis of the zircon morphology and ages, observed by different geochronological methods (fission-track, U-Th/He, U/Pb SHRIMP, U/Pb LA-ICPMS). The fission-track apatite and zircon dating was applied for solving the basic and regional tectonic tasks for the Russian Arctic, Sea of Okhotsk region and Crimea.

Four papers and four abstracts were published in 2010. The results of the research were presented at Russian and International conferences.

**Publications:**

Luchitskaya M.V. and Soloviev A.V., Campanian stage of granite formation in the South of the Sredinnyi Range in Kamchatka: New U-Pb SHRIMP data, *Doklady Earth Sciences*. 2010. Vol. 430. Part 1, pp. 22-27;

Mazarovich A.O., Soloviev A.V., Moiseev A.V., Ol'shanetskii D.M., and Khisamutdinova A.I. Deformations in Tertiary Complexes of Western Kamchatka (Tochilo Section), *Doklady Earth Sciences*, 2010, Vol. 433, Part 1, pp. 851–855;

Scott R.A., Bogolepova O.K., Pease V., Gubanov A.P., Howard J.P., Carter A., Soloviev A., Reichow M. The Uralian Orogen in Arctic Russia, and its significance for adjacent hydrocarbon basins, AAPG Meeting. Canada, Calgary. 12-15 September, 2010;

Soloviev A.V., Miller E.L., 2010 Statistical Comparison of Detrital Zircon Suites from Arctic and their Bearing on Plate Reconstructions, AGU 2010, Fall Meeting. San Francisco, USA, 13-17 December 2010;

Soloviev A.V., Rogov M.A. First Fission-Track Dating of Zircons from Mesozoic Complexes of the Crimea, *Stratigraphy and Geological Correlation*, 2010, Vol. 18, No. 3, pp. 298–306.

**Attended events:**

- XLIII Tectonic conference: “Tectonics and geodynamics of the fold belts and platforms in Phanerozoic”. 02-05 February, 2010, Moscow, Poster by A.V.Soloviev: “The deformations of the Tertiary complexes of the Tochilo section (Western Kamchatka)”;

- All-Russian Conference for 80-years of IGEM RAS: “New ideas in study of the magma- and ore-forming”, Moscow, 8-11 November, 2010. Oral presentation by A.V.Soloviev: “The Early Eocene magmatism in the Sredinnyi Range of the Kamchatka: influence of the mantle and ore-forming”;

- AGU 2010, Fall Meeting. San Francisco, USA, 13-17 December 2010. Poster by A.V.Soloviev: “Statistical Comparison of Detrital Zircon Suites from the Arctic and their Bearing on Plate Reconstructions”.

**Project 555 Rapid Environmental/Climate Change in the Cretaceous Greenhouse World: Ocean-Land Interactions**

Research results are reported by Yu. Zakharov (Project co-leader)

New data on Late Jurassic-Cretaceous flora of Trans-Baikal area and South Primorye (Bugdaeva, Markevich, 2009a,b,c; Markevich, Bugdaeva, 2010a,b,c,d), Early Cretaceous sedimentology (Malinovsky, 2010) and habitats of the Middle Maastrichtian dinosaurs of Zeya-Bureya Basin of Amur River region (Markevich et al., 2009, 2010a,b) have been obtained. The coal-forming plants (mainly Miroviaceae) formed unique resinous coals of Lipovtsy coal field were revealed. Among the coal-forming plants Ginkgoales, cyatheaceous and gleicheniaceus ferns were recognized.

Additional data on Maastrichtian dinosaurs habitats in the Zeya-Bureya Basin, Amur River region, have been obtained (Markevich et al., 2009, 2010a, b).

New data on the Jurassic-Cretaceous boundary and Cretaceous biostratigraphy in Siberia and western Europe have been discussed (Baraboshkin and Blagoveschenskij, 2010; Baraboshkin et al., 2010a,b; Dzyuba, 2010; Gontcharoff and Ruban, 2010; Grinenko et al., 2010; Kopaevich et al., 2010; Rogov et al., 2010; Vishnevskaya, 2010; Yanin and Baraboshkin, 2010).

Additional information on migration ways of some Early Cretaceous molluscs (Zakharov and Mitta, 2010) and geographical differentiation of Late Cretaceous planktonic foraminifera in the southern Indian Ocean has been obtained (Sokolova, 2010). Zakharov, V.A., Mitta, V.V., 2010. Ammonite

After isotopic investigation, there is strong evidence that a pole to equator temperature gradient was significantly reduced in Coniacian time. Judging from the oxygen-isotopic data, obtained for the Coniacian of northern Asia, from western Koryak Upland in the north and Hokkaido in the south, it was suggested that in that time it was only 0.12°C per degree of latitude (Zakharov et al., 2010). Average annual paleotemperature for near bottom water of Coniacian shallow epicontinental seas in high latitudes (Koryak Upland) seems to be about 3.3°C lower than that in middle latitudes (Hokkaido). On basis of another (leaf-physiognomic) method, Herman and Spicer (1996) expected a little bit lower temperatures for Alaska and North Kamchatka during Coniacian time than it was estimated by us. It maybe due in part by predominance of oceanic poleward heat transportation during the Late Cretaceous, but not atmospheric one/

Oxygen and carbon isotope ratios were measured on well-preserved molluscs collected from the Pee Dee, Fox Hills, and Coon Creek formations in South Carolina, South Dakota and Tennessee to compare their relative depth habitats. Judging from calculated palaeotemperatures (13.1-22.4 °C), all investigated Late Campanian-Early Maastrichtian bivalves and ammonoids from these areas inhabited warm waters of epipelagic depths, which is in an agreement with published data. Anomalously light  $\delta^{18}\text{O}$  signatures preserved in an aragonitic ammonoid *Sphenodiscus lenticulata* shell from the Fox Hills Formation confirm Tsuta and Westermann's (1998) and Cochran's et al. (2003) suggestion that some well-streamlined Late Cretaceous ammonoid shells have been secreted in brachyhaline shallow waters of the WIS. In contrast, measurements of  $\delta^{18}\text{O}$  on high-resolution samples across growth bands of the Early Maastrichtian *B. americana* from South Carolina indicate that its representatives were inhabitants of deeper, cooler waters of mesopelagic depths: palaeotemperatures varied mainly between 9.4 °C to 12.0 °C, occasionally (taking into account Lowenstam and Epstein's (1954) analyses newly revised) to 17.8 °C, on average to 12.3°C. Similar original results have been obtained from some Late Maastrichtian and Early Campanian belemnite rostra from Poland Germany (10.6° and 12.90 °C, respectively), whereas Late Maastrichtian bivalve *Dhondtichlamys* from Poland shows palaeotemperature of 20.7°C. Oxygen isotopic data on *B. americana* are consistent with findings suggesting a considerable vertical range of the migration of belemnites in the seawater column and therefore the assessment of belemnite-derived palaeotemperatures for any reconstructions should be made with caution.

Palaeotemperatures for the Cretaceous of India and Madagascar have been determined on the basis of oxygen isotopic analysis of well-preserved Late Albian belemnite rostra and Maastrichtian bivalve shells of from the Trichinopoly district, southern India and Albian nautiloid and ammonoid cephalopods from the Mahajang Province, Madagascar. The Albian (possibly Late Albian) palaeotemperatures for Trichinopoly district are inferred to range from 14.9°C to 18.5°C for the epipelagic zone and from 14.3 °C to 15.9°C for the mesopelagic zone, based on analysis of 65 samples; isotopic palaeotemperatures interpreted as summer and winter values for near-bottom shelf waters in this area fluctuate from 16.3 to 18.5 °C and from 14.9 to 16.1 °C, respectively. The mentioned palaeotemperatures are very similar with those calculated from isotopic composition of middle Albian belemnites of the middle latitude area of Pas de

Calais in Northern hemisphere (Zakharov et al., 2006b) but significantly higher than those calculated from isotopic composition of Albian belemnites from southern Argentina and Antarctic and middle Albian belemnites of Australia (Pirrie et al., 2004) located within the warm-temperate climatic zone. Isotopic analysis of early Albian cephalopods from Madagascar shows somewhat higher palaeotemperatures for summer near-bottom shelf waters in this area (20.2-21.6°C) in comparison with late Albian palaeotemperatures calculated from southern India fossils, but similar winter values (13.3-16.4 °C); however, the latter values are somewhat higher than those calculated from Early Albian ammonoids of the tropical-subtropical climatic zone of the high latitude area of southern Alaska and the Koryak Upland. The new isotopic palaeotemperature data suggest that southern India and Madagascar were located apparently in middle latitudes (within the tropical-subtropical climatic zone) during Albian time. In contrast to the Albian fossils, isotope results of well-preserved Early Maastrichtian bivalve shells from the Ariyalur Group, Trichinopoly district, are characterized by lower  $\delta^{18}\text{O}$  values (up to -5.8‰) but normal  $\delta^{13}\text{C}$  values, which might be a result of the marine environment, having a local fresh-water input. Our data suggest that the Early Maastrichtian palaeotemperature of the southern Indian near-bottom shelf waters was probably about 21.2°C, and that this middle latitude region continued to be a part of tropical-subtropical climatic zone, but with tendency of increasing of humidity at the end of Cretaceous time (Zakharov et al., 2009b).

Twenty nine selected references were reported, below are those ones published in English

Cretaceous flora of the Russian Far East:

Markevich, V.S., Bugdaeva, E.V., 2010b. The Palynofloras at the Jurassic-Cretaceous Boundary (Russian Far East), *Earth Science Frontiers, Short papers for the 8th International Congress on the Jurassic System*, vol. 17., Special issue, P. 173-174.;

Bugdaeva, E.V., Markevich, V.S., 2010c., The Late Jurassic-Early Cretaceous Coal-forming Plants (Russian Far East), *Earth Science Frontiers. Short papers for the 8th International Congress on the Jurassic System*, vol. 17. Special issue, P. 182-183.

Cretaceous invertebrates of the Pacific Magellan Rise:

Zakharov, Y.D., Melnikov, M.E., Popov, A.M., Khudik, V.D., Punina, T.A., Pletnev, S.P., 2010a. Ammonoid and brachiopod fossils from the Pacific floor: evidence from the Cretaceous of the Magellan Seamounts. 8<sup>th</sup> International Symposium, *Cephalopods – Present and Past* (August 30 – September 3, 2010). Abstracts Volume. University of Burgundy & CVRS, Dijon-France, PP. 156-157;

Zakharov, Y.D., Melnikov, M.E., Pletnev, S.P., Safronov, P.P., Popov, A.M., Velivetskaya, T.A., Afanasyeva, T.B., 2010b. Supposed deep-water temperature fluctuations in the Central Pacific during latest Cretaceous time: first evidence from isotopic composition of belemnite rostra. In: Tanabe, K., Shigeta, Y., Sasaki, T. & Hirano, H. (Eds.), *Cephalopods – Present and Past*. Tokai University Press, Tokyo, P. 267-285.

Cretaceous flora, biostratigraphy and palaeoclimatology of Siberia:

Herman, A.B. and Spicer, R.A., 2010. Mid-Cretaceous floras and climate of the Russian high Arctic (Novosibirsk Islands, Northern Yakutia), *Palaeogeography, Palaeoclimatology, Palaeoecology*, vol. 295, P. 409-422.

Cretaceous isotopic thermometry and carbon isotope events:

Nunn E.V., Price G.D., Grocke D.R., Baraboshkin E.Y., Leng M.J., Hart M.B. 2010. The Valanginian positive carbon isotope event in Arctic Russia: Evidence from terrestrial and marine isotope records and implications for global carbon cycling, *Cretaceous Research* xxx, p .1-16;

Zakharov, Y.D., Kazushige, T., Safronov, P.P., Popov, A.M., Smyshlyaeva, O.P., Tatiana A. Velivetskaya, T.A., Afanasyeva, T.B., 2010, Significance of the Early Maastrichtian belemnite



*Belemnitella americana* from the Pee Dee Formation in South Carolina (adopted as an isotopic standard) for oxygen isotope palaeotemperature measurements. Geological 2010 GSA, Denver Annual Meeting (31 Oct. – 3 Nov. 2010), Abstracts with Programs (Paper no. 229-4), vol. 42, no. 5, P 540;

Zakharov, Y.D., Shigeta, Y., Popov, A.M., Velivetskaya, T.A., Afanasyeva, T.B., 2010 (in press). Cretaceous climatic oscillations in the Bering area (Alaska and Koryak Upland): isotopic and palaeontological evidence, *Sedimentary Geology*.

Meetings attended:

- The 8<sup>th</sup> Intern. Symposium, Cephalopods – Present and Past. Aug. 30 – Sept. 3, 2010, Dijon, France.

- V All-Russian meeting "The Cretaceous System of Russia and adjacent regions: problems of stratigraphy and paleogeography" (Aug. 23-28, 2010, Ulyanovsk).

- Geological Society of America (GSA) Annual Meeting, 31 Oct.-3 Nov. 2010.

It is planned by the participants to continue scientific cooperation in a new IGCP project with preliminary title: "Sea level fluctuations and climate changes in the Cretaceous" to be submitted early in the autumn 2011.

### **Project 507: Paleoclimates in Asia during the Cretaceous: their variations, causes, and biotic and environmental responses**

Reported achievements by G.L.Kirillova (WG leader)

Analysis of data from O isotopes obtained for boundary Jurassic to Cretaceous deposits from the sections of the Boreal (Nordvik Peninsular, Northern Siberia; belemnite rostra) (Fig. 1) and Tethyan types (Brodno, West Slovakia, and Puerto Escano, South Spain; limestone) indicated that in the Siberian sections a time-interval from Oxfordian through lower parts of the Ryazanian stage is characterized by a gradual decrease in values  $\delta^{18}\text{O}$  (from + 1.6‰ in the Oxfordian to the values ranging from +0.3 and -0.8‰ at the Upper Volgian substage and lower part of the Berriasian). This trend which was previously established in coeval deposits of the Russian Platform and in the Tethyan sections corresponds either to gradual climatic warming or decrease in  $\delta^{18}\text{O}$  content in the sea water. It would appear reasonable that oxygen-isotope composition of Arctic (Boreal) and Tethyan seas was similar, the differences in the values  $\delta^{18}\text{O}$  will point to differences in temperatures between these basins. Variations in 7-9° C identified between them for Oxfordian decrease towards the Jurassic/Cretaceous boundary, evidencing about considerable decrease of the latitudinal climatic gradient during the Late Jurassic [Zak et al., 2010].

Stratigraphic correlation of the Jurassic to Cretaceous deposits of Northern Siberia and Northern California was made from belemnites [Dzyuba, 2010].

Monographic study of planktonic foraminifers of the superfamily Heterohelicacea Cushman from Upper Cretaceous southern areas of West Siberia revealed essentially greater taxonomic diversity of the representatives of the superfamily, as it was previously suggested. The only representative of this family *Heterohelix globulosa* (Ehrenberg) was previously defined in the Upper Cretaceous deposits of Siberia. Studying morphology of the shells of related form by using microscope has revealed specific differences in a shell structure, apertural organ, and sculpture of the wall. Six species belonging to four genera and two families were defined in Siberia in Upper Cretaceous, such as *Guembelitra cretacea* Cushman, *Heterohelix globulosa* (Ehrenberg), *H. cf. moremani* (Cushman), *H. planata* (Cushman), *Laeviheterohelix* sp., *Planoglobulina cf. carseyae* (Plummer). Some of the described species are representatives of microfauna from the Tethyan areas. Thus, a southern way of immigration of these forms can be proposed (Figs. 2 and 3). The former correlates well with finding of Tethyan sea fauna in Upper Cretaceous Gorny Altai [Marinov, 2010].

Fulfilled was an investigation of sedimentological specific features and biostratigraphy of the Jurassic/Cretaceous deposits of the continental basins of Priamurye (Far East Russia) [Kirillova et al., 2010]. A succession of post-accretionary events in the Cretaceous basin was deciphered [Kirillova, Anoinin, 2010, in print]. The composition and structure of the slope-basin was examined in the Lower Amur [Kirillova, 2010].

Publications:

Dzyuba O.S. Cylindroteuthid belemnite correlation of the Jurassic/Cretaceous boundary strata in Northern Siberia and Northern California // *Earth Science Frontiers. Spec. Issue.* 2010. V. 17. P. 79-80;

Kirillova G.L. Cretaceous geoevents on the East Asian margin of Russia: Research results within the frameworks of the IGCP Projects 245, 350, 434, 507 // *Abstract Book "Geoevents, Geological Heritage, and the Role of the IGCP"*. Caravaca de la Crus, Spain. 2010. P. 132-133.

Kirillova G.L. Post-accretionary Cretaceous basins at the East Asian continental margin (Far East Russia) // *Abstract Volume of the 18<sup>th</sup> International Sedimentological Congress*. Mendoza, Argentina, 2010. P. 503;

Kirillova G.L., Roganov G.V., Kiryanova V.V. Sedimentological features and biostratigraphy of Jurassic/Cretaceous deposits in continental basins in Primorye, Far East Russia // *Global Geology*. 2010. V. 13. N 1. P. 1-19;

Lebedeva N.K. Palynofacies of Upper Cretaceous deposits in Northern Siberia // *Stratigraphy. Geol. Correlation*. 2010, V. 18, N 5. P. 70-87;

Lutikov O.A., Shurygin B.N. New data on systematics of Jurassic to Cretaceous bivalved mollusks of the family Oxytomidae Ichikawa, 1958 // *News of Paleontology and Stratigraphy. Issue 14. Suppl Geology and Geophysics*. 2010. V. 51. P. 111-139;

Lutikov O.A., Tyemkin I.E., Shurygin B.N. Evolution of ontogeneses and phylogeny of some representatives of the family Oxytomidae Ichikawa, 1958 (Mollusca: Bivalvia) // *Stratigraphy. Geol. Correlation*. 2010. V. 18, N 5. P. 28-44;

Marinov V.A. Planktonic foraminifers of superfamily Heterohelicacea Cushman from the Upper Cretaceous in Western Siberia // *Evolution of Life on the Earth: Proceedings of the IV International symposium*. Tomsk, 2010. P. 371-375;

Zak K., Kost'ak M., Man O., Zakharov V.A., Rogov M.A., Pruner P., Rohovec J., Dzyuba O.S., Mazuch M. Comparison of carbonate C and O stable isotope records across the Jurassic/Cretaceous boundary in the Tethyan and Boreal Realms // *Palaeogeogr., Palaeoclimatol., Palaeoecol.* 2010. doi: 10.1016/j.palaeo.2010.10.038.

Attended Meetings:

- LVI Session of Palaeontological Society "Evolution of Organic World and Biotic Crises", Saint-Petersburg, 5-9 April, 2010., Pestchevitskaya E.B., Nikitenko B.L., Khafaeva S.N. Dynamics of taxonomic diversity of microbenthos and microphytoplankton in the Early Valanginian on results of the hole Medvezhiya-50, north of Western Siberia).

- The 8<sup>th</sup> European Palaeobotany-Palynology Conference. Budapest, Hungary, July 6-10, 2010, Pestchevitskaya E., Gnoeva A. Lower Cretaceous detailed stratigraphy and palaeoenvironments of Siberia on dycysts and terrestrial plynomorphs;

- V All-Russian Meeting "Cretaceous System of Russia and the Near Abroad: Problems of Stratigraphy and Palaeogeography", Uliyanovsk, 23-28 August, 2010. (8 reports were submitted by the IGCP Project 507 participants).

- IV International Symposium "Evolution of Life on Earth", Tomsk, 10-12 November, 2010. (4 reports on the Cretaceous biota of Western Siberia were presented by the IGCP Project 507 members).

- International Conference “Geevents, Geological Heritage, and the Role of the IGCP”. Caravaca de la Crus, Spain, September, 15-18, 2010. ( report was presented by G.L. Kirillova);
- The 18<sup>th</sup> International Sedimentological Congress. Mendoza, Argentina, September 26 – October 1, 2010. (Report was presented by G.L. Kirillova, see the list of publications).

### **Project 512 Neoproterozoic ice ages**

Results of the carried out investigations are reported by N.M.Chumakov (WG leader).

Main investigations:

Key Vendian and Late Riphean sections of 5 continents were correlated and 6 discrete glacial periods were stated. They were combined in African glacialera (Chumakov);

Ediacarian fossils discovered at Ura River, Yakutia, were investigated and described (M.V. Leonov) ;

Field investigations were made and collection of Late Precambrian rocks for isotopic investigations were collected in Baikal-Patom Highland (B.G. Pokrovskiy) and at The Ural (A.V. Maslov).

Publications:

Chumakov N.M. Precambrian glaciations and related biospheric events // Stratigraphy and Geological correlations. Стратиграфия, Геологическая корреляция. 2010. V. 18. №5.Р. 3-15; Pokrovsky B.G., Chumakov N.M., Melezhik V.A., Buyakaite M.I. Geochemistry features and problem of origin of Neoproterozoic “cap carbonates” of Patom Palaeobasin // Lithology and Mineral Resources. 2010. № 6.

N.M. Chumakov took part in Conference “Precambrian Life, Time and Environments: Evolving Concepts and Modern Analogues”, India 2-9 February, 2010. In his report “Vendian (Late Ediacaran) glaciation in Central Asia” he shows, that The Baykonurian glaciation was the fourth and the youngest one in succession of great Late Precambrian glaciations (Sturtian-Marinoan-Gaskiers). It was of comparable rank, affected both hemispheres, and resulted in appearance of commensurable negative  $\delta^{13}\text{C}$  anomaly in geological records. Consequently, it is a misleading practice of many publications to ignore the Baykonurian glaciation when analyzing climatic, geological, geochemical, biospheric and biotic history of the Late Precambrian.

### **Project 521 Black Sea-Mediterranean corridor during the last 30 KY: Sea level change and human adaptation**

Reported by T.A. Yanina (Project member)

Russian scientists are actively involved in the IGCP project 521 since its starting activity in 2005. This year Programme of the Sixth Plenary Meeting and Field Trip of INQUA 501 / IGCP 521 "The Caspian-Black Sea-Mediterranean Corridor during the last 30 kyr: Sea-level Change and Human Adaptive Strategies" held on the island of Rhodes, Greece ( September 27- October 6, 2010) included nine oral and 12 poster presentations by Russian scientists. Some papers pertinent to the IGCP Project 521 were also submitted at the International Science Conference:”The Caspian Region: Environmental consequences of the Climate Change” organized by Geographical Faculty of the Moscow State University in October 2010. The aim of the Conference was to show research results in the Caspian region for twenty years of international cooperation within different programmes and projects including the IGCP ones. Besides reports of the Russian IGCP members, research results were submitted by two project leaders: Prof..S. Kroonenberg (project 481, 2003-2008),and Dr.V. Janko-Hombach (project 521, 2005-2011).

### **Project 567 Earthquake Archaeology- Archaeoseismology along the Alpine –Himalayan seismic zone**

Report is submitted by V.G.Trifonov (Project member).

An article with the new obtained data on the archaeoseismology of the territories of Syria, Turkey and Greece was submitted by V.G.Trifonov for publication early in 2011 to the Journal "Geotectonics" (in Russian).

### **Project 572 Restoration of Marine Ecosystems following the Permian-Triassic Mass Extinction: lessons for the present**

Results of the studies are submitted by Yu. Zakharov( WG coordinator) .

New data on amphibian diversification after the end of the Permian crisis and their taxonomy have been obtained (Shishkin and Sulej, 2009; Shishkin, 2010a,b).

New data on biostratigraphy of the Induan-Olenekian transition (Lower Triassic) in Spiti, Central Himalayas, have been discussed (Zakharov, 2010). According to new data on Induan-Olenekian boundary transition in the Mud section, conodont index *N. waageni sensu lato* in the Mud section of this area first occur about 1 m below the level M04-13a3 and therefore materials on the mentioned level, voted by the majority of the IOBWG members in 2009 as Induan-Olenekian boundary, cannot be forwarded to the STS titular members for a vote with the same proposition now.

New information on Early Olenekian ammonoid assemblages from South Primorye have been obtained (Zakharov et al., 2010), which seems to be useful for determination of the I/O boundary in the ammonitiferous beds of western North America, the Mud section at Pin Valley of the Himalayas, a main candidate GSSP for the base of the Olenekian Stage and northwestern Guangxi in South China. The *Euflemingites prynadai* Beds of South Primorye are believed to be synchronous with the lower part of the *Meekoceras gracilitatis* Zone (Kummel and Steele, 1962) in western North America, *Rohillites rohilla*, *Flemingites-Euflemingites* and *Owenites* zones (Krystyn et al., 2007) in Spiti and *Flemingites rursiradiatus* and *Owenites koeneni* beds (Brayard and Bucher, 2008) of Guangxi. The earliest Olenekian *Gyronites separatus* Beds of South Primorye seems to be equivalent to the "*Meekoceras vercherei* Beds (Krystyn et al., 2007) in the Himalayas, underlying the *Rohillites rohilla* Zone. It is characterised by ammonoid species "*Meekoceras vercherei* (Waagen), assigned by us to *Ambitoides*, which is common mainly for the earliest Olenekian layers in South Primorye. However, more research is needed to define the position of the Induan-Olenekian boundary in the Spiti region, Himalayas, from data on ammonoids. The *Gyronites separatus* Beds in South Primorye and their equivalents cannot be contemporaneous with the zone of *Meekoceras gracilitatis*.

Selected references:

Shishkin, M. A., Sulej, T. 2009. Temnospondyl amphibians of the Czatkowice 1 tetrapod assemblage. In: Borsuk-Bialynicka, M. and Evans S.E. (eds.) An Early Triassic vertebrate assemblage from karst deposits at Czatkowice, Poland. *Palaeontologia Polonica*, 65: 31-80;

Shishkin M. A. 2010. On some phantom in the taxonomy of the Gondwanan Triassic amphibians. M. B. Mostovski, M. N. Ovechkina (eds.) Proceedings of the 16th Conference of the Palaeontological Society of Southern Africa (Howick, August 5–8, 2010). Pietermaritzburg, 2010: 96-100;

Shishkin M. A. 2010 (in press). Early stage of amphibian diversification after end-Permian crisis: pattern and implications. Permian-Triassic Palaeontology and Stratigraphy on Northern Eurasia и стратиграфия пермотриаса Северной Евразии. Materials of the 5<sup>th</sup> International Conference, dedicated to 150 years since V.P. Amalitsky's birthday);

Zakharov, Y.D., 2010. New information on biostratigraphy of the Mud section, Spiti, Himalayas. *Albertiana*, no. 38, p. 4-7;

Zakharov, Y.D., Smyshlyaeva, O.P., Safronov, P.P., Popov, A.M., and Buryi, G.I., 2010. Triassic ammonoid succession in South Primorye: 5. Stratigraphical position of the Olenekian *Meekoceras* fauna. *Albertiana*, no. 38, p. 23-

Meetings attended:

- 8<sup>th</sup> International Symposium “Cephalopod – Present and Past” (August 30-September 3 2010, Dijon, France);
- 5<sup>th</sup> International Conference, dedicated to 150 years since V.P. Amalitsky’s birthday (2010, Moscow, Russia).

### **Project 580” Application of magnetic susceptibility on Paleozoic sedimentary rocks”**

Reported by N.G.Izokh (Project member)

In 2010 11 geologists from IPGG SB RAS, IM SB RAS and students from Novosibirsk State University participated in research connected with the Project. Joint field works were carried out in Salair (Kemerovo region) by IPGG SB RAS participants Drs. N.K. Bakharev, N.G. Izokh, O.P. Izokh, and Geological Institute of Czech Academy of Sciences (Prague) Drs. J. HLADIL, L. Slavik, P. Cejchan, PhD student L. Koptikova. Main attention was paid to Pragian and Emsian Stages and inter-regional correlations of Lower Devonian strata of Salair (Russia), Barrandien (Czech Republic) and western Tien-Shan (Uzbekistan Republic). Lower Devonian strata in Salair were sampled for magnetic sensibility as well as for O and C isotopic studies of carbonates. These investigations will provide new data for detailed inter-regional correlations of Lower Devonian sequences of Salair, Barrandien and western Tien-Shan as well as for understanding of Earth’s history during Early Devonian.

A new IGCP project under the title: “**The Early to Middle Palaeozoic Revolution**”, submitted in 2010, had been prepared with active participation of Russian geoscientists.

There are no more significant developments to report. No international meetings within Russia pertinent to the IGCP are planned for 2011.

### **Committee’s Activities 2010.**

The 38<sup>th</sup>. Scientific Board Meeting of the International Geoscience Programme (Paris, 17<sup>th</sup>.-19<sup>th</sup>. February, 2010) was attended by Chairman of the National Committee. Acad. M.A.Fedonkin presented an oral report concentrating it on: mineral deposits, climate changes, geological aspects of biodiversity and outlined activities of Russian geoscientists in several IGCP projects.

M.A.Fedonkin took an active part in the International Conference on Geoevents, Geological Heritage, and the Role of the IGCP (Caravaza de la Cruz, September 15<sup>th</sup>-18<sup>th</sup>, 2010) submitting one of the key reports on the Rise of Animals in the Neoproterozoic oceans: paleobiological and stratigraphic implications. He also delivered a report and led the round table discussion relating to the improving of the procedure of a new IGCP project submission.

Two new IGCP project proposals were endorsed by the Committee in 2010:

#### **“Continental Construction in Central Asia”**

The project was proposed by Dr. Inna Yu.Safonova (V.S. Sobolev Institute of Geology and Mineralogy SB RAS, Russia), Prof. Reimar Seltmann (Natural History Museum, UK) and Prof. Min Sun (University of Hong Kong).

The Project proposal has been endorsed by the Committee only on the condition that a Russian scientist will be its leader. The Committee considers a well-known Russian scientist, Academician Nikolai L. Dobretsov, the best candidate to take leadership of the proposed Project. The Committee comes to this decision having in mind his successful past experience in the IGCP and his strong potential to mobilize financial, technical and human resources of the Siberian Branch of the Russian Academy of Sciences for proper implementation of the proposed Project.

**“Climate Change and Biodiversity Patterns in the Mid-Palaeozoic”** project was Proposed by Dr. Peter Koenigshof (Germany) and co-led by 7 more geoscientists with Dr. Nadezhda Izokh from Russia.

This year the Committee had close contacts with a group of scientists consulting, assisting and encouraging them to initiate a new project on Arctic Stratigraphy, to be submitted in 2011. The Committee is attentive to all UNESCO and IUGS programmes.

**Geoparks Network** initiative is entirely supported by the Committee.

This year the Committee nominated Prof. A.N. Barmin (dean of the Geology and Geography Department, Astrakhan State University) as possible expert for the assessment of the submitted application for a new Geopark at Bogdinsko- Baskunchatsky, Astrakhan Region in Russia.

Information and invitation to support the collaborative project of the **IUGS-IGC-YES Network** on the Early Career Geoscientists Essay Contest “The Future of the Geological Sciences “was distributed by the Committee among Russian universities, young scientist’s boards and publicized in the” News” of the Committee’s website.

The Committee can’t quantify the total financial input into the IGCP by Russia. Financial support procedure of the Russian IGCP members remains without changes. A Russian IGCP member can be granted by the Russian Foundation for Basic Research or by the Russian Academy of Sciences (RAS) upon a personal written application. Modest sum of money from RAS helps the Committee to maintain its website: [www.igcpc.ru](http://www.igcpc.ru) and Secretariat.

Cards of the Committee, designed with its emblem and used for congratulation purposes on the occasion of special events, serve to promoting IGCP visibility in Russia.

Report 2010 on the IGCP activity in Russia was submitted by the Committee to the Commission of the Russian Federation for UNESCO and to the Russian Academy of Sciences.



Mikhail A. Fedonkin  
Acad., Chairman, Russian National Committee for IGCP