



Commission for the Geological Map of the World  
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## Commission for the Geological Map of the World 60 years of Russia's participation

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The booklet describes the brief history of 60-year participation of Russian scientists in the work of the Commission for the Geological Map of the World (CGMW).



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## INTRODUCTION

The Commission for the Geological Map of the World (CGMW) is an international non-profit association governed by French law and is responsible for designing, coordinating, preparing and publishing small-scale thematic Earth Science maps of the globe, continent, major regions and oceans. The CGMW is affiliated to the International Union of Geological Sciences (IUGS) and the International Union of Geodesy and Geophysics (IUGG), and is supported by UNESCO.

**CGMW story in a nutshell.** The CGMW is issued from the International Geological Congress (IGC), the oldest geoscience organization in the World, created in Paris in 1878. The idea of the Commission was first postulated in 1910 at the 11th IGC in Stockholm, and established in 1913 at the 12th IGC in Toronto. It is a non-profit-making scientific and educational association governed by French law. The CGMW is affiliated to the International Union of Geological Sciences (IUGS) since 1966, and to the International Union of Geodesy and Geophysics (IUGG). CGMW is recognized by UNESCO as a Non-Governmental Organization (NGO).

**A wide range of geoscience mapping.** The CGMW is responsible for designing, promoting, coordinating, preparing and publishing small-scale thematic (geology, tectonics, ore deposits, natural resources, climate, etc.) Earth Science maps of the globe, continents, major regions, and oceans. In the context of its mission, the CGMW intends to play a leading role in the use and diffusion of digital cartographic techniques, as well as in the development of international standards.

**How the work is done?** The framework for constructing CGMW maps is highly flexible. The responsibility for each new cartographic project is assigned to a General Coordinator appointed by the Bureau to act as organizer and supervisor. To produce these maps, the CGMW relies on the support provided by the international scientific community and on cooperation agreements established with geological surveys, university laboratories, oceanographic institutes and industrial firms, depending on the characteristics of each project. Before their publication,

all maps are submitted to the review of experts in order to ensure the best scientific quality to all CGMW releases.

**Who are our members and how the Commission is managed?** Geological Surveys (or similar organizations responsible for national geological mapping) of countries and territories throughout the World are Statutory Members of the CGMW. Other scientific and/or industrial organizations can join the CGMW as Associate Members. The mapping activity is financed by the membership fees of the Surveys, IUGS and UNESCO grants and the sponsoring of industrial partners.

The Executive Bureau is ensured by a President, a Secretary General and the heads of the geographic and thematic subcommissions that represent all the continents and the different disciplines of the geosciences. A score of key figures from different Earth Science fields and countries are appointed to fulfill these ad hoc positions.

**General Assembly.** General Assemblies are held every two years, alternately at the UNESCO headquarters in Paris, and during the International Geological Congress. A focal point of these meetings is to assess the aims of future programs and the progress of current cartographic projects.

<http://ccgm.org/en/content/4-about-us>

## RUSSIAN REPRESENTATION IN THE COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

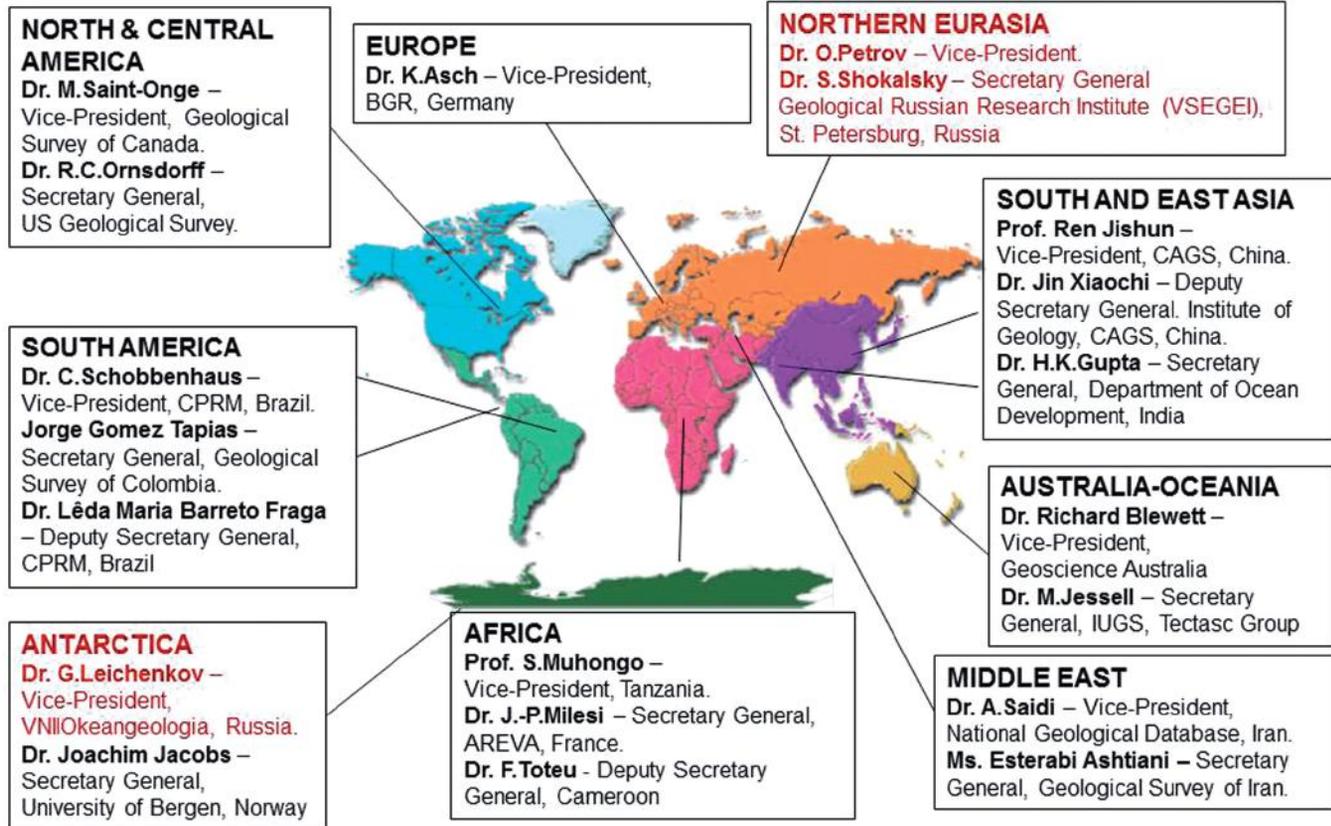
At present, there are three Subcommissions headed by Russian geologists in the Commission for the Geological Map of the World (CGMW). These are two “continental” Subcommissions for Northern Eurasia (Vice-President is Dr. O. V. Petrov, Director General, A. P. Karpinsky Russian Geological Research Institute (VSEGEI), Secretary General Dr. S. P. Shokalsky, Head of Department, VSEGEI) and for Antarctica (Vice-President is Dr. G. L. Leichenkov, Head of Department, VNIIOkeangeologia), and one thematic: Subcommission for Tectonic Maps (President is Dr. N. B. Kuznetsov, Secretary General Dr. I. I. Pospelov, Head of Lab for Tectonic Maps, Geological Institute of the Russian Academy of Sciences). Currently, there are five (of 32) members, heads of Subcommissions, from Russia in the Bureau of the Commission for the Geological Map of the World.

**Subcommission for Northern Eurasia** is leading in the CGMW as concerns compilation of geological maps for the area of the former USSR, adjacent water areas and countries. The Subcommission for Northern Eurasia in cooperation with geological surveys of China, Kazakhstan, Mongolia and Korea, in 2008 completed the compilation of geological, tectonic (jointly with the Subcommission for Tectonic Maps), metallogenic, and energy resources maps under the international project *Atlas of Geological Maps of Central Asia and Adjacent Areas, scale 1 : 2,500,000*. The Atlas received a high appraisal of the international scientific community at the 33rd International Geological Congress in Oslo (Norway, 2008). Compilation of the Atlas of Geological Maps of Northern-Central-Eastern Asia and Adjacent Areas, scale 1 : 2,500,000, with already published Tectonic Map and Explanatory Notes to it as well as the Metallogenic Map, is nearing completion.

In 2009, the Subcommission started compilation of the Tectonic Map of the Circum Arctic, scale 1 : 5,000,000, as part of the international project *Atlas of Geological Maps of the Arctic, scale 1 : 5,000,000*. Geological and geophysical maps have been completed under the project.



## CGMW CONTINENTAL SUBCOMMISSIONS (February 19, 2014)

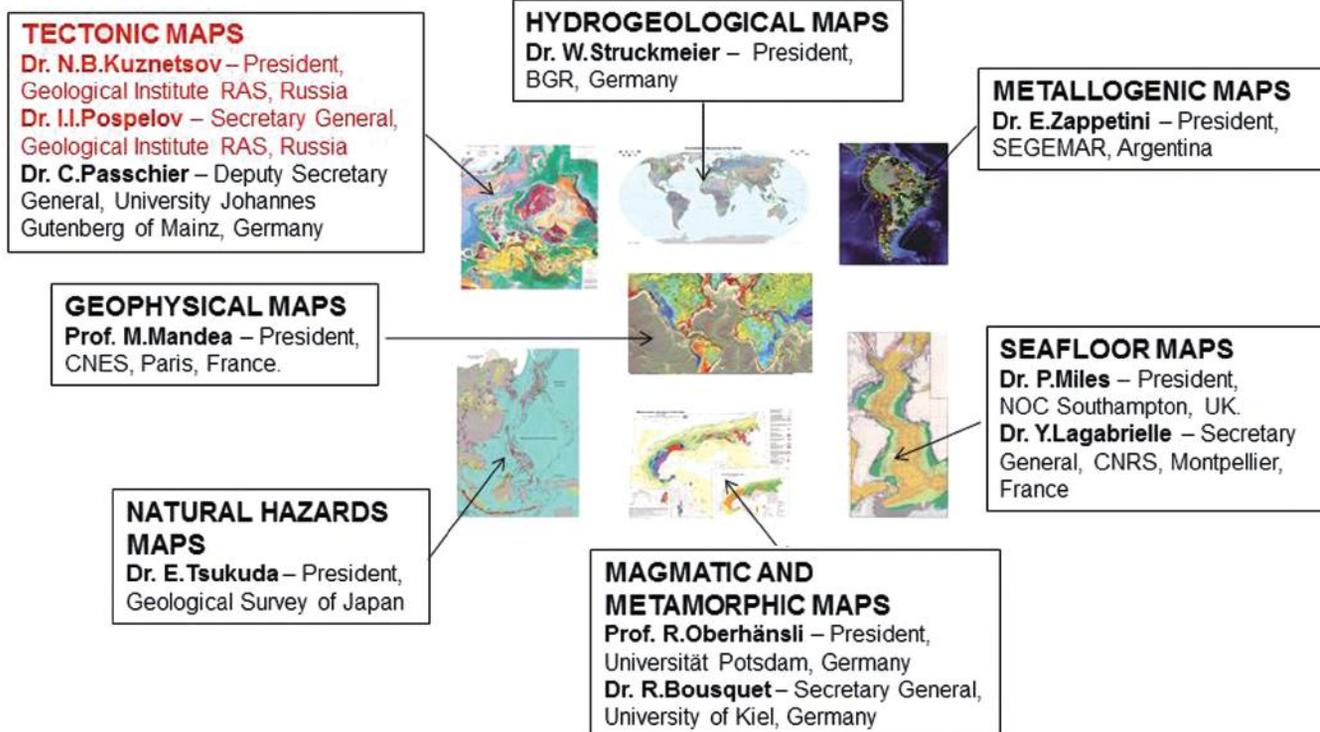


VSEGEI, VNIIOkeangeologia, MAGE, RAS Geological Institute, experts from other RAS institutes and western geologists from geological surveys and scientific institutions of the Cis-Arctic states have taken part in the compilation of the tectonic map.

**Subcommission for Tectonic Maps** is leading in CGMW as concerns designing, compiling, and preparing for publication of tectonic maps of continents and the globe. Now it takes active part in the compilation of the *International Tectonic Map of Asia, 1 : 5,000,000 (ITMA-5000)*.



## CGMW THEMATIC SUBCOMMISSIONS (February 19, 2014)



In 2005–2012, both Subcommissions participated in a major CGMW project *International Geological Map of Asia, scale 1 : 5,000,000 – IGM-5000*, which was compiled by the CGMW Subcommission for South and East Asia under the supervision of Vice-President of CGMW Subcommission for South and East Asia CAS Academician Ren Jishun. In 2013, the map was published in Beijing Cartographic Publishing House with the logos of UNESCO, IUGS, and CGMW.

In 2012, the **Subcommission for Antarctica** completed the *International Tectonic Map of Antarctica, scale 1 : 10,000,000*. It was published by the 34th International Geological Congress in Brisbane (Australia, 2012), where it received a high appraisal at GEOEXPO-2012.

## CGMW SUBCOMMISSION FOR NORTHERN EURASIA



**N. A. Belyaevsky (1913–1978)**  
**Vice-President of the CGMW**  
**Subcommission for the USSR**  
**in 1961–1965**

Formation of the Subcommission for Northern Eurasia has a rather long and interesting history. Dmitry V. Nalivkin (Academician from 1946) made great efforts for its establishing.

As far back as 1937, the *Geological Map of the USSR, scale 1 : 5,000,000* edited by D. V. Nalivkin was published by the 17th International Geological Congress in Moscow; it caused a huge scientific and practical response in Soviet and western geological communities. This map and the *Geological Map of the USSR, scale 1 : 2,500,000* published in 1940 and also edited by D. V. Nalivkin, were used as a basis for the monograph *Geology of the USSR* marking the beginning of systematic studying the geological structure of the vast area of most of Europe and Asia.

Thirteen geological maps of the USSR edited by D. V. Nalivkin were published by 1983. The *Geological Map of the USSR, scale 1 : 2,500,000* (1956) without “white spots” won Grand-Prix at the World Exhibition in Brussels in 1958 similar to two tectonic maps of the USSR published in 1953 and 1956.

Extensive practical experience in the compilation of geological maps of the USSR for one sixth of the land area of the Earth and the international recognition of the country’s success in geological mapping was the reason for creating in 1960 the Subcommission for the USSR as part of the Commission for the Geological Map of the World.

At the 21st International Geological Congress (Copenhagen, 1960), the CGMW General Assembly approved the creation of the Subcommission for the USSR in the rank of “continental” taking into account achievements of Soviet geologists in the compilation of geological (and tectonic; Subcommission for Tectonic Maps had been established four years earlier) maps on a huge area of 22 million km<sup>2</sup>.

As during this Assembly Academician D. V. Nalivkin, on the recommendation of the Presidium of the USSR Academy of Sciences and as Chairman of the Commission of the USSR Academy of Sciences for International Tectonic Maps was elected President of the CGMW Subcommission for Tectonic Maps, it was agreed that the Ministry of Geology of the USSR would delegate a CGMW Vice-President for the USSR to the Commission. Thus, Prof.

Nikolay A. Belyaevsky, Head of the Department of Research Institutes of the USSR Ministry of Geology became the first head of the Subcommittee for the USSR.

Main task of the Subcommittee at the time was the promotion of the Soviet school of geological mapping and presentation of results at various international events, primarily at International Geological Congresses.

At the 22nd International Geological Congress in New Delhi in 1964, the Subcommittee for the USSR demonstrated at the Congress Exhibition, in addition to the Geological Map of the USSR, a number of geological maps of the USSR:

- *Geomorphological Map of the USSR, 1 : 5,000,000; Hydrogeological Map of the USSR, 1 : 2,500,000;*
- *Map of Quaternary Deposits of the USSR, 1 : 5,000,000.*

In 1965, Grigory I. Gorbunov (Corresponding Member of the USSR Academy of Sciences from 1972), Head of the Department of Research Institutes at the USSR Ministry of Geology, was elected CGMW Subcommittee Vice-President.

At the International Geological Congresses in Prague (1968) and Montreal (1972), the Subcommittee presented maps mainly compiled at VSEGEI.

Following maps aroused much interest in Prague:

- new *Tectonic Map of the USSR, 1 : 5,000,000* (1966), which demonstrated crustal structure, including previously understudied areas of the North-East and the Far East,

- *Geological Map of the Crystalline Basement of the Russian Platform, 1 : 2,500,000* (1966),

- *Geological Map of Middle Asia and Adjacent Areas, 1 : 1,500,000* (1966), which showed the ratio of Tien Shan and Pamir structures among geological structures of Central Asia as a result of 30 years of mountain expeditions.

Updated editions of the *Geological Map of the USSR, scale 1 : 2,500,000* (1970, Chief Editor D. V.Nalivkin) and the *Metallogenic Map of the USSR, scale 1 : 2,500,000* (1971) were demonstrated at the Congress Exhibition in Montreal.

Alexander I. Zhamoida (Corresponding Member of the USSR Academy of Sciences/Russian Academy of Sciences from 1987, VSEGEI Director from 1970 to 1986) was elected CGMW



**G. I. Gorbunov (1918–2010)**  
Vice-President of the CGMW  
Subcommission for USSR  
in 1965–1972



**A. I. Zhamoida (born in 1921)**  
**Vice-President for the USSR/  
 Northern Eurasia  
 Subcommittee in 1972–1996**

Subcommission Vice-President for the USSR upon the recommendation of previous CGMW Subcommission Vice-President G. I. Gorbunov at the 24th International Geological Congress in Montreal in 1972.

During 24 years of work of A. I. Zhamoida in CGMW, the USSR and Russia presented all main types of geological maps compiled at institutes of the USSR Ministry of Geology and the USSR Academy of Sciences, including

– *Tectonic Map of the Russian Platform and Adjacent Areas, scale 1 : 1,500,000* (1974);

– *First Geological Map of Eurasia, scale 1 : 5,000,000* (Chief Editor A. P. Markovsky, 1975);

– *Map of Quaternary Deposits of the USSR, scale 1 : 2,500,000* (1976);

– *Geological Map of the USSR, scale 1 : 2,500,000* (Chief Editor D. V. Nalivkin, 1980);

– *Tectonic Map of the Siberian Platform, scale 1 : 1,500,000* (Chief Editor N. S. Malich, 1980);

– *Map of Faults in the USSR and Adjacent Countries, scale 1 : 2,500,000* (1980) under the editorship of Prof. N. A. Belyaevsky, first CGMW Subcommission Vice-President for the USSR.

At the 29th International Geological Congress in Kyoto (Japan, 1992), the CGMW Bureau, on the proposal of A. I. Zhamoida, decided to rename the Subcommission to the CGMW Subcommission for Northern Eurasia. The scope of the Subcommission on the preparation of geological maps covered as previously the entire territory of the former Soviet Union. All the collected information was reflected in the maps, which were shown at the exhibition during the congress:

– *Geological Map of Russia and Adjacent Countries* (within the borders of the former USSR), *scale 1 : 2,500,000* (1992);

– *Map of Mineral Deposits of Russia and Adjacent Countries* (within the borders of the former USSR), *scale 1 : 2,500,000* (1992).

Yulian E. Pogrebitsky, RAS Corresponding Member, was elected the CGMW Subcommission Vice-President for Northern Eurasia at the CGMW Bureau meeting during the 30th International Geological Congress in Beijing in 1996. During eight years, he represented in the Subcommission

VNIIOkeangeologia from St. Petersburg. This period in the turn of the century was marked by a new rise of geological mapping in Russia. Many projects have been carried out in close cooperation of branch institutes of the Ministry of Natural Resources of the Russian Federation (VSEGEI, VNIIOkeangeologia, major regional geological enterprises).

By the 31st International Geological Congress (Rio de Janeiro) in 2000, Russia had prepared for the demonstration at the GEOEXPO the following maps:

- *Geological Map of Russia and Adjacent Seas, scale 1 : 2,500,000* (2000, Chief Editor B. A. Yatskevich);
- *Map of Quaternary Geology of Russia, scale 1 : 5,000,000* (1999);
- *Metallogenic Map of Russia, scale 1 : 5,000,000* (1999, Chief Editor A. D. Shcheglov);
- *Geological Map of the World, scale 1 : 15,000,000* (2000, VSEGEI, VNIIOkeangeologia, Chief Editor B. A. Yatskevich);
- *Geological-Mineragenic Map of the World, scale 1 : 15,000,000* (2000, VSEGEI, VNIIOkeangeologia, etc., Chief Editor L. I. Krasny);
- *Metallogenic Map of the World Ocean, scale 1 : 10,000,000* (2000, VNIIOkeangeologia, with Explanatory Notes) as well as a number of regional geological and tectonic maps for the East European and Siberian platforms, Altai-Sayan Fold Area, Far East, etc.

In 2004, at the meeting of the CGMW Bureau during the 32nd International Geological Congress in Florence (Italy, 19–28 August 2004), changes in the Subcommittee for Northern Eurasia has taken place. New Vice-President Dr. O. V. Petrov and Secretary General of the Subcommittee Dr. S. P. Shokalsky were approved. Thus, since 2004, the CGMW Subcommittee for Northern Eurasia is represented by A. P. Karpinsky Russian Geological Research Institute (VSEGEI), St. Petersburg, part of the Federal Agency on Mineral Resources (Rosnedra) at the Ministry of Natural Resources and Environment of the Russian Federation.

At the General Assembly, new CGMW Subcommittee Vice-President Dr. O. V. Petrov presented the long-term plan of work on compiling international geological maps (primarily geological, tectonic, and metallogenic), and a new form of sets of maps, such as “Atlases of geological maps” for various areas of the Globe. Following international projects were announced:



**Yu. E. Pogrebitsky (1930–2006)**  
**Vice-President CGMW**  
**Subcommission for Northern**  
**Eurasia in 1996–2004**



Subcommission for Northern Eurasia, as well as VSEGEI, is in charge of the preparation for reprinting of periodically updated state geological maps of Russia. This updating and reprinting occurs every four years and, as a rule, in the years of the next International Geological Congress. These maps were demonstrated at GEOEXPOS in 2008 in Oslo, Norway and in 2012 in Brisbane, Australia. For the compilation of the State Geological Map of the Russian Federation, the team of authors was awarded the Prize of the Government of the Russian Federation in Science and Technologies for 2011 (Fig. 1).

### CGMW SUBCOMMISSION FOR ANTARCTICA

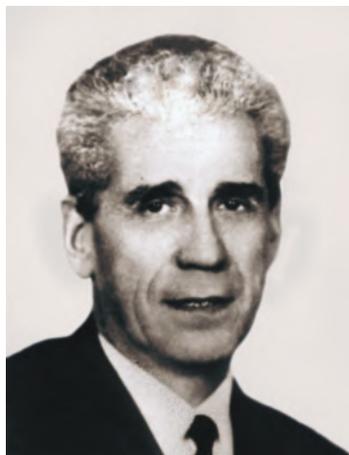
Subcommission for Antarctica is the youngest of CGMW's nine geographical (or continental) subcommissions. It was established in 1964 during the XXII International Geological Congress in New Delhi in response to IUGS recommendation to include Antarctica among CGMW's fields of interest as one of geologically important regions in the world and the area of escalating international activity that followed the entry in force of the Antarctic Treaty.

First schematic cartographic products summarizing the knowledge accumulated by the time of these meetings were published independently in the USA – *Tectonic Map of Antarctica, 1 : 10,000,000* [1] and Russia – *Structural-Tectonic Map of Antarctica, 1 : 20,000,000* [2], *Schematic Geological Map of Antarctica, 1 : 10,000,000* [3], and Antarctica as part of *Tectonic Map of the Polar Regions of the Earth, 1 : 10,000,000* [4]. Russian contributions were produced in the Research Institute for Arctic Geology (NIIGA) of the Ministry of Geology of the USSR (currently I. S. Gramberg Research Institute for Geology and Mineral Resources of the World Ocean “VNII Okeangeologia”) under supervision of Deputy Director Prof. Mikhail G. Ravich who became the second CGMW Subcommission Vice-President for Antarctica after Dr. Adie had resigned from this position in 1974.

Upon proposition by Scientific Committee on Antarctic Research (SCAR), the head of earth sciences division of the British Antarctic Survey Dr. Raymond J. Adie was nominated the first CGMW Subcommission Vice-President for Antarctica. During ten years of his vice-presidency, Dr. Adie supervised publication of a series of maps and accompanying papers based on reconnaissance geological investigations conducted by the Survey in the Antarctic



**R. J. Adie (1925–2006)**  
CGMW Subcommittee  
for Antarctica, Vice-President  
in 1964–1974



**M. G. Ravich (1912–1978)**  
CGMW Subcommittee  
for Antarctica, Vice-President  
in 1974–1978



**C. Craddock (1930–2006)**  
CGMW Subcommittee  
for Antarctica, Vice-President  
in 1978–1991



**G. E. Grikurov (born in 1934)**  
CGMW Subcommittee  
for Antarctica, Vice-President  
in 1991–2008

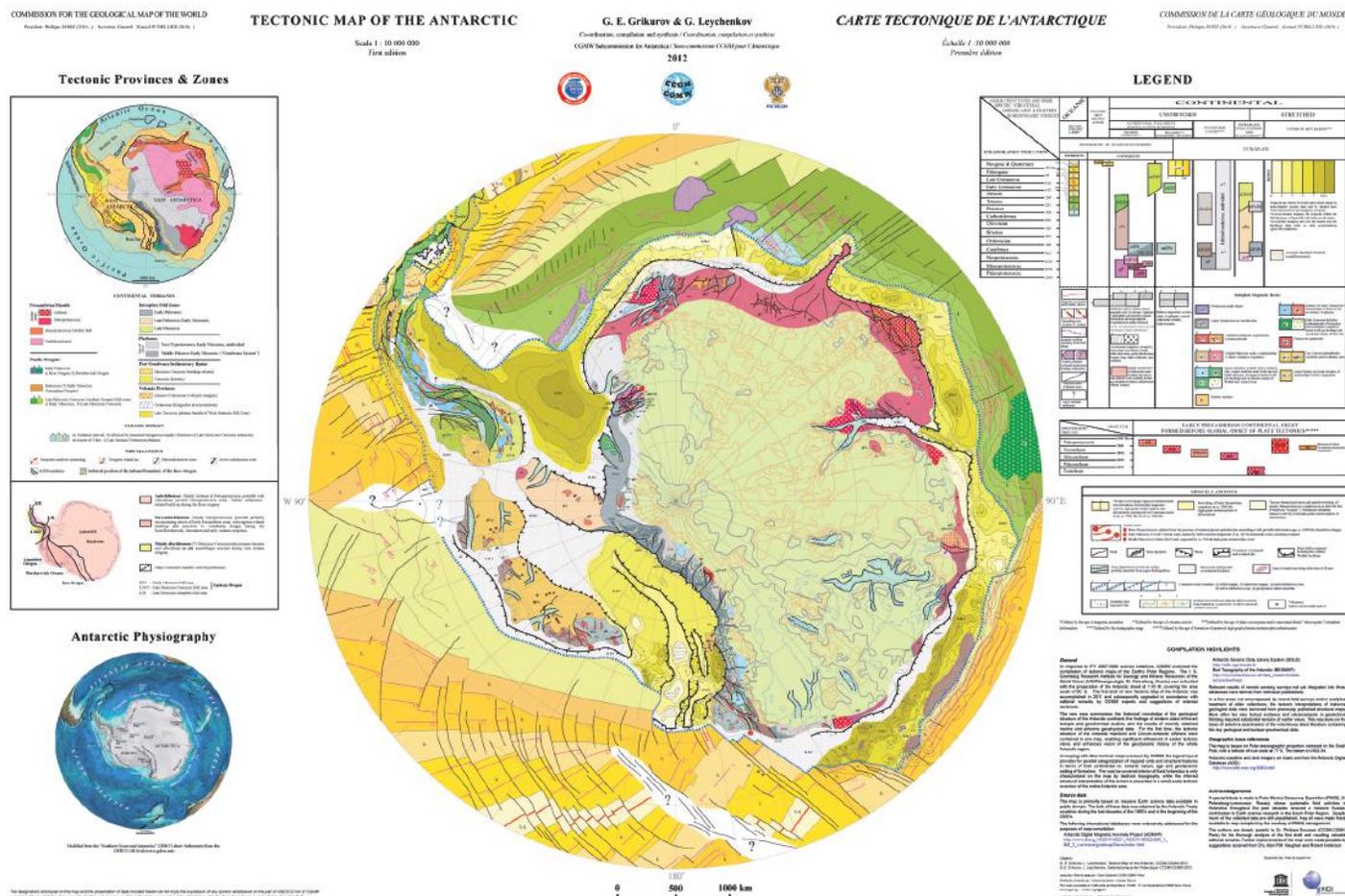
Peninsula. He also made a profound contribution to geological studies of the continent as a main compiler and chief editor of the proceedings of the two first international symposia on Antarctic Earth sciences held in Cape Town (1963) and Oslo (1970).

During Prof. Mikhail G. Ravich's vice-presidency, the efforts of the Subcommittee for Antarctica were focused on developing the Antarctic input to two major CGMW projects: *Geological World Atlas* (GWA, [5]) and *International Tectonic Map of the World* (ITMW, [6]). As a preparatory step, elaboration of *two 1 : 5,000,000 Antarctic maps – geological and metamorphic facies* – was undertaken in NIIGA. The drafts of these maps were presented at the 1976 CGMW General Assembly in Sydney and approved as the basis for developing Antarctic contributions to both worldwide projects; compilation and separate publication of a *new 1 : 10,000,000 tectonic map* based on the ITMW legend was also encouraged. This map and both 1 : 5,000,000 maps were produced in Russia as individual sheets [7, 8, 9] accompanied by offset-printed detailed explanatory notes.

Prof. Campbell Craddock of University of Wisconsin, USA, became Vice-President, Subcommittee for Antarctica in 1978, and in 1991 he was succeeded in this position by Dr. Garrik E. Grikurov of VNIIOkeangeologia.

The time of their vice-presidency coincided with a major change in Antarctic Earth science exploration. Reconnaissance geological

observations on limited Antarctic bedrock exposures were gradually giving way to purposeful detailed studies of key structural complexes critical for paleotectonic reconstructions; this research was mainly based on thorough indoors analytical investigations of rock collections with the help of state-of-the-art isotope and geochemical methods. The field surveys became mainly focused on the subglacial Antarctic interior and Circum-Antarctic marine areas where high-resolution remote sensing technologies were opening new opportunities for interpreting the geological structure.



Accumulation of massive new data on the morphology, potential field characteristics, and crustal structure of both the subglacial interior of the continent and its submarine surroundings, as well as improved understanding of age and structural relationships of previously mapped inland geological units, stimulated production of new maps and/or upgrading of the previously published editions. These modernized compilations were in part accomplished as *Antarctic components of CGMW global projects* (e. g. [10], [11], [12]), and in part as *national mapping initiatives* (e. g. [13], [14], [15]) or *International Antarctic ventures* (e. g. [16], [17]) endorsed by CGMW.

Rapid expansion of Antarctic geological cartography beyond the limits of exposed areas of continental mainland dramatically increased the volume of geoscience data that had to be processed in the course of maps preparations. It also caused a much greater emphasis on geodynamic evolution of the Southern polar region of the Earth as the locus of Gondwana amalgamation and breakup.

To face these new challenges, in 2006, the Subcommittee for Antarctica was strengthened by appointing Dr. German Leichenkov of VNIIOkeangeologia the CGMW Subcommittee Deputy Vice-President who in 2008 replaced Dr. G. E. Grikurov as CGMW Vice-President for Antarctica. Subsequently the position of Subcommittee for Antarctica Secretary General was opened and filled by Dr. Joachim Jacobs of the University of Bergen whose appointment was approved at the 2014 CGMW Bureau meeting.

In response to the International Polar Year 2007–2009, the CGMW proposed a major bipolar cartographic project contemplating compilation of a series of new geoscience maps of Polar regions, including an up-to-date *Tectonic Map of the Antarctic, scale 1 : 10,000,000* (Fig. 2) that would cover both the continent and the surrounding South Ocean domain to 60° S. The final draft was completed by VNIIOkeangeologia in 2011, and the map was out of print in 2012 [18].

#### **Antarctic maps produced as CGMW projects and/or as national and multinational cartographic initiatives endorsed by CGMW**

1. Tectonic Map of Antarctica, 1 : 10,000,000 // Compiler C. Craddock. In: V. C. Bushnell, C. Craddock (eds.): Geological Maps of Antarctica. N. Y., 1970. Pl. XXI. (Antarctic Map Folio Ser., Amer. Geographic Soc.)

2. Structural-Tectonic Map of Antarctica, 1 : 20,000,000 // Compilers P. S. Voronov, A. V. Zhivago, L. V. Klimov, M. G. Ravich, D. S. Soloviev. In: E. I. Tolstikov (ed.): Antarctic Atlas, Vol. 1. Main Administration for Geodesy and Cartography of Ministry of Geology of the USSR, Gidrometeoizdat, 1966.
3. Schematic Geological Map of Antarctica, 1 : 10,000,000 // Compiled by L. V. Klimov, M. G. Ravich, D. S. Soloviev. In: E. I. Tolstikov (ed.): Antarctic Atlas, Vol. 1. Main Administration for Geodesy and Cartography of Ministry of Geology of the USSR, Gidrometeoizdat, 1966.
4. Antarctica // Compilers M. G. Ravich, D. S. Soloviev and G. E. Grikurov. In: Egiazarov B. Kh., Atlasov I. P., Ravich M. G. (eds.): Tectonic Map of the Polar Regions of the Earth, 1 : 10,000,000. Leningrad, NIIGA, 1969.
5. Antarctica // Compiler G. E. Grikurov. In: G. Choubert & A. Faure-Muret, general coordinators, Geological World Atlas, 1 : 10,000,000, Sheet 17 & Explanatory note, continental coordinators M. G. Ravich & C. Craddock. International Geological Mapping Bureau, UNESCO, Paris, 1979.
6. Antarctic Region of the Pacific Ocean, 1 : 30,000,000 // Compiler G. E. Grikurov. In: V. E. Khain & Yu. G. Leonov (eds): International Tectonic Map of the World, 1 : 15,000,000. CGMW Subcommission for Tectonic Maps, Commission for International Tectonic Maps of the Academy of Sciences of the USSR. Leningrad, VSEGEI Cartographic Factory, 1984.
7. Geological Map of Antarctica, 1 : 5,000,000 // Compilers: G. E. Grikurov, G. A. Znachko-Yavorsky, E. N. Kamenev, B. G. Lopatin, M. G. Ravich, V. M. Rudyachenok, D. S. Soloviev, editors M. G. Ravich & G. E. Grikurov. Leningrad, "Aerogeologia", 1976.
8. Map of Antarctic Metamorphic Facies, 1 : 5,000,000 // Compilers: G. E. Grikurov, E. N. Kamenev, G. I. Kameneva, R. G. Kurinin, M. G. Ravich, editors E. N. Kamenev & M. G. Ravich. Leningrad, Ministry of Geology of the USSR, 1979.
9. Tectonic Map of Antarctica, 1 : 10,000,000 // Compilers: G. E. Grikurov, G. A. Znachko-Yavorsky, E. N. Kamenev, R. G. Kurinin, M. G. Ravich, editor G. E. Grikurov. Leningrad, "Aerogeologia", 1978.
10. Geological Map of Antarctica, 1 : 46,000,000, in Geological Map of the World, 1 : 50,000,000, 2nd edition // Compiler: Ph. Bouysse, with Antarctic geology contributed by VNIIOkeangeologia, Paris, CGMW, 2000.
11. Geological Map of Antarctica, 1 : 46,000,000, in Geological Map of the World, 1 : 50,000,000, 3rd edition // Compiler: Ph. Bouysse, with Antarctic geology contributed

- by VNIIOkeangeologia, Paris, CGMW, 2009 (also available at 1 : 23,000,000 scale in Geological Map of the World, 1 : 25,000,000, 3rd edition reprinted in 2010).
12. Structural Map of the Indian Ocean, 1 : 20,000,000, Sheet 2 // Compilers: J. Segoufin, M. Munsch, Ph. Bouysse, V. Mendel, with Antarctic contribution of G. E. Grikurov & G. L. Leichenkov, Paris, CGMW, 2004.
  13. Schematic Geological Map of Antarctica, 1 : 10,000,000 // Compiler: R. J. Tingey. Bureau of Mineral Resources of Australia, Geology & Geophysics, Canberra, 1991.
  14. Structural Map of Antarctica, 1 : 25,500 // Compilers: E. N. Kamenev & G. L. Leichenkov. In: L. I. Krasny (ed): Geological -Minerogenic Map of the World, St. Petersburg, VSEGEI, 2000.
  15. Geological Map of Antarctica, 1 : 10,000,000 // Compilers: E. N. Kamenev, G. I. Kame-neva, G. E. Grikurov. In: E. S. Korotkevich, V. D. Fomchenko, B. S. Fridman (eds): Atlas of Oceans/Antarctica. HDNO-AARI, St. Petersburg, 2005. Pp. 108–109.
  16. Antarctic Digital Magnetic Anomaly Map // Compilers: A. V. Golynsky, M. Ghidella, M. Chiappini, R. R. B. von Frese, A. Grunow, and the ADMAP Working Group. Antarctic Digital Magnetic Anomaly Project (ADMAP), 2008.  
[http://www.scar.org/researchgroups/productsandservices/SCAR08\\_ADMAP.pdf](http://www.scar.org/researchgroups/productsandservices/SCAR08_ADMAP.pdf)
  17. Bedrock Topography of the Antarctica (BEDMAP 2) // Compilers: Fretwell P., Pritchard H. D., Vaughan D. G. et al. Published by the British Antarctic Survey, 2013.
  18. Tectonic Map of the Antarctica, 1 : 10,000,000 – First edition // Compilers: G. E. Grikurov and G. E. Leichenkov. CGMW Subcommittee for Antarctica, 2012.

### CGMW SUBCOMMISSION FOR TECTONIC MAPS

History of work on international tectonic maps commenced from the 20th International Geological Congress (Mexico City, 1956). At that Congress, the exhibition of Soviet geological maps was organized. One of the maps, just published Tectonic Map of the USSR, 1 : 5,000,000 under general editorship of Academician N. S. Shatsky, has attracted great attention of western scientists. It was the world's first tectonic map for major part of the Eurasian continent.

It was Academician N. S. Shatsky, who in 1954 first proposed to establish the thematic Subcommittee for Tectonic maps as part of the Commission for the Geological Map of the World after publishing in 1953 the *Tectonic Map of the USSR and Adjacent Areas*, 1 : 4,000,000 under his leadership.

The Subcommittee was approved in 1956 at the 20th International Geological Congress (Mexico City, Mexico) as the **Subcommission for Tectonic Map of the World**. Academician N. S. Shatsky was elected Subcommittee President and Professor of the Moscow State University (MSU) A. A. Bogdanov, Secretary General. Academician of the German Academy of Sciences H. Stille was elected Subcommittee Honorary President.

By that Congress, the new *Tectonic Map of the USSR, scale 1 : 5,000,000* (1956) was published. Both of the Subcommittee leaders played an important role in its compilation and editing. At the Congress in Mexico City, Soviet geologists proposed the compilation of such a map for Europe (and then for other continents and the Globe). Subcommittee for Tectonic Map of the World under the leadership of N. S. Shatsky was officially incorporated into the CGMW.

In early 1957, Commission for International Tectonic Maps headed by N. S. Shatsky (Chairman) and A. A. Bogdanov (Vice Chairman, Chairman since 1961) was established at the Department of Geological and Geographical Sciences of the USSR Academy of Sciences for practical organization of work and coordination with the Commission for the Geological Map of the World.

In 1958, at the Brussels International Exhibition EXPO-58, both Tectonic Maps of the USSR were awarded Grand Prix and later were used a basis for the compilation of the first *International Tectonic Map of Europe* (1964).

At the 21st International Geological Congress (Copenhagen, 1960), Academician Dmitry V. Nalivkin, on the recommendation of the USSR Academy of Sciences (USSR Academy of Sciences Commission for International Tectonic Maps), was elected new President of the Subcommittee for Tectonic Map of the World.

D. V. Nalivkin had been working in GeolCom from 1907 (from 1939, VSEGEI). Thus, he was the only representative in the CGMW Subcommittee for Tectonic Maps, who was associated with GeolCom-VSEGEI.

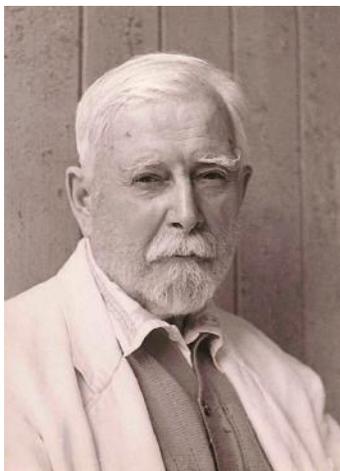
Under the leadership of D. V. Nalivkin and A. A. Bogdanov, in 1964, the *International Tectonic Map of Europe, scale 1 : 2,500,000* (*Carte*



**N. S. Shatsky**  
(1895–1960)  
President in 1956–1960



**A. A. Bogdanov**  
(1907–1971)  
Secretary General in 1956–1971



**D. V. Nalivkin (1889–1982)**  
**President in 1960–1972,**  
**Honorary President in 1972–1982**



**A. V. Peive**  
**(1909–1985)**  
**President in 1972–1985**

*Tectonique Internationale de'Europe, Moscou 1964*) was finally completed and published

This map virtually started a modern series of tectonic maps of continents, oceans, and individual major tectonic structures.

Great achievement of the Subcommittee for Tectonic Maps of the World was the preparation and publication by the USSR Academy of Sciences of the *Tectonic Map of Eurasia, scale 1 : 5,000,000* (1966). This work was started in 1959 by N. S. Shatsky and finished by Academician Alexander L. Yanshin. It was very hard work, because in the early 60s there were many “white spots”, particularly, in the Asian part.

During the work on the map, major deep faults were identified, and their evolution was determined; the prevalence of horizontal movements in the formation and development of crustal structures and the difference between the tectonic history of the Pacific and Atlantic segments of crust were noted; tectonics of the seabed and ocean floor was analysed. Descriptions of major tectonic structures and their origins were given in the Explanatory Notes to the Tectonic Map of Eurasia, which was also published in 1966.

In 1972, at the 24th International Geological Congress in New Delhi, the Subcommittee under the new name “Subcommission for Tectonic Maps” was headed by Academician Alexander V. Peive (President) and USSR Academy of Sciences Corresponding Member (Academician since 1987) Viktor E. Khain (Secretary General). D. V. Nalivkin remained the Honorary President.

International Tectonic Map of Europe published in 1964 was so successful for that time in the contents and design that in 1972, the Commission for the Geological Map of the World decided to prepare a new edition of the map. In 1975, the Subcommittee prepared and published the “trial” *Tectonic Map of Europe, scale 1 : 10,000,000* under the editorship of V. E. Khain and Yu. G. Leonov (RAS Corresponding Member from 1991 and Academician from 1997; Subcommittee President from 1996).

Second edition of the *International Tectonic Map of Europe, scale 1 : 2,500,000* was not published until 1981 in Russian and French, though it had been prepared for publishing in 1975 to be presented at the 25th

International Geological Congress in Sydney. D. V. Nalivkin as ex-president and Honorary President and A. A. Bogdanov as Secretary General and Chief Editor were mentioned on its title to demonstrate the important contribution of the greatest tectonic geologists in the development of Soviet science and tectonic mapping.

Explanatory notes to the International Tectonic Map of Europe in Russian were issued before the map and published in 1978, and in English it was released simultaneously with the map publication (1981–1982) in two volumes: *Tectonics of Europe and Adjacent Areas. Cratons, Baikalides, Caledonides* (1981) and *Tectonics of Europe and Adjacent Areas. Variscides, Epi-Paleozoic Platforms, Alpides* (1982).

Conceptually new *Tectonic Map of Northern Eurasia, scale 1 : 5,000,000* covering the area of the USSR, Western Europe, adjacent areas of Asia and Arctic waters, and Far East seas was issued in 1971–1978 under the leadership of academicians A. V. Peive and A. L. Yanshin.

Map content was based on distinguishing structures differing in time of continental crust initiation, which was identified from the appearance of collisional granite and continental molasses. Such an approach realized further development of tectonic zoning not so much from the age of main folding as from the time of transformation of oceanic crust of the geological past to the new continental crust. All principles of tectonic map compilation based on the age of new formed crust were reflected in the Explanatory Notes to the map *Tectonics of Northern Eurasia* published in 1980.

80–90s of the last century were very productive in the Subcommittee for Tectonic Maps. During these years, the Subcommittee compiled and published the following maps and explanatory notes under the leadership of V. E. Khain and Yu. G. Leonov as chief editors:

– *Tectonic Map of the World, scale 1 : 45,000,000* (1982) as a table version of the map below:

– *International Tectonic Map of the World, scale 1 : 15,000,000* (1984); this tectonic map included the Circum-Polar inset map of the Arctic, showing all tectonic elements not only of the land, but also water areas of the Arctic Ocean



**V. E. Khain**  
(1914–2009)  
Secretary General in 1972–1987,  
President in 1987–1996,  
Honorary President in 1996–2009



**Yu. G. Leonov**  
(born in 1934)  
Secretary General in 1987–1996,  
President in 1996–2012



Fig. 3. International Tectonic Map of Europe, 1 : 5,000,000 (1996)

and the North Atlantic. Later, this map was used as a basis for the new international CGMW project *Tectonic Map of Circum-Arctic, scale 1 : 5,000,000* announced by the Subcommission in 2004;

– Monograph *Tectonics of Continents and Oceans – Explanatory Note to the International Tectonic Map of the World, scale 1 : 15,000,000* (1988, in English and Russian).

At the CGMW Bureau meeting during the 30th International Geological Congress in Beijing in 1996, changes took place in the Subcommission for Tectonic Maps. Academician Yury G. Leonov, Secretary General of the Subcommission was appointed President instead of Academician V. E. Khain who had been working in CGMW for 24 years but continued to work in the Subcommission as a Consultant and Honorary President.

In 2000, at the CGMW General Assembly during the 31st International Geological Congress in Rio de Janeiro, the Subcommission for Tectonic Maps presented the new *International Tectonic Map of Europe, scale 1 : 5,000,000* (chief editors V. E. Khain and Yu. G. Leonov, 3rd edition, in 1996 in English, in 1998 in Russian) (Fig. 3). The map in its content and design was recognized as a standard of tectonic maps for continents, and its legend became a reference for legends to subsequent small-scale international tectonic maps of continents and major tectonic structures. In 1999, VSEGEI Cartographic Factory (St. Petersburg) participated in the International Cartographic Conference in Canada and was awarded the Diploma for the *International Tectonic Map of Europe, scale 1 : 5,000,000*.

In Rio de Janeiro, at the Bureau meeting, Dr. I. I. Pospelov, Head of Lab for Tectonic Maps, RAS Geological Institute, was proposed as a candidate for the position of the Secretary General in the Subcommission for Tectonic Maps.

Active work on preparing the new CGMW project *International Tectonic Map of Asia, scale 1 : 7,500,000* started after the Congress. Information on oceanic crust, fold-thrust belts, and chronology of tectonic events in Asia and adjacent continents was greatly extended.

## THE LATEST STAGE OF TECTONIC MAPPING

### Russian Bureau members of the Commission for the Geological Map of the World (CGMW)

The beginning of the 21st century was marked by a new rise of international geological and tectonic mapping, as there was a need for analysis and synthesis of a vast body of geological



**Dr. Oleg Petrov**  
CGMW Subcommission  
for Northern Eurasia,  
Vice-President since 2004



**Dr. Sergey Shokalsky**  
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Northern Eurasia,  
Secretary General since 2004



**Dr. German Leichenkov**  
CGMW Subcommission  
for Antarctica, Vice-President  
since 2008



**Dr. Igor Pospelov**  
CGMW Subcommission  
for Tectonic Maps,  
Secretary General since 2000

information accumulated over the past century. In addition to standard geological and tectonic maps, the compilation of special-purpose geoscience maps was set up. The whole set of cartographic image techniques gradually adds new elements to the principles of new geoscience map compilation, and, as before, the Commission for the Geological Map of the World is the leader and organizer of the compilation of new small-scale geological maps.

Therefore, even before the International Geological Congress in Florence, future leaders of the Subcommission for Northern Eurasia, Vice-President Dr. O. V. Petrov and Secretary General Dr. S. P. Shokalsky proposed that first efforts of two leading institutes to be joined, and from 2004, the efforts of two Subcommissions in the work on major international projects:

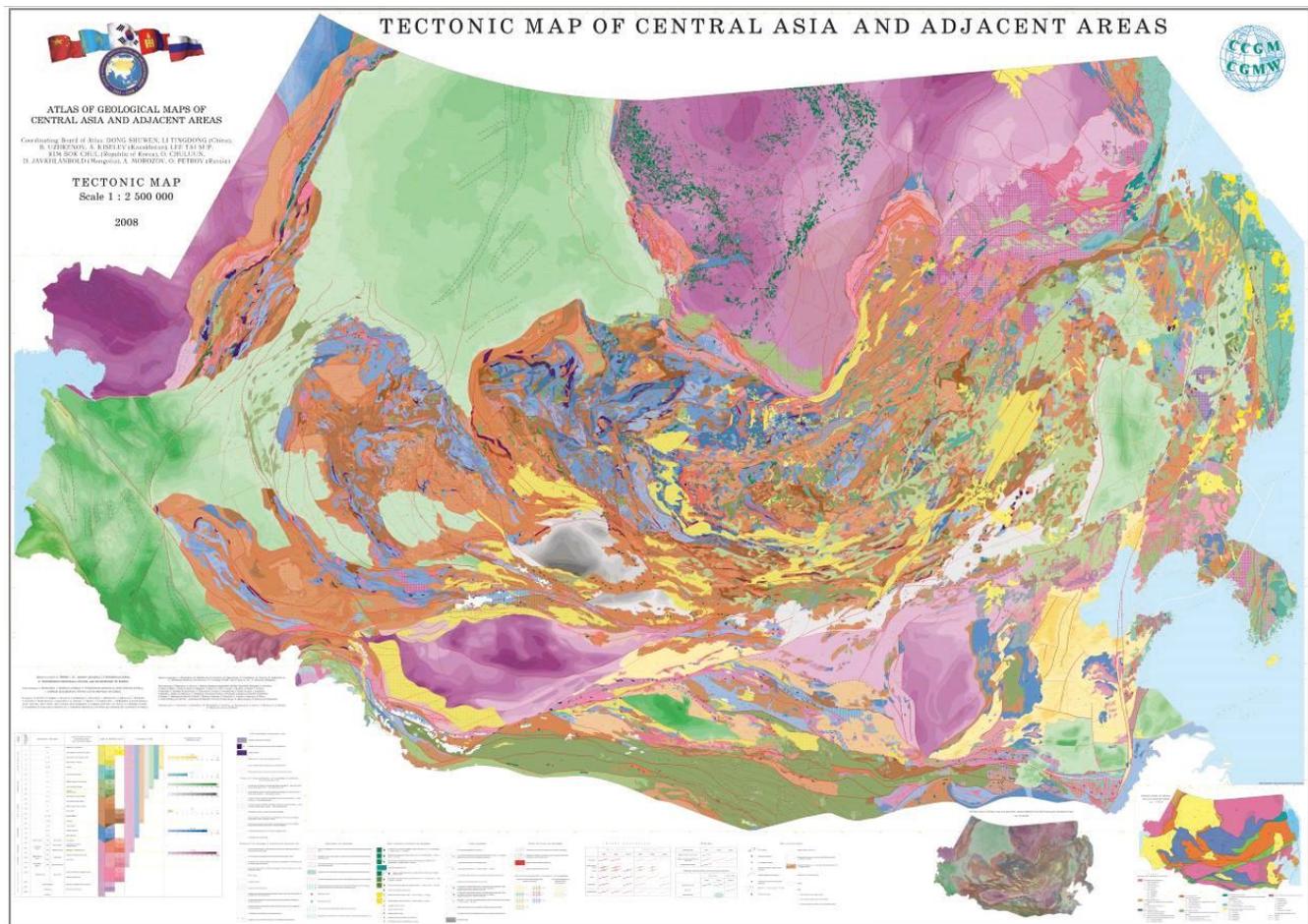
- for Northern Eurasia as representing geological scientific and production potential of Russia with extensive experience in mapping in the system of the Federal Agency on Mineral Resources (ROSNEDRA) and

- for Tectonic Maps as representing Russian academic science with the experience in the elaboration of new principles of tectonic map compilation.

This cooperation was laid down as far back as 2002–2003, when the international project *Atlas of Geological Maps of Central*

*Asia and Adjacent Areas* started. But now this cooperation has been implemented at the level of the Commission for the Geological Map of the World, and the participation in it expanded the cooperation of the Subcommittee for Northern Eurasia with other CGMW Subcommissions, e. g., for South and East Asia.

Both Subcommissions in tectonic map compilation used the legend and image techniques that had been applied for the *International Tectonic Map of Europe, scale 1 : 5,000,000*



**Fig. 4. Tectonic Map of Central Asia and Adjacent Areas, 1 : 2,500,000 (2008)**

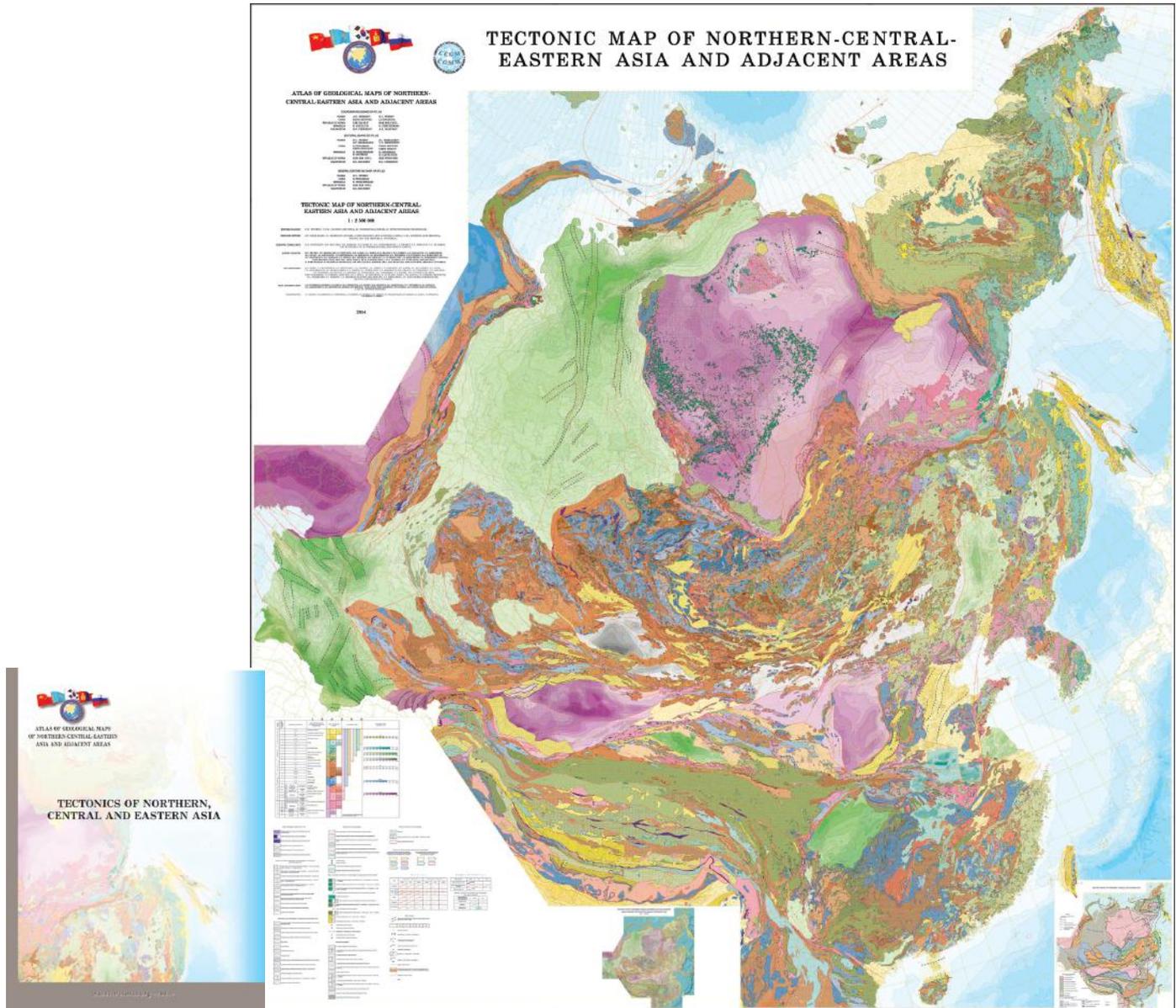


Fig. 5. Tectonic Map of Northern-Central-Eastern Asia and Adjacent Areas, 1 : 2,500,000 (2014) and Explanatory Note to the map (2015)

(1996–1998). This map is still an example of successful use of design, and the Legend became the basis for legends of tectonic maps of Asia and its individual parts.

First of all, this is the ongoing CGMW project *International Tectonic Map of Asia*, scale 1 : 7,500,000, which was suspended in 2006, since it had been decided first to compile the *International Geological Map of Asia*, scale 1 : 5,000,000 and only after its completion to return to the tectonic map.

Similar legend was used in international projects of Russia, China, Mongolia, Kazakhstan, and Korea *Tectonic Map of Central Asia and Adjacent Areas*, scale 1 : 2,500,000 published in 2008 (Fig. 4) and *Tectonic Map of Northern-Central-Eastern Asia and Adjacent Areas*, scale 1 : 2,500,000 published in 2014 (Fig. 5). For these two maps, the legend was extended and updated due to the change in the map scales.

The two Subcommissions played an important role in the *International Geological Map of Asia*, scale 1 : 5,000,000 – *IGMA-5000*. They formed part of two working groups that were responsible for the geological content of the map in Russia (Working Group 1 – Russia and Western Europe with adjacent water areas) and Central Asian republics (Working Group 3 – China, Mongolia, countries of South-East Asia, Kazakhstan, Uzbekistan, Tajikistan, Turkmenistan, and Kyrgyzstan). CGMW Subcommission Vice-President for South and East Asia CAS Academician Ren Jishun (Institute of Geology, Chinese Academy of Geological Sciences, Beijing) was the initiator and leader of the project. This project, largest in the history of CGMW, culminated in the publication of the map in the Beijing Cartographic Publishing House (2013); over 100 experts from 20 countries took part in its compilation.

Among international mapping projects under the auspices of the Commission for the Geological Map of the World, particular consideration is given to the project *Tectonic Map of the Circum-Arctic*, scale 1 : 5,000,000, which is part of the Atlas of Geological Maps of the Arctic, scale 1 : 5,000,000. This tectonic map is the fourth map after two geophysical maps published under the auspices of the Commission in 2008 by the Norwegian Geological Survey, and the *Geological Map of the Arctic*, scale 1 : 5,000,000, published by the Geological Survey of Canada in 2010. The geological map was compiled under the leadership of Dr. Ch. Harrison (project coordinator, Geological Survey of Canada) and Dr. M. Saint-Onge (current CGMW Subcommission Vice-President for North & Central America).

Russian experts, including members from two CGMW Subcommissions, has been responsible for the *Tectonic Map of the Circum-Arctic*. The Subcommission for Northern

Eurasia (A. P. Karpinsky Russian Geological Research Institute – VSEGEI) is responsible for the general management of mapping and coordination of activities with Russian and western experts. Another one is the Subcommission for Tectonic Maps (RAS Geological Institute), which prepares separate layouts of the map and acquires material for the Explanatory Note. The Subcommission for Antarctica (VNIIOkeangeologia, St. Petersburg), which coordinates the work of the Institute staff has been also attracted to this work.

In 2009, Russian Subcommissions started compilation of a uniform layout of the Tectonic Map of the Circum-Arctic. This was preceded by the international discussion and approval of the legend to the tectonic map. In April 2010, the draft legend was discussed at the ad hoc international workshop at VSEGEI, which was attended, in addition to Russian participants, by geologists from Canada, Norway, Sweden, Denmark, Germany, France, Finland. In April 2011, in Paris, most of the project participants from western countries adopted the legend. After that, the subcommissions started finalization of the *Tectonic Map of the Circum-Arctic, scale 1 : 5,000,000*.

Due to the fact that the Tectonic Map of the Circum-Arctic is created as an international map under the auspices of CGMW (Commission for the Geological Map of the World), IUGS (International Union of Geological Sciences) and UNESCO, the existing international practice should be taken into account in its content and design. Therefore, all the maps published under the auspices of international organizations, are published in English or French (often in both languages) as official languages of the Commission for the Geological Map of the World. At the CGMW General Assembly in February 2010, it was decided to prepare the tectonic map in English.

*Tectonic Map of the Circum-Arctic, scale 1 : 5,000,000* corresponds to the best national and western models of using graphic means and marginal design of the map. Corresponding international translation of Russian terms of structural elements and geographical names is given in the English-language version of the map in accordance with the “Oxford Dictionary of Geographical Names.” Generally accepted English names of units and structural elements of the map in the legend correspond to the current state of geotectonic science.

The map is supplemented with inset maps, scale 1 : 25,000,000 including maps of Arctic crust blocks, lithosphere thickness, crustal thickness, thickness of the sedimentary cover on the consolidated crust, different types of continental, transitional and oceanic crust (Fig. 6). The map shows deep seismic line across the Arctic Ocean, which reflects the ocean crustal structure and the ratio of different crustal types.



Numerous intermediate versions of the *Tectonic Map of the Circum-Arctic, scale 1 : 5,000,000* has been repeatedly demonstrated at scientific meetings and conferences (CGMW General Assemblies, European Union of Geosciences – EGU, International Conference on Arctic Margins – ICAM, etc.) for public discussion of the project.

After the compilation of the *Tectonic Map of Central Asia and Adjacent Areas, scale 1 : 2,500,000* (2008) and the *Tectonic Map of Northern-Central-Eastern Asia and Adjacent Areas, scale 1 : 2,500,000* (2014), both Subcommissions started implementation of the CGMW project *International Tectonic Map of Asia, scale 1 : 5,000,000 – ITMA-5000*, announced as far back as 2000. To prepare such a map, in addition to the extensive practical experience, there is a good geological basis in the form of the *International Geological Map of Asia, scale 1 : 5,000,000 – IGMA-5000* (2013). Legend to the tectonic map of Europe, later revised to correspond the tectonic structure of Asia is taken as a basis, and the scale was changed for graphic conformity to international geological and tectonic maps of Asia.

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COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD  
60 YEARS OF RUSSIA'S PARTICIPATION

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