УДК 551.24+553.81

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The first find of diamond on the Sredny and Rybachy Peninsulas in the north-eastern Baltic Shield

The regular features of the region's spatial-temporal evolution have been discussed. Based on geodynamic analysis and the time scale of the crust formation in the eastern Baltic Shield, it is defined, that the most promising search areas for diamond-bearing rocks are intersections of deep lithospheric faults and discovered belts of possible diamond-bearing kimberlitic magmatism. The paper suggests the most promising search areas for diamond-bearing kimberlitic explosion pipes that can be united in the single diamond-bearing Norwegian-Mesensky belt. Prospecting for diamonds was carried out in the area of the Rybachy and Sredny Peninsulas in 2005–2007. Detailed decoding of large-scale aerial photographs and *in situ* measuring of fractures in the northern margin of the Sredny Peninsula allowed defining prospective intersection nodes of deep faults. Heavy mineral concentrate has been sampled here and indicated diamonds and associated minerals. They can suggest either native wash-out origins, or immediate scouring of Paleo-marine terraces that used to be rich in these minerals. No magmatic explosion pipes of the kimberlitic composition have been found here. It can be due to a lack of geological data on the region obtained by large-scale geophysical methods. The diamond finds have made it possible to recommend enhancing such investigations and paying more attention to this issue. We take into account that the Riphean sedimentary complexes of the Rybachy and Sredny Peninsulas are formations of the passive continental margin at that time and the watershed of the Musta-Tunturi Range is close to the study area. Based on that, we suggest that the matter transfer was not significant, just first km or, probably, first tens of km. Therefore, bedrocks of diamond-bearing explosion pipes should be prospected for close to the location of the diamond find.

Key words: diamond, moissanite, chrome diopside, chrome spinellid, Rybachy Peninsula, Sredny Peninsula

Article info: *received 26.01.2018*

Introduction

The issue of prospecting for diamonds in the North-East of the Baltic Shield has been discussed for a long time [1–5]. This interest is quite reasonable, since back in the late IX century a diamond grain (or several grains, according to some sources) was found by Ch. Rabot (with Ch. Vellain, according to some sources) on the Paz River (Paatsjoki in Finnish, Pasvikelva in Norwegian). Noteworthy, further attempts at finding diamonds here or in the area adjacent to the north-western Murmansk region have failed.

Researchers of the Geological Institute KSC RAS, including the authors of this paper, have studied and prospected the area with a full set of geophysical, lithological, mineralogical, petrographical and geochemical methods. Combined with results of geodynamic analysis, these methods allowed justifying potential diamond placers in the southern and south-eastern Kola Peninsula. Thus, new possible kimberlitic fields have been detected on the Tersky coast, i. e. the Pulongskoye and Snezhnitskoye fields [2]. After years of searching, just several diamond grains have been found here between the Pyalitsa and Babya Rivers [1]. Besides, one diamond grain has been identified in the central Kola Peninsula, using the heavy concentrate analysis of a sample from the Elnjok river-bed deposits in the White Tundra area to the east of Lovozero. It has extended the area of possible diamond placers [2]. Yet, there were no reasons to include north-western parts of the region in this target area, and the find of diamonds near the Paz River remained underestimated.

Based on general concepts [5], the authors of the work have doubted this approach and continued prospecting for diamonds in the north-west of the Kola region. Finally, the search has become a success, as described in this paper.

Materials and methods

To forecast areas of the diamond-bearing magmatism in the north-eastern Baltic Shield, the main task is to study general patterns of the spatial and temporal evolution of the region.

In this regard, we should note that one of the latest peaks of tectonic activity in the study area was in the late Ordovician, about 480–450 Ma ago, when the Paleo-Atlantic Iapetus Ocean closed. At that time, the Grampian-Caledonian Geosyncline changed the regime of its development. The setting of subduction zones replaced the regime of the passive continental margin along the north-western coast of the European platform from Scotland, through Norway to the Spitsbergen Islands. In the early and middle Devonian (390–370 Ma ago), there was a collision between continental lithospheric plates that rimmed the Iapetus Paleo-ocean. By the early Devonian, the North-American continent had collided with the East European continent. As a result, a single continental lithospheric plate was produced. At the same time, the Caledonian fold belt formed, stretching from Scotland to the north of Scandinavia and Spitsbergen Islands and marking the continental collision line. The Caledonian Geosyncline Complex with ophiolites was pushed out of the geosyncline and thrusted over Archaean and Proterozoic formations as extensive allochtone covers in the north-western margin of the Baltic Shield. In the second half of the Devonian and early Carboniferous (340–320 Ma ago), continents continued converging with each other, gradually composing the Pangaea supercontinent.

The closure of the Iapetus Ocean can be reconstructed based on the present-day shape of continental plates in the northern part of the Atlantic Ocean and on the structural pattern of the Caledonian allochthone in the northern Baltic Shield, marking the ancient suture zone. At that, the collision of the wedge-shaped eastern part of the Greenland lithospheric plate with the European plate should have produced tensile stress in the northern Baltic Shield along the Northern Norway – Kola Peninsula – Arkhangelsk region line, i. e. from the north-west to the south-east (Fig. 1).

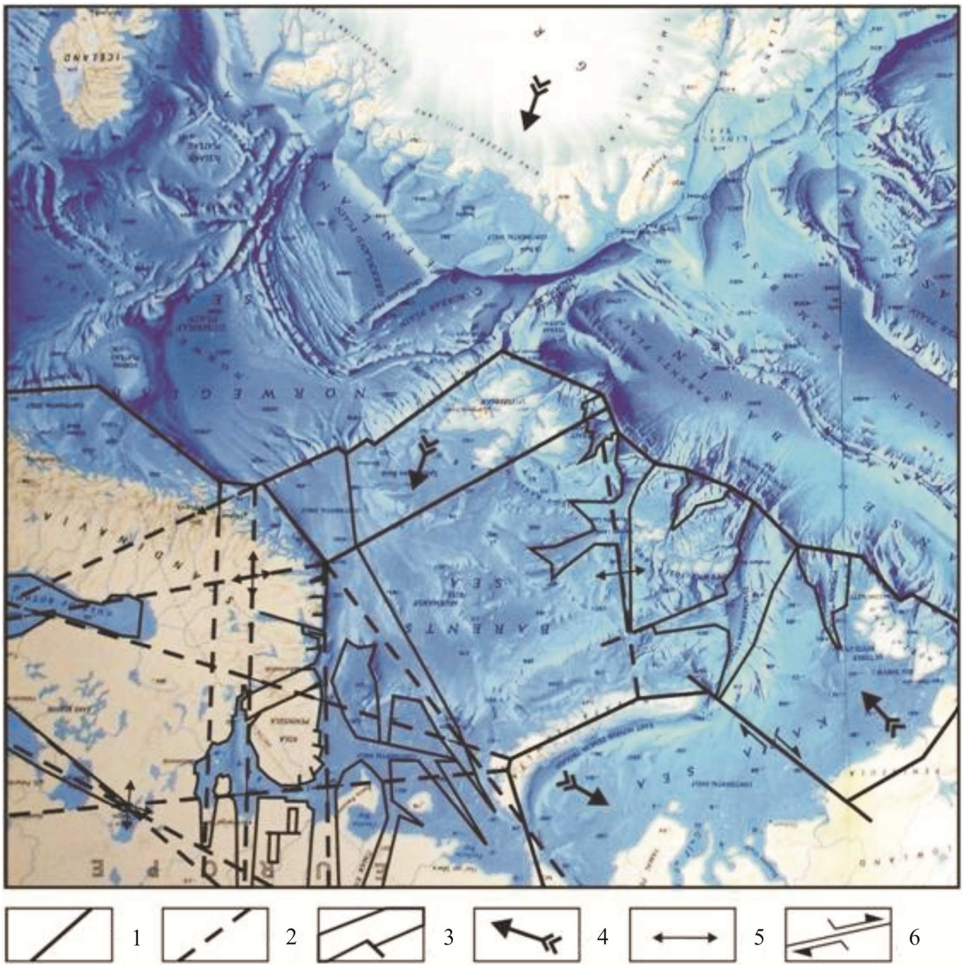

Fig. 1. Reconstructed fracturing of the East-European and ancient Siberian Platforms in the Palaeozoic – Early Mesozoic (650–241 Ma): 1 – boundary between lithospheric plates that marked the closure of palaeooceans and collision; 2 – major lineaments that form in the continental lithospheric plate; 3 – rifts; 4 – unified direction of shifting lithospheric plates; 5 – vectors of stress fields in the continental lithosphere; 6 – transform fault.
Source: DOI: 10.21443/1560-9278-2016-1/1-123-137
Рис. 1. Реконструкция разрывных нарушений в древней Восточно-Европейской, молодой Западно-Сибирской и древней Сибирской платформах в палеозое – раннем мезозое (650–241 млн лет): 1 – граница литосферных плит, вдоль которых происходило закрытие палеоокеанов и коллизия; 2 – основные линиаменты, формирующиеся в континентальной литосферной плите; 3 – рифты; 4 – генерализованное направление перемещения литосферных плит; 5 – векторы полей напряжения в континентальной литосфере; 6 – трансформный разлом

It appears likewise, that the tensile stress zone originated along the Novaya Zemlya – Nokuev Island – Kandalaksha town – Gulf of Bothnia line, when the Devonian Paleo-Ural Ocean closed and the West-Siberian epi-Paleozoic Platform collided with the Russian Platform in the Late Carboniferous (Fig. 1). At that, the protrusion of the Kara Plate, which is marked as a knee fold of the Novaya Zemlya structures, intruded into the Barents Sea Platform, like a wedge.

Events at the rims of the Baltic Shield affected its inner physical state. As a result, an almost orthogonal fault system formed in the eastern part of the shield. Branches of this system are oriented north-westwards and north-eastwards (Fig. 1). The pattern of these deformations predetermined the genesis of another fault system that formed in result of decomposition of forces. The submeridional-sublatitudinal orthogonal system formed in the described period as a secondary process with no significant shifts along faults. These facts of the Paleozoic structural arrangements in the north-eastern Baltic Shield indicate different timing of the fault systems origination. First, the north-western and north-eastern systems formed; next, the submeridional and sublatitudinal systems occurred. Tensile stress in the eastern Baltic Shield produced a number of rift structures. According to geophysical data, there are two systems of rift formations in the Kola Peninsula, i. e. the White Sea and Barents Sea systems. They mark faults of the north-western strike and an extension fault system that is normally oriented towards the faults. This extension is marked by the water area of the White Sea Throat.

The origin and renewal of the described fault systems at about 450–320 Ma should be confined to the intensive alkaline-ultrabasic and kimberlitic magmatism in the Baltic Shield and northern Russian Platform. Massifs of alkaline-ultrabasic intrusions are localized in the central Kola Peninsula and eastern Finland (Fig. 2). Explosion pipes are distributed east of the localized alkaline-ultrabasic intrusions and occupy a small area within the Yermakovsky Graben. An individual explosion pipe has been first discovered near the Ivanovskaya Bay on the Barents Sea shore. Explosion pipes have been also discovered in the Arkhangelsk region, all gathered in the Zimnebrazhnaya area of the kimberlitic and melilitite magmatism. Most of the explosion pipes on the Tersky coast of the Kandalaksha Bay and an individual find on the Murmansk shore of the White Sea have the melilitite composition. In the Arkhangelsk region, there was both the melilitite, and deeper kimberlitic magmatism. Besides intrusions and explosion pipes, the Caledonian and Hercynian magmatism in the Kola Peninsula is characterized by widespread dyke complexes that occur as two separate areas. One of them stretches along the Murmansk coast from northern Norway to the Ivanovskaya Bay in the east (Fig. 2). These dykes are alkaline-ultrabasic mostly. There are also doleritic dykes in the western part of the distribution area mainly.

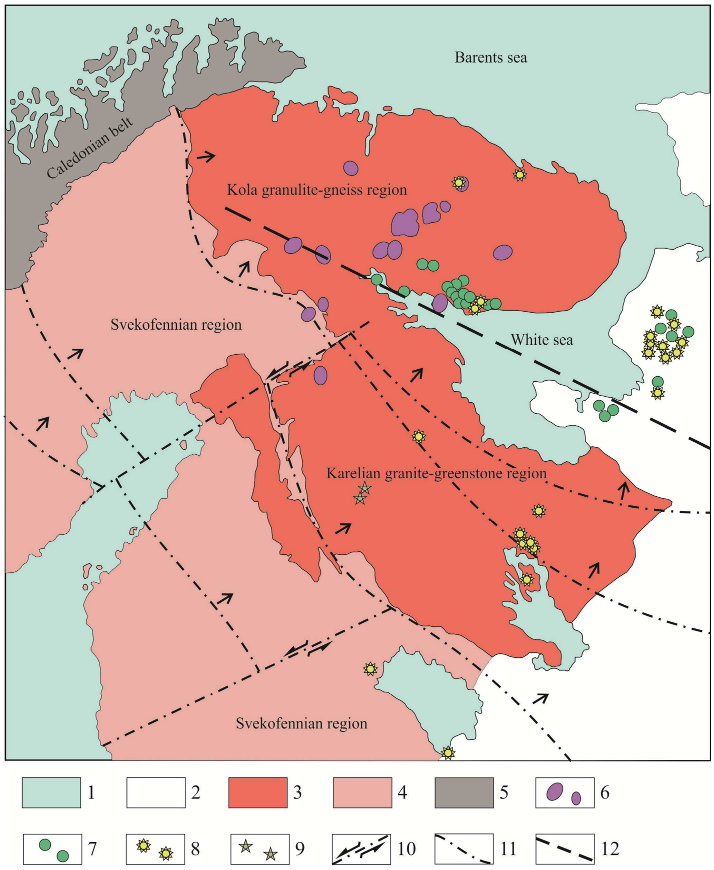

Fig. 2. Geological scheme of the eastern Baltic Shield: 1 – hydrosphere; 2 – sedimentary cover of the Russian Platform; 3 – Archaean continental-crustal associations; 4 – Early Proterozoic (Svecofennian) sedimentary-volcanogenic and intrusive complexes; 5 – Caledonian allochthone covers; 6 – alkaline-ultrabasic intrusions; 7 – picrite and melilitite explosion pipes; 8 – kimberlites; 9 – lamproites; 10 – transform-type fractures; 11 – subduction zones and directions of subduction (indicated by arrows) of the Early Proterozoic oceanic plates (1.9–1.8 Ga ago); 12 – axis of the Paleozoic Kandalaksha-Dvina rift system

Рис. 2. Геологическая схема восточной части Балтийского щита: 1 – гидросфера; 2 – осадочный чехол Русской платформы; 3 – континентально-коровые ассоциации архея; 4 – осадочно-вулканогенные и интрузивные комплексы раннепротерозойского (свекофеннского) возраста; 5 – аллохтонные покровы каледонского возраста; 6 – интрузии щелочно-ультраосновного состава; 7 – трубки взрыва пикритового и мелилититового составов; 8 – кимберлиты; 9 – лампроиты; 10 – разрывные нарушения трансформного типа; 11 – зоны субдукции и направления поддвига океанических плит (показаны стрелками) раннепротерозойского возраста (1.9–1.8 млрд лет назад); 12 – ось Кандалакшско-Двинской рифтовой системы палеозойского возраста

The second area of the dyke magmatism is constrained by the north-eastern coast of the Kandalaksha Bay. Nowadays, more than 300 dykes are known here. Most of them are oriented north-eastwards and compose a series of subparallel bodies with a distance between them ranging from 20–50 m to 500–700 m. Almost all of the dykes are alkaline-ultrabasic.

The study of age characteristics of the intrusive magmatism allowed defining two age intervals of its activity. Early intrusive bodies, explosion pipes and dykes intruded in the period of 480–400 Ma ago. They form a north-westwards elongated zone stretching along the coast of the Kandalaksha Bay and further, including the Kovdor massif. Later magmatic events were 400–320 Ma ago. They are confined to fracturing of the north-eastern and northern strike. The defined pattern indicates a younger age of origination of the meridional and diagonal (north-eastern) fault systems.

We have analyzed spatial-temporal settings of magmatic formations in the eastern Baltic Shield and revealed that they were regularly located close to intersection nodes of major fractures in all of the four directions (Fig. 1). In general, there are 16 major nodes within the described region with intense magmatism in 10 of them. The rest 6 areas are in the north-western and eastern parts of the Kola Peninsula and on the Rybachy Peninsula. These areas have no evidence of magmatism yet, being either closed or poorly studied. Noteworthy, as a result of the research made by the authors in 1997 on the eastern Kola Peninsula (the Pulonga – Babya Rivers), a number of melilitite and kimberlite dykes have been discovered on the Kola coast of the White Sea Throat. These dyke formations have a peculiar spider-like shape with the isometrically isolated matter in the centre and 4–6-ray radiating dykes. The diameter of central bodies ranges from 2 to 8 m, apophyses are as long as 30–80 m. Dyke bodies break the Archaean crystalline basement; they are not metamorphosed and often have peculiar diagonal primary fractures formed under the magma crystallization. By the present day, these formations are poorly studied, but preliminary data indicate their Paleozoic age.

As a result of the Caledonian-Hercynian activity in the Baltic Shield, several magmatic complexes intruded and formed on the shoulders of these structures, in rift areas and intersection nodes of the largest lineaments (Fig. 3). Consequently, the Paleozoic alkaline-ultrabasic, melilitite and kimberlite magmatic province was formed within the Baltic Shield and northern Russian Platform.

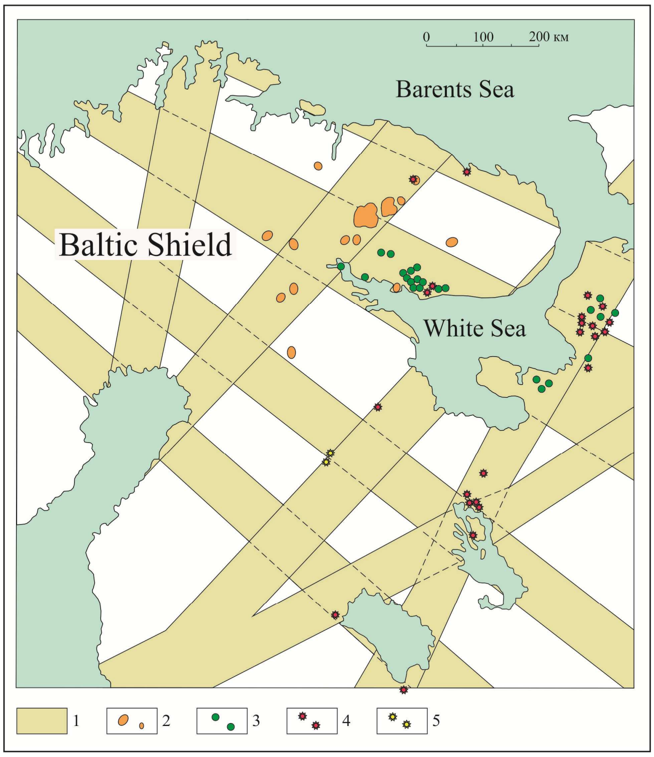

Fig. 3. Scheme of tectonics and distribution of major intrusive massifs and Paleozoic explosion pipes in the north-eastern Baltic Shield: 1 – linear areas of localized Paleozoic deep tectonic faults; 2 – alkaline-ultrabasic intrusions; 3 – melilitite explosion dykes; 4 – kimberlite explosion pipes; 5 – lamproite explosion pipes

Рис. 3. Схема проявления тектоники и распределения основных интрузивных массивов и трубок взрыва палеозойского возраста в северо-восточной части Балтийского щита: 1 – линейные зоны концентрации глубинных тектонических разломов палеозойского возраста; 2 – интрузии щелочно-ультраосновного состава; 3 – мелилититовые трубки взрыва; 4 – кимберлитовые трубки взрыва; 5 – лампроитовые трубки взрыва

According to the geodynamic analysis and timeline of the crustal formation in the eastern Baltic Shield, the most promising areas for diamond-bearing rocks are intersection points of deep-seated breaks in the lithosphere and defined belts of possible diamond-bearing kimberlitic magmatism (Fig. 1; 3). Thus, Fig. 4 shows the most promising areas for prospecting for diamond-bearing kimberlitic explosion pipes. These areas can be united into the single diamond-bearing Norwegian-Mesensky belt.

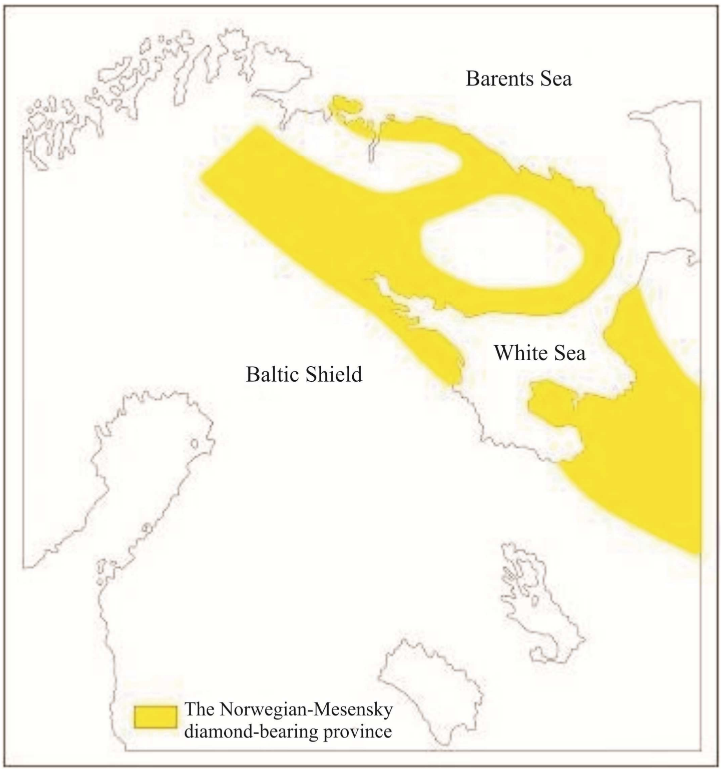

Fig. 4. Location of the Norwegian-Mesensky diamond-bearing belt within the north-eastern Baltic Shield and northern Russian Platform
Рис. 4. Схема расположения Норвежско-Мезенского алмазоносного пояса в пределах северо-восточной части Балтийского щита и севера Русской платформы

The Rybachy and Sredny Peninsulas have been prospected for diamonds (Fig. 5). Detailed decoding of large-scale aerial photographs and in situ measuring of fractures in the northern margin of the Sredny Peninsula allowed defining prospective intersection nodes of deep faults. Heavy mineral concentrate has been sampled here and indicated diamonds and associated minerals. The obtained results are provided below. They can indicate either native wash-out origins, or immediate scouring of Paleo-marine terraces that used to be rich in these minerals. Samples have been picked out the middle flow of a creek, upstream a bit from its crossing with the road that goes from the isthmus to the Zemlyanoy Cape of the Sredny Peninsula (Fig. 6). During the sampling, 480 kg of alluvial deposits from fluvial and coastal facies have been processed. After sieving and washing, 1.5 kg of gray sand has been prepared for further analyses. The sand has been processed in the Laboratory for Mineralogy of Geological Institute KSC RAS, as described below.

Three samples of -0.75B class with an average weight of ~300 g have been transferred to the laboratory. The samples have been processed for the reduced mineralogical analysis, according to the following technique:

1. VLTK-500 counter balance is used to determine the weights with accuracy of 0.1 g.

2. The material is separated according to its specific weight in bromoform with a specific weight of 2.9 g/cm^3. As a result, heavy fraction is produced.

3. The heavy fraction is subject to the magnetic and electromagnetic separation (using the Sochnev magnet). As a result, magnetic, electromagnetic and nonmagnetic fractions have been obtained. All fractions are weighted.

4. All fractions have been studied under the binocular magnifying glass. Minerals have been identified visually, using a microscope in immersion fluids. In some cases, the X-ray and microprobe analysis on Cameca MS-46 have been provided. Pictures of single grains have been taken using the Stemi binocular. The content (%) of zircon, rutile, ilmenite has been calculated regarding the heavy fraction weight.

Вестник МГТУ. 2019. Т. 22, № 1. С. 36–47.
DOI: 10.21443/1560-9278-2019-22-1-36-47

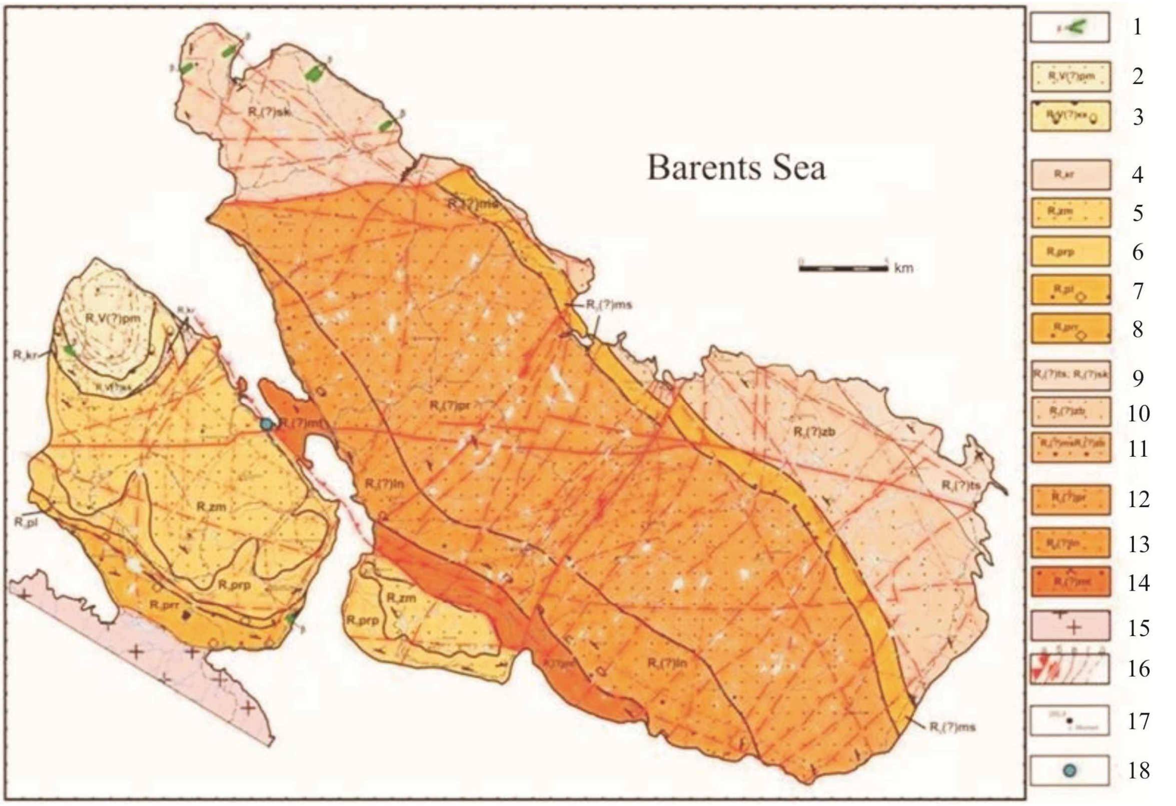

Fig. 5. Geological map of the Sredny and Rybachy Peninsulas: 1 – dolerite dykes; 2–8 – **Upper Riphean (Vendian?)**, **Kildin Structural and Formation Zone**: *Volokovaya series* (2, 3): Pumanskaya suite – interlayered yellowish gray arcosic psammites, siltstones and mafic pelites (2); Kuyakanskaya suite – yellowish gray polymict conglobreccia with fragments of phosphorites, arcosic gritstones and psammites with thinly layered mafic siltstones and pelites (3); *Keldinskaya series* (4–8): Karuyarvinskaya suite – interlayered varicolored arcosic and oligomict psammites, siltstones and dolomites (4); Zemlepakhtinskaya suite – yellowish gray arcosic psammites with thinly layered siltstones and pelites with lenses of phosphorite-bearing rocks (5); Poropelonskaya suite – interlayered grayish green arcosic psammites and mafic siltstones (6); Palvinskaya suite – interlayered varicolored quartz, oligomict and arcosic psammites, siltstones, pelites and dolomites (7); Pyaryayarvinskaya suite – interlayered grayish green and quartz, oligomict and arcosic psammites, mafic siltstones and pelites (8); 9–14 – **Middle Riphean, Rybachinskaya Structural and Formation Zone**: *Bargoutnaya series* (9–11): Tsypnovolokskaya (R2ts) and Skarbeevskaya (R2sk) suites – interlayered mudstones and siltstones with lenses of carbonate rocks (9); Zubovskaya suite – interlayered gray polymict psammites, siltstones, pelites (10); Mayskaya suite – interlayered gray quartz and polymict conglomerates with polymict psammites (11); *Einovskaya series* (12–14): Perevalnaya suite – suite of gray polymict psammites and gritstones with rare interlayers of polymict conglomerates, siltstones and pelites (12); Lonskaya suite – interlayered gray polymict conglomerates, gritstones, psammites with rare interlayers of siltstones and pelites (13); Motovskaya suite – gray polymict conglobreccia and gritstones with interlayers of polymict psammites with rare interlayers and lenses of siltstones and pelites (14); 15 – Neoarchaean undissected tonalite-granodiorite complex; 16 – tectonic deformations: I – rank fractures (*а–в*): thrusts and wrench faults (*а*), shears (*б*), faults with unclear kynematics (*в*); II – rank fractures (*г*); III – rank faults (*д*); 17 – elevation marks; 18 – disposal site of diamond and associated mineral grains

Рис. 5. Геологическая карта п-ов Средний и Рыбачий: 1 – дайки долеритов; 2–8 – **верхний рифей (венд?)**, **кильдинская структурно-формационная зона**: *волоковая серия* (2, 3): пуманская свита – переслаивание желтовато-серых аркозовых псаммитов, алевролитов и темноцветных пелитов (2); куяканская свита – желтовато-серые полимиктовые конглобрекчии с обломками фосфоритов, аркозовые гравелиты и псаммиты с маломощными прослоями темноцветных алевролитов и пелитов (3); *кильдинская серия* (4–8): каруярвинская свита – переслаивание пестроцветноокрашенных аркозовых и олигомиктовых псаммитов, алевролитов и доломитов (4); землепахтинская свита – желтовато-серые аркозовые псаммиты с маломощными прослоями алевролитов и пелитов с линзами фосфоритсодержащих пород (5); поропелонская свита – переслаивание серо-зеленых аркозовых псаммитов и темноцветных алевролитов (6); палвинская свита – переслаивание разноцветных кварцевых, олигомиктовых и аркозовых псаммитов, алевролитов, пелитов и доломитов (7); пяряярвинская свита – переслаивание серо-зеленых и кварцевых, олигомиктовых и аркозовых псаммитов, темноцветных алевролитов и пелитов (8); 9–14 – **средний рифей**, **рыбачинская структурно-формационная зона**: *баргоутная серия* (9–11): цыпнаволокская (R2ts) и скарбеевская (R2sk) свиты – переслаивание аргиллитов и алевролитов с линзами карбонатных пород (9); зубовская свита – переслаивание сероцветных полимиктовых псаммитов, алевролитов, пелитов (10); майская свита – переслаивание сероцветных кварцевых и полимиктовых конгломератов с полимиктовыми псаммитами (11); *эйновская серия* (12–14): перевальная свита – толща сероцветных полимиктовых псаммитов и гравелитов с редкими прослоями полимиктовых конгломератов, алевролитов и пелитов (12); лонская свита – переслаивание сероцветных полимиктовых конгломератов, гравелитов, псаммитов с редкими прослоями алевролитов и пелитов (13); мотовская свита – сероцветные полимиктовые конглобрекчии и гравелиты с прослоями полимиктовых псаммитов с редкими прослоями и линзами алевролитов и пелитов (14); 15 – нерасчлененный комплекс тоналит-гранодиоритов неоархея; 16 – тектонические нарушения: разрывные первого ранга (*а–в*): надвиги и взбросо-сдвиги (*а*), сдвиги (*б*), разломы с неясной кинематикой (*в*); разрывные второго ранга (*г*); разломы третьего ранга (*д*); 17 – высотные отметки; 18 – место обнаружения зерен алмазов и минералов-спутников

Fig. 6. Sampling point
Рис. 6. Место отбора проб

Results and discussions

The Table provides results of the research. The minerals closest to the kimberlitic association in their optical properties have been analyzed using the semi-quantitative X-ray and structural (microprobe) analyses.

Diamond is a single particle. It occurs as a transparent, almost colorless fragment with a yellowish tint and silky diamond luster. The fragment is 0.1 mm big, flattened and irregularly angular-shaped. It has irregular conchoidal and step-like chips with an uneven and rough surface. Under a magnifying glass it is clearly visible that some chips have the step-like structure, while the others are covered by a net of perpendicularly intersected fractures (Fig. 7). Verified by the X-ray structural analysis (X-ray diagram, Fig. 8).

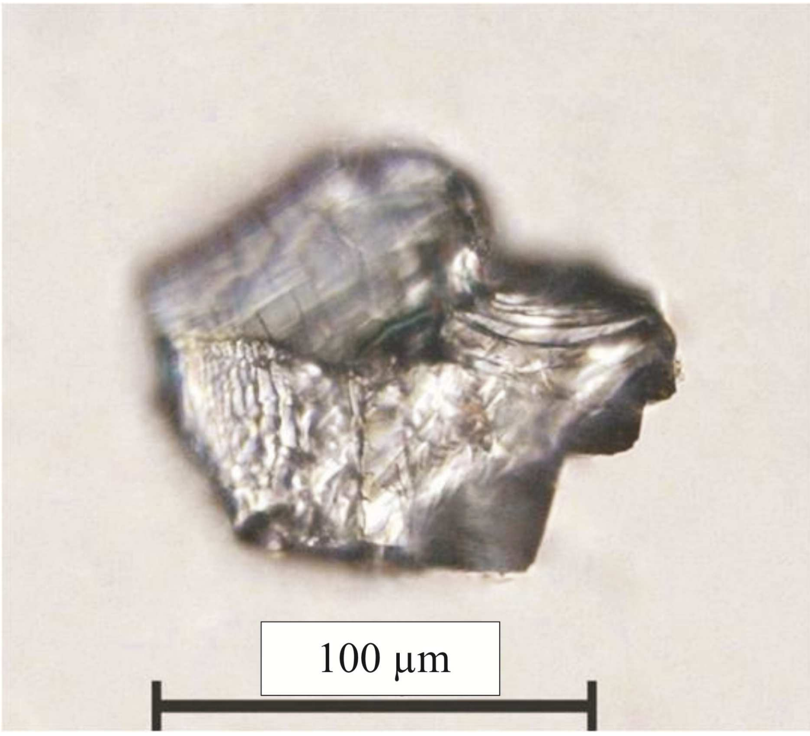

Fig. 7. Fragment of a dipiramidal diamond crystal. Facets of the head are clearly visible
Рис. 7. Осколок дипирамидального кристалла алмаза. Хорошо видны грани головки

Carbon silicide – from rare (on the left coast) to tens of particles (on the right coast) – occurs as sharply angular- and irregular-shaped fragments, rare irregularly angular-shaped fragments or single tabular crystals colored dark blue, greenish light blue, grayish light blue and rarely light gray with a shiny metallic luster. The fracture is conchoidal, the surface is clean. The common size of fragments is 0.1–0.2 mm (on the left side mostly) to 0.45 mm (on the right side), single particles are up to 0.7 mm (Fig. 9). Verified by the microprobe analysis (Table).

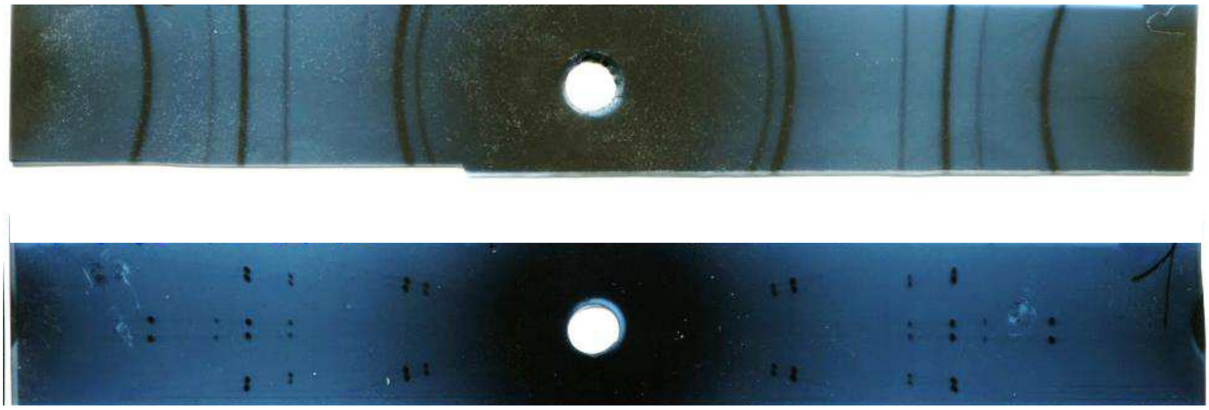

Fig. 8. X-ray diagram of a diamond grain (bottom) compared with standard diamond powder (top)
Рис. 8. Ренгенограмма зерна алмаза (нижняя часть рисунка) в сравнении с эталоном алмазного порошка (верхняя часть)

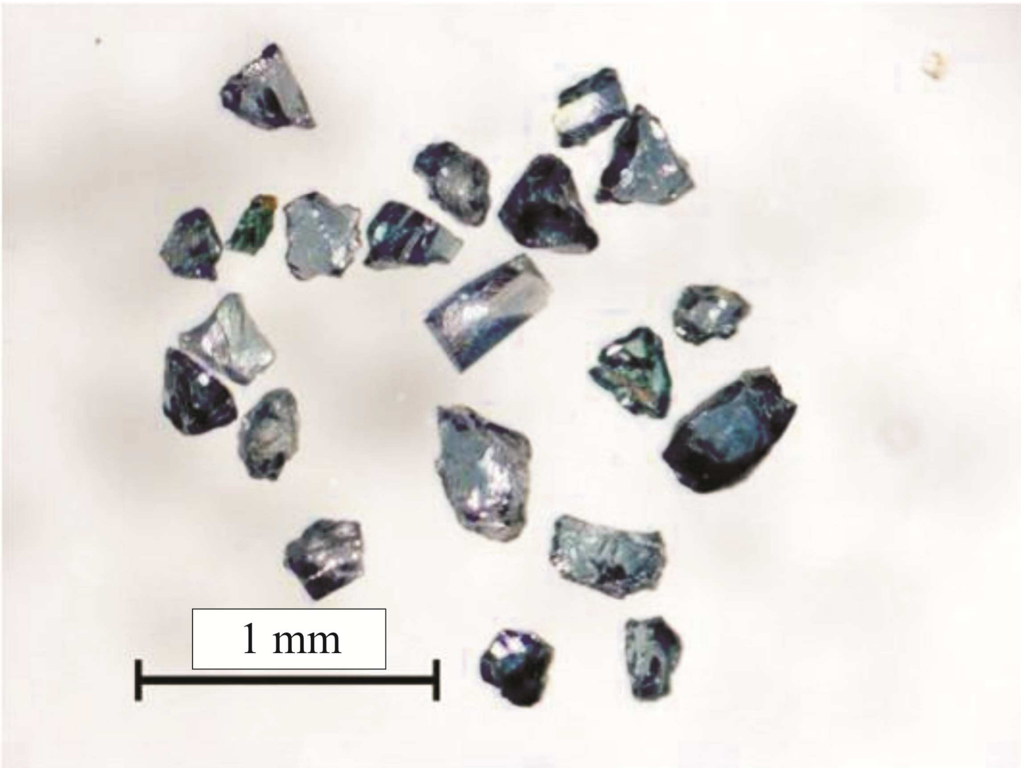

Fig. 9. Fragments of moissanite crystals (carbon silicide)
Рис. 9. Осколки кристаллов муассанита (карбид кремния)

Chromium diopside occurs as single half-rounded pale-green fragments and single angular-shaped debris. The surface of the debris is coarse-grained, each fragment has conchoidal fractures. The size of particles is about 0.3 mm. The debris gabitus is prismatic mainly (Fig. 10). The content of Cr_2O_3 is about 1 %, which is verified by the microprobe analysis (Table).

Fig. 10. Fragments of chromium-diopside crystals
Рис. 10. Осколки кристаллов хром-диопсида

Chromium-spinellid is found as a single particle in the alluvial sample on the right side. It is 0.1 mm big, octahedron-shaped and dark brown (Fig. 11). Verified by the microprobe analysis (Table).

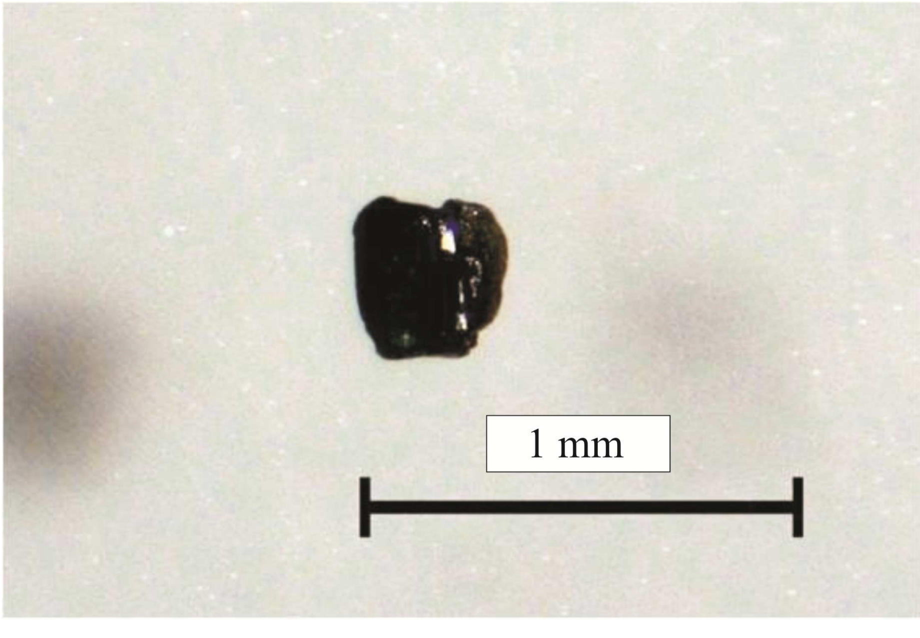

Fig. 11. Fragments of chromium-spinellid crystals
Рис. 11. Осколки кристаллов хром-шпинелида

Zircon occurs mostly as fine (about 0.1–0.2 mm) elongated crystals or rare pale-pink debris. The content in samples is about 1.5–2 % of the heavy fraction weight.

Rutile occurs mostly as fine (0.1–0.2 mm) elongated or round black or deep red crystals. The content in samples is about 0.5–1 % of the heavy fraction weight.

Ilmenite occurs mostly as irregular rounded and angular-shaped grains with a size of 0.1 to 0.5 mm. The content in samples is about 1–3 % of the heavy fraction weight.

Table. Results of heavy concentrate analyses
Таблица. Результаты анализа шлиховых проб

Sample No.	Sample type	Primary characteristics of sample	Task	Sample weight	Heavy fraction weight	Mineral content
Left river bed	Alluvial-fluvial	175 kg, washed to gray sand, sieved	Diamond, accessories, gold, zircon, rutile, ilmenite	330.0 g	25.4 g	Carbon silicide – rare part., chromium-diopside – single part., zircon – 1.3 %, rutile – 0.5 %, ilmenite – 1.6 %
Right river bed	Alluvial-fluvial	125 kg, washed to gray sand, sieved	Diamond, accessories, gold, zircon, rutile, ilmenite	220.0 g	22.8 g	Diamond – single part., carbon silicide – tens of part., chromium spinellid – single part., chromium diopside – single part., zircon – 1.5 %, rutile – 1 %, ilmenite – 2.8 %
Right coast	Alluvial-coastal	250 kg, washed to gray sand, sieved	Diamond, accessories, gold, zircon, rutile, ilmenite	350.0 g	26.0 g	Carbon silicide – tens of part., chromium dioside – single part., zircon – 2.2 %, rutile – 0.3 % ilmenite – 1 %

Conclusion

Our research has indicated diamond placers and associated minerals in Riphean sedimentary suites on the Rybachy and Sredny Peninsulas. We have not studied magmatic explosion pipes of kimberlitic composition. Thus, we may conclude that this region lacks profound geophysical research and requires close attention in this respect. We take into account that (a) Riphean sedimentary complexes of the Rybachy and Sredny Peninsulas are formations of the passive continental margin of that time, and (b) the watershed of the Musta-Tunturi Range is close to the study area. Based on that, we suggest that the matter transfer was not significant, just first km or, probably, first tens of km. We believe that bedrocks of diamond-bearing explosion pipes should be prospected for close to the location of the diamond find.

Acknowledgments

The study has been carried out in the framework of the state orders No. 0149-2019-0005 and No. 0226-2019-0053.

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Вестник МГТУ. 2019. Т. 22, № 1. С. 36–47.
DOI: 10.21443/1560-9278-2019-22-1-36-47

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Первая находка алмаза на полуостровах Средний и Рыбачий в северо-восточной части Балтийского щита

Рассмотрены общие закономерности пространственно-временной эволюции региона. Применение принципов геодинамического анализа и периодизация процессов корообразования восточной части Балтийского щита позволили определить, что наиболее перспективными областями поиска алмазоносных пород являются места пересечения глубинных расколов литосферы с выявленными поясами возможного проявления алмазоносного кимберлитового магматизма. Предложены наиболее перспективные зоны для поиска алмазоносных кимберлитовых трубок взрыва, которые могут составить единый алмазоносный Норвежско-Мезенский пояс. Поиски алмазов проводились в районе полуостровов Рыбачий и Средний в 2005–2007 гг. Детальные работы по дешифрированию крупномасштабных аэрофотоснимков и полевой заверке разрывных нарушений на северной оконечности п-ова Средний позволили выявить перспективные узлы пересечения глубинных разломов. Проведенное в этом месте шлиховое опробование дало положительный результат на обнаружение алмазов и минералов-спутников. Полученные результаты опробования могут указывать либо на наличие коренных источников размыва, либо на непосредственный размыв палеоморских террас, некогда обогащенных данными минералами. При этом магматические трубки взрыва кимберлитового состава обнаружены не были, что может быть связано со слабой геологической изученностью исследуемого региона крупномасштабными геофизическими методами. В связи с находками алмазов высказана рекомендация о расширении подобных исследований и привлечении дополнительного, более пристального внимания к данной проблеме. Исходя из того что рифейские осадочные комплексы полуостровов Рыбачий и Средний являются образованиями пассивной окраины континента того времени, а водораздел хребта Муста-Тунтури находится в непосредственной близости от места исследований, предполагается, что масштаб переноса вещества не был очень существенным и составлял первые километры, возможно, первые десятки километров. В связи с этим коренные выходы алмазоносных трубок взрыва следует искать в непосредственной близости от места находки алмаза.

Ключевые слова: алмаз, муассанит, хром-диопсид, хром-шпинелид, полуостров Рыбачий, полуостров Средний

Информация о статье: *поступила в редакцию 26.01.2018*