PARTIAL REVISED SUBMISSION OF THE RUSSIAN FEDERATION TO THE COMMISSION ON THE LIMITS OF THE CONTINENTAL SHELF IN RESPECT OF THE CONTINENTAL SHELF OF THE RUSSIAN FEDERATION IN THE ARCTIC OCEAN

EXECUTIVE SUMMARY

2015

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CONTENT

ABBREVIATIONS 4

LIST OF FIGURES 4

INTRODUCTION 5

1. EXTENDED CONTINENTAL SHELF OF THE RUSSIAN FEDERATION IN THE ARCTIC OCEAN 5

2. PROVISIONS OF ARTICLE 76 APPLIED TO SUPPORT THE SUBMISSION 8

3. COMMISION MEMBERS WHO PROVIDED ADVICE IN THE PREPARATION OF THE PARTIAL REVISED SUBMISSION 9

4. GOVERNMENTAL INSTITUTIONS RESPONSIBLE FOR PREPARATION OF THE PARTIAL REVISED SUBMISSION OF THE RUSSIAN FEDERATION FOR ESTABLISHMENT OF THE OLCS IN THE ARCTIC OCEAN 9

5. MARITIME DELIMITATION AND OTHER ISSUES 9

6. GEOLOGY OF THE CENTRAL ARCTIC SUBMARINE ELEVATIONS COMPLEX OF THE IN LIGHT OF NEW DATA 12

7. ESCRIPTION OF THE RUSSIAN CONTINENTAL SHELF OUTER LIMIT LINE ALONG ITS SECTIONS 20

COORDINATES OF FIXED POINTS OF THE REVISED OLCS OF THE RUSSIAN FEDERATION IN THE ARCTIC OCEAN 31

ABBREVIATIONS

OLCS ..... Outer limit of the continental shelf

Submission ..... Submission to the Commission on the Limits of the Continental Shelf in respect of the continental shelf

Commission ..... Commission on the Limits of the Continental Shelf

Convention ..... United Nations Convention on the Law of the Sea of 1982 (reference to the relevant paragraphs of the Convention Articles is indicated in the text in square brackets)

MCS ..... Multi-Channel Seismic

STG ..... Scientific and Technical Guidelines of the Commission on the Limits of the Continental Shelf

FOS ..... Foot of the continental slope

AO ..... Arctic Ocean

LIST OF FIGURES

Fig.1. Claimed OLCS line under Article 76 of the Convention in accordance with this partial revised Submission 7

Fig.2. Examples of some modern Russian trans-regional MCS line 14

Fig.3. Comparison of the databases on MCS surveys before 2002 and at the beginning of 2015 15

Fig.4. Composite MCS line through the Arctic Ocean from the Siberian shallow shelf in the west to the Canada Basin in the east 16

Fig.5. Scheme of the Arctic Ocean basins development 19

Fig.6. Scheme of major structural and tectonic elements in the areas that are relevant to the presented partial revised Submission 21

Fig.7. Revised OLCS of the Russian Federation in the Arctic Ocean 23

Fig.8. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, sections I–II 24

Fig.9. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, sections III–IV 25

Fig.10. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, sections V–VI 26

Fig.11. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, section VII 27

INTRODUCTION

The Russian Federation signed 1982 United Nations Convention on the Law of the Sea ("Convention") on 10 December 1982 (then the USSR) and ratified it on 26 February 1997. The Convention entered into force for the Russian Federation on 11 April 1997. In accordance with Article 77 of the Convention, the Russian Federation proceeds from the fact that the rights of the coastal state over the continental shelf exist *ipso facto* and *ab initio*.

This Submission of the Russian Federation, which is made on the basis of Article 76.8 of the Convention, is a partial revised submission and covers the part of the Arctic Ocean region. The area under consideration was included in the first Submission of the Russian Federation (made on 10 December 2001) in respect of the extended continental shelf, which was considered at the 11th session of the Commission from 24 to 28 June 2002.

Recommendations relating to the Arctic Ocean adopted at that session of the Commission (*L. Recommendations / D. Summary of recommendations. Central Arctic Ocean*) say:

154/166. *The Commission recommends that the Russian Federation make a revised submission in respect of its extended continental shelf in the Central Arctic Ocean based on the findings contained in these recommendations.*

155/167. The Commission recommends that the Russian Federation follow the scientific and technical advice contained in its Scientific and Technical Guidelines, and as indicated in the various sections of these Recommendations of the Commission.

156/168. The Commission recommends that according to the materials provided in the submission the Lomonosov Ridge cannot be considered a submarine elevation under the Convention.

157/169. The Commission recommends that, according to the current state of scientific knowledge, the Alpha-Mendeleev Ridge Complex cannot be considered a submarine elevation under the Convention.

Guided by the provisions of the Rules of Procedure and the STG, and also taking into account the practice of the Commission, the Russian Federation reserves the right to introduce amendments and additions to this partial revised Submission that can be based on new or additional research data and may provide changes to the presented OLCS line of the Russian Federation.

1. EXTENDED CONTINENTAL SHELF OF THE RUSSIAN FEDERATION IN THE ARCTIC OCEAN

This partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean is made to include in the extended continental shelf of the Russian Federation, in accordance with article 76 of the Convention, the seabed and its subsoil in the central Arctic Ocean which is natural prolongation of the Russian land territory.

The basis for the extension of rights to the extended continental shelf in the Arctic Ocean is the identity of the submitted areas to the continental shelf, as well as the OLCS position under Article 76 of the Convention at a distance of more than 200 nautical miles from the baselines from which the breadth of the territorial sea is measured. In the case of the Russian Federation, this distance coincides with the boundary of the Russian exclusive economic zone. Paragraph 1 of Article 3 of the Federal Act "On the Exclusive Economic Zone of the Russian Federation"(No. 191, dated December 17, 1998) states that:

- The outer limit of the exclusive economic zone is established at a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured, unless otherwise is stipulated by the international treaties of the Russian Federation.

Requirements of Paragraph 1 of Article 75 of the Convention provide that:

- Subject to this Part, the outer limit lines of the exclusive economic zone and the lines of delimitation drawn in accordance with article 74 shall be shown on charts of a scale or scales adequate for ascertaining their position. Where appropriate, such limit lines or delimitation lines may be substituted by a list of geographical coordinates of points, specifying the geodetic datum.

The line of the Russian exclusive economic zone is shown on the chart of Central Arctic Basin (admiralty No. 91115), publication of the Department of Navigation and Oceanography of the Russian Ministry of Defense in 2014.

The list of straight baseline points was approved by Decree of the USSR Council of Ministers of 15 January 1985 and published in the book "Maritime Legislation of the Russian Federation" (1994) by the Main Department of Navigation and Oceanography (admiralty No. 9055). An English translation of the said list has been officially handed over to the UN Secretary General and placed on the UN website (see List of straight baseline points 4450 "RUS_1985_Declaration").

The List contains coordinates of the straight baseline endpoints. The position of the normal baselines adjoining the straight baselines in this document is recorded with the text: "*onwards along the low-water line up to the base point …. No.*".

The area of the seabed of the Arctic ocean (Fig. 1), considered in this revised partial submission and relevant to the OLCS determination of the Russian Federation under article 76 of the Convention, covers the geomorphological continental shelf of the Russian Arctic marginal seas, part of the Eurasian basin (Nansen basin and Amundsen, the Gakkel ridgeThe Arctic Ocean seabed area considered in this partial revised Submission that for establishment of the OLCS of the Russian Federation under Article 76 of the Convention includes the geomorphological shelf of the Russian Arctic marginal seas, part of the Eurasian Basin (the Nansen, Amundsen basins and the Gakkel Ridge), and the Central Amerasian Basin consisting of the Makarov Basin and Complex of the Central Arctic Submarine Elevations, which includes the Lomonosov Ridge, Podvodnikov Basin, Mendeleev-Alpha Rise, Mendeleev and Chukchi basins, and Chukchi Plateau.

Partial revised Submission of the Russian Federation on the establishment of the OLCS in the Arctic Ocean proceeds from the scientific understanding that the constituent parts of the Complex of the Central Arctic Submarine Elevations, namely the Lomonosov Ridge, Mendeleev-Alpha Rise, and Chukchi Plateau, and separating them the Podvodnikov and Chukchi Basins have the continental origin and belong to submarine elevations that are natural components of the continental margin under paragraph 6 of Article 76 of the Convention, which are not subject to distance limit of 350 nautical miles from the baselines.

The submitted OLCS line under Article 76 of the Convention in accordance with this partial revised Submission is shown on the schematic map included in the Executive Summary (Fig. 1). A more detailed description of the claimed OLCS is given below in the corresponding section of the Executive Summary.

In accordance with Paragraphs 3.2.1 and 3.2.3 of the STG, all distances in the partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean are given in nautical miles (M) or metres (m).

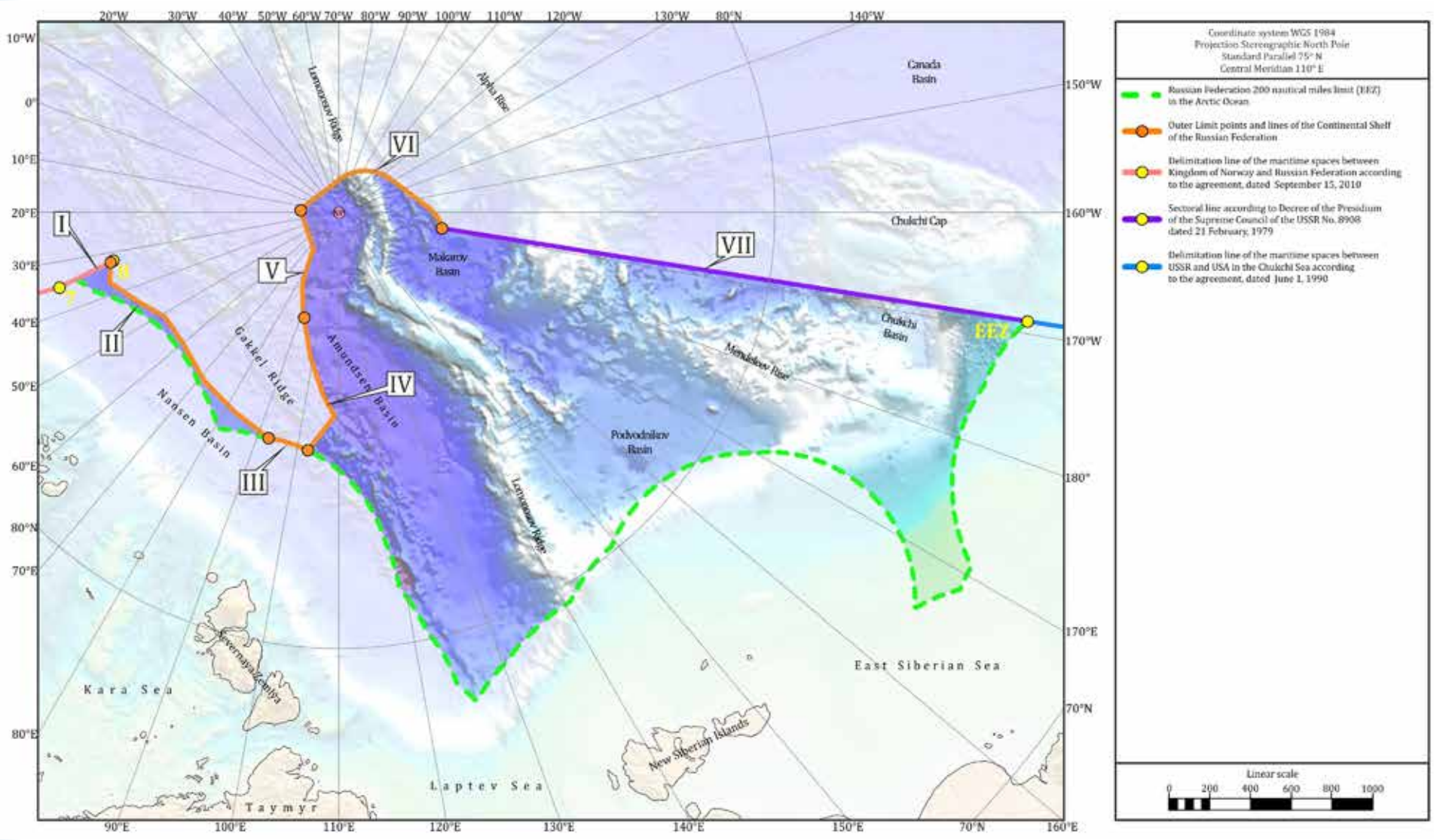


Fig.1. Claimed OLCS line under Article 76 of the Convention in accordance with this partial revised Submission

Geodetic coordinates are given in two versions:

- degrees, minutes and seconds, accurate to the second digit after the decimal point in decimal fractions of a second;
- degrees, with a precision of six decimal places in decimal.

In accordance with the recommendations in paragraphs 3.2.8 – 3.2.13 of the STG, all geodetic coordinates and calculated distances used in the partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean are defined in the geocentric World Geodetic System WGS-84.

Russian national geodetic and cartographic source materials are, as a rule, in the State coordinate system of 1942 (Pulkovo-42" on the ellipsoid Krassovsky 1940).

For coordinate conversion from a geodetic coordinate system Pulkovo-42" in WGS-84 in the Russian Federation adopted the transformation parameters set forth both in the "Parameters of the Earth 1990 (PZ-90.02)" (enacted by the Russian Government Decree of 20 June 2007 No. 797-p) and in State Standard GOST R 51794-2008 "Global navigation satellite system. Coordinate systems. Methods of transformations of the coordinates of the designated point".

The Manual S-60, published by the International Hydrographic Bureau (User's Handbook on Datum transformations involving WGS-84. Monaco, 2003), contains data for coordinate transformation from the coordinate system of 1942 ("Pulkovo-1942 Russia") in WGS-84.

In this partial revised Submission, determination of the FOS points was carried out by means of the GeoCAP software using the "Change of Average Gradient" algorithm.

2. THE APPLICABLE PROVISIONS OF ARTICLE 76 OF THE CONVENTION

The provisions of the following paragraphs of article 76 of the Convention have been used to justify the OLCS position of the Russian Federation in this revised partial Submission of the Russian Federation:

- **paragraph 1** — in relation to the concept of the continental shelf as a natural prolongation of land territory *"The continental shelf of a coastal State comprises the seabed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance"*;
- **paragraph 3** — in relation to the constituent elements of the continental margin;
- **paragraph 4** — in relation to the criteria for determining the FOS in accordance with paragraphs 76.4 (a.i), 76.4 (a.ii), and 76.4(b) on the basis of morphological, bathymetric, and seismic data;
- **paragraph 5**— in relation to distance criteria for drawing the OLCS at a distance:
  - not exceeding 350 nautical miles from the baselines from which the breadth of the territorial sea is measured, or
  - not exceeding 100 nautical miles from the 2,500 metre isobath, which is a line connecting the depth of 2,500 metres;
- **paragraph 6** — in relation to inapplicability of the distance criterion "350 nautical miles from the baselines" to submarine elevations that are natural components of the continental margin;

- **paragraph 7** — in relation to the OLCS establishment, where that shelf extends beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured, by straight lines not exceeding 60 nautical miles in length, connecting fixed points, defined by coordinates of latitude and longitude.

3. COMMISION MEMBERS WHO PROVIDED ADVICE IN THE PREPARATION OF THE PARTIAL REVISED SUBMISSION

In preparing the partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean, scientific advice was provided by Dr. I.F. Glumov (member of the Commission from 2012 to present), Dr. Yu. B. Kazmin (member of the Commission from 1997 to 2012), and Dr. H. Brekke (member of the Commission from 1997 to 2012). None of the other members of the Commission provided advice.

4. GOVERNMENTAL INSTITUTIONS RESPONSIBLE FOR PREPARATION OF THE PARTIAL REVISED SUBMISSION OF THE RUSSIAN FEDERATION FOR ESTABLISHMENT OF THE OLCS IN THE ARCTIC OCEAN

Governmental authorities responsible for the preparation of the partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean are the Federal Agency on Mineral Resources (Rosnedra) of the Ministry of Natural Resources and Environment of the Russian Federation, Ministry of Foreign Affairs of the Russian Federation, Department of Navigation and Oceanography of the Ministry of Defence of the Russian Federation, and the Russian Academy of Sciences.

Text of the partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean as well as the maps, figures, annexes, and relevant databases contained in the Submission were prepared by Russian Research Institute of Geology and Mineral Resources of the World Ocean named after Academician I. S. Gramberg (I.S. Gramberg VNIIOkeangeologia) of the Federal Agency on Mineral Resources with the participation of the State Research Navigation-Hydrographic Institute «GNINGI» (Russian Ministry of Defence) and the P.P. Shirshov Institute of Oceanology (Russian Academy of Science).

5. MARITIME DELIMITATION AND OTHER ISSUES

In accordance with Paragraph 2 of Annex 1 (CLCS/40/Rev.1) of the Rules of Procedure of the Commission, the Russian Federation informs the Commission of the presence of unresolved disputes of maritime delimitation in the following areas of the Arctic Ocean:

- in the Amundsen Basin, on the Lomonosov Ridge, in Makarov and Podvodnikov basins - between the Russian Federation and the Kingdom of Denmark;
- in the Makarov Basin and on the Mendeleev Rise between the Russian Federation and Canada.

In respect to delimitation of the continental shelf in the Arctic Ocean there are the following agreements in the context of paragraph 10 of Article 76 of the Convention, Article 9 of Annex II to the Convention and Rule 46 of the Rules of Procedure of the Commission and Annex 1 to the Rules of Procedure of the Commission (CLCS/40/Rev.1):

Kingdom of Norway

The Kingdom of Norway and the Russian Federation have held bilateral consultations on delimitation of the areas comprising the continental shelf beyond 200 nautical miles in the Barents Sea, as well as in the western Nansen Basin in the Arctic Ocean.

After the first Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean (made on December 20, 2001) concerning one of these areas, the Government of the Kingdom of Norway sent on March 20, 2002 to the Secretary General of the United Nations a note (see notification CLCS.01.2001.LOS/NOR) in relation to these areas. In this note, the Kingdom of Norway pointed to the large area in the central Barents Sea beyond 200 nautical miles from the baselines of the Kingdom of Norway and the Russian Federation as the subject of the above-mentioned bilateral negotiations with the Russian Federation with a view to conclude an agreement on the maritime boundary between the two States.

In this case, in accordance with Rule 5(a) of Annex I of the Rules of Procedure of the Commission, the Kingdom of Norway gave consent to the Commission to consider and make recommendations based on the Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean in respect of these areas, without prejudice to the bilateral delimitation of the continental shelf between the Kingdom of Norway and the Russian Federation and by understanding the various aspects mentioned in the above note.

Subsequently, the Commission recommended that in relation to the area in the Barents Sea, after the entry into force of the treaty on the maritime boundary between the Kingdom of Norway and the Russian Federation, the maps and coordinates of the delimitation line were transmitted to the Commission.

The report of the UN Secretary-General "Oceans and the Law of the Sea", contained in document A/57/57/Add.1, formulates recommendations of the Commission in this regard. It was stated that the delimitation line would represent the western limit of the continental shelf of the Russian Federation, as well as the eastern limit of the continental shelf of the Kingdom of Norway beyond 200 nautical miles in the Barents Sea, and that the recommendations of the Commission do not prejudge the result of bilateral delimitation.

In the aforementioned note of March 20, 2002 (see Notification CLCS.01.2001.LOS/NOR), the Kingdom of Norway described the eastern portion of the western Nansen Basin as another subject of the above bilateral negotiations with the Russian Federation with a view to conclude a treaty on the maritime boundary between the two States.

The issue of maritime delimitation in the Barents Sea and Arctic Ocean between the Russian Federation and the Kingdom of Norway was settled with the entry into force on July 7, 2011 of the Treaty between the Russian Federation and the Kingdom of Norway on Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean of September 15, 2010.

United States of America

Under the Agreement between the USSR and the USA of June 1, 1990, the Parties delimited the territorial sea, economic zones, and continental shelf in the Chukchi and Bering seas, as well as in the Arctic and Pacific oceans. The United States ratified this Agreement; the Russian Federation applies it provisionally from the date of signature to present.

Kingdom of Denmark

The claimed areas in the Submission of the Kingdom of Denmark in respect of the continental shelf north of Greenland substantially overlap the areas included in this partial Submission. In particular, it concerns the polar region of the Arctic Ocean and parts of the Lomonosov ridge.

The Russian Federation and the Kingdom of Denmark held consultations on the issue and agreed on the following:

"When one State makes Submission to the Commission, the other State shall immediately forward to the Secretary-General of the UN a diplomatic note that exactly says:

1. A State does not object to the Commission considering the Submission of the other State and make recommendations thereon;

2. The recommendations made by the Commission in respect of the Submission of one State shall be without prejudice to the rights of the other State in the course of the Commission's consideration of its own Submission;

3. The above recommendations with respect to any State shall not prejudice the delimitation of the continental shelf between the two States.

Each Party refers to this agreement in its Submission to the Commission; requests the Commission to make recommendations based on this agreement; and requests the Secretary-General of the United Nations to declare the content of the above-mentioned diplomatic note to Member States of the United Nations and the States parties to the Convention."

Canada

Canada's upcoming Submission may relate to the areas in the Arctic Ocean included in this partial Submission. The Russian Federation and Canada held consultations on this issue and reached the following understanding:

"When one State makes Submission to the Commission, the other State shall immediately forward to the Secretary-General of the UN a diplomatic note that exactly says:

1. A State does not object to the Commission considering the Submission of the other State and make recommendations thereon;

2. The recommendations made by the Commission in respect of the Submission of one State shall be without prejudice to the rights of the other State in the course of the Commission's consideration of its own Submission;

3. The above recommendations with respect to any State shall not prejudice the delimitation of the continental shelf between the two States.

Each Party refers to this agreement in its Submission to the Commission; requests the Commission to make recommendations based on this agreement; and requests the Secretary-General of the United Nations to declare the content of the above-mentioned diplomatic note to Member States of the United Nations and the States parties to the Convention."

In view of the above, the Russian Federation requests the Commission to consider these and other materials to this partial revised Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean relating to the extended continental shelf in the Arctic Ocean and to make recommendations thereon, without prejudice to any subsequent transfer of data and other materials of the Russian Federation, the Kingdom of Denmark, Canada, the Kingdom of Norway, and the United States, or to the delimitation of the continental shelf between the Russian Federation, the Kingdom of Denmark, Canada, and the United States of America.

Final delimitation of the continental shelf of the Russian Federation in the Arctic Ocean with the Kingdom of Denmark, Canada, the Kingdom of Norway, and the United States shall be carried out in accordance with

the provisions of Article 83 of the Convention (after the adoption of Commission recommendations on the Submission of the Russian Federation for establishment of the OLCS in the Arctic Ocean).

Guided by the provisions of the Rules of Procedure and the STG, and also taking into account the practice of the Commission, the Russian Federation reserves the right to introduce amendments and additions to this partial revised Submission, which can be based on new or additional research data and may provide for changing the OLCS line of the Russian Federation.

6. GEOLOGY OF THE CENTRAL ARCTIC SUBMARINE ELEVATIONS COMPLEX OF THE IN LIGHT OF NEW DATA

Database

In the recommendations of the Commission on the first Russian Submission the main comments on substance dealt with the Lomonosov Ridge and the Mendeleev Rise, which were considered in the submission as submarine elevations under paragraph 6 Article 76 of the Convention to be natural components of the continental margin. The Commission then recommended that taking into account the information provided in the Submission, the Lomonosov Ridge cannot be considered as a submarine elevation under the Convention. The Commission also concluded that according to the current state of scientific knowledge the complex of Mendeleev-Alpha Rise cannot be considered as a submarine elevation under the Convention.

The above observations of the Commission are scientific in nature and relate to such issues as a natural prolongation and nature of the Lomonosov Ridge, geology, tectonic position and nature of the Mendeleev-Alpha Rise and the Podvodnikov Basin. The Commission considered the matters related to nature of the acoustic basement and the composition and nature of the Earth's crust in these structures. The Submission's viewpoint on the continental origin of the elevations was not supported by the Commission. Although the recommendations admit the existence of several hypotheses aimed at explaining the origin of the Mendeleev-Alpha Rise complex (a displaced fragment of the continent, the extinct axis of seafloor spreading, a large oceanic igneous province), only the last viewpoint was taken into account, namely that the Mendeleev-Alpha Rise formed as a large volcanic oceanic plateau built on the oceanic crust of the Canada Basin after its opening as a result of passage of the magmatic "hot spot".

The analysis of the recommendations has indicated that main cause of the conclusions drawn by the Commission was such a factor as the "state of scientific knowledge" at the time of consideration of the first Submission, a reference to which is made in the recommendations. It should be noted that at that time the main available seismic reflection database included only surveys carried out before 1990 from drifting ice stations. Only from the early 1990's, the MCS observations from the icebreakers started. In the area of the Lomonosov Ridge, at the beginning of 2002, the database of seismic surveys comprised only five intersections by drifting ice stations with the relevant quality of reflection seismic data and six intersections by the MCS lines from the icebreakers. Within the Mendeleev-Alpha Rise, there was a limited number of drifting ice stations with reflection seismic observations and three short MCS lines run by the RV "Polarstern" in 1998. Seismic lines were also run by refraction and reflection seismic from ice across the Podvodnikov Basin to the Makarov Basin (1989-1991), across the Lomonosov Ridge (1992), and in 2000 - on the Mendeleev Rise.

Thus, most of the few MCS lines with relatively modern research technologies from the research vessels were run in the area of the Lomonosov Ridge. The Mendeleev and Alpha rises and the Podvodnikov

and Makarov basins were virtually not covered by the MCS and DSS-refraction sounding, except for three rather short reflection lines from the RV "Polarstern" in 1998. Basalt samples, on the basis of which far-reaching conclusions about the origin of the Mendeleev-Alpha Rise were made in 2002, were taken only in one place. Contradictory information was given about the composition of these volcanic rocks with an absolute age of 82 Ma.

In 2005-2014, the Russian organizations carried out a wide range of geological and geophysical studies in order to prepare a partial revised Submission of the Russian Federation in the Arctic Ocean taking into account the recommendations of the Commission of 2002. After 2002, in the central Arctic Basin Russia accomplished: deep seismic sounding of over 4,000 km; over 23,000 km of MCS lines; over 35,000 km of bathymetry survey; 120 stations of geological sampling. Examples of some latest trans-regional MCS lines are shown in Fig. 2 large complex of geological and geophysical studies was carried out in recent years by the Danish, Canadian and American researchers [Funck et al., 2011]. However, most of the results of these studies are restricted and not available in public domain.

It should be noted that the most significant event was the first deep-water drilling in the Arctic on the Lomonosov Ridge in 2004 (Project IODP\ACEX).

Comparison of databases on the main type of research, namely MCS obtained before 2002 and as of the beginning of 2015 is illustrated in Fig. 3.

Geological Setting. Russian MCS surveys in 2011, 2012 and 2014 resulted in extensive regional seismic lines across the entire Arctic and provided scientific data for better understanding of the composition and structure of the Eurasian and Amerasian basins. General bathymetry and seismic lines clearly demonstrate that the Lomonosov Ridge, the Mendeleev Rise, the Chukchi Rise and separating them the Podvodnikov Basin and the Chukchi Basin form a single consolidated block of continental crust — "Complex of the Central Arctic Submarine Elevations" elevated to 1.5 km above the level of the deep seabed of the Canada Basin and Amundsen Basin. This block is a component of the continental margin of the Arctic Ocean and constitutes a natural prolongation of the continental margin of Eurasia (Fig. 4).

Natural prolongation. Bathymetric and seismic surveys of 2010-2014 point to a natural morphological prolongation without traces of any interruption or tectonism, of shallow shelves of the East Siberian and Chukchi seas to the Lomonosov Ridge and the Mendeleev Rise. The seismic refraction and reflection data provide evidence of a natural prolongation of the sedimentary cover and the Earth's crust from the shallow shelf to the submarine elevations and lows of the Podvodnikov and Chukchi basins in the Amerasian Basin.

Rifting Extension. The MSC sections clearly illustrate that the shelf of the East Siberian Sea, the Lomonosov Ridge, the Podvodnikov Basin, the Mendeleev-Alpha Rise, the Chukchi Basin and the Chukchi Caps are the structures of rifting extension and expansion, which is the most important factor in relation to the origin and tectonic evolution of the Amerasian Basin. The entire area of the Central Arctic Elevations Complex is controlled by normal faults, grabens, semi-grabens and other tectonic structures of rifting, extension and expansion of the Earth's crust (tilted blocks, listric faults, growth faults, drag folds, etc.). The structures that are consistent with this type of rifting and extension occur ubiquitously within the Central Arctic Elevations Complex.

Bathymetric and seismic data indicate an approximate north-south orientation of the structures formed along the extension stretching in the east-west direction, which is similar to the directions mapped on the adjacent shallow shelves in the Russian Arctic.

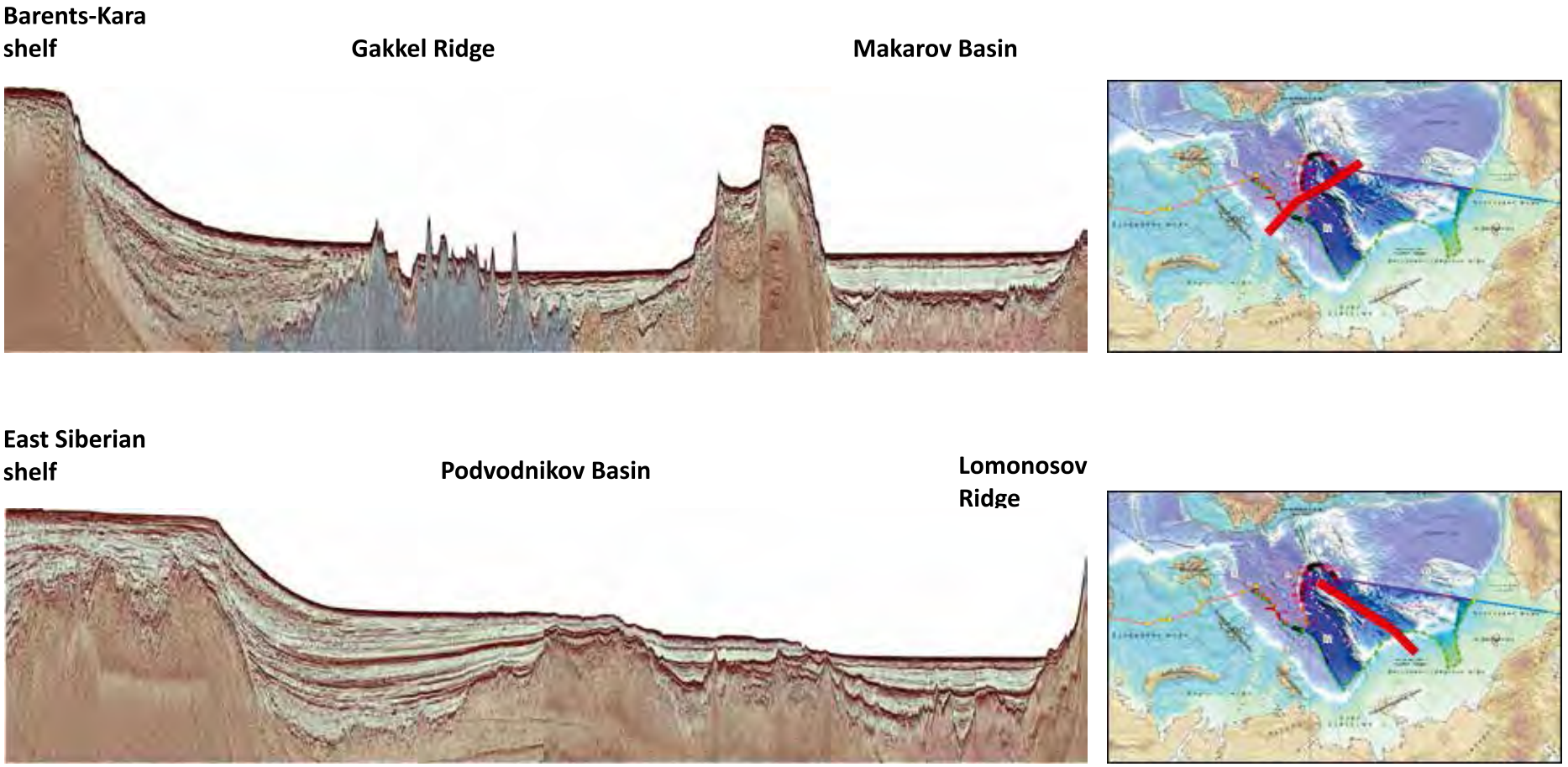


Fig.2. Examples of some modern Russian trans-regional MCS line

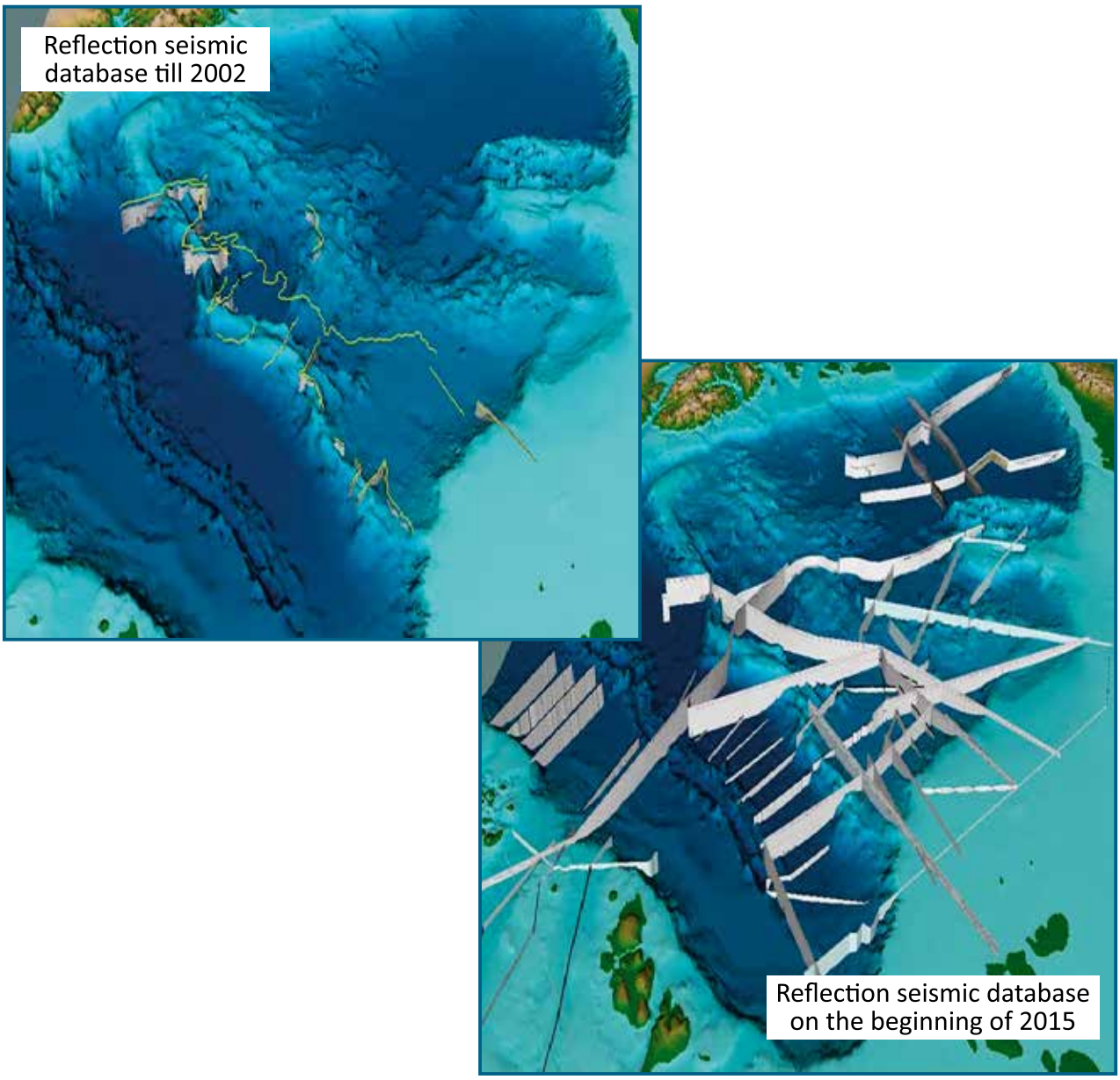


Fig.3. Comparison of the databases on MCS surveys before 2002 and at the beginning of 2015

Magmatism. Based on the latest data it was ascertained that within most parts of the Central Arctic Elevations Complex two phases of magmatism of the High Arctic Large Igneous Province (HALIP) showed up.

The first phase of magmatism with the age of 120-130 Ma on the Mendeleev Rise was confirmed in 2012 by sampling basalts with the age of 128 Ma [Morozov et al., 2013]. A younger, second phase of magmatism (80-90 Ma) is represented by the majority of samples taken in the area of the Mendeleev-Alpha Rise. According to Mukasa et al. [2009, 2012], the samples taken by the icebreaker "Healy" north of the Chukchi Cap are represented by sub-alkaline basalts; on the Northwind Ridge - by alkaline basalts; on the Mendeleev Rise - by sub-alkaline and alkaline basalts. Basaltic volcanism of the Amerasian Basin is similar to magmatic shows of the same age and composition in the known continental structures of the Arctic Basin: Svalbard, Franz Josef Land, De Long Archipelago, Ellesmere Island and other islands of the Canadian Arctic Archipelago [Maher, 2001].

Analysis of basalt samples showed that they were represented by volcaniclastic rocks -products of underwater subaerial eruptions in a shallow water environment.

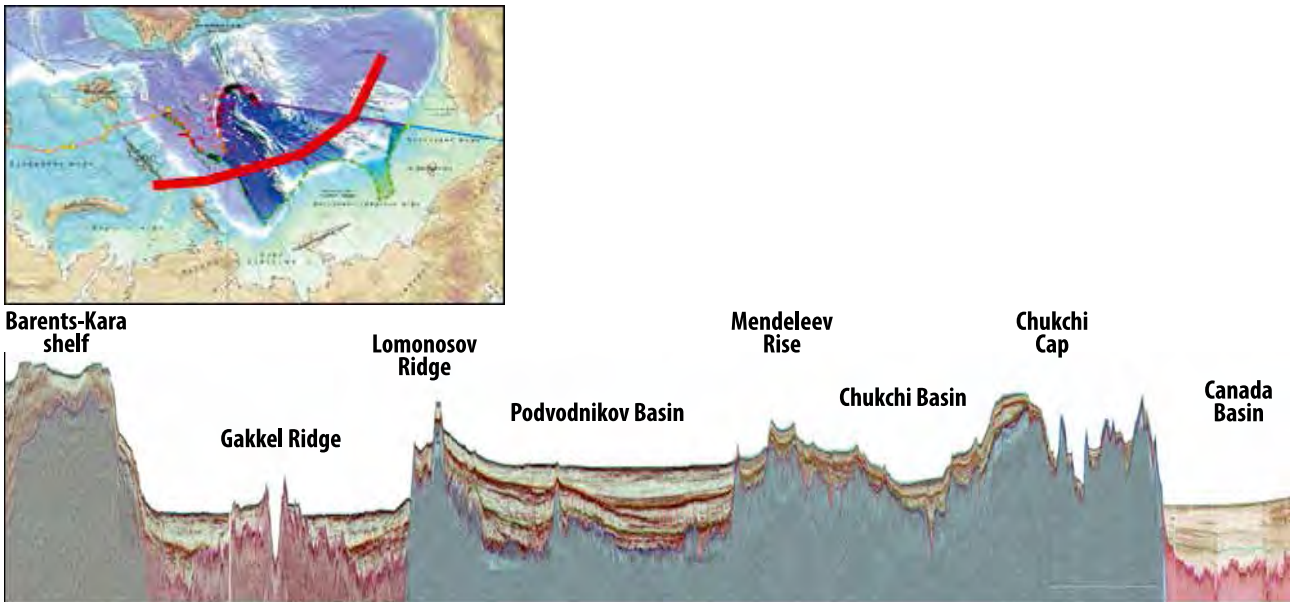


Fig.4. Composite MCS line through the Arctic Ocean from the Siberian shallow shelf in the west to the Canada Basin in the east

Acoustic basement. The results of the MCS carried out by the Russian and foreign scientists in 2005-2014 show that bright high-amplitude reflections occur at the boundary of the acoustic basement, in places continuous, sometimes with sharp breaks, often disrupted, passing into chaotic ones, occurring at the top of the acoustic basement or above the basement below the stratified sedimentary sequence. These acoustic facies are interpreted as sequences composed of basalt flows and sills alternating with thick layers of tuffs and, possibly, sedimentary rocks. Volcanic sequences are developed both within the grabens, and on the slopes and structural elevations indicating that they formed during rifting, extension and expansion of the basement and the formation of grabens as a result of fault tectonics.

Seismic stratigraphic analysis of the materials of recent Russian MCS in 2011, 2012 and 2014 shows that on the Mendeleev-Alpha Rise and the Chukchi Cap, and the separating Chukchi Basin the acoustic basement is overlain by flood basalts traps and the associated volcanics. Thickness of the volcanic section varies greatly - from the first hundreds of meters on the slopes and local highs to 1-1.5 km in recent basement depressions.

Traps are represented by variations of trachybasalts and alkaline basalts, which is not typical for the large igneous provinces of continents and oceans. The available data based on the obtained samples support the viewpoint that the synrift basalts erupted at the early stages of continental crust rifting in the Amerasian Basin (128 - 112 Ma). A younger, second stage of volcanism (80-90 Ma) completes the Mesozoic stage of the HALIP bimodal volcanism during rifting extension in the Russian Arctic and the Amerasian Basin.

In 2005-2012, in many areas of submarine elevations in the Arctic Ocean, rock material dredging was conducted which provided information on a possible type and age of basement under the covers of traps. During the Russian marine expeditions, numerous sedimentary, metamorphic and igneous rocks were dredged on the escarps of the Mendeleev Rise (Morozov, 2013) (Fig. 6). Sedimentary rocks are represented by carbonate and clastic varieties. Sandstones show different age of detrital zircons including the Archean and Proterozoic. The youngest zircon populations give ages of 450-350 Ma and 250-200 Ma, suggesting the occurrence of the Paleozoic and Triassic-Early Jurassic sandstones in the acoustic

basement. Carbonate rocks are represented by limestones and dolomites. Limestones contain macrofauna of the Middle and Late Paleozoic.

Type of crust. The STG of the Commission (paragraph 7.2.9) state that the geological crust types cannot be the sole qualifier in the classification of ridges and elevations of the sea floor into legal categories of paragraph 6 of Article 76. This conclusion is fully valid in relation to the Arctic Basin.

Shelf crust covering almost all shallow-water areas of the Arctic Ocean is a thinned continental crust (about 35 km) with a very uniform basement, but with a very diverse structure.

Deep seismic sounding lines (DSS) were run on the East Siberian shelf along and across the strike of the Lomonosov Ridge and the Podvodnikov Basin. However, the processing and the interpretation did not allow a reliable determination of the crust types due to an ambiguous interpretation of seismic velocities in the lower crust above the Moho discontinuity. Processing and interpretation of the same DSS projects and experiments by different authors give different results and significant variations in velocities. Thus, high seismic velocities in the lower crust cannot be considered as the sole qualifier in determination of the oceanic or continental type of the crust. Of great importance is the fact that the DSS line ("Dreamline") obtained in 2010 on the East Siberian shelf with continental crust gives values of seismic velocities in the lower crust above the Moho discontinuity (7.2 m/s) similar to those on the DSS line of 2012 across the strike of the Mendeleev Rise (7.2-7.3 m/s), which may testify in favor of the continental crust type of the Mendeleev Rise.

Geological model of formation of the Arctic Basin. The STG of the Commission (paragraph 7.3.1) state that in case of "submarine elevations" according to paragraph 6 of the Convention the list of such elevations contained in the Convention is not complete: *"Common to all these elevations is that they are natural components of the continental margin. This makes it relevant to consider the formation processes of continental margins and growth of continents"*.

Scientific data obtained in the period of 2002-2015 do not confirm the viewpoint supported in the first recommendations of the Commission of 2002 that the complex of the Mendeleev-Alpha Rise formed as a large volcanic oceanic plateau built on the oceanic crust of the Canada Basin after its opening as a result of a passage of a magmatic "hot spot". These hypotheses were based on geological data and information on the adjacent land due to the absence or scarcity of the necessary geological and geophysical data on the deep-water part of the Arctic Basin at the time.

In this connection, for the purposes of this partial revised Submission, a geological model of evolution of the Arctic Basin taking into account the new data was developed and proposed (Fig. 5).

A three-stage model of formation of the Arctic Basin is proposed. According to modern notions, the Arctic Basin did not exist in the Triassic (225 Ma). Its future origination site was on the margin of the Pangea Paleocontinent on the coast of the Angayucham Sea - the gulf of the Paleopacific Ocean (Paleopacific).

- **Stage 1.** The Arctic Ocean originated as a result of opening of the Canada Basin during the Late Jurassic-Early Cretaceous as a back-arc basin with a subduction zone in the Pacific Ocean mainly along the Late Paleozoic Ellesmerian orogenic system. A.Grantz (1998) after S.Carey (1958) suggested that opening of the Canada Basin was a result of counterclockwise rotation of the "Arctic Alaska-Chukotka" block by 66° from the Canadian Arctic along a strike-slip zone at the Lomonosov Ridge with the rotation center in the area the Mackenzie River mouth. Since then such a "rotational model" has become popular among many scientists. We accept a rotational model

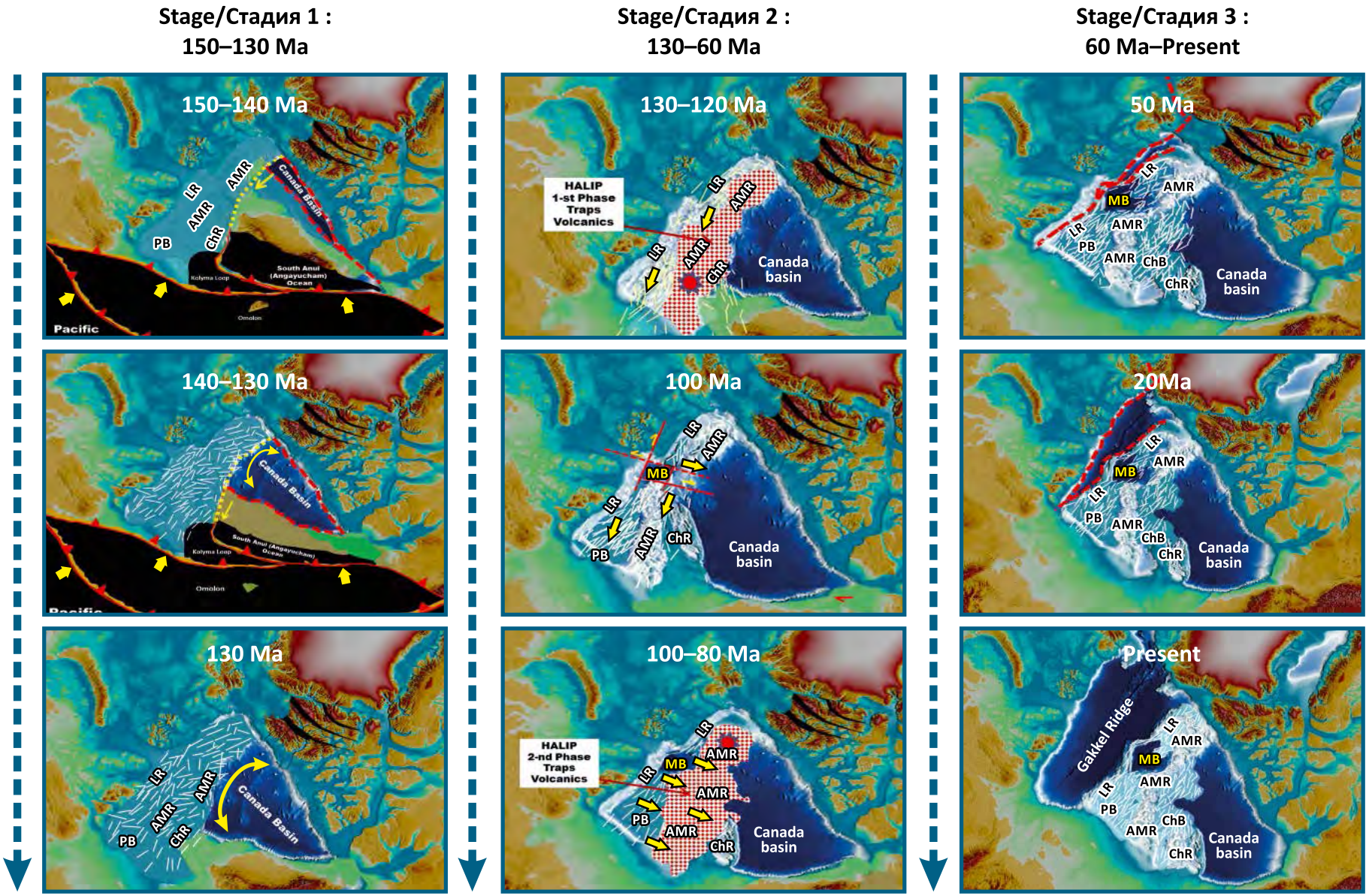
for the Canada basin development, but with the location of the transform (strike-slip) fault along the eastern margin of the present Alpha- Mendeleev Rise and the Chukchi Rise, not along the Lomonosov Ridge. After opening of the Canada Basin, the modern Complex of the Central Arctic Submarine Elevations became a part of the Siberian shelf and, therefore, a natural component of the Chukchi-Siberian continental margin.

- **Stage 2.** In this period, the formation of submarine elevations occurs as a result of rift stretching of the continental crust from the Lomonosov Ridge eastwards. In the area of the shelf seas, from the Laptev Sea to the Chukchi Sea, rifting started simultaneously across the territory at about Middle Aptian. Rifting and stretching showed up in the Podvodnikov Basin and the Chukchi Basin, which led to their subsidence.

During the period 130-110 Ma, the first phase of the HALIP traps magmatism showed up extensively. Simultaneously with the beginning of magmatic activity, rifting and stretching of the thinned and heated lithosphere developed. Under such conditions, stretching of the crust could reach 50-100% or more. The second phase of the HALIP traps magmatism showed up in the Late Cretaceous in the interval 90-80 Ma. Rifting at this stage had a shear component in the modern sub-polar region, which led to formation of the Makarov Basin as a near-shear "pull-apart" basin (110-80 Ma). Modern horst-graben morphology of elevations and basins in the Amerasian Basin is a result of the rift stretching simultaneously with the first phase of traps magmatism. The second phase of magmatism, in the Late Cretaceous, subsidence of a block of the Central Arctic Submarine Elevations occurred, and the process of sedimentation in the Late Cretaceous-Paleogene began. "Cesar" and "T-3" expedition took samples of the Maastrichtian-Campanian sedimentary rocks from the base of the sedimentary cover atop basalts.

- **Stage 3.** As a result of spreading along the Gakkel Ridge, which began 56 Ma ago, opening of the Eurasian Basin occurred. The Lomonosov Ridge splits off and moves away from the Barents-Kara shelf. It becomes a part of the Complex of the Central Arctic Submarine Elevations. In the Amerasian Basin, rifting and stretching continue within the Chukchi Borderland, the Mendeleev-Alpha Rise, in the Podvodnikov Basin and the Chukchi Basin as well as on the Lomonosov Ridge. The tectonic activity attenuates in the Middle Miocene to formation of the upper, tectonically undisturbed hemipelagic sedimentary cover continuously blanket-style covering almost the entire area of the Mendeleev-Alpha Rise, the Lomonosov Ridge and the Chukchi Cap as well as the Podvodnikov and Chuchi basins..

The Fig. 6 shows a scheme of major structural and tectonic elements and geological position of the region related to this partial revised Submission.



LR – Lomonosov Ridge; **MB** – Makarov Basin; **PB** – Podvodnikov Basin; **AMR** – Alfa-Mendeleev Rise; **ChB** – Chukchi Basin; **ChR** – Chukchi Rise

Fig.5. Scheme of the Arctic Ocean basins development

7. DESCRIPTION OF THE RUSSIAN CONTINENTAL SHELF OUTER LIMIT LINE ALONG ITS SECTIONS

The Russian Federation OLCS revised line in the Arctic Ocean is constructed in accordance with paragraphs of Article 76 of the Convention and is shown in Fig.1 and 7.

The OLCS consists of a series of consecutive sections (II-VII) fixed by geodetic coordinates of separate numerous points and presented in the form of a table of coordinates of fixed points of the revised OLCS of the Russian Federation in the Arctic Ocean. OLCS position is determined various criteria specified in article 76 of the Convention. Areas of legal continental shelf of the Russian Federation are located not further than 100 nautical miles from the 2,500 m isobath in the Nansen and Amundsen basins.

The area of the Russian Federation extended continental shelf in accordance with the Russian Federation partial revised Submission for establishment of the OLCS in the Arctic Ocean is 1,191,347 sq. km (Fig. 1).

Analysis of bathymetric and seismic data was performed using the software package GeoCAP that implements the mathematical analysis of two-dimensional bathymetric profiles using three-dimensional bathymetric models of bottom topography. The digital bathymetric models were used to generate the bathymetric profiles for the purpose of analysis of the FOS point positions and fixing the positions of the 2,500 m isobaths points.

The GeoCAP project attached to the Russian Federation partial revised Submission for the establishment of the OLCS in the Arctic Ocean contains all calculated results as a combination of the formula and constraint lines in accordance with the requirements of Article 76 of the Convention. The final results are also incorporated into a geographic information system database. Fig. 08-11 illustrate the schematic maps of the Russian Federation OLCS in the Arctic Ocean, which show the formula and constraint lines as well as the seven sections of the OLCS revised line:

- **Sea floor area bounded by the limits of sections II-III-IV-V** includes the southern Gakkel Ridge and the adjacent ocean areas of the Nansen and Amundsen basins and belongs to the extended continental shelf of the Russian Federation [76.3].
- **Sea floor area bounded by the limits of sections IV-V-VI.** Assignment to the Russian Federation extended continental shelf of the entire sea floor area in this region, except the Makarov Basin, is based on the belonging of this area to the natural components of the Russian continental margin [76.6].

A small part of the sea floor area in the Makarov Basin with a possible oceanic crust is included into the extended continental shelf of the Russian Federation on the basis of the criterion of 60 nautical miles from the FOS [76.4.a.ii].

- **Sea floor area bounded by the limits of section VII is** within the Makarov Basin and the Mendeleev Rise is based on affiliation of the Mendeleev Rise to the natural components of the Russian continental margin [76.6].

Geographic coordinates of the sections fixed points were determined on the basis of the criteria provided for in Article 76 of the Convention. The considered areas are located completely seaward of the 2,500 meter isobath in the Nansen and Amundsen basins, and are not further than 100 nautical miles from the 2,500 meter isobath [76.5] in the vicinity of the Lomonosov Ridge and the Mendeleev Rise slopes.

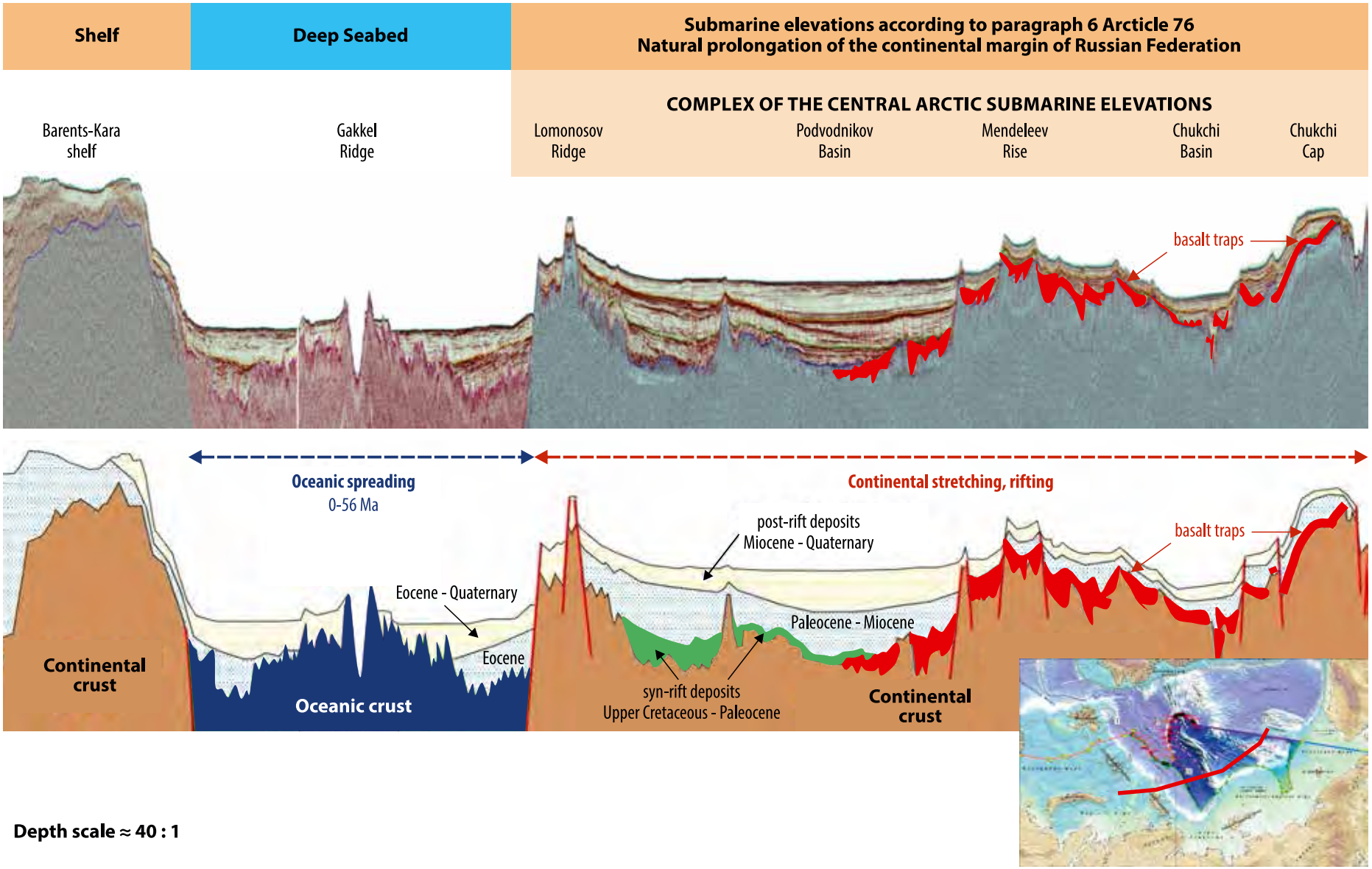


Fig.6. Scheme of major structural and tectonic elements in the areas that are relevant to the presented partial revised Submission

SECTION I is not the OLCS section and is drawn along the delimitation line of the bilateral maritime boundary between the Russian Federation and the Kingdom of Norway in the Barents Sea and the Arctic Ocean (Fig. 7), which is fixed in the Treaty between the Russian Federation and the Kingdom of Norway of September 15, 2010.

In accordance with the Treaty (Article 1, paragraph 1) the OLCS common point of the Kingdom of Norway and the Russian Federation, which is the "end point of the delimitation line", is established according to the following rules:

> "Endpoint of the delimitation line is defined as a point of intersection of a geodetic line drawn through points 7 and 8, and the geodesic line joining the easternmost point of the outer limit of the continental shelf of Norway and the westernmost point of the outer limit of the continental shelf of the Russian Federation, as established in accordance with Article 76 and Annex II of the Convention".

Coordinates of points 7 and 8 set by the Treaty between the Kingdom of Norway and the Russian Federation (Article 1, paragraph 1) are given below:

7. *latitude: 83°21′07.00″N;* *longitude: 35°00′00.29″ E;*

8. *latitude: 84°41′40.67″N;* *longitude: 32°03′5L36″ E;*

According to the text of The Continental Shelf Submission of Norway Executive Summary (2006), the eastern point of the OLCS of the Kingdom of Norway (point "A01") has the following coordinates:

latitude: 84°41′ 53.00″N; *longitude: 29°15′12.70″ E (in coordinate system WGS-84);*

The westernmost fixed point of the Russian Federation OLCS (point **"2G 2"**) determined by the Gardiner formula (sedimentary cover thickness exceeds or is equal to 1% of the shortest distance to the FOS) has the following coordinates:

latitude: 84°29′19.21″N; *longitude: 37°00′16.82″ E (in coordinate system WGS-84);*

Intersection of the geodetic line connecting these points with the geodetic line passing through points 7 and 8 (the coordinates of which are given in paragraph 1, Article 1 of the Treaty between the Russian Federation and the Kingdom of Norway) makes it possible to fix the Russian Federation OLCS initial point (common with the OLCS of the Kingdom of Norway) according to the rules established in accordance with Article 76 of the Convention and Annex II of the Convention.

Thus, the initial westernmost point of the OLCS of the Russian Federation (point **"2C 1"**) has the following coordinates:

latitude: 84°37′51.25″ N; *longitude: 32°14′ 15.59″ E (in coordinate system WGS-84);*

The distance between points **"2G 2"** and **"2C 1"** is 52.90 km (28.56 nautical miles).

Northern part of the delimitation line of the bilateral maritime boundary between the Russian Federation and the Kingdom of Norway in the Barents Sea and the Arctic Ocean, as well as the easternmost point of the OLCS of the Kingdom of Norway (point "A01"), the western point of the Russian Federation OLCS (point **"2C 1")** and the initial point of the Russian Federation OLCS (point **"2C 1")** are shown on the map (Fig. 7).

SECTION II of the Russian Federation OLCS revised line is drawn along the line connecting 7 fixed points constructed on the basis of Hedberg formula (FOS + 60M) and Gardiner formula (Fig. 8), which do not go beyond the distance limit of 350 nautical miles from the points of baselines of the Russian Federation [76.5].

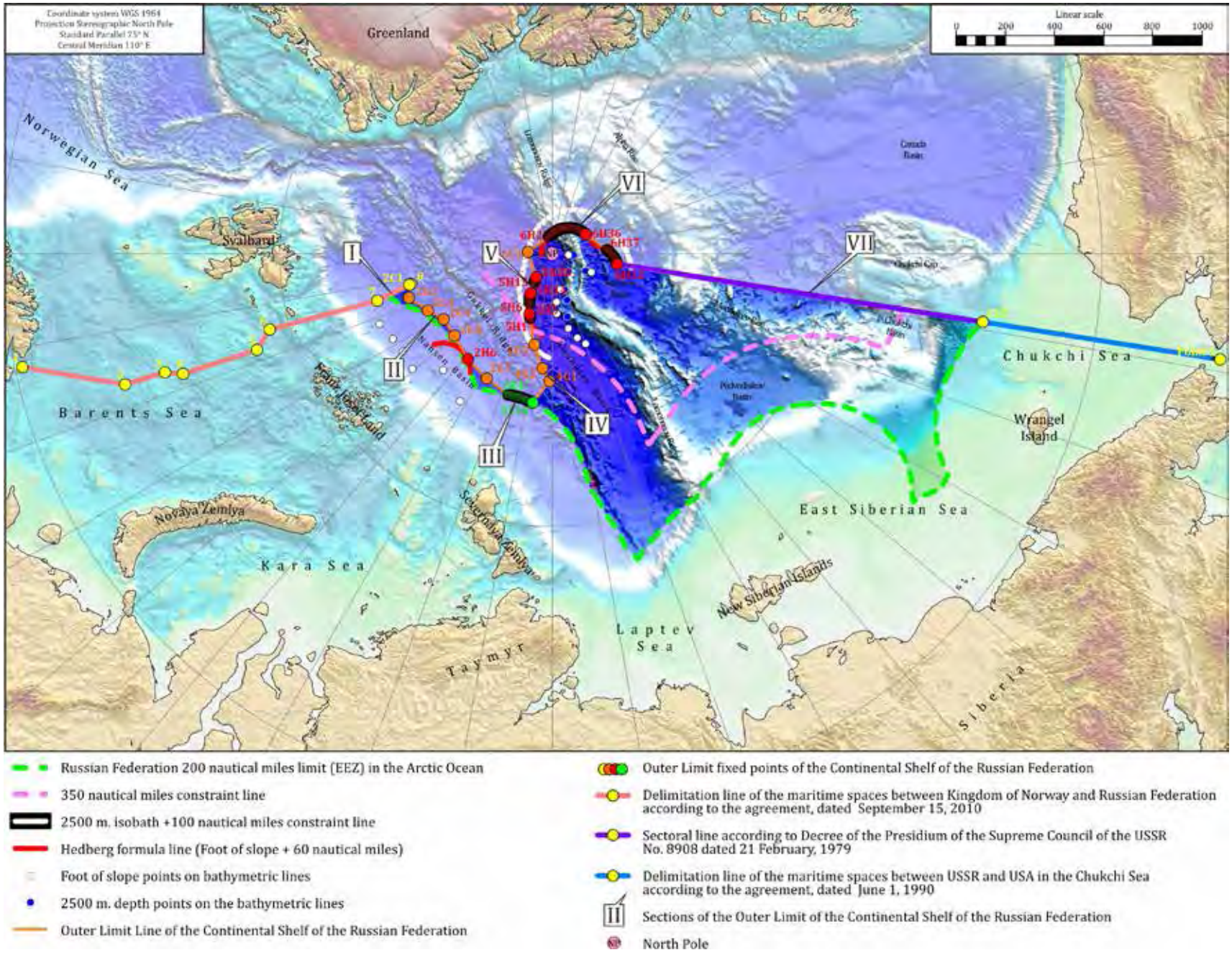


Fig.7. Revised OLCS of the Russian Federation in the Arctic Ocean

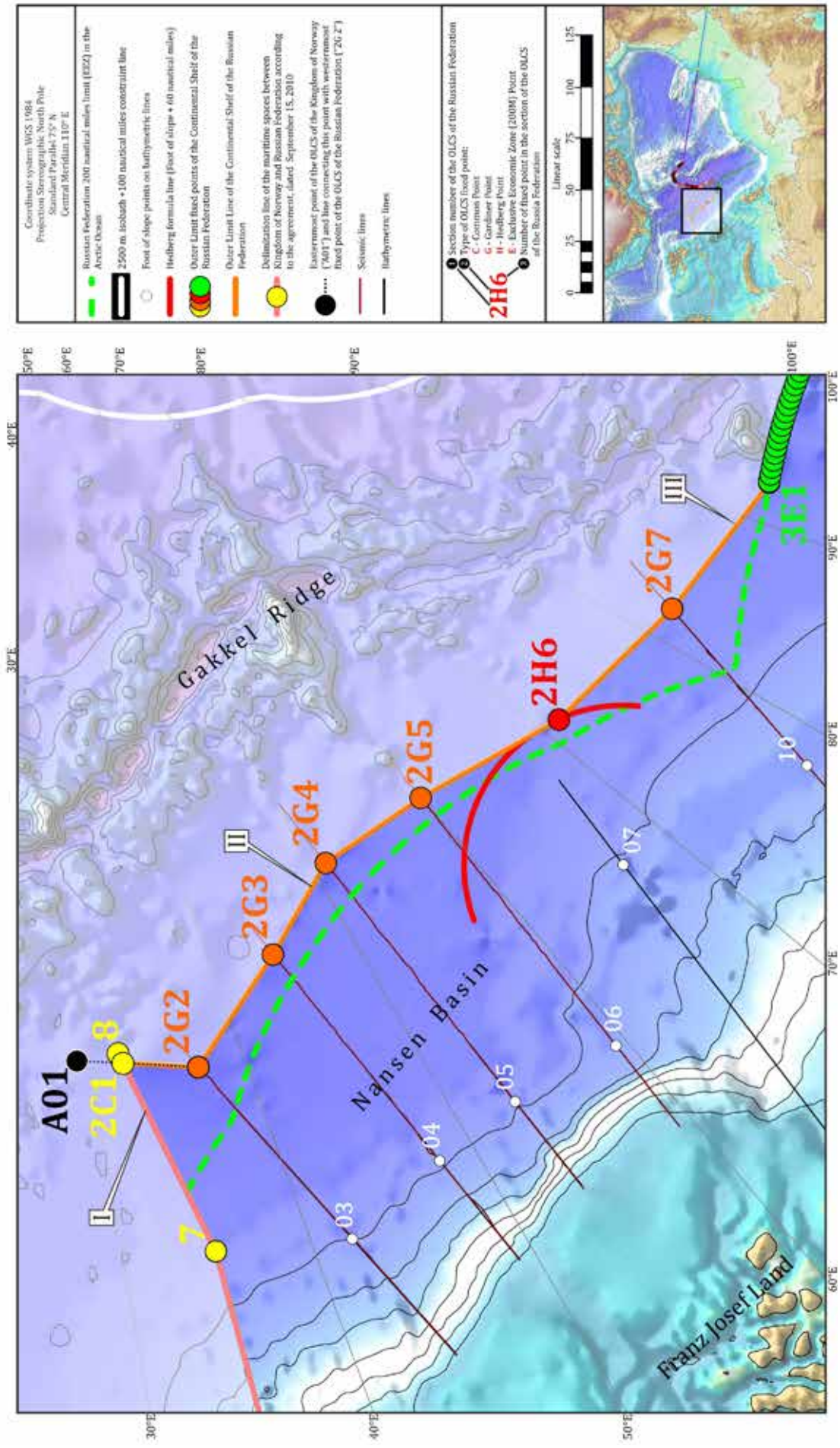


Fig.8. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, sections I–II

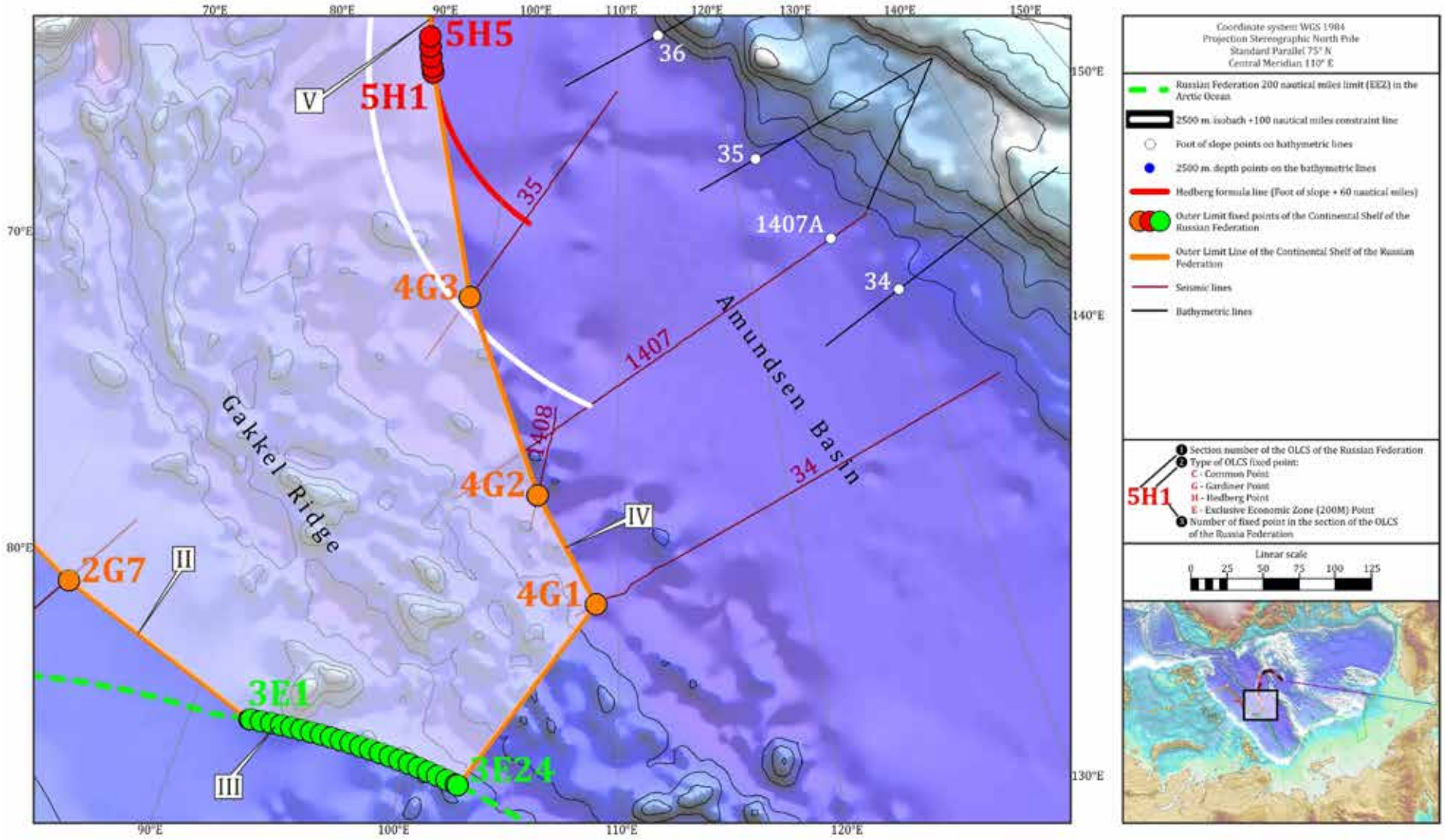


Fig.9. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, sections III–IV

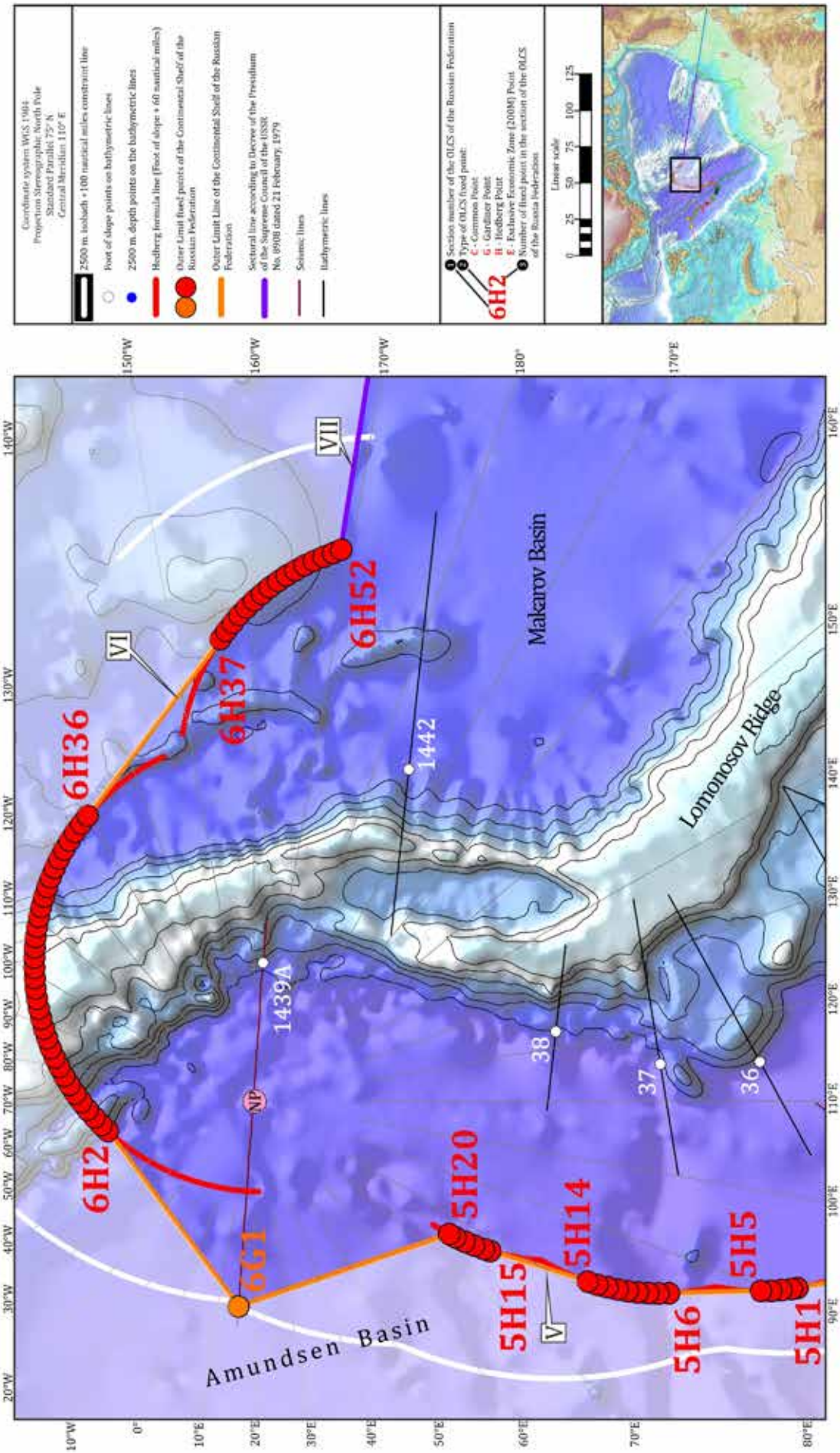


Fig.10. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, sections V–VI

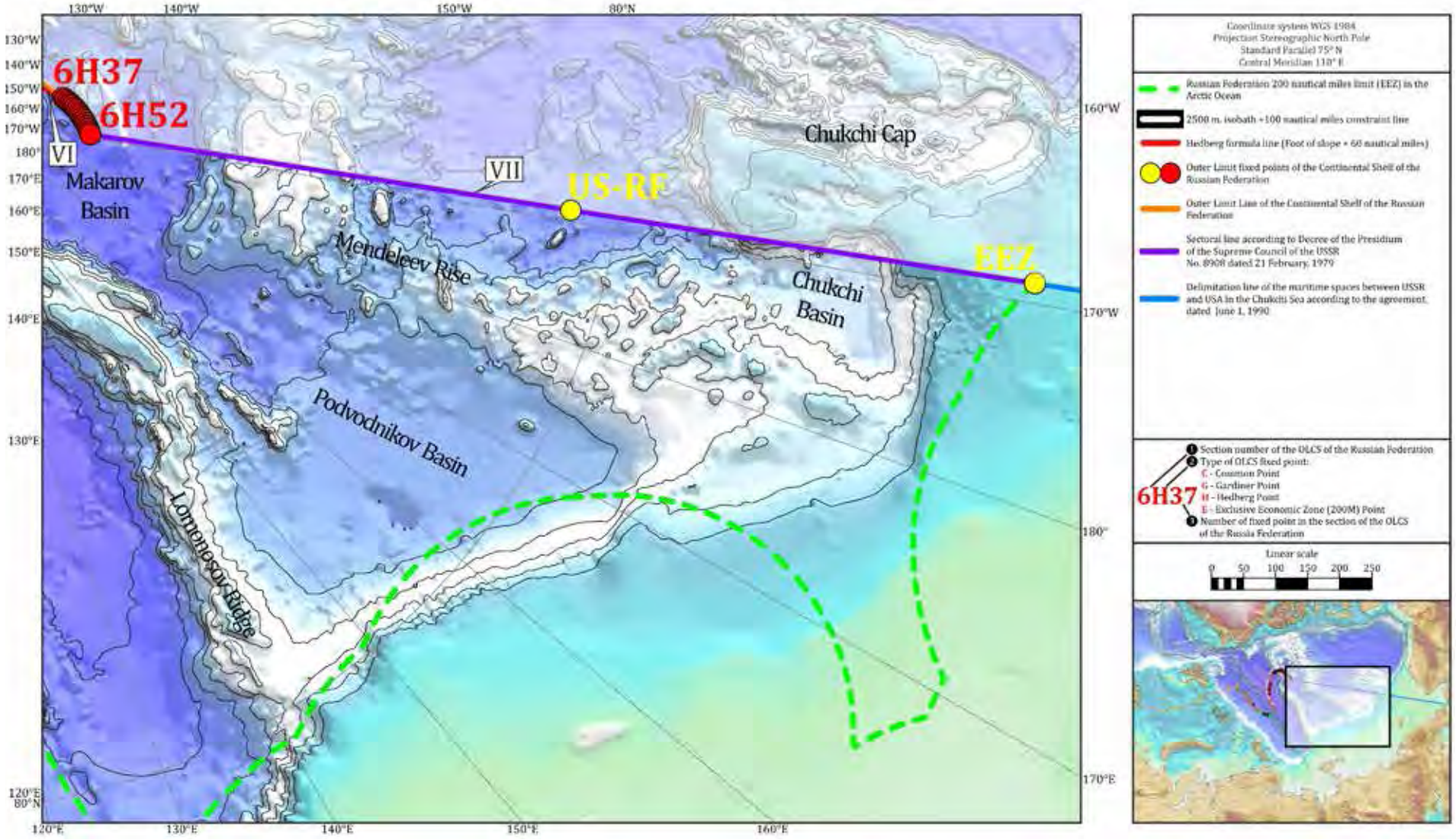


Fig.11. Schematic map of the OLCS of the Russian Federation in the Arctic Ocean, section VII

For the formation of the OLCS on section II, seismic bathymetric lines with numbers 3, 4, 5, 6 and 10 were used derived from the data of multibeam surveying and multichannel seismic surveying in 2011, as well as bathymetric line 7 formed on the basis of retrospective bathymetric data. With the help of the GeoCAP software package, analysis of each line was performed and the FOS points were determined. Then, after Hedberg formula (FOS + 60M), **"2H 6"** point was determined. Points **"2G 2", "2G 3", "2G 4", "2G 5"** and **"2G 7"** on seismic bathymetric lines were obtained on the basis of Gardiner criterion.

The distance between fixed points received according to the Gardiner and Hedberg formula does not exceed 60 nautical miles. Between fixed points: **"2C 1", "2G 2", "2G 3", "2G 4", "2G 5", "2H 6"** and **"2G 7"** the OLCS line is fixed by the coordinates of points of the geodetic line connecting these fixed points. The coordinates of fixed points of the OLCS in section II are given in the Table of the Annex.A fragment of a detailed map illustrating section II of the revised line of the OLCS of the Russian Federation is presented in Fig.8. The end point of section II of the OLCS is point **"3E 1"** common with section III.

SECTION III of the revised line of the Russian OLCS is drawn along a line of 24 points coinciding with the boundary of the exclusive economic zone of the RF in the Arctic Ocean, held at a distance of 200 nautical miles from the baselines of the Russian Federation.

Position of island territories of the Russian Federation provides possibility of inclusion into the 200-mile zone of the Russian Federation in this area a part of the abyssal Nansen Basin. A fragment of the detailed map illustrating section III of the revised line of the OLCS of the Russian Federation in the Arctic Ocean is shown in Fig. 9.

SECTION IV of the revised OLCS line of the Russian Federation is drawn along the line connecting 4 fixed points, **"3E 24", "4G 1", "4G 2", "4G 3"** constructed on the basis of Gardiner formula on seismic bathymetric lines 1407, 1408. One fixed point **"5H 1"** calculated from Hedberg formula is also used (bathymetric line 36, surveying of 2010). These fixed points are connected by straight lines making up the OLCS (Fig. 9). Distance between the fixed points obtained according to Gardiner and Hedberg formula does not exceed 60 nautical miles.

Line of the OLCS on section IV is drawn in accordance with the new geological and geophysical data confirming the affiliation of the Lomonosov Ridge to the natural prolongation of the continental margin of Eurasia [76.6] and does not go beyond the distance limit of 350 nautical miles from the baselines, from which the breadth of the territorial sea is measured [76.5]; it also not beyond the distance limit 100 nautical miles from 2,500 m isobath (point **"5H 1").**

Between fixed points **"3E 24" "4G 1", "4G 2", "4G 3"** and **"5H 1"** the OLCS line is determined by the coordinates of points of the geodetic line connecting the above fixed points. Coordinates of the fixed points of the OLCS in section IV are given in the Table of the Annex. A fragment of the detailed map illustrating section IV of the line of the OLCS of the Russian Federation in the Arctic Ocean is shown in Fig. 9.

SECTION V of the revised OLCS line of the Russian Federation in the area of the central part of the Amundsen Basin is based on the Hedberg formula (Fig. 10) and drawn across the points fixed on bathymetric lines with numbers 36, 37 and 38 [76.4.a.ii]. The last point of section V with number **"6G 1"** is constructed on the basis of the Gardiner formula on seismic bathymetric line 1439A (2014 survey).

The limit does not go beyond the distance limit of 100 nautical miles from the 2,500 meter isobath [76.5].

Coordinates of the OLCS in the Amundsen Basin are determined by the method of conjugate arcs with subsequent straightening in the place of arcs conjugation.

Straightening of the OLCS line, determined by the method of conjugate arcs, is performed using the option "Maximizing the Outer Limit Line" implemented in the software package GeoCAP. Using this option allows switching from the conjugate arcs drawn from the points of the FOS with a radius of 60 nautical miles to the uniform line of the OLCS.

Section V of the OLCS is fixed by 21 points, the names of which start with the prefix "5H"; some of them are "specific" points, indicating the beginnings and ends of sections straightening the OLCS line. Distance between the "specific" points, in accordance with requirements of the Article [76 4.a.ii], does not exceed 60 nautical miles.

"Specific" points have numbers **"5H 1", "5H 5", "5H 6", "5H 14", "5H 15"** and **"5H 20".** Other filling points are given at intervals of 5 km. Point with number **"6G 1"** is the initial point of section VI and has coordinates:

latitude: 89°06'16,13" N; longitude: 15°43'31.55" W (in coordinate system WGS-84);

Coordinates of the points of section V are given in the Table of the Annex. OLCS position on section V is shown on the map in Fig. 10.

SECTION VI of the OLCS revised line of the Russian Federation in the polar region of the Amundsen Basin and in the Makarov Basin is drawn on the basis of Hedberg and Gardiner formula [76.4.a.ii] (Fig. 10) . The 60 nautical miles radius arc was drawn from the FOS points on the seismic bathymetric line 1439A and bathymetric lines 1442. The point defined by the sediment thickness formula on the seismic bathymetric lines 1439A was connected with these Hedberg arcs using the conjugate arcs option implemented in the software package Geocap providing the straightening of the OLCS line. The limit is not beyond 100 nautical miles distance from the 2,500 meter isobath [76.5]. The OLCS coordinates on this section are determined by the method of conjugate arcs with subsequent straightening in places of arcs conjugation.

The limit is not beyond 100 nautical miles distance from the 2,500 meter isobath [76.5]. The OLCS coordinates on this section are determined by the method of conjugate arcs with subsequent straightening in places of arcs conjugation.

Section VI of the OLCS is fixed by 52 points, the names of which start with prefix "**6H**", some of them are "specific" points of the beginning and end of the sections straightening the OLCS line. The distance between the "specific" points, in accordance with the requirements of the Article [76.4.a.ii], does not exceed 60 nautical miles.

"Specific" points have numbers: **6H 2, 6H 36, 6H 37** and **6H 52.** Other filling points are given at intervals of 5 km. Point with number **6H 52** is the initial point of section VII and has coordinates:

latitude: 87°34'28,27" N; longitude: 168°58'37.00" W (in coordinate system WGS-84).

Coordinates of section VI are given in the Table of the Annex. The OLCS position on section VI is shown in the map in Fig. 10.

SECTION VII of the revised line of the OLCS of the Russian Federation is drawn along the line coinciding with the sector line of the Russian Federation in the Arctic Ocean (Fig. 11).

The sector line is approved by the Decree of the Presidium of the Supreme Council of the USSR No. 8908 dated 21 February, 1979. The Decree provided for *"making clarification to presentation in the Soviet maps of the eastern boundary of polar domains of the USSR in the Arctic Ocean'",* replacing the numerical value of the meridian *168°49'30"W* on the Order of the Presidium of the USSR Central Executive Committee

of 1926 *"On the declaration the territory of the USSR of lands and islands in the Arctic Ocean" to the new value: 168°58'49.4''W (in Krasovsky ellipsoid)*. In the coordinate system WGS-84, this meridian has the value *168°58'37.00''W* recorded in the Agreement between the United States of America and the Union of Soviet Socialist Republics on Maritime Boundary in the Chukchi and Bering Seas signed in 1990.

Section VII of the revised Russian Federation OLCS line will be the subject of negotiations with the Kingdom of Denmark and Canada.

The limit on section VII is also drawn along a conditional delimitation line of the maritime spaces between the Russian Federation and the USA in the context of the Agreement between the United States of America and the Union of Soviet Socialist Republics on Maritime Boundary signed in 1990. The United States ratified this Agreement; the Russian Federation applies it provisionally from the date of signature to present.Coordinates of the points forming the delimitation line of maritime spaces between the USSR and the United States according to the Agreement of 01.06.1990 are presented at the UN website (see the Agreement between the United States of America and the Union of Soviet Socialist Republics USA-RUS1990MB).

The agreement between the USSR and the USA on Maritime Delimitation concerns the Chukchi and Bering seas. The Agreement has fixed the "initial point" of delimitation (point 1) in the Bering Strait. Article 2 of the Agreement between the USSR and the USA (paragraph 1) states: *"From the initial point of 65°30' N, 168°58'37" W the maritime boundary extends north along the 168°58'37" W across the Bering Strait and Chukchi Sea into the Arctic Ocean as far as permitted under international law"*.

In the context of the Agreement between the USSR and the USA on Maritime Delimitation the delimitation line of maritime spaces in the Arctic Ocean should be extended to the intersection point with the median line, which determines the maritime delimitation between Canada and the United States. This point, called the starting point of the conditional maritime boundary of the USSR and the USA (point US-RF), has coordinates:

latitude: 80° 40'31.38" N; longitude: 168°58' 37.00" W (in coordinate system WGS-84).

The intermediate point on section VII is the point of intersection of the lines of 200M limit of the exclusive economic zone of the Russian Federation in the Chukchi Sea with the limit on section VII (EEZ point). EEZ point has coordinates:

latitude: 74°04'05.83" N; longitude: 168°58'37.00" W (in coordinate system WGS-84).

The endpoint of section VII is the initial point of delimitation (point 1) determined in accordance with the Agreement between the USSR and the USA on Maritime Delimitation in the Chukchi and Bering Seas, which has coordinates:

latitude: 65°30'00.00" N; longitude: 168°58' 37.00" W (in coordinate system WGS-84).

The coordinates of the initial point and the endpoint of section VII are given in the Table of the Annex (point with names "US-RF" and "Point 1", respectively).

COORDINATES OF FIXED POINTS OF THE REVISED OLCS OF THE RUSSIAN FEDERATION IN THE ARCTIC OCEAN

Coordinate system WGS 84

№	Outer Limit Fixed Point Name	Type of OLCS Fixed point	Latitude N (deg. min. sec.)	Longitude E\W (deg. min. sec.)	Latitude N (deg.)	Longitude E\W (deg.)	Distance between points, nautical miles / kilometres	Note
1	2	3	4	5	6	7	8	9
Area II, western Nansen Basin								
1	2C 1	Common Points	84°37'51.25"N	032°14'15.59"E	84.630903	32.237664	0.00/0.00	Common OLCS (.) of the RF and Norway
2	2G 2	Gardiner	84°29'19.21"N	037°00'16.81"E	84.488670	37.004671	28.56/52.90	СБП 3
3	2G 3	Gardiner	84°58'54.98"N	044°28'14.60"E	84.981939	44.470723	50.85/94.17	СБП 4
4	2G 4	Gardiner	85°20'13.47"N	051°04'00.63"E	85.337076	51.066843	39.78/73.68	СБП 5
5	2G 5	Gardiner	85°19'25.48"N	059°56'23.12"E	85.323745	59.939757	43.53/80.61	СБП 6
6	2H 6	Hedberg	85°02'53.58"N	071°18'29.11"E	85.048218	71.308088	59.78/110.70	СБП 7
7	2G 7	Gardiner	84°49'54.11"N	082°17'47.91"E	84.831698	82.296643	59.79/110.73	СБП 10
8	3E 1	200 miles	84°34'23.70"N	092°42'03.92"E	84.573252	92.701089	59.90/110.94	Common (.) of area II-III

№	Outer Limit Fixed Point Name	Type of OLCS Fixed point	Latitude N (deg. min. sec.)	Longitude E\W (deg. min. sec.)	Latitude N (deg.)	Longitude E\W (deg.)	Distance between points, nautical miles / kilometres	Note
1	2	3	4	5	6	7	8	9
Area III, eastern Nansen Basin								
8	3E 1	200miles	84°34'23.70"N	092°42'03.92"E	84.573252	92.701089	59.90/ 110.94	Common (.) of area II-III
9	3E 2	200 miles	84°34'26.43"N	092°45'30.13"E	84.574010	92.758370	0.33/0.61	–
10	3E 3	200 miles	84°34'45.62"N	093°13'43.10"E	84.579340	93.228640	2.70/5.00	–
11	3E 4	200 miles	84°35'01.42"N	093°42'01.65"E	84.583730	93.700460	2.70/5.00	–
12	3E 5	200 miles	84°35'14.38"N	094°10'24.02"E	84.587330	94.173340	2.70/5.00	–
13	3E 6	200 miles	84°35'23.92"N	094°38'50.02"E	84.589980	94.647230	2.70/5.00	–
14	3E 7	200 miles	84°35'29.90"N	095°07'18.44"E	84.591640	95.121790	2.70/5.00	–
15	3E 8	200 miles	84°35'32.46"N	095°35'48.22"E	84.592350	95.596730	2.70/5.00	–
16	3E 9	200 miles	84°35'31.41"N	096°04'18.26"E	84.592060	96.071740	2.70/5.00	–
17	3E 10	200 miles	84°35'26.91"N	096°32'47.40"E	84.590810	96.546500	2.70/5.00	–
18	3E 11	200 miles	84°35'18.92"N	097°01'14.55"E	84.588590	97.020710	2.70/5.00	–
19	3E 12	200 miles	84°35'07.44"N	097°29'38.61"E	84.585400	97.494060	2.70/5.00	–
20	3E 13	200 miles	84°34'52.46"N	097°57'58.53"E	84.581240	97.966260	2.70/5.00	–
21	3E 14	200 miles	84°34'34.06N	098°26'13.20"E	84.576130	98.437000	2.70/5.00	–
22	3E 15	200 miles	84°34'12.50"N	098°54'21.92"E	84.570140	98.906090	2.70/5.00	–
23	3E 16	200 miles	84°33'47.48"N	099°22'23.34"E	84.563190	99.373150	2.70/5.00	–
24	3E 17	200 miles	84°33'19.08"N	099°50'16.44"E	84.555300	99.837900	2.70/5.00	–
25	3E 18	200 miles	84°32'47.22"N	100°18'00.10"E	84.546450	100.300030	2.70/5.00	–
26	3E 19	200 miles	84°32'11.97"N	100°45'33.33"E	84.536660	100.759260	2.70/5.00	–
27	3E 20	200 miles	84°31'33.38"N	101°12'55.18"E	84.525940	101.215330	2.70/5.00	–
28	3E 21	200 miles	84°30'51.44"N	101°40'04.72"E	84.514290	101.667980	2.70/5.00	–
29	3E 22	200 miles	84°30'06.22"N	102°07'00.91"E	84.501730	102.116920	2.70/5.00	–
30	3E 23	200 miles	84°29'17.66"N	102°33'42.94"E	84.488240	102.561930	2.70/5.00	–
31	3E 24	200 miles	84°29'08.25"N	102°38'35.02"E	84.485626	102.643062	0.50/0.92	Common (.) of area III-IV

№	Outer Limit Fixed Point Name	Type of OLCS Fixed point	Latitude N (deg. min. sec.)	Longitude E\W (deg. min. sec.)	Latitude N (deg.)	Longitude E\W (deg.)	Distance between points, nautical miles / kilometres	Note
1	2	3	4	5	6	7	8	9
Area IV, eastern Amundsen Basin								
31	3E 24	200 miles	84°29'08.25"N	102°38'35.02"E	84.485626	102.643062	0.50/0.92	Common (.) of area III-IV
32	4G 1	Gardiner	85°19'05.46"N	108°45'43.90"E	85.318186	108.762197	59.90/110.93	СБП 34
33	4G 2	Gardiner	85°46'49.14"N	105°09'41.90"E	85.780319	105.161640	32.55/60.29	СБП 1407-1408
34	4G 3	Gardiner	86°35'45.56"N	098°57'10.42"E	86.595989	98.952897	55.06/101.97	СБП 35
35	5H 1	Hedberg	87°30'12.67"N	091°00'38.77"E	87.503521	91.010771	59.90/110.93	БП 36 Common (.) of area IV-V

№	Outer Limit Fixed Point Name	Type of OLCS Fixed point	Latitude N (deg. min. sec.)	Longitude E\W (deg. min. sec.)	Latitude N (deg.)	Longitude E\W (deg.)	Distance between points, nautical miles / kilometres	Note
1	2	3	4	5	6	7	8	9
Area V, central Amundsen Basin								
35	5H 1	Hedberg	87°30'12.67"N	091°00'38.77"E	87.503521	91.010771	59.90/110.93	БП 36 Common (.) of area IV-V
36	5H 2	Hedberg	87°31'28.03"N	090°44'59.57"E	87.524453	90.749882	1.44/2.66	БП 36
37	5H 3	Hedberg	87°33'52.67"N	090°17'19.87"E	87.564632	90.288854	2.70/5.00	БП 36
38	5H 4	Hedberg	87°36'19.86"N	089°51'21.18"E	87.605518	89.855884	2.70/5.00	БП 36
39	5H 5	Hedberg	87°38'49.41"N	089°27'10.63"E	87.647060	89.452955	2.70/5.00	БП 36
40	5H 6	Hedberg	88°00'46.90"N	085°09'01.04"E	88.013030	85.150291	24.14/44.72	БП 37
41	5H 7	Hedberg	88°03'11.77"N	084°34'43.18"E	88.053272	84.578662	2.70/5.00	БП 37
42	5H 8	Hedberg	88°05'39.05"N	084°02'15.28"E	88.094183	84.037580	2.70/5.00	БП 37
43	5H 9	Hedberg	88°08'08.57"N	083°31'46.68"E	88.135716	83.529636	2.70/5.00	БП 37
44	5H 10	Hedberg	88°10'40.19"N	083°03'27.23"E	88.177831	83.057564	2.70/5.00	БП 37
45	5H 11	Hedberg	88°13'13.73"N	082°37'27.89"E	88.220483	82.624416	2.70/5.00	БП 37
46	5H 12	Hedberg	88°15'49.01"N	082°14'00.93"E	88.263616	82.233593	2.70/5.00	БП 37
47	5H 13	Hedberg	88°18'25.85"N	081°53'19.62"E	88.307181	81.888786	2.70/5.00	БП 37
48	5H 14	Hedberg	88°21'04.02"N	081°35'38.84"E	88.351117	81.594124	2.70/5.00	БП 37
49	5H 15	Hedberg	88°47'01.38"N	077°37'15.31"E	88.783718	77.620921	26.75/49.55	БП 38
50	5H 16	Hedberg	88°48'41.53"N	077°15'51.10"E	88.811537	77.264196	1.74/3.22	БП 38
51	5H 17	Hedberg	88°51'18.33"N	076°45'16.88"E	88.855094	76.754689	2.70/5.00	БП 38
52	5H 18	Hedberg	88°53'56.40"N	076°18'25.77"E	88.899000	76.307161	2.70/5.00	БП 38
53	5H 19	Hedberg	88°56'35.53"N	075°55'47.42"E	88.943205	75.929841	2.70/5.00	БП 38
54	5H 20	Hedberg	88°58'22.60"N	075°44'00.39"E	88.972946	75.733443	1.81/3.35	БП 38
55	6G 1	Gardiner	89°06'16.50"N	015°43'24.99"E	89.104584	15.723608	58.39/108.13	СБП 1439A Common (.) of area V-VI

№	Outer Limit Fixed Point Name	Type of OLCS Fixed point	Latitude N (deg. min. sec.)	Longitude E\W (deg. min. sec.)	Latitude N (deg.)	Longitude E\W (deg.)	Distance between points, nautical miles / kilometres	Note
1	2	3	4	5	6	7	8	9
Area VI, OLCS along the maritime spaces delimitation line- subject of negotiations with Canada and the Kingdom of Denmark								
55	6G 1	Gardiner	89°06'16.50"N	015°43'24.99"E	89.104584	15.723608	58.39/108.13	СБП 1439A Common (.) of area V-VI
56	6H 2	Hedberg	89°21'08.92"N	058°24'04.83"W	89.352479	-58.401342	57.34/106.20	БП1439A
57	6H 3	Hedberg	89°19'49.30"N	061°02'11.61"W	89.330362	-61.036561	2.26/ 4.19	БП1439A
58	6H 4	Hedberg	89°18'13.66"N	064°03'39.04"W	89.303796	-64.060845	2.70/5.00	БП1439A
59	6H 5	Hedberg	89°16'37.17"N	066°57'24.88"W	89.276992	-66.956912	2.70/5.00	БП1439A
60	6H 6	Hedberg	89°15'00.09"N	069°44'16.35"W	89.250026	-69.737876	2.70/5.00	БП1439A
61	6H 7	Hedberg	89°13'22.67"N	072°24'54.45"W	89.222966	-72.415125	2.70/5.00	БП1439A
62	6H 8	Hedberg	89°11'45.15"N	074°59'55.61"W	89.195875	-74.998782	2.70/5.00	БП1439A
63	6H 9	Hedberg	89°10'07.70"N	077°29'53.18"W	89.168808	-77.498107	2.70/5.00	БП1439A
64	6H 10	Hedberg	89°08'30.53"N	079°55'16.20"W	89.141814	-79.921169	2.70/5.00	БП1439A
65	6H 11	Hedberg	89°06'53.78"N	082°16'30.93"W	89.114939	-82.275259	2.70/5.00	БП1439A
66	6H 12	Hedberg	89°05'17.61"N	084°34'00.22"W	89.088225	-84.566729	2.70/5.00	БП1439A
67	6H 13	Hedberg	89°03'42.15"N	086°48'04.81"W	89.061709	-86.801338	2.70/5.00	БП1439A
68	6H 14	Hedberg	89°02'07.53"N	088°59'03.13"W	89.035427	-88.984205	2.70/5.00	БП1439A
69	6H 15	Hedberg	89°00'33.87"N	091°07'11.67"W	89.00941	-91.11991	2.70/5.00	БП1439A
70	6H 16	Hedberg	88°59'01.28"N	093°12'45.11"W	88.983691	-93.212532	2.70/5.00	БП1439A
71	6H 17	Hedberg	88°57'29.86"N	095°15'56.67"W	88.958295	-95.265744	2.70/5.00	БП1439A
72	6H 18	Hedberg	88°55'59.70"N	097°16'58.32"W	88.93325	-97.282869	2.70/5.00	БП1439A
73	6H 19	Hedberg	88°54'30.89"N	099°16'00.63"W	88.908582	-99.266842	2.70/5.00	БП1439A
74	6H 20	Hedberg	88°53'03.52"N	101°13'13.26"W	88.884312	-101.22035	2.70/5.00	БП1439A
75	6H 21	Hedberg	88°51'37.67"N	103°08'44.90"W	88.860464	-103.145807	2.70/5.00	БП1439A
76	6H 22	Hedberg	88°50'13.41"N	105°02'43.26"W	88.837059	-105.04535	2.70/5.00	БП1439A
77	6H 23	Hedberg	88°48'50.81"N	106°55'15.84"W	88.814116	-106.921067	2.70/5.00	БП1439A
78	6H 24	Hedberg	88°47'29.94"N	108°46'29.42"W	88.791652	-108.774839	2.70/5.00	БП1439A
79	6H 25	Hedberg	88°46'10.87"N	110°36'29.85"W	88.769687	-110.608294	2.70/5.00	БП1439A
80	6H 26	Hedberg	88°44'53.65"N	112°25'22.34"W	88.748238	-112.422874	2.70/5.00	БП1439A
81	6H 27	Hedberg	88°43'38.35"N	114°13'11.47"W	88.727322	-114.219854	2.70/5.00	БП1439A
82	6H 28	Hedberg	88°42'25.03"N	116°00'02.25"W	88.706954	-116.000625	2.70/5.00	БП1439A
83	6H 29	Hedberg	88°41'13.72"N	117°45'59.40"W	88.687147	-117.766502	2.70/5.00	БП1439A
84	6H 30	Hedberg	88°40'04.50"N	119°31'06.39"W	88.667917	-119.518443	2.70/5.00	БП1439A
85	6H 31	Hedberg	88°38'57.39"N	121°15'26.58"W	88.649277	-121.257385	2.70/5.00	БП1439A
86	6H 32	Hedberg	88°37'52.47"N	122°59'03.02"W	88.631242	-122.984174	2.70/5.00	БП1439A
87	6H 33	Hedberg	88°36'49.75"N	124°41'59.02"W	88.613822	-124.699728	2.70/5.00	БП1439A
88	6H 34	Hedberg	88°35'49.30"N	126°24'18.01"W	88.597028	-126.405003	2.70/5.00	БП 1439A
89	6H 35	Hedberg	88°34'51.14"N	128°06'02.27"W	88.580873	-128.100631	2.70/5.00	БП 1439A
90	6H 36	Hedberg	88°33'55.31"N	129°47'14.25"W	88.565366	-129.787292	2.70/5.00	БП 1439A
91	6H 37	Hedberg	87°59'19.75"N	155°50'49.76"W	87.988822	-155.847156	57.81/107.07	БП1442
92	6H 38	Hedberg	87°57'15.62"N	156°39'13.86"W	87.954341	-156.65385	2.70/5.00	БП 1442
93	6H 39	Hedberg	87°55'14.72"N	157°28'34.86"W	87.920756	-157.476352	2.70/5.00	БП 1442
94	6H 40	Hedberg	87°53'17.12"N	158°18'48.60"W	87.88809	-158.313502	2.70/5.00	БП 1442
95	6H 41	Hedberg	87°51'22.91"N	159°09'51.30"W	87.856365	-159.164251	2.70/5.00	БП 1442

1	2	3	4	5	6	7	8	9
96	6H 42	Hedberg	87°49'32.17"N	160°01'39.45"W	87.825603	-160.027626	2.70/5.00	БП 1442
97	6H 43	Hedberg	87°47'44.97"N	160°54'09.78"W	87.795825	-160.902719	2.70/5.00	БП 1442
98	6H 44	Hedberg	87°46'01.38"N	161°47'19.25"W	87.767052	-161.788682	2.70/5.00	БП 1442
99	6H 45	Hedberg	87°44'21.48"N	162°41'05.02"W	87.739301	-162.684728	2.70/5.00	БП 1442
100	6H 46	Hedberg	87°42'45.32"N	163°35'24.57"W	87.712591	-163.590159	2.70/5.00	БП 1442
101	6H 47	Hedberg	87°41'12.97"N	164°30'15.52"W	87.686938	-164.504313	2.70/5.00	БП 1442
102	6H 48	Hedberg	87°39'44.49"N	165°25'35.58"W	87.662359	-165.42655	2.70/5.00	БП 1442
103	6H 49	Hedberg	87°38'19.92"N	166°21'22.56"W	87.638869	-166.356268	2.70/5.00	БП 1442
104	6H 50	Hedberg	87°36'59.34"N	167°17'34.44"W	87.616485	-167.2929	2.70/5.00	БП 1442
105	6H 51	Hedberg	87°35'42.78"N	168°14'09.54"W	87.595218	-168.235984	2.70/5.00	БП 1442
106	6H 52	Hedberg	87°34'28.27"N	169°58'37.00"W	87.574872	-169.01924	2.34/4.33	Common (.) of area VI-VII

№	Outer Limit Fixed Point Name	Type of OLCS Fixed point	Latitude N (deg. min. sec.)	Longitude E\W (deg. min. sec.)	Latitude N (deg.)	Longitude E\W (deg.)	Distance between points, nautical miles / kilometres	Note
1	2	3	4	5	6	7	8	9
Area VII, OLCS along the maritime spaces delimitation line of the RF-USA (in the context of Agreement, 1990) subject-matter of negotiations with Canada and the Kingdom of Denmark								
106	6H 52	Hedberg	87°34'28.27"N	169°58'37.00"W	87.574872	-169.01924	2.34/4.33	Common (.) of area VI-VII
107	US-RF	–	80°40'31.38''N	168°58'37.00''W	80.675383	-168.976945		Intersection point of the USA median line with delimitation line of maritime boundary between USSR- USA under Agreement of 1990
108	EEZ	–	74°04'05.83''N	168°58'37.00''W	74.068286	-168.976945	–	Intersection point of 200M EEZ of the RF with delimitation line of maritime boundary between USSR- USA under Agreement of 1990
109	Point 1		65°30'00.00''N	168°58'37.00''W	65.5	-168.976945	–	Point No.1 of delimitation line of maritime boundary between USSR and USAunder Agreement of 1990