



A. P. KARPINSKY RUSSIAN GEOLOGICAL  
RESEARCH INSTITUTE

# MODEL OF THE FORMATION OF THE SEDIMENTATION SYSTEM OF THE EURASIAN BASIN OF THE ARCTIC OCEAN AS A BASIS FOR RECONSTRUCTING Its TECTONIC HISTORY

Neevin Igor, Pavel Rekant, Budanov Leonid

Igor\_Neevin@karpinskyinstitute.ru



Sharing is  
encouraged

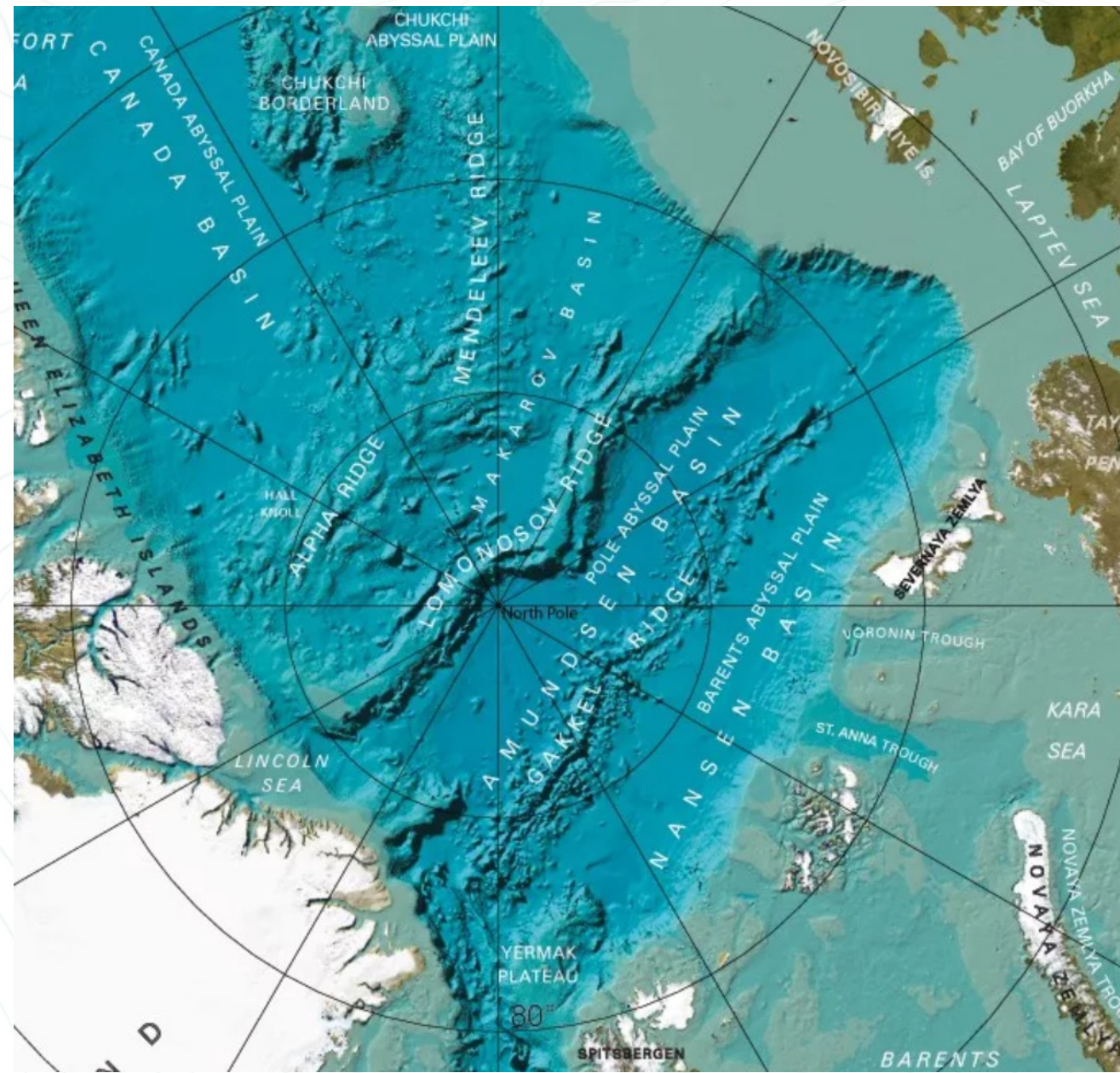
EGU24-18255ECS

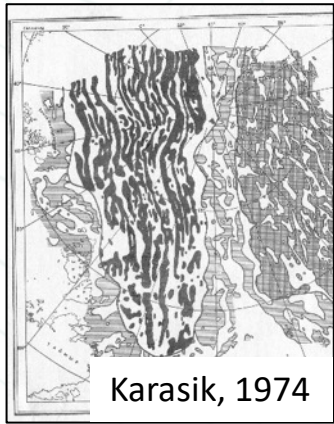
**P. V. Rekant, O. V. Petrov,  
and E. A. Gusev**

**Model of Formation of the  
Sedimentary System of the Eurasian  
Basin, the Arctic Ocean, as a Basis  
for Reconstructing Its Tectonic  
Evolution.**

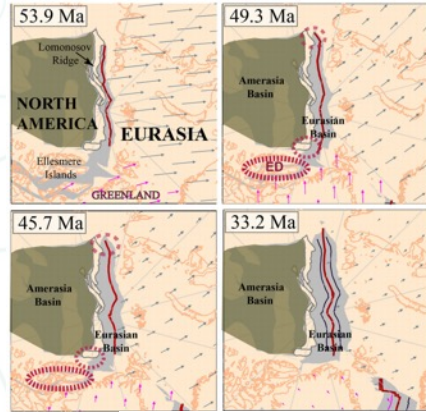
**Geotectonics (2021). 55. p676-696.**

**DOI:10.1134/S001685212105006X.**

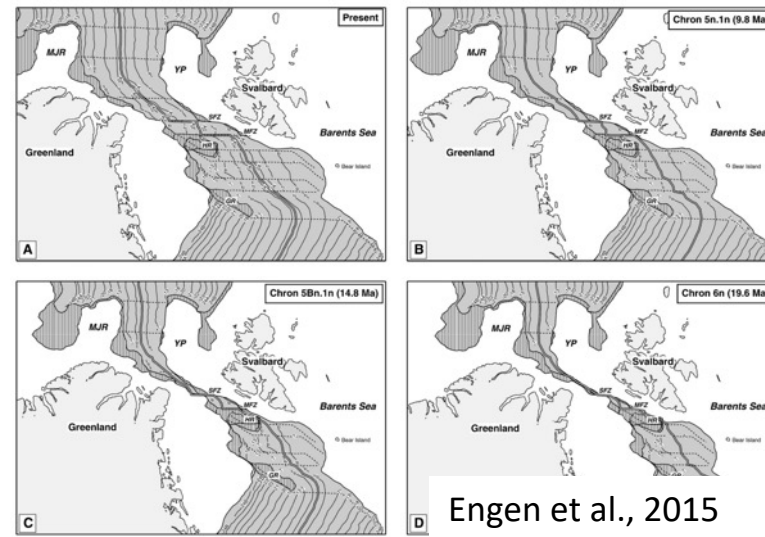




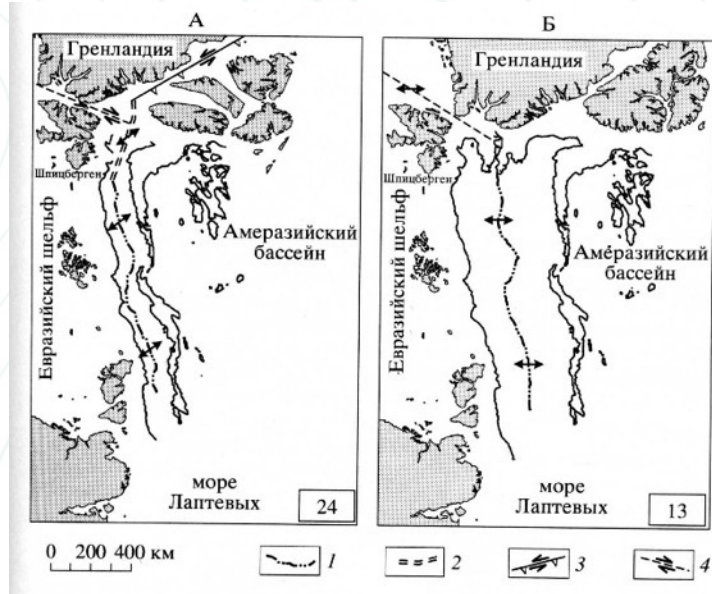
Karasik, 1974



Gaina et al., 2015



Engen et al., 2015



Glebovsky et al, 2006

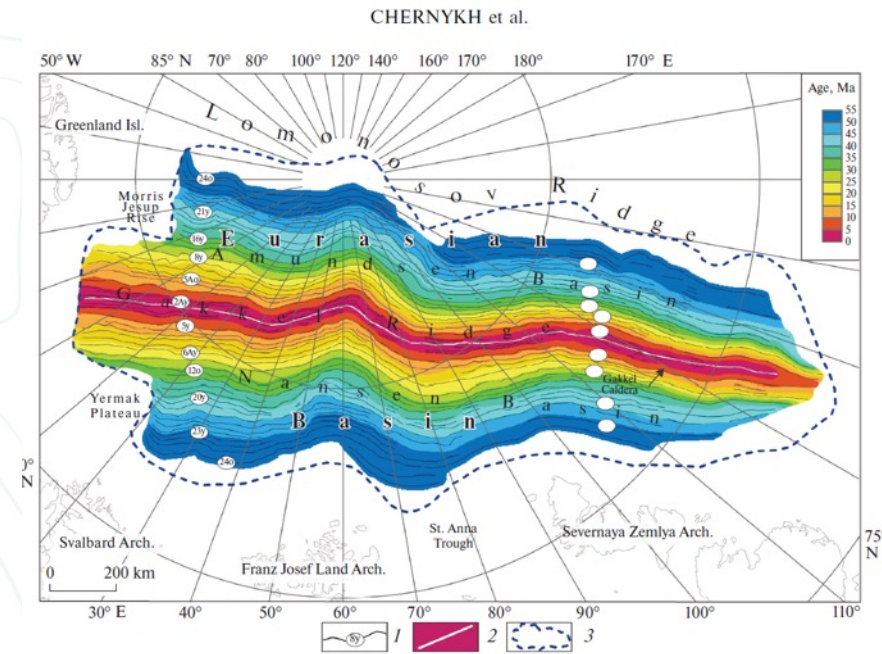
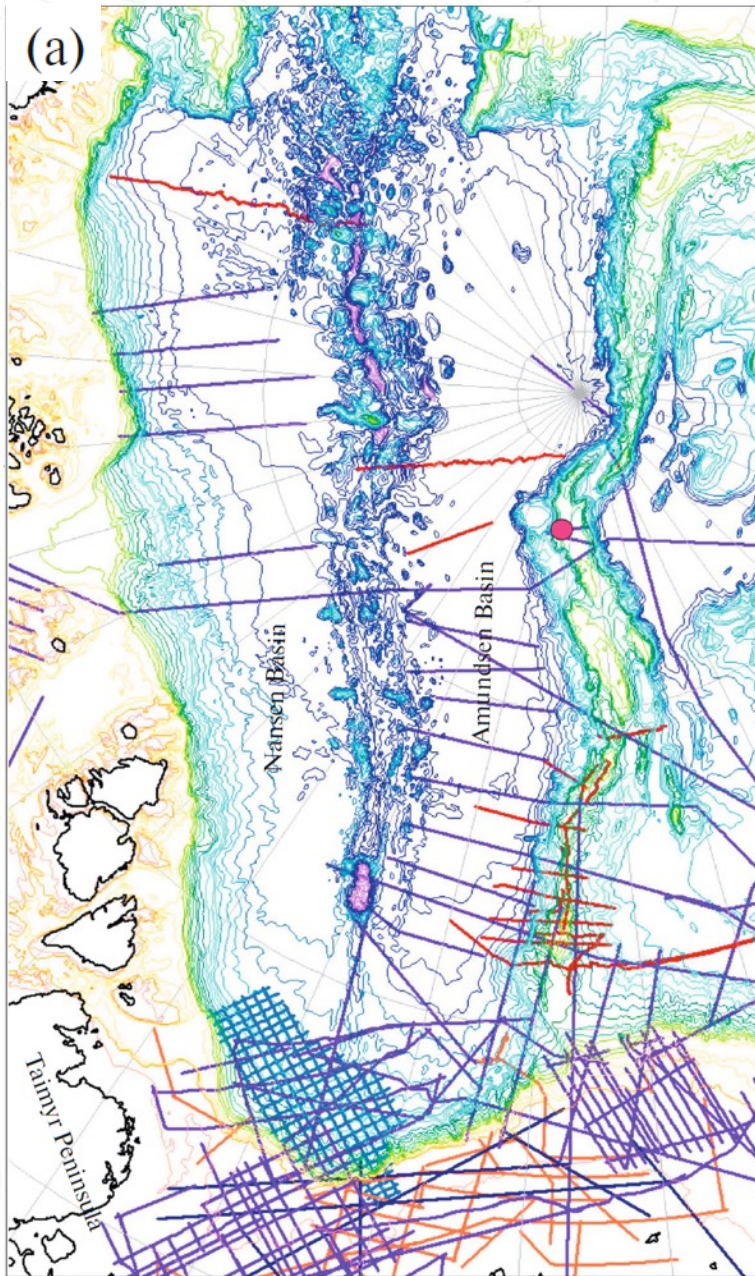


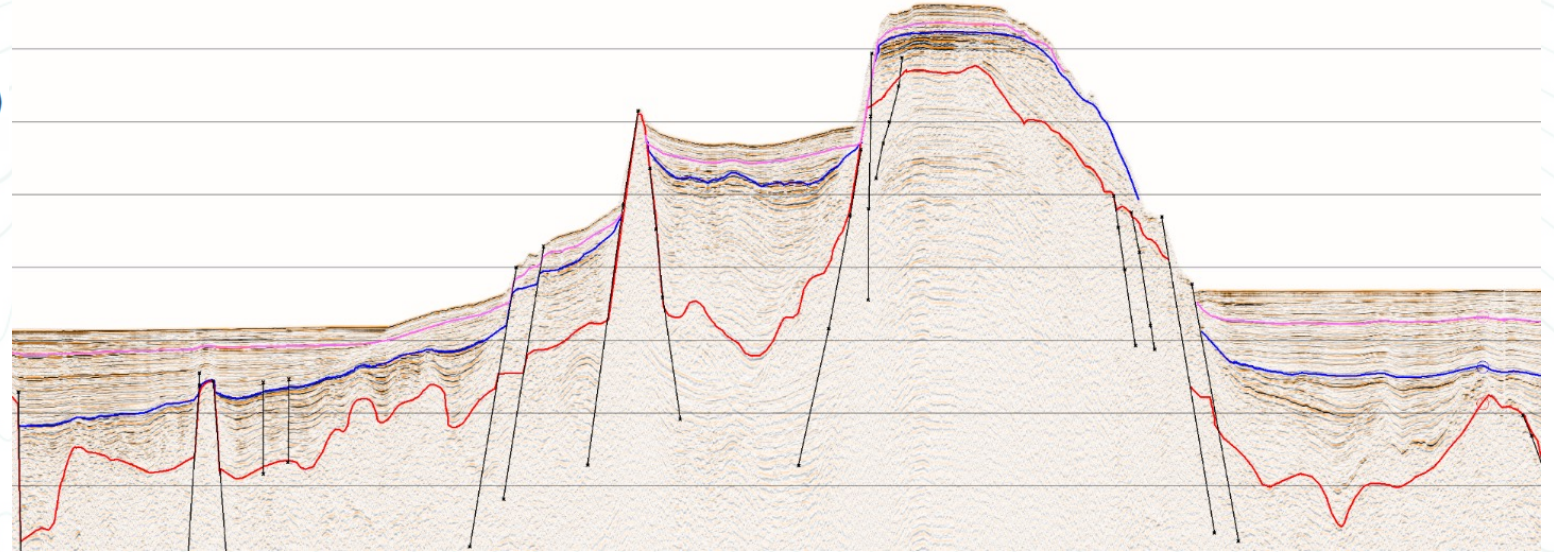
Fig. 4. Grid of the oceanic crust age. (1), magnetochrons; (2), axial magnetic anomaly; (3), study area outline.

P. Rekant, Z.L. Ling and Tao Zhang  
 Challenges of single model approach in poorly studied areas.  
 Insights from analysis of sedimentary architecture of the Gakkel Ridge (Arctic ocean).  
 Digital Depth meeting, Xiamen, 9 November 2023

**MODEL OF THE FORMATION OF THE SEDIMENTATION SYSTEM OF THE EURASIAN BASIN OF THE ARCTIC OCEAN AS A BASIS FOR RECONSTRUCTING ITS TECTONIC HISTORY**  
 NEEVIN IGOR, PAVEL REKANT, LEONID BUDANOV, INSTITUTE KARPINSKY, EGU24-18255ECS

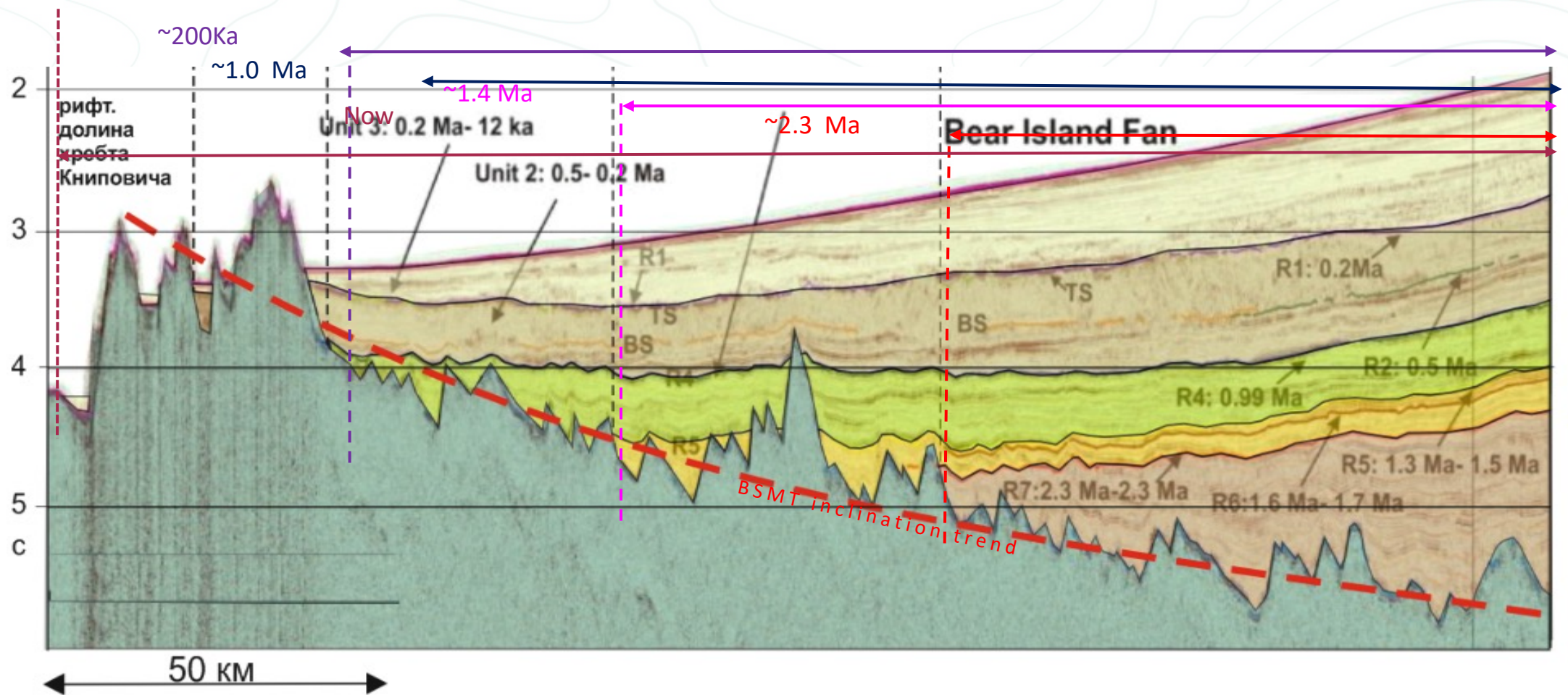


(b)



**a)** Seismic profile network over Eurasian Basin. 1–4, seismic profiles: 1—JSC MAGE; 2—JSC DMNG; 3— BGR (Germany); 4—AWI (Germany), 5—ACEX borehole.  
**b)** Example of seismic data

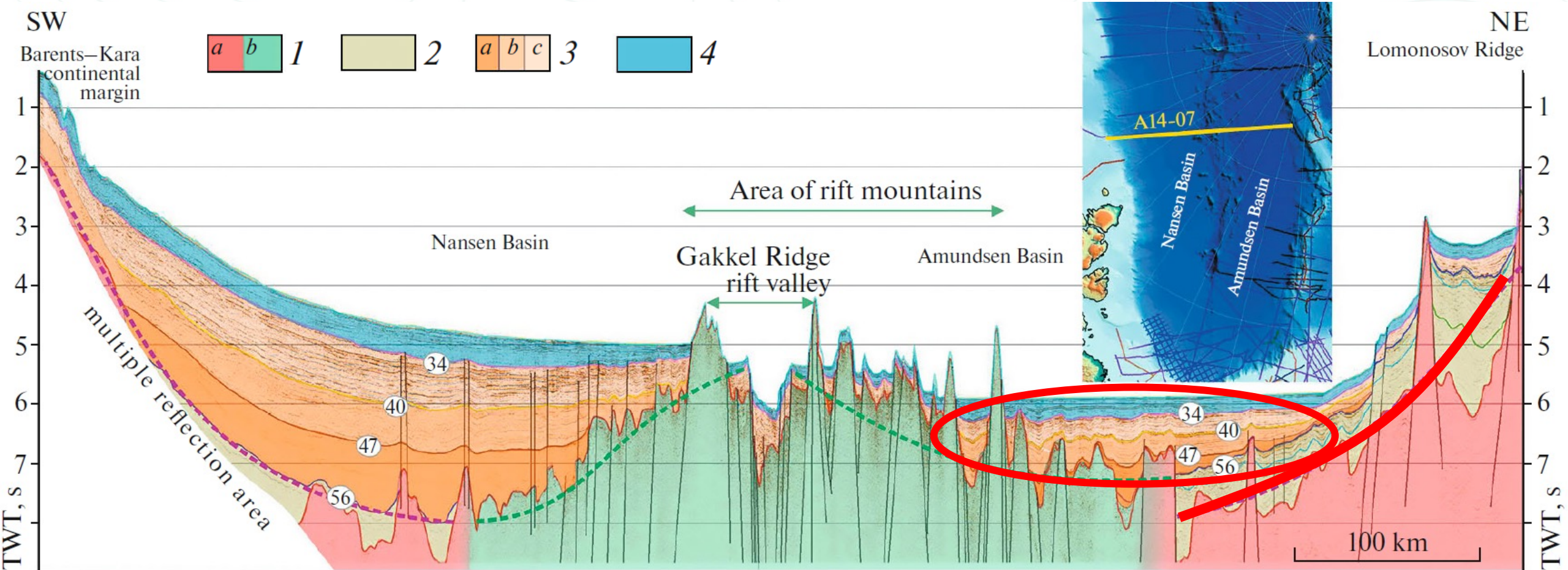
1 2 3 4 5



## The idealistic model of the Knipovitch ridge architecture

[<https://doi.org/10.1029/2008TC002396>].

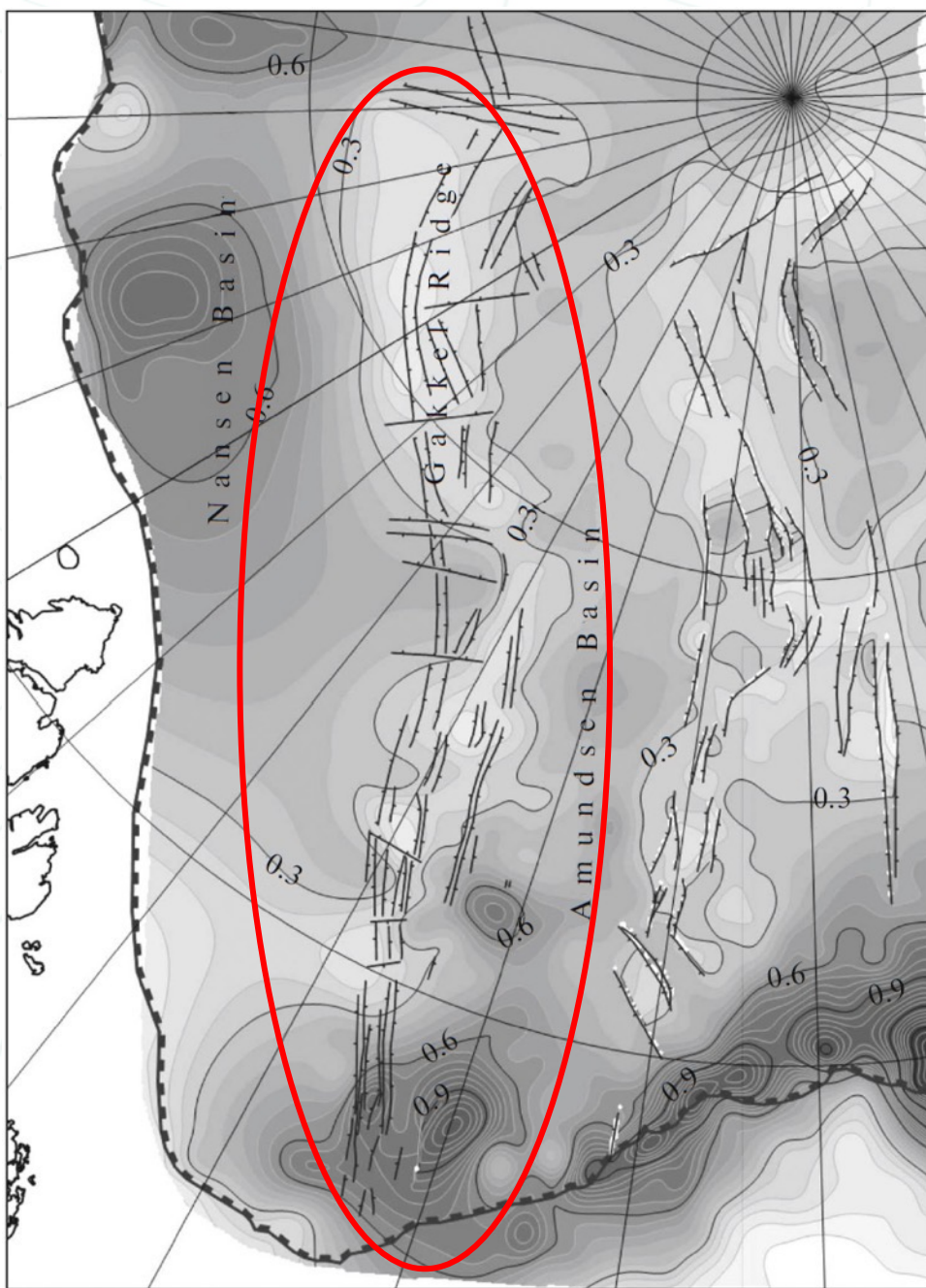
1. The accommodation space is progressively expanding along with oceanic crust accretion
2. The **age** and **thickness** of sediments in the vicinity of rift valley tends to zero
3. The **basement surface gradually deepens** from the ridge axis toward the edge of the basin



**Basement:**

1, crust: (a) continental, (b) oceanic;

2–4, sedimentary complexes: 2, Paleocene Cretaceous, 3, Eocene, 4, Oligocene–Quaternary.

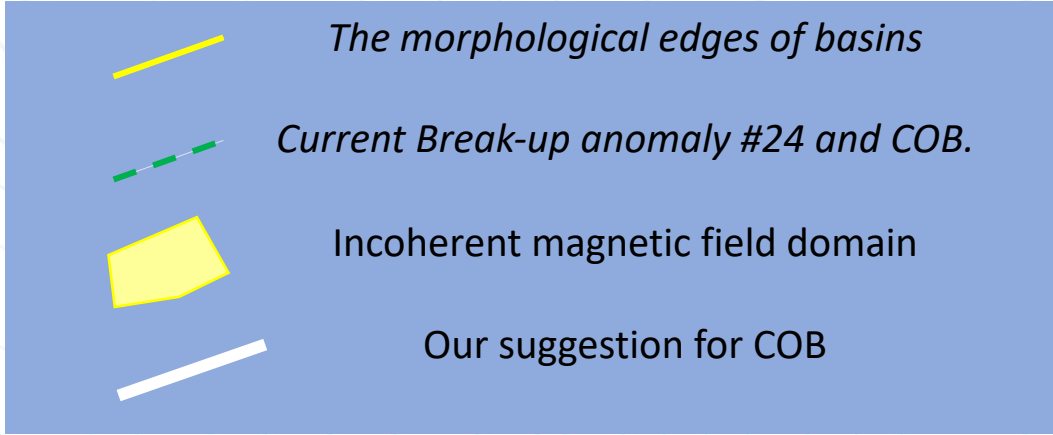
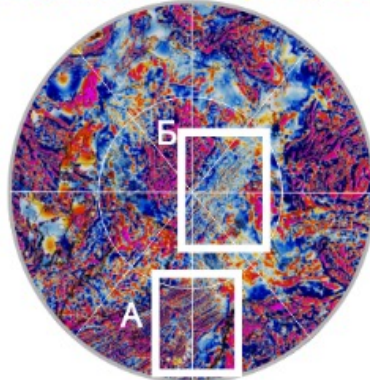
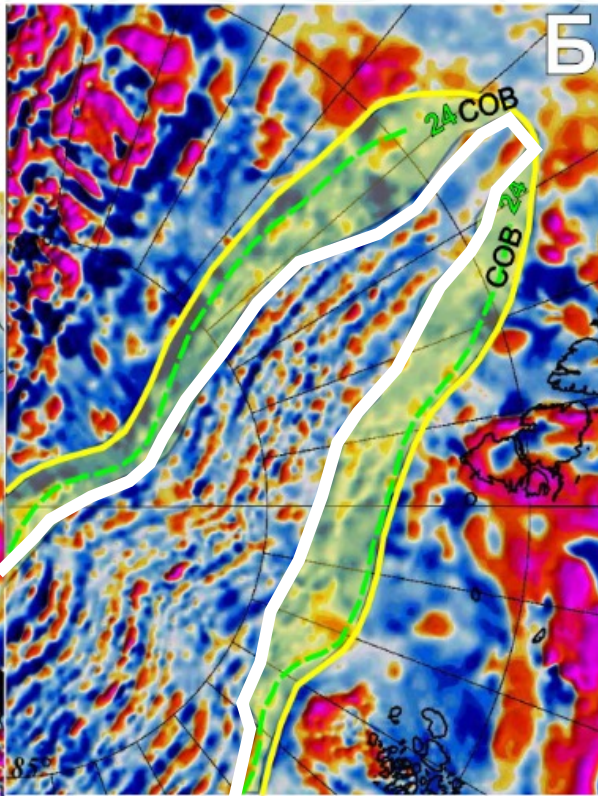
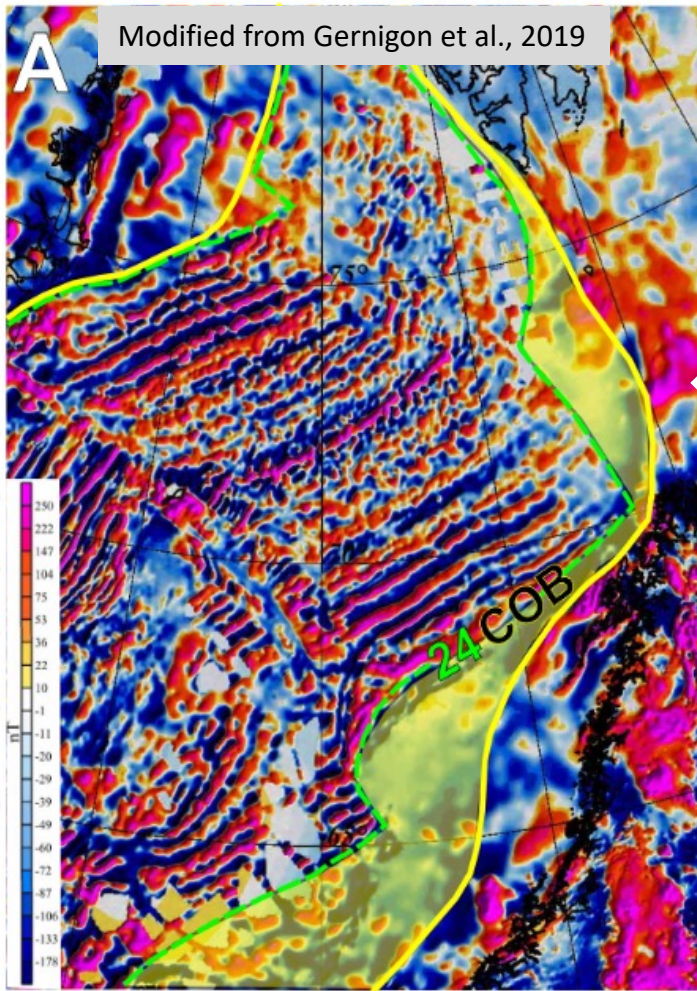


Isopach map of Oligocene–Quaternary sedimentary unit in the southern Eurasian Basin, in kilometers.

## Model of seafloor spreading in the Eurasian basin

- **Stage I.** Epicontinental sag basin
- **Stage II.** Expansion of the accommodation space, caused by seafloor spreading in the Gakkel Ridge
- **Stage III.** Accumulation of the hemipelagic deposits veneer throughout the region. There is no expansion of the accommodation space.
- **Stage IV.** Recent tectonic activation



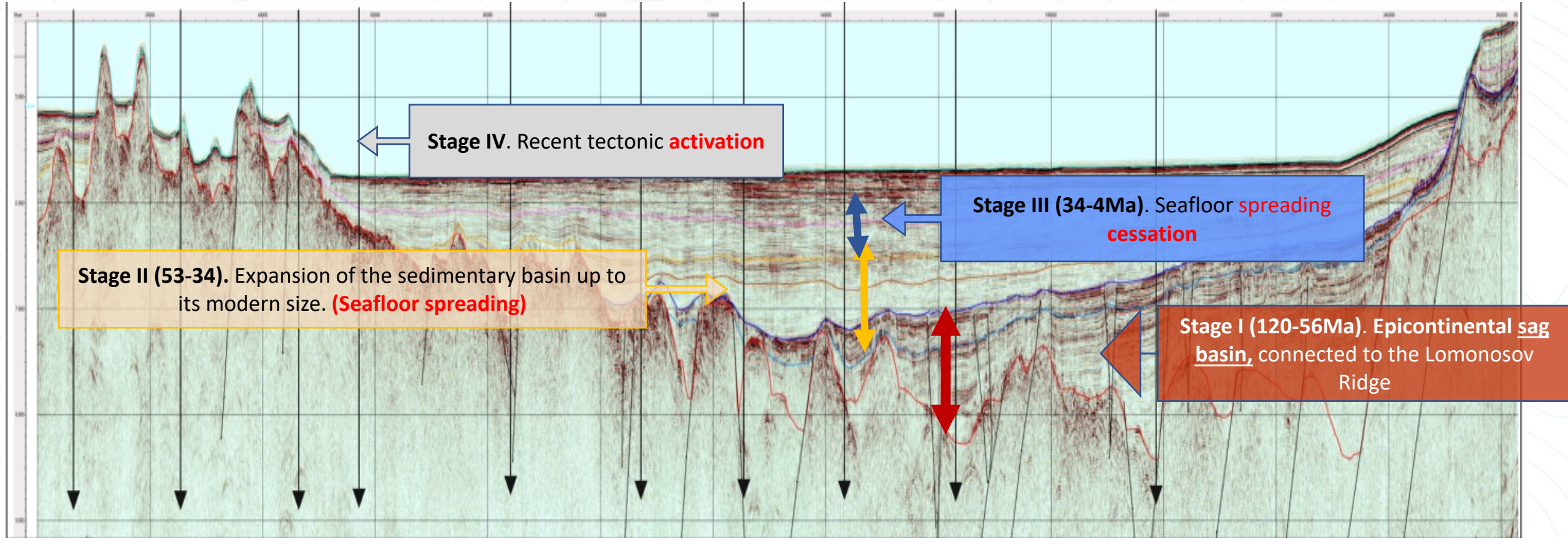


NB! Note the offset of the break-up anomaly ( - - - ) from morphological edge of the deep-sea basin ( / ) in the North Atlantic. Zone of **incoherent magnetic field** in the North Atlantic ( ) has been attributed to the deep-seated **continental crust domain**, yet similar feature in the Arctic Ocean is still included into the oceanic domain.

North Atlantic (A) vs Arctic Ocean (B) magnetic field .

Digital Depth meeting, Xiamen, 9 November 2023

# Arctic Ocean sedimentary architecture



Digital Depth meeting, Xiamen, 9 November 2023

## 4 stages – 4 styles of sedimentation

# CONCLUSIONS

1. Cretaceous-Paleocene stage (130 (?)-56 Ma) begins with the formation of a linear epicontinental rifting trough. It covers the western part of the Amundsen Basin and the eastern part of the Nansen Basin in modern coordinates.

Regional stretching is the main tectonic process of this stage. It appeared when the Late Cimmerian folding was completed and continued until the end of the Late Cretaceous. The end of the stage is characterised by an environment of tectonic quiescence.

2. Eocene stage (53-34 Ma) is defined by the onset of spreading in the Gakkel Ridge. Spreading divided the single epicontinental basin into the Nansen and Amundsen basins.

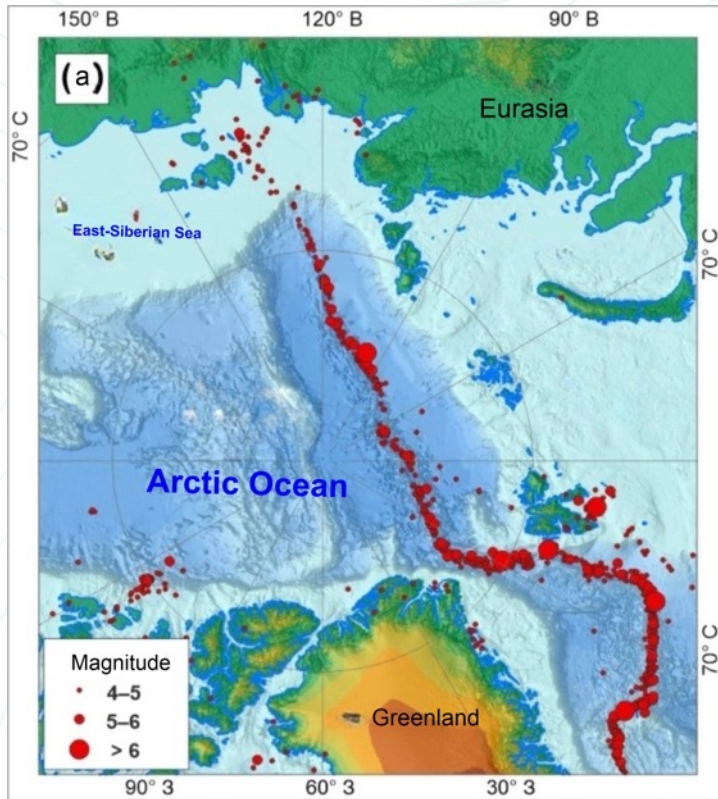
The final manifestations of the Eurecan orogeny triggered differentiated subsidence of the central part of the Arctic Ocean. That was the beginning of oceanic sedimentogenesis.

3. Oligocene-Miocene stage (34-5 Ma) is characterised by tectonically quiescent conditions of consedimentary basin trough.

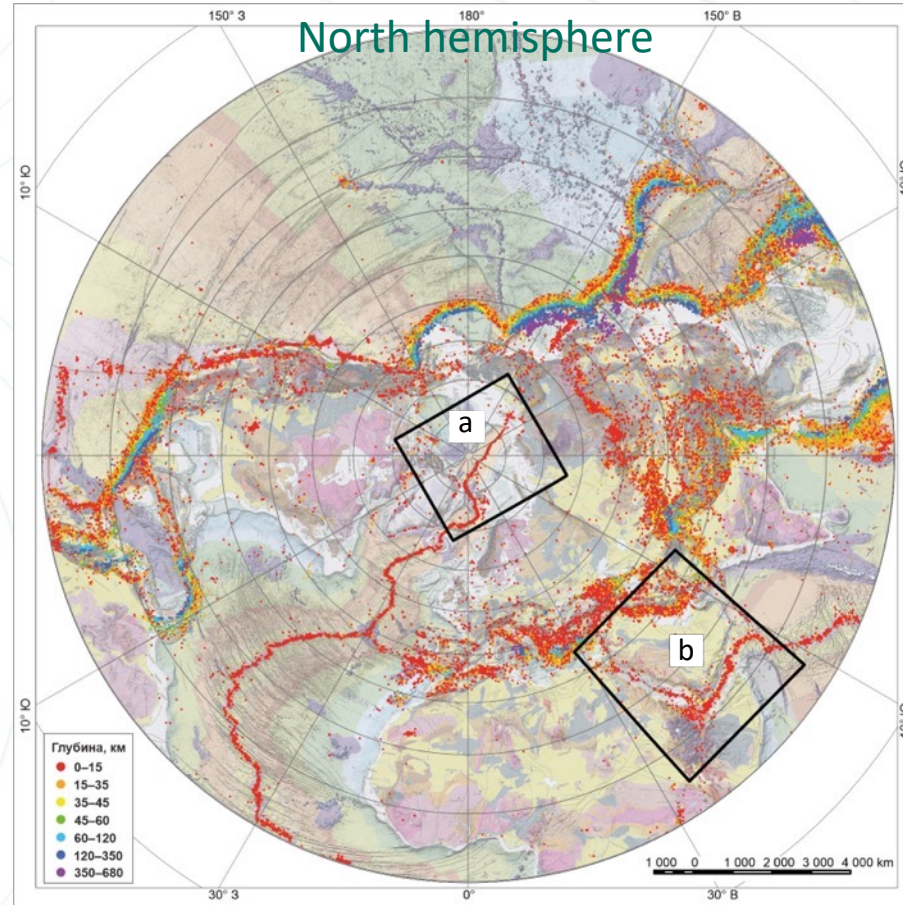
4. The modern stage is characterised by the resumption of the process of stretching of the oceanic lithosphere in the rift valley zone of the Gakkel Ridge. This process is caused by the successive development of spreading from the Norwegian-Greenland Basin. The newest tectonic disturbances in the axial zone of the basin and several modern shallow-focus earthquakes of tectonic and magmatic origin are associated with this stage. They are fixed in the zone of rift mountains.

# Additional question for discussion.

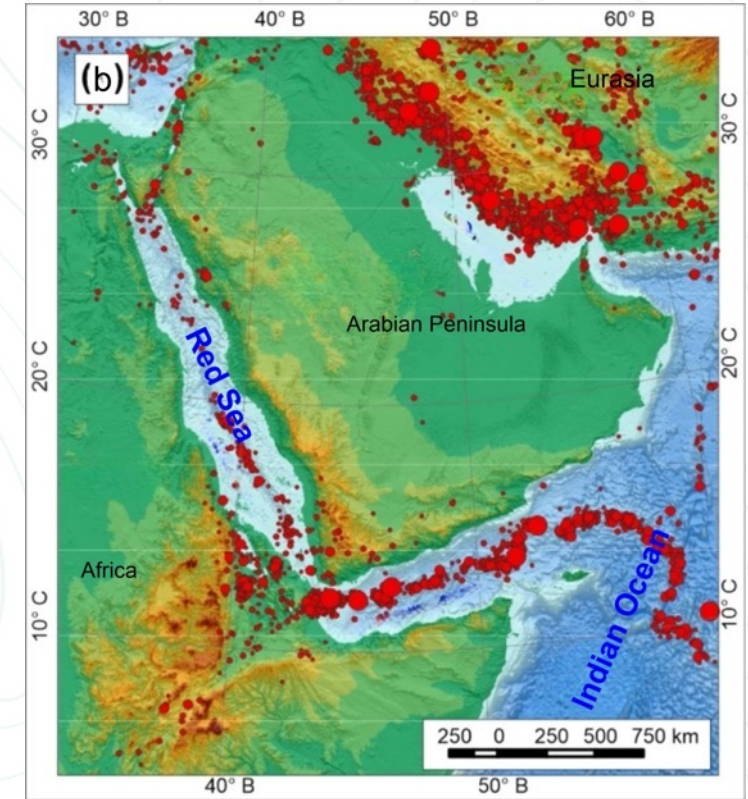
## Eurasian Basin



## North hemisphere



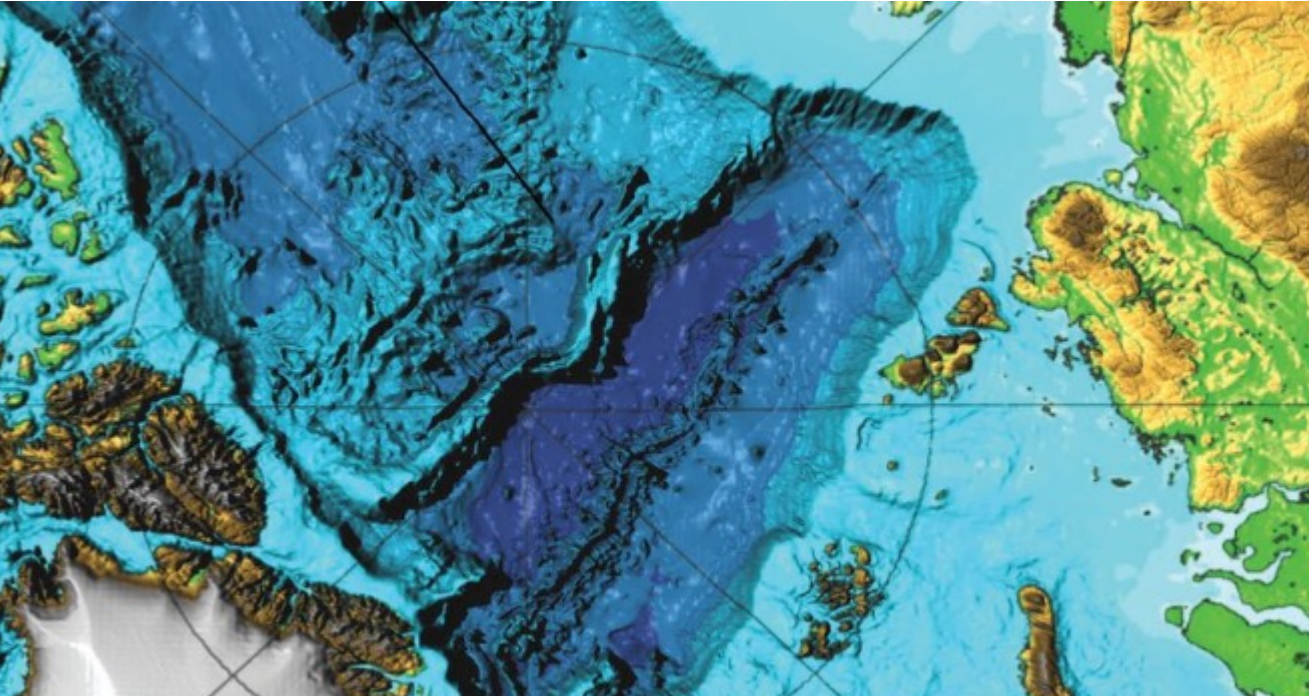
## Red Sea region



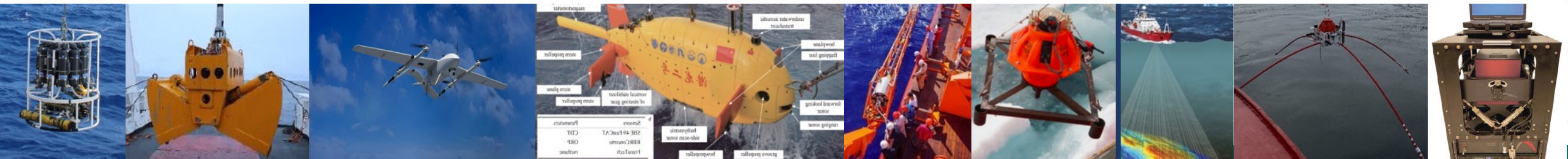
Modern seismicity according to data  
(Global Seismographic Network, 2000-2017 гг.)



# Welcome to XUE LONG 2! New data! New discoveries! New publications! Second Institute of Oceanography



## Sino Arctic Scientific Gakkel Ridge Expedition 2024





KARPINSKY  
INSTITUTE

Leading Institute, which is responsible for the state geological mapping of the Russian Federation and its adjacent waters since **1882**.

A unique closed-cycle enterprise with enormous scientific potential, modern research infrastructure, highly qualified experts to perform all types of work, from compiling a geological map to assessing mineral reserves.



## ADVANTAGES OF THE KARPINSKY INSTITUTE

- ✓ High quality of regional geological and geophysical survey
- ✓ High expertise and practical experience
- ✓ High level of qualification and competence of personnel
- ✓ Participation in international cooperation and UNESCO programs
- ✓ A unique material resource and scientific base and its continuous updating



# KARPINSKY INSTITUTE

Geological mapping

Regional geology,  
mapping and  
methodological  
support

General and specialized  
metallogeny

Geology of sedimentary  
basins, marine geology  
and fossil fuel deposits

Creation of special  
information systems



## GIS CENTRE

- 1) authorized courses on ESRI software products
- 2) personal certificates of standard pattern



## SHERPA TECHNOLOGY

software and hardware package  
for field geological documentation



## REGIONAL GEOCHEMISTRY, HYDROGEOLOGY AND HYDROCHEMISTRY

analytical geochemical and  
hydrochemical works



## PALEONTOLOGICAL SOCIETY & INTERDEPARTMENTAL STRATIGRAPHIC COMMITTEE

preservation of paleontological collections,  
continuation and development of paleontological  
and stratigraphic research



## EURASIAN CENTRE FOR IMPLEMENTATION OF ENHANCED OIL RECOVERY METHODS

application of polymer flooding  
technology



## DIGITAL TWIN OF MINERAL RESOURCES OF RUSSIA

- 1) created and organized with the help of modern technology and approaches
- 2) contain geological information of different scale 1:1 000 000, 1:200 000, 1:50 000, 1:25 000



## LABORATORIES AND ANALYTICAL CENTERS

SHRIMP-II Secondary Ion Mass Spectrometer for isotope studies

Optically Stimulated Luminescence Laboratory for dating of Quaternary sediments

Laboratory and analytical support of regional surveys



## Contact



IGOR NEEVIN

<https://www.linkedin.com/in/igor-neevin-662a406b/>

[igor.neevin@gmail.com](mailto:igor.neevin@gmail.com)

[Igor\\_Neevin@karpinskyinstitute.ru](mailto:Igor_Neevin@karpinskyinstitute.ru)

A. P. KARPINSKY RUSSIAN GEOLOGICAL  
RESEARCH INSTITUTE

Russia, Saint Petersburg, Sredny pr., 74

Tel.: +7 (812) 328-90-90

[info@karpinskyinstitute.ru](mailto:info@karpinskyinstitute.ru)



@NEEV1N

My  
Telegram



EGU24-18255



Institute's  
website