ICAM8 Abstracts -Posters

Stratigraphy & biostratigraphy

Biostratigraphy and palaeontology of the lower Cambrian Duolbagáisá Formation on the Digermulen Peninsula, Arctic Norway

Ebbestad, J.O.R., Högström, A.E.S., Palacios, T., Jensen, S., Meinhold, G., Høyberget, M., Agić, H., & Taylor, W.L.

jan-ove.ebbestad@em.uu.se

The lower Cambrian sequence on the Digermulen Peninsula (Finnmark, Arctic Norway) is the northernmost extension of the Cambrian deposits along the Caledonian front. It is exceedingly thick compared to cratonal successions typical of most of Baltica. The Duolbagáisá Formation represents the youngest lower Cambrian unit on the peninsula with the first trilobite-bearing strata, a plethora of trace fossils including diverse arthropod traces and Plagiogmus arcuatus, and abundant and well-preserved organic walled microfossils (OWM). Extensive field work by the Digermulen Early Life Research Group allows for the first time a detailed appreciation of the age and faunal composition of the unit. The lower member is ~250 m thick with thin-bedded siltstone, sandstone and mudstone. A single unidentifiable holmiid thorax region occurs alongside arthropod trace fossils. OWM indicate the S. ornata-F. membranacea Zone. The upper member is ~390 m thick and consist of several upward shallowing parasequences with fine-grained sandstone, siltstone and mudstone followed by thick mature quartzite. The trace fossil Syringomorpha occurs throughout the upper member and Cruziana and Rusophycus are especially abundant in the upper parts. The first identifiable olenellid trilobites occur in a thick mudstone/siltstone interval at the middle of the member, along with an elliptocephalid trilobite and other arthropods. Abundant OWM indicate the H. dissimilare-S. ciliosa Zone with the higher levels belonging to the Volkovia-Liepaina Zone. The entire sequence thus span the Cambrian Series 2, stages 3–5.

Review of infrazonal ammonite biostratigraphy and palaeobiogeography of the Kimmeridgian Stage in Arctic

Rogov M.A.

russianjurassic@gmail.com

Kimmeridgian deposits are widely distributed in Arctic. They are generally characterized by eudemic cardioceratid ammonites, which permits to recognize succession of zonal and infrazonal units, well-traced throughout this region and also in Subboreal areas. Only in East Greenland, Subpolar Urals and the Khatanga depression these ammonites are permanently associated with Subboreal aulacostephanids except the terminal Kimmeridgian. In other Boreal sites such as Spitsbergen, Barents Sea shelf, Franz-Josef Land, Western Siberia, Arctic Canada and British Columbia aulacostephanids are mainly restricted by two narrow intervals indicating short-time immigration events (cymodoce horizon of the Lower Kimmeridgian and sachsi horizon of the Upper Kimmeridgian). Base of the Kimmeridgian Stage marked by appearance of ammonite genus Plasmatites is well-traced through nearly all Boreal areas except NE Russia and Pacific region, in which these ammonites are unknown. Position of the Lower-Upper Kimmeridgian boundary in Arctic is nearly coincides with the base of the Modestum Subzone of the Kitchini Zone, although due to rarity or endemism in aulacostephanids this correlation could be considered as preliminary. Cardioceratids became extinct before the end of the Kimmeridgian, in the beginning of the Autissiodorensis Chron, and uppermost zone of the Boreal Kimmeridgian (Taimyrensis Zone) is characterized by eudemic oppeliids only. Position of the Kimmeridgian-Volgian boundary in Arctic is unclear; it is associated with regionally traced gap. This study has been supported by PRAS program 19.

Paleogene Eurekan deformation: dating of syn-sedimentary movement at Stenkul Fiord (Ellesmere Island, Canadian Arctic)

Lutz Reinhardt, Werner von Gosen, Mark Schmitz, Andreas Lückge, Jennifer M. Galloway, Christopher K. West, Martina Dolezych, & Markus Sudermann

lutz.reinhardt@bgr.de

At Stenkul Fiord, mainly fluvial clastic sediments with intercalated coals seams of the Margaret Formation were deposited during the Paleocene/Eocene. The sediments were affected by ongoing Eurekan deformation during the Paleogene. Attempts to refine the dating of these movements include detailed field studies and an interpreted satellite image. The clastic deposits consist of at least four sedimentary units separated by unconformities.

Volcanic ash layers of cm-thickness and preserved as crandallite group minerals occur in coal seams. New U-Pb zircon ages (ID-TIMS) reveal that the volcanic ash-fall took place at 53.7 Ma, i.e. within the range of the ETM-2 hyperthermal. Negative excursions of carbon isotopes of bulk coal and amber droplets indicate the likely extent of the ETM-2 hyperthermal in the section.

To overcome limitations of earlier sampling resolution, work is underway on more closely spaced samples including quantitative palynology. This is done also to prove that the dated volcanic ash layer is in the range of the negative isotope excursion.

Together the U-Pb zircon age and the position of the ETM-2 hyperthermal provide a new stratigraphic tie-point assigning sedimentary Unit 1 to the late Paleocene-earliest Eocene, Units 2, 3, and 4 to the early to middle Eocene and enabling to study the timing of syn-sedimentary movements, also causal for unconformities in the section.

Eustatic events on the Palaeozoic carbonate platform in the NE Baltica Palaeocontinent – comparative study of the biotic and abiotic changes

Peep Männik, Tatyana M. Beznosova, Andrei V. Zhuravlev, Vladimir A. Matveev, Artem N. Plotitsin, Lyubov' V. Sokolova, Deniss A. Gruzdev

peep.mannik@ttu.ee

The late Ludlow (Silurian) and Mid-Tournaisian (Carboniferous) eustatic and bioevents recorded in the Timan-Pechora region are compared. The upper Ludlow succession, dominated by mixed siliciclastic-carbonate deposits, contain numerous ostracods, brachiopods Didymothyris didyma, and conodonts among which rare specimens of Polygnathoides siluricus occur. Late Ludlow regression resulted in deposition of microbial carbonates in the region. The regression resulted in a gap of considerable duration in the succession. In some parts of the region the strata corresponding to the Lau Event are completely missing and the positive δ13C shift has not been recorded. The event caused dramatic decrease in faunal diversity, mass burial of Pentamerid brachiopods and extinction of reefal ecosystems. The crisis was followed by renovation of faunas during transgression in Přídolí. Two negative δ13C excursions mark the Late Ludlow sea level lowstand in the region.

An Early Carboniferous regression related to the Mid-Tournaisian Event resulted in rapid drop in abundance and diversity of conodonts, foraminifers and brachiopods. Following the event transgression in the early crenulata time was marked by appearance of rich faunas and new morphologies in the conodont succession. The Early Crboniferous Event is also marked by a negative δ13C shift.

Both events resulted in decrease in diversity and abundance of faunas and were followed by flourishing of the benthic and planktic associations. The events led to similar negative δ13C shifts probably caused by decreasing in organic carbon burial rate.

Volcanic provinces, tectonics & terrane correlation

Rifting and Volcanism around the Jan Mayen Fracture Zone, NE Greenland

Kai Berglar, Dieter Franke, Volkmar Damm, Udo Barckhausen, Anke Dannowski, Axel Ehrhardt, Martin Engels, Thomas Funck, Peter Klitzke, Andreas Madsen, Michael Schnabel, Martin Thorwart

kai.berglar@bgr.de

In 2017, we sailed with the German Research vessel Maria S. Merian offshore NE Greenland to study the architecture of the rifted continental margin around the Jan Mayen fracture zone. Newly acquired multichannel seismic data provide a structural image of the sediments and crustal architecture. Acquisition was done using BGR's reflection seismic instrumentation with a 4500-m-long digital streamer and a G-airgun array with a total volume of 3100 in^3.

Key questions are the distribution of volcanism as manifest in seaward dipping reflectors and the continent-ocean transition. From the pinch-out of seafloor spreading anomalies, a margin-parallel COT off East Greenland would indicate an N-S opening in the Norwegian/Greenland Sea, i.e. towards the postulated thermal anomaly. A second question is the timing, duration and distribution of magmatism that resulted in the formation of the North Atlantic large igneous province. Here, we study the dependence of magmatism with distance from the proposed thermal anomaly and the influence of major fracture zones on volcanism. The "volcanic province" offshore NE Greenland turns out to host several shelf basins, either rift basins or pull –apart grabens. The Jan Mayen Fracture Zone, which is clearly delineated in the oceanic domain, shows a structural continuation onto the continental shelf. This is, however, not a single straight line but consists of several shorter segments, which are offset in an N-S direction across the shelf.

Sulphur mobilisation from sedimentary host rocks in the High Arctic Large Igneous Province

Frances M. Deegan, Jean H. Bédard, Valentin R. Troll, Martin J. Whitehouse, Erika Hagerfors, & Harri Geiger

frances.deegan@geo.uu.se

In the Canadian Arctic Islands, a complex network of dykes and sills are exposed that belong to the High Arctic Large Igneous Province (HALIP). The HALIP is a Mesozoic continental basalt suite, which intruded volatile-rich sedimentary rocks of the Sverdrup Basin (shale, limestone, sandstone, and evaporite) some 130 to 120 million years ago. These magmatic intrusions can advect considerable amounts of heat into the crust, potentially generating large amounts of greenhouse gases from carbon and sulphur-rich host rocks. Here we focus on a specific narrow sill (17m) on Ellesmere Island that was emplaced into Murray Harbour Formation balck shale. We performed in-situ Secondary Ionisation Mass Spectrometry (SIMS) □34S analysis of pyrite in rock slices from the sill margins and at ca. 60 cm distance from the margin. All samples analysed reveal strongly negative (sub-mantle) □34S values, commensurate with the strongly neagative □34S values of the surrounding shale and in contrast to the relatively mantle-like □34S values of the sill interior. Notably, the larger, cubic grains of pyrite analysed are homogeneous with respect to major elements and □34S values. Our data thus lead us to suggest that the sill margins record rapid flushing of sulphur from the surrounding sedimentary rocks, although the exact mode of sulphur transfer has yet to be determined. Despite this caveat, it seems plausible that sill emplacement during HALIP activity could have triggered widespread sulphur mobilisation.

Zircon grains from serpentinite of the Voykar Massif, Polar Urals: Trace elements, U-Pb and Lu-Hf isotopic data

Koglin, N. & Estrada, S.

nikola.koglin@bgr.de

The Voykar Massif consists of an ultramafic complex in the NW, followed by a mafic complex and an evolved island arc to the SE. Previous radiometric dating has yielded a late Neoproterozoic age (585±6 Ma) for the ultramafic complex, a range of late Cambrian to Silurian ages (428±7 to 490±7 Ma) for the mafic complex, and Early Devonian ages (c. 390–400 Ma) for the evolved island arc. The mafic complex is dominated by gabbro, dolerite, and basalt with minor andesite and plagiogranite formed in a supra-subduction zone environment. By the river Lagortayu, the mafic complex also contains serpentinite fragments with zircon grains that are visible in thin section. LA-ICP-MS U-Pb dating of the zircon grains yield an upper intercept age of 548±5 Ma with an age range of 527–549 Ma. Additionally, few older grains up to 3277 Ma were found. Trace element patterns of the zircon grains show fractionation from high HREE to low LREE with pronounced positive Ce and negative Eu anomalies. Grains with younger ages (<548 Ma) are enriched in LREE without Ce anomaly. Hafnium isotopic data of the main age group show 176Hf/177Hf(t) from 0.28242 to 028249 and εHf(t) ranging from 1.9 to 1.0. Two grains show lower εHf(t) of 5.6 and 6.5. The previously obtained age for the ultramafic complex and our new age on mantle-derived serpentinite indicate zircon formation in the mantle during the Timanian Orogeny. Although a primitive island arc signature was found for the mafic complex, the evolved Hf isotope data point to an involvement of a crustal component in the underlying mantle.

Upper Cretaceous rhyolite ash beds from the New Siberian Islands

V. Kostyleva, E.Shchepetova, A. Kotelnikov

kovikto@yandex.ru

Upper Cretaceous rift-related rocks are only found in the New Siberian Islands of the Anjou archipelago. Synchronous sedimentary rocks on Novaya Sibir Island are represented by a coal-bearing, mixed volcanogenic-terrigenous siliciclastics. The Turonian-Cogniacian Derevyannogorskaya Formation (with a thickness of 95 m) is mainly composed of unlithified rhyolitic tuffaceous rocks intercalated with brown coaly layers (up to 8 m) and multiple volcanic (rhyolitic) ash beds (up to 2.5 m).

The permanent presence of the fine-sized crystalloclastic and vitroclastic ash material indicates an intense explosive volcanic activity in this region during the Turonian-Cognacian time interval. Apparently, the Late Cretaceous volcanic centers were located close to Novaya Sibir Island and were inherited from the Early Albian volcanic activity in the region. Upper Cretaceous ash material from the Island Novaya Sibir is petrochemically similar to the Lower Albian volcanic rocks from other sites of the Anjou archipelago. This fact allow us to suggest the same chamber for the Early Albian and Late Cretaceous (Turonian-Cognacian) eruptions of acidic (rhyolitic) magma.

Late Ordovician granitoid magmatism of the Kara Terrane (Russian high Arctic)

M.Yu. Kurapov, V.B. Ershova, A.K. Khudoley, A.A. Makariev, E.V. Makarieva

mikhail.kurapov@gmail.com

The Severnaya Zemlya Archipelago and the northern part the Taimyr Peninsula together constitute the southern part of the Kara Terrane. Two granitoid intrusions located within the southeast and east of October Revolution Island (Severnaya Zemlya Archipelago) were studied. Intrusions consist of granite-porphyries and biotite granites. According to their chemical composition, studied granites are magnesian, peraluminous, alkali-calcic and calcic. The granitoids have initial 87Sr/86Sr ratio of 0.70748. U-Pb dating of zircons show the Late Ordovician age of both intrusions crystallized at ca. 457 Ma.

The petrographic and chemical compositions of the Ordovician intrusions of the Severnaya Zemlya Archipelago indicate their formation in an island-arc environment. Granitoid intrusions similar in age and tectonic setting are widely distributed in the Caledonian Orogen of Greenland, Scotland and Norway. Probably, formation of the Ordovician granitoids of October Revolution Island was associated with subduction events along the active margins of the Iapetus Ocean as well.

The research was supported by the Russian Science Foundation (project no. 17-17-01171).

New data on the tectonics and the age of granitoid and mafic magmatism of the northeastern part of October Revolution Island (Severnaya Zemlya Archipelago)

Andrei Prokopiev, Victoria Ershova, Nikolay Sobolev, Anton Shmanyak, Eugeniy Petrov, & Andrey Khudoley

prokopiev@diamond.ysn.ru

In the northeastern part of October Revolution Island there is an exposed volcanogenic-sedimentary complex about 1000 m thick, including variegated tuff-siltstones, tuff-mudstones, tuff-sandstones, and rhyolite lavas aged at 483±3 Ma (Middle Ordovician, zircons, SHRIMP-II). They have associated subvolcanic granite porphyries dated at 461–472 Ma (12 samples, Middle Ordovician, zircons, SHRIMP-II) as well as basalts and basaltic lava breccias and dolerite sills with the ages of 467±16 and 435±15Ma (baddeleytte, SHRIMP-II). The rocks have sublatitudinal strike and are deformed by early WE-trending sinistral strike slips and thrusts and by late mainly submeridional strike-slip faults. This volcaniclastic complex is overlain by flat-lying thin Carboniferous-Permian continental terrigenous rocks.

To the east, these volcaniclastic rocks are separated by a submeridional dextral strike-slip fault from Cambrian (?) sedimentary rocks represented by deltaic sandstones, siltstones, mudstones, conglomerates and limestones rarely intruded by dolerite dikes of unknown age. The rocks underwent at least two periods of deformation. There are observed early east-verging tight to isoclinal folds of the first generation deformed by dextral strike-slip faults. Rare folds with subvertical axes are associated with the second strike-slip stage. Cleavage and bedding intersection lineation is steeply inclined to NE.

The research was supported by the project of DPMGI no. 0381-2016-0001.

Marine geology & geophysics

Surficial geology of the Amerasian Basin from sub-bottom profiler data

Kai Boggild, David Cole Mosher, Catalina Gebhardt, Martin Jakobsson, Larry Mayer, Matt O'Regan, Kelly Hogan, & Dayton Dove

martin.jakobsson@geo.su.se

International research efforts of the past decade have led to a multi-fold increase in the quantity of marine geophysical and geological data holdings in the high Arctic. There is now sufficient subbottom profiler, multibeam and seafloor sample data in many regions to map the surficial geology and provide it as a layer to compliment the International Bathymetric Chart of the Arctic Ocean (Jakobsson et al. 2012). Such additional information provides a resource for collective analysis of the morphology and geology of the Arctic seafloor, and has a variety of applications including environmental assessment, habitat mapping, geohazard identification and oceanographic and geologic process studies. Acoustic facies derived from subbottom profiler data form the foundation of this surficial geology map. More than 140,000 km of subbottom profiler data are now interpreted and mapped in the Amerasian Basin. Additionally, gridded single beam and multibeam echosounder data help define geologic boundaries. Mapped acoustic facies reveal the distribution of sediment types and associated processes in the region, such as extensively ice-scoured shelves; debris flows and fan deposits along continental margins; and drifts, bedforms, and deep-sea channel systems in the Canada abyssal plain. Here we present the acoustic facies used for classification and the current extent of mapped surficial units in the Amerasian Basin

The sedimentary cover structure of the East Siberian Shelf by the results of 3D gravity modelling

Savin V.A. and Piskarev A.L.

savinvasily@rambler.ru

The two 3D models of the Earth crust have been constructed covering the Laptev Sea and the eastern part of the East Siberian Sea. Factual data included the MCS data collected by expeditions BGR, MAGE, SMNG, DMNG and etc. in 1986-2016 (more than 150 lines). This made it possible to study in detail the structure of the sedimentary cover.

Based on modelling results the thickness map of the sedimentary cover has been detailed, the geometry of sedimentary sequences has been studied, the boundaries of sedimentary basins have been clarified and a scheme of the sedimentary cover has been drawn. A system of Late Mesozoic – Cenozoic continental rift, post-rift basins and individual Late Mesozoic synorogenic basins have been noted within the East Siberian Shelf.

Several stages of Late Mesozoic – Cenozoic rifting have been indicated in the sedimentary cover structure of the region. The following stages of sedimentation within the Laptev Sea are distinguished: Early – Late Cretaceous, Paleocene – Eocene, Oligocene – Early Miocene and Late Miocene – Quaternary. The Early Mesozoic (?), Early – Late Cretaceous, Paleocene – Eocene and Oligocene – Quaternary stages have been distinguished within the East Siberian Sea.

The stages of sedimentation correspond to the phases of formation the deep-water basins of the Arctic Ocean. Comparison of the phasing and zonality of rifting processes on the East Siberian Shelf indicates their close spatiotemporal connection with the processes taking place in the deep-water part of the Arctic Ocean..

Testing Contrasting Hypotheses for the Early Eocene Origin of North America's Pacific subarctic Margin—the Aleutian Subduction Zone and its backarc Aleutian Basin

David W. Scholl, R. J. Stern, G.A. Barth, D. Scheirer, M. Malkowski, & J.A. John

dscholl1934@gmail.com

INTRODUCTION: In the E. Eocene (50-55 Ma) major plate boundary reconfigurations occurred in the Arctic Basin and also in the subarctic north Pacific, e.g., the seaward shift of the convergent North American-Kula plate boundary from the Beringian continental margin (BCM) to the offshore Aleutian Subduction Zone (ASZ), arc (AA), and backarc Aleutian Basin (BAB). Two hypotheses have been proposed to explain this new plate-boundary arrangement:

1) A large sector ~0.5 x10^6 km^2) of Mesozoic oceanic plate accreted to the North American plate forcing the offshore creation of the ASZ, AA, and BAB.
2) The BAB formed in-place by backarc spreading behind a seaward migrating ASZ away from the BCM.

CONSTRAINING OBSERVATIONS:

1) The Eoc AIA is a westward extension of the Alaska Peninsula constructed of Permo-Triassic arc basement.
2) Paleomagnetic data attest that wrt Alaska the AA formed in place.
3) The ASZ is a western continuation of the Permo-Triassic Alaska SZ.
4) The BAB exhibits a prominent pattern of ~N-S-striking magnetic anomalies of unknown age trending ~normal to that of the ASZ.

HYPOTHESIS TESTING: IODP drilling has been proposed to test both premises by sampling ABB basement at the summits of sediment-buried seamounts. Basement and deepest sediment samples will determine edifice age, paleolatitude of formation, and formative setting. This information will determine if BAB basement is (1) an accreted sector of Mesozoic Pacific crust, or (2) Eocene crust formed by backarc spreading. These results will identify the tectonic setting that birthed the Aleutian SZ.

Seismostratigraphy and tectonics of Podvodnikov Basin and shelf of the East Siberian Sea

N. N. Zhukov, A. M. Nikishin, and E.I. Petrov

n.zhukov@ginras.com

New results of detailed study of deep-seated structure are presented for the Podvodnikov Basin. Interpretation of seismic lines in network over the East Siberian Sea is accepted to be a work basis. Two main stages of seismic complex formation—synrifting and postrifting—are distinguished in section of sedimentary cover. One phase of synrifting, whose boundary is traced at Aptian–Albian, has been established. The unconformity dated at Cretaceous–Paleogene in the East Siberian Basin is caused by two factors: completion of synrifting and superposition of deformations related to strike-slip shearing and compression.

The Podvodnikov Basin was formed in Aptian–Albian, being related to coeval onset of rifting, which is dated close to age of basalts from De Long plateau. An age of rifting–post-rifting is dated conditionally, as a boundary between Early and Late Cretaceous. Since the Late Cretaceous, the Podvodnikov Basin has gradually undergone a thermal post-rifting submergence. Clinoforms have been identified in postrifting sedimentary cover. The history of their formation may be preliminarily divided into three stages: (i) Paleocene–Eocene, whose sole serves as boundaries of (ii) Cretaceous–Paleogene unconformity; (iii) Eocene–Pliocene or Pliocene–Quaternary.

A strongly extended and flattened continental crust is suggested for the Podvodnikov Basin. This is followed from typical rift structures at the base of section. Rifts with such geometry and synrift sediments are typical for continental rifting.

The study was funded by RFBR - project 18-35-00133.

Arctic resources

Source rock geochemistry of Silurian black shales of the Eurasian Arctic

Olga K. Bogolepova & Alexander P. Gubanov

olga.bogolepova@ires.uu.se

The Silurian interval is characterised by the wide distribution of oil-prone rocks. Together, they generate ~9% of the world's petroleum reserves. These rocks are also an important source of unconventional oil and gas. However, despite their global importance there is still much basic information lacking in many parts of the world, nowhere more so than in Russia.

We provided data on the Silurian black shale distribution across the Eurasian Arctic Russia (11 regions, 28 formations) summarising their temporal and spatial distribution, as well as source rock potential (i.e. measured content of TOC).

Combined Rock-Eval and other geochemistry analyses on the Silurian samples reveal the presence of Silurian source rocks in Taimyr, Kotel'ny Island of the New Siberian Islands, northern East Siberia, northern Urals and Pai-Khoi. The most interesting targets are the Early Silurian "hot" shales of the northern East Siberia and the organic-rich shales of Severnaya Zemlya Archipelago. The occurrence of organic-rich shales in the Silurian of the northern Urals and Pai-Khoi provides an important insight into the Early Palaeozoic petroleum systems of the adjacent Timan-Pechora basin.

Mineral and gold potential of the Central sector of Russian Arctic

V.F. Proskurnin, A.V. Gavrish

Vasily_Proskurnin@vsegei.ru

The largest mineral deposits formed by the youngest tectonic Middle Mesozoic-Cenozoic cycle that divides the central Russian Arctic into mineral megaprovinces (MMP), provinces (MP), areas (MA), megazones (MMZ) and zones (MZ). These correspond to post-accretionary structural complexes and tectonic units (parts). In structure they are regional or structure-mineral provinces (SMP), which submit to tectono-mineral cycles or large geological stages. In the central Russian Arctic parts of the following largest MP are defined:

- Atlantic-Euroasian oceanic MP with Eurasic SMP potentially Cu-sulfide-bearing;
- Verkhoyano-Kolymsky fold belt (Late Cimmerian) with Khatanga-Laptev Sea Late Mesozoic-Cenozoic potentially oil-bearing SMP, Verkhoyanskaya Late Cimmerian gold-silver-polimetallic SMP;
- Arctic fold belt (Early Cimmerian) with middle Mesozoic-Cenozoic Barents Sea-North Kara, South Kara-Ust'eniseyskaya oil-bearing and Novaya Zemlya-Taimyro-Severnaya Zemlya placer gold-bearing SMP;
- Uralo-Mongolian (Hercynian) fold belt with West Siberian Early Mesozoic-Cenozoic oil and gas-bearing SMP;
- East Siberian platform with Cenozoic placer- and diamond-bearing Guly-Popigay SMP, Middle Mesozoic-Cenozoic oil and gas-bearing Khatanga-Viluy SMP, Riphean-Paleozoic oil and gas-bearing Lena-Tunguska SMP.

Indigenous gold contents of the central Russian Arctic is connected with mineralization MMZs of the Late Hercynian Kara MA and Late Cimmerian Byrranga MA which are parts of Arctic belt MP. Our predictive estimation of gold resources of these MAs is 2574 tones

The Holocene dynamic retreat of Petermann Glacier

Martin Jakobsson, Larry A. Mayer, Kelly A. Hogan, Alan Mix, Anne Jennings, Joe Stoner, Björn Eriksson, Kevin Jerram, Rezwan Mohammad, Christof Pearce, Brendan Reilly, & Christian Stranne

martin.jakobsson@geo.su.se

The Petermann 2015 Expedition with Swedish icebreaker Oden mapped ca 3100 km2 of the seafloor bathymetry and collected >6000 km of sub-bottom profiles in the Petermann Fjord and the adjacent Hall Basin of Nares Strait, northwest Greenland. The seafloor at the margin of one of the smaller outlet glaciers draining into the Petermann Fjord and selected shallow areas along the coast were in addition mapped using the small survey boat RV Skidbladner, equipped with a high-resolution shallow-water multibeam. Furthermore, 36 sediment cores and 46 CTD (Conductivity-Temperature-Depth) profiles were retrieved. The seafloor morphology in Petermann Fjord and the adjacent Hall Basin is dominated by an assemblage of remarkable, well preserved, submarine glacial landforms, which provides information about the Petermann Glacier's Holocene retreat. In this presentation the retreat dynamics based on the interpretation of the submarine glacial landforms will be presented and discussed. The landforms show that the seafloor geology played a major role in controlling where the glacier halted during its retreat from Hall Basin into Petermann Fjord. A large grounding-zone wedge demonstrates that the glacier stabilized at the entrance to fjord for a considerable time, perhaps for as long as 1100 years as indicated by nearby dated land records. The submarine landforms furthermore show that the final retreat from the fjord mouth was likely driven by marine ice cliff instability. The Holocene retreat is characterized by abrupt events driven by glacial dynamics rather than a steady retreat.

Environmental changes in the Arctic Ocean over the past 8 million years recorded in Fe-Mn oxide crusts from the Lomonosov Ridge flank.

Christian Knudsen, Paul Bierman, Robert Frei and Paul Knutz

ckn@geus.dk

A Fe-Mn oxide encrusted rock was dredged from the Eurasian flank of the Lomonosov Ridge at c. 3 km water depth in 2012. Be isotope dating show that the crust was precipitated from Arctic Ocean seawater over the past 8 million years and thus represents an archive of paleo-oceanographic and paleo-climatic changes.

The 15 cm thick oxide crust was subject to high-resolution geochemical microprobe analyses. In addition, 30 samples were analysed for their Sr, Pb, Nd and O isotopic composition as well as trace elements content. The crust is laminated with alternating FeMn oxides and laminae rich in clay minerals. The FeMn oxide composition varies from 50/50 to almost pure Fe oxide. Redox sensitive elements such as U, Th and Ce provides information on seawater oxygen fugacity, and a change to more oxygen-rich bottom water conditions from about 2 Ma is inferred from U/Th and Ce/La ratios.

The isotope data provides additional insight into seawater composition and paleo-oceanographic environment and of the deep Arctic Ocean. A decrease in εNd of -9,5 to -10 from 8 to ca. 4.5 Ma and a further shift over the last 2 Ma to a recent value of -11.5 is attributed to enhanced contributions from North Atlantic inflow. The increasing North Atlantic contribution from 2 Ma is also observed by a change in $^{206}Pb/^{204}Pb$ from c. 18.3 to 18.7. Earlier studies points to an opening of the Fram during Early Miocene, but our results suggest that the inflow of North Atlantic surface waters did not have a large impact on the composition of bottom waters in the Eurasian Basin before about 2 Ma.

Early Holocene iceberg and meltwater pulses from the eastern Laurentide Ice Sheet

Christof Pearce, Anne Jennings, John Andrews, James Williams, & Marit-Solveig Seidenkrantz

christof.pearce@geo.au.dk

The gradual demise of the Laurentide Ice Sheet during the last deglaciation was characterized by large-scale and abrupt glacial events along its eastern margin. During the early Holocene, several episodes of iceberg and meltwater release originated from glacial advances and retreats mostly from the Hudson Strait region. Evidence for these events are found in marine sediment cores from the Labrador Sea region as increased input of ice-rafted debris and detrital carbonate. These events are especially clear at sites proximal to Hudson Strait and downstream of the Labrador Current on the Labrador Shelf. We present signals for several early Holocene ice sheet instabilities from marine sediment cores. The layers were investigated using a multi-proxy approach consisting of high resolution X-ray fluorescence (XRF) core scans, grain size analysis, quantitative X-ray diffraction (XRD), and biomarker analysis. The presence of detrital carbonate was most clearly found from elevated calcium – strontium ratios based on XRF core scanning results and further confirmed by increased content of calcite and dolomite and an ancient biomarker composition. The widespread signature of these glacial events can be used for correlation of climate archives over a large geographic area. We propose that by detailed fingerprinting of the composition of these layers, they can be used as time-synchronous correlation tools, which may be used to infer past leads and lags in climatic and oceanographic variability as well as help to unravel unknown past marine radiocarbon reservoir ages in the Labrador Sea.