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Poster Abstracts

Title: Changing palaeoenvironment and bottom current history in the western Fram Strait – preliminary lithostratigraphic results

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Abstract:
Marine sediment cores are an invaluable tool for reconstructing past sedimentary environments and oceanographic conditions in the climate-sensitive Arctic region. This work focuses on multi-proxy analysis of a sediment gravity core recovered from 3393 m water depth at ca. 81° N in the western Fram Strait, offshore NE Greenland. The analyses include magnetic susceptibility, x-radiography, line scan imaging, grain size analysis, and x-ray fluorescence core scanning. The processes affecting marine sedimentation in the western Fram Strait are complex and influenced by changing conditions onshore Greenland and in the Arctic Ocean. This includes the growth and decay of the Greenland Ice Sheet; changes in the intensity of the East Greenland Current, which carries Arctic Water from the Arctic Ocean through the Fram Strait; as well as the Transpolar Drift, which results in the export of ice from the Arctic Ocean. Additionally, intermediate and bottom water masses also exchange water between the Arctic and Atlantic oceans through the Fram Strait.

The preliminary results from this core provide insights into variations in sedimentary processes and bottom-current activity, as well as the history of ice-rafted debris deposition offshore NE-Greenland through time. Establishing a chronology remains challenging; however, based on preliminary correlations with other dated sediment cores, this core contains sediments dating to at least MIS 8. Upcoming paleomagnetic data are expected to improve the age determination of the core. Within the core, cyclic changes in the sediments, including changes in colour, grain size, elemental composition, and magnetic susceptibility, suggest repeated changes in environmental conditions in MIS 7 and 6, and 4 and 3. Additionally, there are periods with increased deposition of ice-rafted material around 28 cal ka BP, MIS 5 and MIS 8, and there is evidence of higher energy sedimentation in the sediments older than MIS 8.

Title: Reconstructing early Holocene warmth in outer Isfjorden, Svalbard using stable isotope analysis on the ocean quahog, *Arctica islandica*

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Abstract:
The early Holocene, (11,700-8,200 years ago) is understood as a period marked by unusual warmth globally, including the Norwegian high arctic. Reconstructions of warmth from temperate bivalves in western Spitsbergen provide insights to the impact of intrusion of warm Atlantic Water with a pronounced warming effect in the Svalbard archipelago. Here, we use early Holocene bivalve *Arctica islandica* to reconstruct marine climate in outer Isfjorden, Svalbard's largest western fjord. Sub-fossil shells of *Arctica* were collected near Hollendarbukta and were sampled for shell carbonate and periostracum to gain an understanding of not only ocean temperature (oxygen isotopes in shell carbonate) but nitrogen (nitrogen isotopes in periostracum). Yearly growth bands of each clam were sampled for shell oxygen isotopes ($\delta^{18}O$) in the carbonate material, which can be used to estimate water temperature for the lifespan of the organism if the oxygen isotopic composition of the water is known or can be estimated. Additionally, the preserved organic periostracum layer on the surface of the shell was sampled for nitrogen isotopes ($\delta^{15}N$), which likely reflects diet and the isotopic composition nitrogen of the water column thus indicative of the water mass properties in the fjord. Shell carbonate stable isotope analysis reflected seasonal cycles in temperature and fluctuations of average temperature annually. Yearly temperature seasonality ranged from 6.2°C to 10.8°C. Early Holocene temperature reconstructions across all samples resulted in a maximum temperature of 8.8°C and a minimum of -1.5°C. Average temperature (across all samples) was 3.6°C. Periostracum analysis of one shell (9748 $\pm$ 116.5 cal yrs BP) indicated an average $\delta^{15}N$ value of 6.98‰. When compared to other bivalve records of $\delta^{15}N$ living in Atlantic vs. Arctic water masses, periostracum more closely resembled Atlantic water, pointing towards an Atlantic water influence in Isfjorden during the early Holocene.

Title: Ecological impact of human occupation in Skíðadalur in North Iceland: preliminary results.

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Abstract: Settlement patterns and processes, and changes in social structures and strata in medieval Iceland are currently being investigated by the interdisciplinary "Two Valleys" project. The investigation area comprises two valleys, Svarfaðardalur and Hörgárdalur in the Eyjafjörður area in northern Iceland at ~65°N. Land and access to, and exploitation of, resources are fundamental to this investigation. As part of the Two Valleys project we present preliminary results about the occupation history, land-use and environmental change associated with the farm Kot, in Skíðadalur within the investigation area. History and archaeology suggest that Kot was established by around AD 1100 in the inner, remote area of Skíðadalur. Kot is examined here as an example of a farm of a low social standing in the community of Svarfaðardalur. The main questions that will be addressed concern (A) the timing and nature of onset of human impact, (B) periodicities in habitation (e.g. as a result of plague) and (C) environmental change in a broader sense.

Sample profiles were collected from a peatland in close proximity to where the farm was located. The study utilizes palynology and soil proxies such as dry bulk density (BD), organic matter content (%OM); the data are placed into tephra-derived chronological framework.

Preliminary results are at hand. They suggest an ecological decline, represented mainly as *Betula* woodland retreat, following two major events. First, the initial settlement in the valley around AD 877 AD. The second after AD 1104, probably as a result of the settlement expansion into the marginal areas of the valley.

Title: Testing the enemy release hypothesis of non-native plants across time and space using herbarium specimens in Norway.

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Abstract:
The number of non-native plants becoming introduced to high latitude regions is increasing. Determining which factors contribute to their success is therefore important in understanding how these plants may respond in the future. A widely tested hypothesis is that enemy release, or movement of a plant outside the range of its natural enemies, is resulting in lower herbivory levels which may give non-native plants a competitive edge. However, few studies have looked into how enemy release may change over time or space. Over time, herbivores may shift hosts from native to introduced plants, or expand their ranges into regions where introduced plants have become invasive. Spatially, it is hypothesised that there are fewer biotic interactions as latitude increases which may reduce the competitive advantage non-native plants have at higher latitudes but would reduce herbivory as a limiting factor. In this study, we use herbarium specimens of native and closely-related introduced plant species spanning over a century and across a latitudinal transect in Norway, to assess how herbivory has changed across time and space and to determine whether herbivory levels differ between native and non-native plants. We found no change in herbivory over time, but there was significantly lower herbivory at higher latitudes. There was no difference between herbivory levels of native and non-native species. These results suggest that non-native plants were already recognised as a food source at the beginning of our sampling period. In addition, our sampled non-native plants are not benefitting from enemy release and are therefore unlikely to have a competitive advantage over native species in terms of herbivory. However, our results also show that non-native species are less limited by herbivores at higher latitudes which has implications for the success of non-native plants in Arctic regions.

Title: JAN MAYEN - Quaternary geological map

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Abstract:
The Geological Survey of Norway recently published a Quaternary geological map of Jan Mayen, scale 1:50 000. The map is made in accordance with procedures for mapping of surficial deposits and landforms on mainland Norway. As post-glacial volcanic rocks and sediments commonly occur on the island, these are also included in the map.

Jan Mayen is a volcanic island, remotely located in the Norwegian-Greenland Sea. The island is younger than 600.000 years, and volcanism is still active. A research project funded by the Research Council of Norway had as one of its goals, to study the glacial history of the island. This was largely unknown, and it was even disputed if the entire island had ever been glaciated. For this study, geo-referenced observations were needed from the ground over large parts of the island. Jan Mayen has gone through many volcanic eruptions in the Holocene which obscures and covers other surficial deposits. We therefore had to traverse the island by foot in the search for glaciogenic deposits between lava flows and volcanoclastic material, and to collect samples for dating. This resulted in many hundreds of ground observations that were combined with satellite images in an ArcGIS 10.6 project for further interpretations and delineation between different sediment and rock types.

Almost the entire island of Jan Mayen is a nature reserve. The map is an important contribution to the management of the reserve for which the County Governor of Nordland is responsible.

Printed map, Lysså, A., Larsen, E. & Hiksdal, A. 2022: JAN MAYEN, kvartærgeologisk kart M 1:50 000. Norges geologiske undersøkelse, can be ordered at distribusjonen@ngu.no
The map can also be downloaded as pdf at
https://www.ngu.no/.../Publikasjoner/Kart/JanMayen_KV50.pdf

Title: The Power of Multi-Matrix Monitoring in the Pan-Arctic Region: Plastics in Water and Sediment

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Abstract:
Assessing Arctic ecosystems for litter and plastic pollution is high on the agenda of the Arctic Council and Arctic Monitoring and Assessment Plan (AMAP) nations. Coordinated efforts by all parties will contribute to a combined knowledge of the distribution and fate of this global pollutant and aid in identifying where mitigation efforts should be focused. There are increasing reports of microplastics in the Arctic. Yet, efforts to track microplastics have been uncoordinated with little follow-up on the state of the ecosystem where they were initially found. Further, the data that is currently available is sporadic, collected with different methods and processed with different approaches, generating results that are not currently comparable across the Arctic region. Without comparable, harmonised baseline data across the Arctic region - collected from water bodies and sediment - it becomes far too complicated to compile the data required by policy and researchers to model the movement and consequences of plastic pollution. We have used the framework of the AMAP to illustrate how scientists, governments, and Arctic Peoples can work together to address microplastic pollution. Our focus is on linking efforts together to build an understanding of this pollutant from the local scale to the full breadth of the Arctic. To achieve this, it will be necessary to obtain data from more than one sample matrix. Quantifying microplastics in sediment and water from the same region will facilitate a three-dimensional picture of microplastics, not only as a snapshot in time, but as an ongoing process of pollution within the Arctic. We highlight the latest technical recommendations for monitoring microplastic pollution across the pan-Arctic and consider how the challenges of conducting research in the polar environment may be overcome.

Title: Evaluating past deep-water formation using 1D physical-biogeochemical model

Presenting Author: Musan, Israela[1]

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Abstract:
Deep-water formation, the sinking of cold and dense water from the surface to abyssal depth, profoundly influences the world's climate. It also affects the ocean's ability to sequester heat and carbon dioxide and supply nutrients supporting the ecological system. The importance of understanding deep-water formation, being part of the Meridional Overturning Circulation in the ocean, cannot be overstated. However, identifying where and when deep water formation takes place, the processes involved, and quantifying these processes have been among the most difficult challenges facing oceanographers for over a hundred years. One difficulty arises because deep water formation usually occurs in remote locations under harsh winter conditions making continuous, direct observation difficult and costly. We use a 1D physical-biogeochemical model that includes the different processes controlling the evolution of O_2, triple oxygen isotopes (TOI) of O_2 (a unique conservative tracer in the deep sea), and noble gases. The model enables us to evaluate the relative importance of different processes such as air-sea gas exchange, ocean stratification and marine gross production. At the International Arctic Workshop 2022 we will discuss model results and compare them to new observations of TOI in the deep Labrador Sea and across the abyssal North Atlantic.

T**itle:** A Quantitative Analysis of Seasonal and Regional Forcing on the Terminus of Store Glacier, Greenland, from High Resolution Photogrammetry

Presenting Author: Pearson, Hayden[1]

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Abstract:
Store Gletcher located in the Uummannaq district is the third largest outlet glacier in western Greenland with a catchment area of 1.988% of the Greenland Ice Sheet. Store Gletcher has a thick, interstitial proglacial mélange that forms in front of the calving face of the glacier for several months out of the year. Anthropogenic climate change has decreased Arctic sea ice area and as such has reduced the duration the proglacial mélange occupies the proglacial fjord. It is theorized that this proglacial mélange inhibits or alters the calving dynamics and flow regimes of tidewater glaciers. The reduction or possible loss of mélange could allow increased calving and contribute to draining the Greenland Ice Sheet at an accelerated rate. Here we show that the weakening of the proglacial mélange alters the calving dynamics across the terminus of Store Gletcher through the quantification of glacial velocity and strain. Due to the nature of marine terminating calving glaciers, UAV photogrammetry collected at a 0.4m ground sampling resolution during the 2014 field season was used in conjunction with ImGRAFT to look at glacial strain and velocity. This was then correlated with localized weather data collected for the corresponding time period. The results from this study highlight the importance and complications surrounding the modeling of Greenland tidewater glaciers. Store Glacier will continue to play an important role in quantification of calving dynamics across marine terminating glaciers in order to better understand the full impact that the Greenland Ice Sheet and marine terminating glacier discharge will have on future sea level rise globally.

Title: Revised marine reservoir offset (ΔR) values for molluscs and marine mammals for the archipelagos of Arctic North America and the Barents Sea

Presenting Author: Pieńkowski, Anna J.[1, 2]

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Abstract:
Using appropriate marine-terrestrial offset (ΔR) values when calibrating marine radiocarbon dates underpins accurate chronologies necessary for comparisons between environments, regions, and across different geochronological methods. However, ΔR values are strictly valid for the specific calibration curve that their calculation is based on. Here we present revised ΔR values for the Marine20 calibration curve from two Arctic-Atlantic ocean gateways, the Canadian Arctic Archipelago (CAA) and the Barents Sea. Our calculations are based on previously-published ^{14}C dates on pre-bomb live-collected marine molluscs and cetaceans, and bowhead whale-driftwood age comparisons from the same glacio-isostatically uplifted shorelines. For the CAA, molluscan-based ΔR are: Chukchi/Beaufort sea coasts, 265 ± 116 ^{14}C yrs; NW CAA, 188 ± 91 ^{14}C yrs; NE Baffin Island, 81 ± 18 ^{14}C yrs; SE Baffin Island, 14 ± 58 ^{14}C yrs; Hudson Strait, -73 ± 64 ^{14}C yrs; Ungava Bay, 0 ± 86 ^{14}C yrs; Foxe Basin, 175 ± 89 ^{14}C yrs; Hudson Bay, -21 ± 72 ^{14}C yrs; James Bay, 209 ± 114 ^{14}C yrs. Species-specific marine mammal ΔR terms are 108 ± 60 ^{14}C yrs for beluga and 9 ± 69 ^{14}C yrs for bowheads. For the Barents Sea, molluscan ΔR are: western Svalbard, -61 ± 37 ^{14}C yrs; Franz Josef Land, -277 ± 57 ^{14}C yrs; Novaya Zemlya, -156 ± 73 ^{14}C yrs; N Norway, -86 ± 39 ^{14}C yrs. Cetacean ΔR are: toothed whales, -161 ± 41 ^{14}C yrs; baleen whales, -158 ± 43 ^{14}C yrs; combined baleen-toothed whales, -160 ± 41^{14}C yrs. Our revised ΔR values are applicable for as long as those broad oceanographic conditions (circulation, ventilation) have persisted, i.e., through the Holocene. While molluscan values are applicable to other marine carbonate (e.g., foraminifera), cetacean ΔR are valid only for the species they were calculated for and should not be applied to other marine mammals.

Title: Environment Monitoring in a Warming Hydroclimatic Regime, Linnédalen, West Spitsbergen

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Abstract:
The ability to understand and predict ongoing and near-future rapid environmental changes in the rapidly warming high arctic is highly dependent on detailed long-term records of baseline environmental data. Long-term hydroclimate monitoring in Linnédalen, west Spitsbergen provides a baseline for understanding climate and environmental change in the rapidly warming 21st century climate regime in Svalbard.

The monitoring program in the watershed, which began in 2003, is an integral part of the Kapp Linné Environmental Observatory (KLEO) within the Svalbard Integrated Arctic Earth Observing System (SIOS). A network of instrumentation in Linnédalen documents changes in the glacial-fluvial-lake system and includes an automated weather station, snow depth and stream water temperature sensors, time-lapse cameras, and moorings deployed in Linnévatnet. Short-term hydrological measurements, glacier mass balance measurements and sediment transport studies in the rivers and lake are carried out in annual spring and summer field campaigns.

Linnébreen, the small valley glacier at the head of the valley, has thinned markedly and has retreated about 1.3 km since the Little Ice Age, over 600 meters of which since 2004.

Snowmelt in Linnédalen has steadily started and ended earlier in the spring season since 2003.

Stream flow duration in Linnéelva has increased steadily ranging from 79 days in 2005 to a maximum of 149 days in 2016. Peak river discharge has occurred during two main modes, the spring nival flood, and more recently in late summer or fall due to heavy late season rainfall.

Lake ice duration on Linnévatnet: Although the date of spring ice breakup may vary from year to year, since 2013, lake ice formation has occurred later, as late as late November or early December.

Peak Lake surface water temperature reached 10°C (Surface air temperature 20°C) in July 2020 and Linnévatnet remained thermally stratified for a 10-day period.

Title: Depositional Environments Recorded in 2013029-64PC, Northern Baffin Bay

Presenting Author: Roth, Wendy J.[1]

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Abstract:
Core 2013029-064PC has a lithofacies sequence that is thought to reflect the Last Glacial Maximum (LGM) to Late Holocene environments in Baffin Bay, including Baffin Bay Detrital Carbonate (BBDC) events 2, 1 and 0. The lithofacies sequence, mineralogy of the full core and foraminiferal assemblages of the upper 220 cm were described in recent research. The setting of the core is critical for understanding the environments of the LGM and last deglaciation on the northern Baffin Island shelf. The core site is at 875 m water depth between Lancaster Sound and Buchan Trough. Geophysical data have shown that the Lancaster Sound Ice Stream advanced over the site near to its junction with the Pond Ice Stream at the maximum ice extent of MIS-2. Grounding zone wedges of the Pond Ice Stream among other outlets on northern Baffin Island suggest that fringing ice shelves may have been present after initial retreat from the LGM ice margins. The 713 cm core begins with a dark gray-brown diamicton overlain by brown, rose, gray mud with high detrital dolomite content inferred to be BBDC 2. 'BBDC 2' is overlain by strongly laminated mud. Overlying the laminated mud are black to dark gray diamicton units that represent sediment supplied laterally by glaciers extended onto the NE Baffin Shelf prior to BBDC events 1 and 0. The tan detrital carbonate rich units of BBDC 1 and 0 reflect ice retreat into Lancaster Sound. We are testing the origins and ages of the lithofacies that underlye BBDC 1 and 0. In particular, using foraminifera, more detailed mineralogy and additional radiocarbon dating, we look in detail at the origin of the basal diamicton and overlying 'BBDC 2' and test the hypothesis that the laminated facies represents a fringing ice shelf environment of the Pond Ice Stream.

Title: Assessing the Contribution of Permafrost-Derived Organic Carbon in Arctic Alaska for the Last 40,000yrs Using Radiocarbon Age Offsets in Burial Lake Sediment Core

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Abstract:
Burial Lake, situated in northwestern arctic Alaska, is underlain by continuous permafrost and has recorded changes in climate for the last ~40,000 years. The location of Burial Lake in a climatically vulnerable region, the length of the continuous sediment record, and the abundance of existing proxy records allows for a unique opportunity to investigate permafrost mobilization in arctic Alaska spanning major climatic events from MIS 3 to present. Organic carbon (OC) is stored in permafrost for long periods of time. Therefore, radiocarbon ages of bulk sediment samples that contain permafrost-derived OC are expected to be older than the ages of macrofossils that represent the depositional age of the lake sediment. As a result, we interpret the downcore changes in radiocarbon age offsets between macrofossils and bulk sediment as variations in the amount of permafrost-derived OC being deposited in the lake. In Burial Lake, the radiocarbon age offset is narrowest during the Holocene, widest during the LGM, and narrow during MIS 3. Ramped pyrolysis-oxidation analysis performed on seven intervals downcore revealed two distinct pCO_2 thermogram patterns: (1) a single peak during the Holocene and MIS 3, (2) a lower main peak with a high temperature shoulder during and immediately preceding the LGM. The combination of the wide age offset and the high temperature shoulder of the pCO_2 thermogram likely indicates a greater input of permafrost-derived OC to the lake during MIS 2 compared to the Holocene and MIS 3. Low and fluctuating lake level and a poorly vegetated landscape associated with cold/arid conditions during MIS 2 likely promoted the erosion of permafrost soils into the lake. In contrast, warmer/wetter conditions during the Holocene promoted vegetation expansion and increased lake productivity, inhibiting erosion of permafrost and leading to the greater relative abundance of young OC in the lake sediment record.

Title: Holocene vegetation dynamics in central part of Nordenskiöld Land (Spitsbergen Island) inferred from pollen records

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Abstract:
Reconstruction of vegetation temporal changes at the regional level on Spitsbergen is complicated task. This is a consequence of the limited number of objects suitable for paleobotanical study, in particular, palynological research and mosaic structure of vegetation cover.

Strong indicators of local changes in the paleoenvironment are the presence in the sediments of fossil pollen or botanical remains of plants that do not currently grow in the study area. Nowadays a number of thermophilic species have a limited range on Spitsbergen Island, of which dwarf birch (Betula sect.Nanae) can be distinguished.

The four outcrops of alluvial sediments in Colesdalen, Gröndalen and Semmeldalen valleys and peat sequences in Colesdalen valley were studied during the last researches of the Russian Arctic expedition in the central part of Spitsbergen Island. The local differences in vegetation dynamics of Central Svalbard during the Holocene were revealed according to our and published pollen and radiocarbon data. The asynchrony of the vegetation cover changes was found.

The formation of peat strata started in the upper reaches of the Colesdalen valley during Early Holocene. The paleovegetation was represented by sedge-moss communities with patches of shrub-forbs tundra in drained areas of Colesdalen valley as well as in the middle of Reindalen valley. First, the shrub-sedge tundra developed and then it was followed by willow-sedge tundra in the middle Holocene in the Semmeldalen valley. At the same time, sedge and grassy moss tundra dominated in the Colesdalen and the Gröndalen valleys.

The dwarf birch was found in the most valleys of the Nordenskiöld Land during the Holocene thermal maximum. Formation of the peat sequences in the Colesdalen and the Reindalen valleys stopped in Late Holocene. The polar willow was spread but at the same time, dwarf birch disappeared in the vegetation covers of the Gröndalen and Semmeldalen valleys.

Title: Not Gone With The Wind: coastal lake sediments from southern tip of Svalbard track changes in Holocene storminess on human-relevant timescales

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Abstract:
The Arctic is the region characterized by one of most rapidly responses to climatic changes in the World. Higher and more frequent waves over increasingly open waters, combined with shifting winds, and melting permafrost result in an increase in coastal erosion. Our project aims to answer the question of how increased storminess will affect future Arctic coastlines.

To do so, we target coastal sediment archives, as they continuously record changes in storminess and coastal evolution through time. These include past windows into the future – such as the warmer-than-present Early Holocene.

Here we present a lake sediment record retrieved from Steinbruvatnet lake on Sørkappøya, at the southern tip of Svalbard. Exposed to the westerly winds, sheltered by a bedrock barrier, and without negligible isostatic rebound, this site is uniquely suited to reconstruct past changes in storminess. To do so, we track the wind-driven input using a multi-proxy approach that includes CT and XRF scanning, as well as laser-based granulometry. Preliminary ^{14}C ages derived from terrigenous plant remnants reveal that the investigated ~1m sediment core covers the entire Holocene. Also, the regular occurrence of mm-scale minerogenic event layers raise the possibility that this record resolves Holocene storminess on Svalbard on human-relevant timescales

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Title: Reconstructing past sea ice variability in northern Svalbard using coralline algae records

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Abstract:
Arctic sea ice extent and concentrations have declined significantly since the beginning of the satellite measurements in the late 1970s. Sea ice reconstructions provide a vital long-term perspective on these marked changes, needed for a better understanding of their implications for the regional and global climate. Recent studies demonstrated the high potential of long-lived crustose coralline algae *Clathromorphum compactum* as a multiproxy archive for reconstructions of Arctic climate and sea ice variability. It has been shown that growth rates and Mg/Ca ratios in algal thalli are dependent on the light availability and temperature at the shallow seafloor habitats, related to the duration of the seasonal sea-ice cover. By analyzing annual growth increments and geochemistry, precise calendar dating of algal thalli can be archived, enabling high-resolution reconstructions for up to several centuries in the past.

Here, we present the first results of a study of *C. compactum* specimens collected off the coast of northern Svalbard (80°28 N, 19°54E). This is a key location for reconstructions of Arctic sea-ice variability due to the oceanographic influence of warm Atlantic water via West Spitsbergen Current, which plays a major role in shaping ice conditions. The main aim of this study is to develop coralline algae growth and Mg/Ca records and evaluate their use for reconstructions of past sea-ice variability at the study site. Using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) and sclerochronological analysis, we examine the growth and trace element composition of three *C. compactum* specimens. The results yielded continuous records for up to 270 years (1741-2019 CE). We compare combined algal proxy record with observational data and analyze in the context of the sea-ice variability.

Title: Evaporation from the snow cover surface in Svalbard

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Abstract:
Since 2001 AARI has been conducting water balance investigation of the Gronfjord basin water objects. Since 2021 observations of evaporation from the snow cover surface have been introduced into the water balance investigation in order to make assess more precise.

Observational method is based on standards developed for water balance stations in 1987. Evaporation measurement site located near of meteorological station. Site contains two thermometers and two evaporators with an area of 500 cm^2, made of a material with thermal conductivity and heat capacity close to the snow cover. Snow samples in evaporators weighed twice a day. The snow cover surface temperature, air temperature and dew point temperature, as well as wind speed at a height of 10 meters are recorded together with the mass of the samples. In 2021, observations were carried out from April 21 to May 26. A total of 69 measurements were made, 42 were selected for further processing. About 30% of the measurements were rejected due to adverse weather conditions, damage of the samples by wild animals or measurement errors. To restore gaps in observations, evaporation values are calculated on the basis of experimentally obtained data and measured meteorological parameters. According to the results of observations, the average measured daily evaporation from the snow cover surface was 0.57 mm/day (minimum 0.05 mm/day, maximum 1.10 mm/day). The average calculated evaporation over the entire observation period was 0.54 mm/day (minimum 0.08 mm/day, maximum 1.74 mm/day). The measured value of evaporation makes it possible to estimate the amount of moisture evaporated from the watersheds of local rivers. Thus, in total during the observed period (36 days), 0.72×10^6 m^3 of 28.5×10^6 m^3 of water stored in the snow cover evaporated from the catchment area of the Grendalselva river (about 2.5%). In 2022, experimental evaporation measurements are continued.

Title: High resolution mapping of soil properties at the Canadian Beaufort Coast

Presenting Author: Wagner, Julia[1]

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Abstract:

A quarter of the land at the northern hemisphere is underlain by permafrost. The upper two meters of soil in permafrost regions contain 582 Pg soil organic carbon (SOC) which represents 26% of the global SOC pool. Because of increasing coastal erosion rates in the Arctic, and especially at the Canadian Beaufort Sea coast, this carbon could be rapidly released to the Arctic Ocean, leading to drastic impacts on the coastal ecosystem. Yet, little information exists on the exact amount of SOC stored in the soils of the Canadian Beaufort Sea coast.

To address this issue, we sampled two representative coastal catchments on the Yukon Coastal Plain, one of which was covered by the Laurentide ice sheet during the last glacial maximum (LGM) and one not, to investigate

(1) how much SOC and Nitrogen (N) are stored in the upper meter and whether the glacial history of the catchments implies differences on SOC/ N storage, (2) which parameters are relevant drivers of SOC/ N stocks distribution and (3) whether models can be transferred between sites to predict SOC stock distribution.

To answer these questions, we used machine learning digital soil mapping methods and included environmental data based on optical satellite imagery, radar satellite data, landcover data and a digital elevation model as input variables. We created maps of SOC and N stocks for the depth increments 0-5, 5-15, 15-30, 30-60 and 60-100 cm.

Preliminary results show that the largest difference between both areas concerns the depth 60-100cm. The catchment that was ice-covered during the LGM contains more ground ice and therefore SOC and N stocks are much lower in the depth increment 60-100 cm than in the catchment that used to be ice-free. An important index reflecting SOC and N stocks distribution in the upper soil of both areas is the normalized difference vegetation index (NDVI).

This work is part of the EU H2020 project "Nunataryuk".

Title: Hydroclimate Reconstruction from Proglacial Linnévatnet, Svalbard, Norwegian High Arctic

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Abstract:
In order to provide a historic context to today's climate change and to investigate how it presents itself in a sedimentary record, geochemical and geophysical properties from a 1,45 m long sediment core from proglacial lake Linnévatnet (Kapp Linné, western Spitsbergen) were analysed to derive Neoglacial climate changes. Structure of sedimentary laminations, µ-XRF and magnetic susceptibility analyses as well as loss on ignition (LOI) measurements allow conclusions on glacial activity which in turn can be used as a proxy for climate conditions. While high titanium content and LOI-values reflect increased glacial erosion during cold periods, magnetic susceptibility and the Fe/Ti ratio seem to be linked to warmer periods, possibly indicating increased meltwater discharge. Based on this assessment, four major climatic periods can be defined in the sediment core: a cold period extending from the deep end of the core (~200 CE) to around 950 CE, the Medieval Warm Period approximately between 950 CE and 1320 CE, the Little Ice Age between ~1320 CE and 1850 CE and the current era of climate change starting at ~1850 CE.

A second aim of this study was to identify a geochemical or physical signature that relates to periods of increased precipitation by indicating amplified erosion by run-off water in the catchment area. Although the influence of precipitation on the sediment record is not quantifiable, it seems likely that increased Ca-values of most recent years can be traced back to the eastern slopes of Linnévatnet, consisting mainly of limestone and gypsum bedrock. High Ca-values possibly indicate an increased influx of run-off water coming from the eastern side of the lake. The assessment is limited by a lack of independent precipitation reconstructions with which to compare the geochemical record of the sediment core, especially considering periods predating instrumental precipitation measurements which started in Svalbard in the 1900s.

Title: Sediment, sediment everywhere, but not enough on the beaches: Could regional exposure of coastal glacial deposits lead to sediment starvation, increased risk of erosion and poor climate change resilience.

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Abstract:
Recent fieldwork conducted at sites along the North Wales and northwest England coastlines has revealed that existing coastal geomorphology (inter-tidal ridge and trough morphology) appears to be moribund. After a year of monthly elevation surveys the position of the ridges and troughs has remained consistent. The presence of substantial fine sediments within the troughs persisted throughout the surveys becoming increasingly consolidated over the year. The provenance of the fine sediments is consistent with red clay winnowed from exposed inter-tidal glacial deposits elsewhere along the coast. It is suggested that the combination of the low energy tidal regime and the lack of seabed sand coverage has promoted the erosion of the glacial surface, the sediment from which, settling out into the troughs appears to decrease the cross-shore migration of the ridge and trough morphology.