



Open Call

Expedition GEOEO North of Greenland 2024

The Swedish Polar Research Secretariat open a call for research project onboard I/B Oden to North of Greenland in 2024.
Apply by 2 March, 2023.



**SWEDISH POLAR
RESEARCH SECRETARIAT**
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Apply for participation!

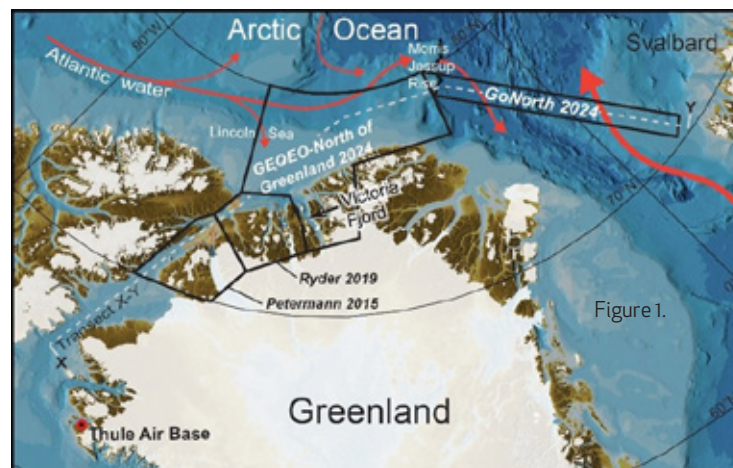
Researchers affiliated with a Swedish university or research institute are invited to apply for participation and space on board I/B Oden with their research projects during the expedition to North of Greenland 2024. The expedition forms a part of the theme GEOEO (North Greenland Earth-Ocean-Ecosystem Observatory), addressing scientific questions focused on understanding the marine cryosphere's dynamic history and response to future climate change, including implications for marine and terrestrial ecosystems in North Greenland and adjacent Arctic Ocean. GEOEO builds on the legacy of international research expeditions, projects and networks over the past decade, specifically the Petermann 2015 and Ryder 2019 expeditions with I/B Oden to North Greenland. The GEOEO - North of Greenland 2024 expedition will take place August-September 2024.



Geographical focus area

The GEOEO - North of Greenland 2024 expedition will build on the earlier efforts of Petermann 2015 and Ryder 2019 expedition and expand the geographic research area by targeting the unexplored Victoria Fjord, located east of Sherard Osborn Fjord, which was visited during the Ryder 2019 expedition (figure 1). The Lincoln Sea adjacent to Victoria Fjord is also part of the area of interest. The expedition will start from Thule and, ice conditions permitting, end by taking a route north of Greenland. Through collaboration with the Norwegian GoNorth project and their expedition 2024 with FF Kronprins Haakon, GEOEO aims to complete a synoptic transect (stippled line in map figure 1) extending from west of Svalbard, across the Fram Strait, to north-western Greenland. If the ice conditions do not permit a route north of Greenland, the expedition will instead end by returning to Thule.

Figure 1. Map of Northern Greenland and the Arctic Ocean. The expedition in 2024 aims to complete a synoptic transect, stippled line in map.





Research topics

The projects that will be accepted to take part in the GEOEO - North of Greenland 2024 expedition onboard I/B Oden shall contribute to one or several of the seven research goals (described below) defined in the GEOEO theme. It is also expected that accepted projects collaborate in order to maximize the field data collection, and that data are shared between groups. Moreover, accepted projects are expected to contribute to a synthesis report after the expedition. The GEOEO - North of Greenland 2024 expedition will be designed to acquire the field data required to reach the defined goals in the most efficient way.

Goal I): Unravelling the Late Glacial to Holocene history and dynamics of the North Greenland Ice Sheet (NGIS): As no marine field data exist, reconstructions of the NGIS in the Lincoln Sea area are largely based on extrapolating terrestrial information, except from the retreat history of Ryder Glacier which has been reconstructed based on data from the Ryder 2019 expedition. New information on the retreat dynamics, the role of ice shelves/tongues and retreat-pace from palaeo-records (glacial landforms, sediment cores etc) would add to our knowledge on how fast marine based ice sheets can retreat, a critical question considering the present climate warming, specifically to constrain numerical modelling predictions of future ice retreat. Goal I involves answering the following research questions: 1) Can we document patterns, sudden dynamic changes, and/or specific locations/times of stability during the NGIS's Late Glacial to Holocene retreat from the continental margin? 2) How and when did the presence/absence of floating ice tongues/ice shelves, sea-ice conditions and influx of warmer ocean water of Atlantic origin influence the NGIS's retreat pace and dynamics? 3) Did seafloor geology (bedrock and/or the shape of the submerged landscape) influence the NGIS's retreat dynamics? 4) Can we identify areas where marine ice-cliff instability may have caused rapid ice break-up?

Goal II): Providing new insight into the variability of the marine cryosphere of North Greenland and the adjacent Arctic Ocean: There are to-date no in-situ observations or paleo-records from the Lincoln Sea area north of approximately 82°30'. Answering questions on the variability of the marine cryosphere will provide critical knowledge for assessments of its future development, not only in North Greenland, but in some aspects for the entire Arctic Ocean as the region north of Greenland is hypothesized to be a sea-ice indicator for the entire Arctic Ocean. Goal II includes answering the following research questions: 1) When did the Arctic Ocean north of Greenland last experience sea-ice free summers? 2) Have past occurrences with sea-ice free summers in the northern Greenland realm been linked to a complete loss of Arctic Ocean's summer sea-ice cover? 3) Are sea-ice variations in northern Greenland during the Holocene linked to known climate forcings, e.g.



solar insolation and atmospheric greenhouse gases? 4) To what extent do variations of Atlantic water inflow to northern Greenland affect sea-ice conditions and the stability of ice tongues? 5) How fast could the summer sea ice and collapsed ice tongues recover if the climate is cooled? 6) Are there climatic thresholds beyond which the cryospheric retreat becomes irreversible? 7) What are the water mass structures and distributions of dissolved constituents (gases, nutrients, carbonate system, transient tracers) in this key gateway area for export of Arctic-derived water of both Atlantic, Pacific and riverine origin to the North Atlantic?

Goal III): Investigating the interaction between ecosystem community composition, anthropogenic dynamics and climate fluctuations: Planktonic and benthic organisms are commonly used to document the current state of Arctic marine biology; in the unexplored regions of North of Greenland such information is absent. In addition, genomic analyses may contribute with novel insights into temporal dynamics in marine biodiversity and how these are related to past changes in climate and sea-ice cover. On the terrestrial side, such analyses will enhance our knowledge of the extent to which pioneering human populations were affected by changes in terrestrial and marine biotic communities, especially prey population demography, in the context of Holocene climate fluctuations. Goal III includes answering the following research questions: 1) How is genomic biodiversity distributed throughout the marine water column of North Greenland? 2) To what extent are past changes in Holocene biodiversity correlated with inferred changes in temperature, sea-ice cover and ice shelf dynamics? 3) Do we find invasive subpolar species? Does presence-absence of DNA from organisms that depend on sea ice lend support to inferences of earlier periods of an ice-free Arctic Ocean? 4) To what extent is the arrival and disappearance of human cultures on Greenland correlated with past climate change, coastal sea ice changes, and/or prey species population dynamics?

Goal IV): Quantifying ecosystem production and nutrient state in changing marine ecosystems of North Greenland: Local and regional synoptic insights of the present and future Arctic marine carbon and nutrient cycles are central to achieving Goal IV. This can be realized through on-board continuous CO₂ and stable isotope water monitoring systems, CTD Rosette profiling for nutrients, microscopic and primary productivity measurements, and chemical and biological profiling of sediments and porewaters. Goal IV involve addressing the following critical questions regarding the present and future marine productivity of the unexplored marine realm of northern Greenland: 1) What is the coupling between meltwater plumes, Arctic Ocean circulation, warm water pools and biological productivity, export, and remineralization? 2) Who are the primary producers in these ecosystems? 3) What sustains the biological productivity in fjords and near shore areas– nutrient inflow



of Arctic Ocean water or subglacial runoff from land? 4) What were the biogeochemical changes over the past decades and what can they tell us about future ecosystem changes?

Goal V): Mapping of the remote ocean frontiers: There has been growing recognition that our limited knowledge of the seafloor shape and depth has a severe impact on our ability to model ocean circulation and global heat transport, understand sediment dynamics and glacial history, assess sea-level rise, predict tsunamis and storm surge, and manage critical benthic habitats. Goal V of the GEOEO program is to collect seafloor and sub-bottom mapping data during the GEOEO - North of Greenland 2024 expedition, which targets areas that to a large extent have never been mapped before and potentially may never be mapped again. Acquired data will directly be provided to the Seabed 2030 project, which assembles these data to freely available data compilations.

Goal VI): Mapping the presence of gas hydrates in marine sediments and gas in water column and atmosphere: The dynamic interactions between the marine hydrate reservoir and the global ocean and climate system is a vital component for understanding the carbon cycle on geologic time scales, ocean acidification, and future climate change. The sediments in the target area of the GEOEO - North of Greenland 2024 expedition could potentially store vast amounts of methane hydrates. Goal VI includes addressing the following scientific questions: 1) Are there gas hydrates in the sediments? 2) Are there signs of hydrate dissociation and seafloor methane release? 3) How sensitive are the hydrate deposits (if present) to climate warming?

Goal VII): Numerical modelling of the ice-ocean-atmosphere-geodynamic system: Estimates of the potential future contribution of global sea-level rise from the northern sector of the Greenland Ice Sheet under different climate scenarios, require numerical modelling of interactions between the atmosphere, ocean, cryosphere, and the solid earth. A specific goal of the GEOEO - North of Greenland 2024 expedition is to collect base data that can be used in numerical modelling to address the sea-level question, as well as several others that require modelling based on boundary conditions comprised from real geophysical, geodetic, geological and oceanographic data. Goal VII involves answering the following questions: 1) What is the potential contribution to global sea-level rise from the NGIS under IPCCs RCPs? 2) How sensitive is Glacial Isostatic Adjustment (GIA) to geophysical inferred variations in deeper crustal and upper mantle rheologies and how do these geodynamics affect ice dynamics and contribution to sea-level rise? 3) Which are the most critical feedback processes and environmental parameters (influx of warmer water, etc.) controlling the NGIS's future behaviour under the different climate scenarios RCP?





Prerequisites for projects onboard I/B Oden

All basic infrastructure onboard I/B Oden is provided and managed by the crew and by the staff of the Swedish Polar Research Secretariat (SPRS), such as i.e., winches, cranes, etc. Some sampling equipment can also be provided by SPRS, for example, CTD, laboratories, water inlet, gas etc. Specific measuring instruments and research equipment are the responsibility of the research projects and the handling onboard will be planned in close collaboration with SPRS. A prerequisite is that the proposed project logistically can be supported by SPRS and adaptable to other projects considering time and space onboard.

[Technical description of I/B Oden.](#)



Application

Submit the application form to office@polar.se. Please use the registration number 2023-22 in the subject line. The last day to apply is 2 March, 2023.

[Application form \(word file\)](#)

Requested documentation

- » Name, affiliation and contact details of the lead applicant of the project proposal.
- » Names (can be preliminary or listed as NN) and affiliations of other Swedish-based or international collaborating project team members.
- » Number of berths required onboard I/B Oden needed to execute the project. Indicate onboard sampling or observational tasks where the project relies on collaboration with other groups (e.g., CTD/Niskin, sediment sampling) and indicate how this may influence required number of onboard participants/berths.
- » A scientific project description, including the aim and objectives that also clarify where and how the onboard work tasks are intended to be performed. Clearly motivate the fit and relationship to the overarching theme of the GEOEO expedition (appendix 1).
- » CV and a list of publications for the lead applicant and any deputy/co-lead participant. In the publication list highlight up to ten selected publications that you find relevant for GEOEO. Also include the number of citations of each publication for these ten (appendix 2).
- » Documentation that proves that sufficient and relevant research funding has been granted / is available to the project group. It is understood that this can come from a variety of sources, including external grants from national research agencies in Sweden, EU or elsewhere. Given existing funding cycles, parts of this could be amended until 3 December 2023 (appendix 3).



According to Swedish law, the Swedish Polar Research Secretariat is bound by the principle of the Public Access to Information and Secrecy Act. Upon submission to the Secretariat, project proposals (including appendices) are thus considered general public documents. Consequently, the Swedish Polar Research Secretariat is obligated to disclose application documents if requested.



Assessment and selection

Submitted applications will be assessed according to the following criteria: scientific excellence, relevance to the research theme, feasibility on board I/B Oden and how the project describes the applicability to synthesis work. A research project can only be accepted if the project has received funding through research financiers who use peer-review in selection.



Contact

If you have any questions, please contact:

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