

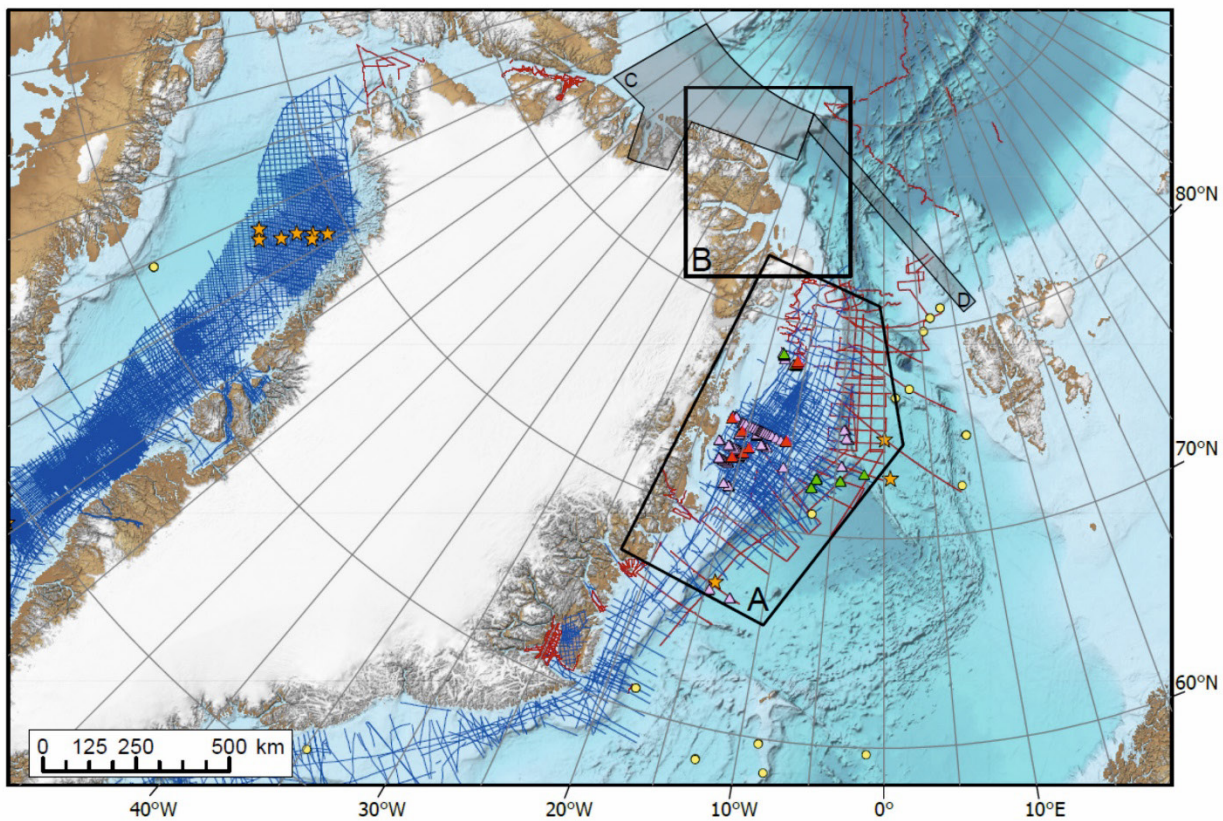
21-23 November 2022, Copenhagen, Denmark



NorthGreen

Northeast Greenland: Unlocking records from sea to land

Theodor Sorgenfrei auditorium
Geological Survey of Denmark and Greenland - GEUS
Øster Voldgade 10, Copenhagen (Denmark)



NorthGreen aims to develop MSP proposals with focus on Northeast Greenland margins (Areas A & B) and the surrounding Arctic Ocean.

NorthGreen organizing committee

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Northeast Greenland: Unlocking records from sea to land

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Summary

The projections of future scenarios under the current trend of global climate change demand a better understanding of the long-term ice-ocean-tectonic interactions, and in particular the potential meltwater contributions from modern ice sheets. The sensitivity of the Greenland ice sheet to polar amplification, changes in ocean heat transport and deteriorating perennial sea ice conditions makes the Northeast Greenland margin one of the most critical locations to understand the impact of future climate change on ice sheet instability and associated sea level rise. In addition, the development of oceanic gateways controlling the long-term water mass exchanges between the Arctic and Atlantic oceans, notably the Fram Strait and the Greenland-Scotland Ridge, have played a pivotal role for the Cenozoic evolution of the Northeast Greenland regions. In Northeast Greenland, ice-ocean-tectonic interactions and coupling between the ice sheet, the subsurface, the ocean, and sea ice are readily observable today, but geological records that can illuminate long-term trends are lacking. Consequently, **NorthGreen MagellanPlus workshop** was organised at the Geological Survey of Denmark and Greenland in collaboration with Aarhus (Denmark) and Stockholm (Sweden) universities in November 2022 (Fig. 1) to develop Mission Specific Platform (MSP) proposals on the Northeast Greenland margins under the umbrella of the European Consortium for Ocean Research Drilling (ECORD). For three days, seventy-one participants (56 in person + 15 online) discussed the key scientific questions and primary targets for scientific drilling in Northeast Greenland (Fig.2). Three pre-proposals were initiated during the workshop targeting Morris Jesup Rise, Northeast Greenland continental shelf, and Denmark Strait.



Figure 1: Participants in the NorthGreen MagellanPlus workshop, 23 November 2022.

Scientific scope and objectives

Rationale: The projections of future scenarios under the current trend of global climate change demand a better understanding of long-term ice-ocean-tectonic interactions¹. The largest uncertainties in future sea-level rise estimates concern the potential contributions from ice sheets in Greenland and Antarctica under a rapidly warming global climate^{1,2}. The Greenland ice sheet has been a major contributor to global sea-level rise in

recent decades³, and future projections show a marked increase in the ice sheet runoff during this century as a consequence of the polar amplification^{4,5}. In Northeast Greenland, coupling between the ice sheet, ocean and sea ice are readily observable today but geological records that can illuminate long-term trends are lacking.

Previous scientific drilling expeditions in the Arctic Ocean and northern North Atlantic have focused on sites far away from the Greenland margins, e.g., ODP 151, IODP 302 - ACEX, IODP 377. Similarly, active proposals and forthcoming expeditions, e.g., IODP 403, IODP 404, aim to provide primarily deep water records on the paleoceanography and tectonic evolution of the Fram Strait. In the context of previous and planned deep drilling missions, the Northeast Greenland margin represents a major knowledge gap in the Cenozoic climate-tectonic evolution. Key scientific questions relate to: (1) Sea ice history: e.g., when did a perennial sea ice cover develop in the Arctic Ocean and how often did sea ice free conditions occur? (2) Greenland ice sheet evolution: when did glaciation incur and how did the ice sheet evolve over Cenozoic time scales? Did past warm climates (super-interglacials) cause whole or partial deglaciation in Northern Greenland⁶? Or is glaciation of Northeast Greenland a relatively pervasive feature in the climate system⁷? (3) Fram Strait gateway: what is the timing and progression of the opening? What is the subsidence history of the conjugate Morris Jesup Rise and Yermak Plateau? How did the gateway opening influence the development of the Arctic Ocean, from isolated to fully ventilated^{8,9}?

Scope: Data required to illuminate these questions are potentially contained in the sedimentary successions offshore and onshore Northeast Greenland. However, the harsh environmental conditions have limited geophysical data acquisition needed to define drilling targets. Nevertheless, over the last two decades data collection has increased substantially. The Atlantic margin of Northeast Greenland (Area A) is now well covered by high-quality industry seismic data¹⁰ (Fig. 1). In addition, collection of shallow seismic data, gravity cores, and shallow industry boreholes demonstrates the possibility of mission specific platform (MSP) operations. Hence, sufficient data is available to start developing an MSP proposal in Area A. In contrast, the Arctic margin of Northeast Greenland (Area B) remains vastly unexplored. However, ice conditions have become more amenable in recent years, facilitating logistically feasible work as proved by a 2018 *Polarstern* expedition that collected deep seismic data north of Peary Land¹¹, and the scheduled GoNorth and GEOEO projects to sail in 2024 (Areas C and D, respectively). Thus, **NorthGreen MagellanPlus workshop** has constituted the kickoff of a long-term (10 years) research strategy of the Northeast Greenland margins.

Objectives: The key objectives of the **NorthGreen MagellanPlus workshop** were:

- 1) To discuss the potential development of coordinated International Ocean Discovery Program (IODP) MSP proposals in Northeast Greenland including both onshore and offshore operations, within short and long timeframes.
- 2) To define specific Cenozoic drilling targets based on existing data.
- 3) To identify the data gaps in key research areas, e.g., along shelf to fjord transects.
- 4) To establish collaborations among the wide scientific community integrating the results of past and forthcoming IODP expeditions around the Greenland margins, expanding the scientific network.

Programme

The workshop took place in the *Theodor Sorgenfrei* auditorium at GEUS in *Øster Voldgade 10*, Copenhagen on 21-23 November 2022. The workshop program included several scientific and technical talks (10 to 30 minutes long, see abstracts in Appendix A) delivered by international keynote speakers (Table 1). In addition,

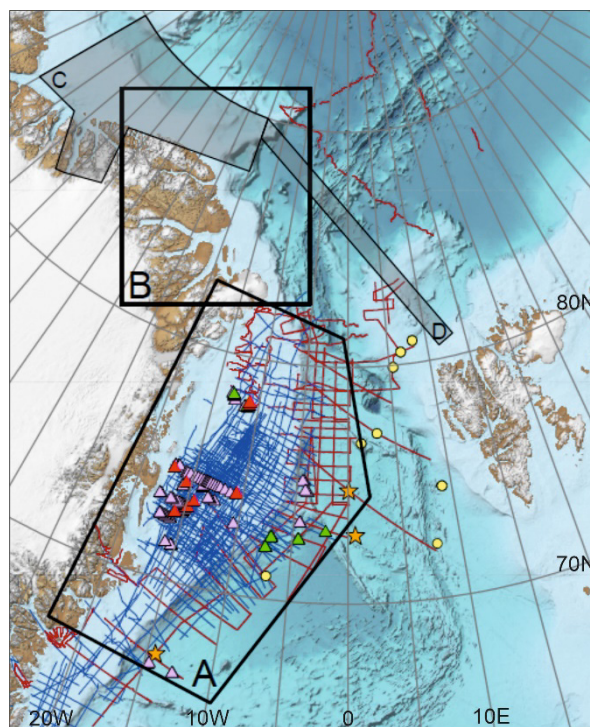


Figure 1: A and B - areas of interest of the NorthGreen MagellanPlus workshop; C and D - GEOEO and GoNorth 2024 plans; blue lines - seismic reflection data available at GEUS, red lines - other seismic reflection data available from data owners; yellow dots - existing DSDP and ODP drill sites; orange stars - proposed IODP drill sites with JRFB; red triangles - Kanumas 2008 cores; pink triangles - industry gravity cores; green triangles - industry dredges.

break-out sessions were organised to develop ideas to motivate new MSP proposals. Fifteen posters were available during coffee breaks for the duration of the workshop (Table 2).

Monday 21 November 2022	
9:00 Start of Day 1	
○	Welcome and outline [<i>Organizers</i>] (15 mins)
Scientific Drilling: Active proposals	
○	Summary of recent drilling and existing proposals relevant to Greenland margins and Arctic Ocean [<i>Organizers</i>] (15 mins)
○	The Opening of the Arctic-Atlantic Gateway: Tectonic, Oceanographic and Climatic Dynamics – IODP proposal 979/expedition 404 [<i>Keynote: W. Geissler</i>] (30 mins)
○	IODP 985Full, Eastern Fram Strait Palaeo-archive – FRAME [<i>Keynote: R. Lucchi</i>] (30 mins)
10:30-10:45 Coffee break	
MSPs and challenges of drilling on polar margins (x 20 mins)	
○	IODP Mission-Specific Platform Expeditions and Their Role in a Future Scientific Ocean Drilling Program [<i>Keynote: G. Uenzelmann-Neben & D. McInroy</i>]
○	Sensitivity of the West Antarctic Ice Sheet to +2°C (SWAIS 2C) [<i>Keynote: R. Levy</i>]
○	Drilling in the Amundsen Sea and results on West Antarctic paleoclimate and ice sheet history [<i>Keynote: K. Gohl</i>]
12:00-13:00 Lunch	
Current projects and proposals along the Northeast Greenland margins (x 20 mins)	
○	Project GreenDrill – Measuring cosmogenic-nuclides in sub-ice bedrock archives to constrain northern Greenland Ice Sheet size during interglacial periods [<i>Keynote: J. Briner</i>]
○	North Greenland Earth-Ocean-Ecosystem Observatory (GEOEO) [<i>Keynote: M. Jakobsson</i>]
○	GoNorth – Geosciences in the Northern Arctic [<i>Keynote: G. Sand (online)</i>]
○	Deglacial and Holocene changes in ocean conditions and interaction with the cryosphere: shallow seismic data and sediment records from NE Greenland [<i>Keynote: M. -S. Seidenkrantz</i>]
○	Morris Jesup Rise: Drilling the Arctic Ocean Exit Gateway [<i>Keynote: M. O'Regan</i>]
14:45-15:00 Coffee break	
State of the art (x 20 mins)	
○	Building deformable plate models for the Northeast Atlantic [<i>Keynote: G. Shephard</i>]
○	Cenozoic paleogeographic evolution of oceanic gateways to the Arctic Ocean: Implications for ocean circulation and climate [<i>Keynote: E. Straume</i>]
○	Geology of Northeast Greenland [<i>Keynote: M. Bjerager</i>]
○	Aspects of the Cenozoic depositional, tectonic, oceanographic and climatic development offshore NE Greenland [<i>Keynote: T. Nielsen & M. Fyhn</i>]
○	Informing future scientific drilling efforts in glaciated margins in support of Science Framework 2050 [<i>Keynote: S. Gulick (online)</i>]
General discussion: Open scientific questions and breakout session topics (50 mins)	
17:30 End of Day 1	
Reception/icebreaker - GEUS	

Tuesday 22 November 2022	
9:00 Start of Day 2	
○	Welcome to Day 2 and Summary of Day 1 [<i>Organizers</i>] (15 mins)
Breakout session 1: Potential for MSP coordinated proposals in Northeast Greenland	
10:30-10:45 Coffee break	
Breakout session 1	
12:00-13:00 Lunch	

Data availability and considerations (x 10 mins)
<ul style="list-style-type: none"> GreenFlux - Effect of climate change on greenhouse gas fluxes from marine Arctic regions [C. Böttner]
<ul style="list-style-type: none"> Crustal and sedimentary thicknesses from Receiver Function analysis – North Greenland [T. Dahl-Jensen]
<ul style="list-style-type: none"> SEGMENT-2017 & GREENMATE 2018 seismic surveys from NE Greenland and links to field work of CASE 20 [P. Klitzke]
<ul style="list-style-type: none"> AWI data: seismic and hydroacoustics [C. Gebhardt & W.H. Geissler]
<ul style="list-style-type: none"> LAMEX campaign [C. Gebhardt]
<ul style="list-style-type: none"> IODP proposal 962 [J. Stoner]
14:00-15:00 Coffee break and Posters
Breakout session 2: Potential for site survey studies and data acquisition
17:00 Summary of Day 2 and overview of proposed site surveys
17:30 End of Day 2
NorthGreen Dinner – Almanak at Opera House

Wednesday 23 November 2022
9:00 Start of Day 3
<ul style="list-style-type: none"> Welcome to Day 3 and Summary of Day 2 [Organizers] 15 mins
Core database and proxies (x 10 mins)
<ul style="list-style-type: none"> Pre-Holocene proxies for the northern high latitudes [K. Sliwiska]
<ul style="list-style-type: none"> Lipid and nucleic acid biomarkers as temperature, water cycle, and ecosystem proxies [E. Thomas]
<ul style="list-style-type: none"> Using paleomagnetism for high resolution stratigraphy [J. Stoner]
<ul style="list-style-type: none"> Petermann Project (OD15): the geomagnetic field in NorthGreen [J. Stoner]
<ul style="list-style-type: none"> The sedimentary imprint of the Greenland ice sheet on the NE Greenland continental shelf [D. Roberts]
10:15-10:30 Coffee break
Breakout session 3: Proposal work in groups and discussion
12:00-13:00 Lunch
13:00-14:00 Workshop synthesis and outcome [Organizers]
Breakout rooms available for continued discussion
16:00 End of Day 3

Table 1: Outline of the programme of the NorthGreen MagellanPlus workshop

Presenting author	Title
<i>Katrine J. Andresen</i>	Cyclic sedimentation patterns and mass transport deposition in Young Sound, NE Greenland
<i>Trine Dahl-Jensen</i>	Receiver functions in Greenland
<i>Joseph Stoner</i>	The last interglacial in Eirik Ridge (South Greenland): insights on deglacial processes
<i>Joseph Stoner</i>	BaD-Ex NSF in Baffin Bay
<i>Dieter Franke</i>	SEGMENT seismic survey (2017) - Northern East Greenland Volcanic Province
<i>Lutz Reinhardt</i>	NE-Greenland – fieldwork of expedition CASE 20 in relation to RV POLARSTERN seismic survey GREENMATE (2018)
<i>Kwangchul Jang</i>	Future KOPRI research plan on paleoceanographic studies at the Atlantic gateway to the Arctic Ocean
<i>Wolfram. H. Geissler</i>	The opening of the Fram Strait and its influence on sediment transport, climate and ocean circulation between the Arctic Ocean and the North Atlantic
<i>Thomas Funk</i>	Seismic refraction data from the northern continental margin of Greenland towards the Morris Jesup Rise
<i>Christian Schiffer</i>	Recent research activities and future proposals in the Arctic, Geophysics Section, Uppsala University
<i>Monica Winsborrow</i>	iC3- Centre for ice, Cryosphere, Carbon and Climate
<i>Paul Knutz</i>	KANUMAS records
<i>John Hopper</i>	Northeast Greenland data
<i>Sverre Planke</i>	IODP Expedition 396: Mid-Norwegian Margin Magmatism and Paleoclimate Implications
<i>Sverre Planke</i>	Seabed Sampling on the Northeast Greenland Margin EGS11, EGS12, EGS16

Table 2: Poster contributions to the NorthGreen MagellanPlus workshop.

Workshop outcomes and future plans

Attendance: **NorthGreen MagellanPlus workshop** was attended by a wide scientific community of marine scientists, paleoclimatologists as well as glaciologists interested in the past evolution of our planet. The coordination of MSP and International Continental Drilling Program (ICDP) land-to-sea proposals was highlighted, thus several land geologists also attended. The workshop included participants from 13 countries (Table 3) with a total of seventy-one participants, fifty-six of whom attended in person in Copenhagen, while fifteen more joined online. Fifteen of the participants were early career researchers. Thus, **NorthGreen** was a successful workshop gathering an international group of scientists of across different disciplines to discuss scientific objectives and hypotheses relevant for the Northeast Greenland margins and the adjoining ocean regions.

Future proposals: A key outcome of the workshop was that scientific drilling of the Northeast Greenland margins allows research within all seven of the strategic objectives of the *IODP 2050 Science Framework*¹². It was also highlighted that Northeast Greenland drilling will be crucial for the *Ground truthing Future Climate Change* flagship initiative. During the workshop relevant drilling areas with the potential to uncover the tectonic, oceanographic, and cryospheric history of Northeast Greenland and the Arctic Ocean were defined (Fig. 2). The most relevant topics discussed were related to the (i) Greenland ice sheet extension during past interglacial periods; (ii) Cenozoic key intervals as paleo-constraints in future projections; (iii) Climate and biosphere interactions; and (iv) Oceanic gateways: the Arctic Ocean – North Atlantic tectonic connections and its implications on the global thermohaline circulation. As main output of **NorthGreen**, the baseline towards three MST IODP proposals was established:

- 1) **Northeast Greenland continental shelf:** the main objective discussed is to investigate the onset of the Greenland glaciation and ice sheet history with a focus on its behavior during past warm periods. Additional objectives include understanding the paleoceanographic implications of Fram Strait opening on global thermohaline circulation and understanding of the evolution of the Northeast Greenland ice stream (Area A, Fig. 1). Discussion on further possibilities for onshore scientific drilling in correlation with the offshore initiatives have been initiated. Several onshore projects lead by workshop participants have been highlighted as an initial step towards land-to-sea connections in Northeast Greenland, both in a short term and long-term perspective.
- 2) **Denmark Strait Gateway:** focusing on palaeoceanography and tectonics, this proposal envisages to obtain a continuous record of the overflow water fluctuations across the Denmark Strait and clarify the earliest spreading history of the southern Kolbeinsey Ridge. A key objective is to investigate whether climate or tectonics is the main control factor of the Denmark Strait overflow water. Proposals for additional site survey data are under development to fill some data gaps in critical areas.
- 3) **Morris Jesup Rise:** this proposal has two broad objectives: a) the sea ice history of the Arctic Ocean as well as the North Greenland ice sheet development (Area B, Fig. 1); and b) the improvement of plate tectonic models of Arctic Ocean development, specifically the movement and dynamics of the Greenland microplate. This will include investigating the history of volcanic activity at Morris Jesup Rise and Yermak Plateau, defining the subsidence history of these features and how they impacted oceanic exchange with the Atlantic Ocean. A pre-proposal on the Morris Jesup Rise was submitted in 2009 and received favorable reviews by the science evaluation panel of IODP. However, lack of site survey data has made it difficult to fully develop a proposal. Thus, the workshop has served to promote the expansion of this previous proposal and has identified potential synergies between planned Swedish, German and Norwegian icebreaker expeditions (e.g., GoNorth and GEOEO expeditions in 2024) to the region to help collect additional site survey information.

Outreach and dissemination: The daily activities and outputs of **NorthGreen MagellanPlus workshop** were broadly disseminated on different social media platforms under #NorthGreen (e.g., Twitter, LinkedIn, Facebook). In addition, the workshop initiative was presented in the partner MagellanPlus workshop *SVALCLIME*. The main outcomes of **NorthGreen** have been discussed at the ECORD J-DESC workshop

Country	Nr. participants
Denmark	21
Germany	13
US	8
Norway	5
UK	6
Sweden	6
Canada	4
Korea	3
Ireland	1
Italy	1
New Zealand	1
Poland	1
The Netherlands	1
Total	71

Table 3: Number of participants by country. Note that 59 participants come from ECORD countries.

Future of Scientific Drilling with Mission-Specific Platforms and Chikyū. The mentioned MST proposals will be further promoted at the *Greenland Ice Sheet Stability* workshop in Bergen, Norway, and the *General Assembly 2023* of the European Geosciences Union (EGU23) in Vienna, Austria.

List of participants

The list of participants in **NorthGreen MagellanPlus workshop** is included below (Table 4) considering organizing committee, keynote speakers, in-person and online participants, and highlighting early career researchers (*).

Participant name	Institution	Country	Email	Attendance
Allison Cluett	Buffalo University	US	Allison.Cluett@nau.edu	Participant
Anne de Vernal	Université du Québec à Montréal	Canada	devernal.anne@uqam.ca	Participant online
Antonia Ruppel	BGR	Germany	antonia.ruppel@bgr.de	Participant
Bernard Coakley	University of Alaska	US	bjcoakley@alaska.edu	Participant
Camilla Snowman Andresen	GEUS	Denmark	csa@geus.dk	Participant
Catalina Gebhardt	AWI	Germany	catalina.gebhardt@awi.de	Participant
Christian Schiffer	Uppsala University	Sweden	christian.schiffer@geo.uu.se	Participant *
Christian Tegner	Aarhus University	Denmark	christian.tegner@geo.au.dk	Participant
Christoph Böttner	Kiel University	Germany	christoph.boettner@ifg.uni-kiel.de	Participant *
Colm O'Coifagh	Durham University	UK	colm.ocofaigh@durham.ac.uk	Participant
Cornelia Spiegel-Behnke	University of Bremen	Germany	cornelia.spiegel@uni-bremen.de	Participant
Dave McInroy	BGS	UK	dbm@bgs.ac.uk	Keynote online
Dave Roberts	Durham University	UK	d.h.roberts@durham.ac.uk	Participant
Dieter Franke	BGR	Germany	Dieter.Franke@bgr.de	Participant online
Drew Christ	University of Vermont	US	Andrew.Christ@uvm.edu	Participant *
Eivind O. Straume	University of Texas	US	eivind.straume@jsg.utexas.edu	Keynote *
Elizabeth Thomas	Buffalo University	US	ekthomas@buffalo.edu	Participant
Emilie R. Bennedsen	GEUS/KU	Denmark	xfz288@alumni.ku.dk	Participant
Gabriele Uenzelmann-Neben	AWI	Germany	gabriele.uenzelmann-neben@awi.de	Keynote
Grace Shephard	University of Oslo	Norway	grace.shephard@geo.uio.no	Keynote *
Gregers Dam	GEUS	Denmark	gda@geus.dk	Participant
Guillaume St-Onge	Institut des sciences de la mer de Rimouski	Canada	guillaume_st-onge@uqar.ca	Participant online
Gunnar Sand	SINTEF	Norway	gunnar.sand@sintef.no	Keynote online
Henk Brinkhuis	Utrecht University	The Netherlands	henk.brinkhuis@nioz.nl	Participant online
James Barnett	Stockholm University	Sweden	jamie.barnett@geo.su.se	Participant online*
Jason Briner	Buffalo University	US	jbriner@buffalo.edu	Keynote
Jeremy Lloyd	Durham University	UK	j.m.lloyd@durham.ac.uk	Participant online
John Hopper	GEUS	Denmark	jrh@geus.dk	Organiser
Joseph Stoner	Oregon State University	US	joe.stoner@oregonstate.edu	Participant
Jung-Hyun Kim	KOPRI	Korea	jhkim123@kopri.re.kr	Participant
Karsten Gohl	AWI	Germany	karsten.gohl@awi.de	Keynote
Kasia Sliwinska	GEUS	Denmark	kksl@geus.dk	Participant
Katrin Meier	University of Bremen	Germany	k.meier@uni-bremen.de	Participant online*
Katrine Juul Andresen	Aarhus University	Denmark	katrine.andresen@geo.au.dk	Participant
Kelly Hogan	BAS	UK	kelgan@bas.ac.uk	Participant

Kwangchul Jang	KOPRI	Korea	kjang@kopri.re.kr	Participant
Lara F. Pérez	GEUS	Denmark	lfp@geus.dk	Organiser *
Lis Allaart	GEUS	Denmark	lisal@geus.dk	Participant *
Lutz Reinhardt	BGR	Germany	lutz.reinhardt@bgr.de	Participant
Maciej Jez	Institute of Geological Sciences, Polish Academy of Sciences	Poland	maciek.lim@gmail.com	Participant *
Madeleine Larissa Vickers	University of Oslo	Norway	m.l.vickers@geo.uio.no	Participant online
Marit-Solveig Seidenkrantz	Aarhus University	Denmark	mss@geo.au.dk	Organiser/Keynote
Martin Jakobsson	Stockholm University	Sweden	martin.jakobsson@geo.su.se	Keynote
Mary-Lynn Dickson	RNCanada	Canada	mary-lynn.dickson@NRCan-RNCan.gc.ca	Participant
Matthew O'Regan	Stockholm University	Sweden	matthew.oregan@geo.su.se	Organiser/Keynote
Michael Bryld Wessel Fyhn	GEUS	Denmark	mbwf@geus.dk	Keynote
Monica Winsborrow	UiT – The Arctic University of Norway	Norway	monica.winsborrow@uit.no	Participant
Morten Bjerager	GEUS	Denmark	mbj@geus.dk	Keynote
Naima El bani Altuna	UiT – The Arctic University of Norway	Norway	naima.elbani.altuna@uit.no	Participant *
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Paul Knutz	GEUS	Denmark	pkn@geus.dk	Organiser
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Rebecca Pickering	Lund University	Sweden	rebecca.pickering@geol.lu.se	Participant *
Renata Giulia Lucchi	OGS	Italy	rglucchi@ogs.it	Keynote
Richard Levy	GNS Science	New Zealand	R.Levy@gns.cri.nz	Keynote
Sarah Benetti	Ulster University	Ireland	s.benetti@ulster.ac.uk	Participant
Sean Gulick	Texas A&M	US	sean@ig.utexas.edu	Keynote online
Seung-II Nam	KOPRI	Korea	sinam@kopri.re.kr	Participant
Sofia Ribeiro	GEUS	Denmark	sri@geus.dk	Participant
Stephen Grasby	Geological Survey of Canada	Canada	steve.grasby@NRCan-RNCan.gc.ca	Participant
Stephen Jones	University of Birmingham	UK	s.jones.4@bham.ac.uk	Participant
Sverre Planke	VBPR	Norway	planke@vbpr.no	Participant
Thomas Funk	GEUS	Denmark	tf@geus.dk	Participant
Thorsten Nagel	Aarhus University	Denmark	thorsten.nagel@geo.au.dk	Participant
Tove Nielsen	GEUS	Denmark	tni@geus.dk	Keynote
Trine Dahl-Jensen	GEUS	Denmark	tdj@geus.dk	Participant
Vivi Kathrine Pedersen	Aarhus University	Denmark	vkp@geo.au.dk	Participant *
Wei-Li Hong	Stockholm University	Sweden	wei-li.hong@geo.su.se	Participant online
Wolfram Geissler	AWI	Germany	Wolfram.Geissler@awi.de	Keynote

Table 4: The list of participants in NorthGreen MagellanPlus workshop considering organizing committee, keynote speakers, in-person and online participants, and highlighting early career researchers (*). AiU: The Arctic University of Norway; AWI: Alfred Wegener Institute; GEUS: Geological Survey of Denmark and Greenland; NOC: National Oceanographic Center; OGS: National Institute of Oceanography and Applied Geophysics.

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