

NOTIFICATION OF PROPOSED RESEARCH CRUISE

PART A: GENERAL

1. NAME OF RESEARCH SHIP CRUISE NO. NA
Ocean glider observations in the Nordic Seas
2. DATES OF CRUISE From: 2023-12-01 To: 2026-10-01
3. OPERATING AUTHORITY:
Geophysical Institute, University of Bergen
P.O.Box 7803, 5020 Bergen, Norway
TELEPHONE: +47-55582600, E-MAIL: post@gf.uib.no
4. OWNER
(if different from no. 3)
5. PARTICULARS OF SHIP:
Name: Autonomous ocean gliders
Nationality: Norwegian
Overall length: 2 meters
Maximum draught: NA
Net tonnage: 50 kg
Propulsion: Buoyancy driven
Call sign: Seagliders, Slocum gliders
Registration port and number (if registered fishing vessel): NA
6. CREW Name of master: NA. Autonomous platform, piloted remotely
Number of crew: 0
7. SCIENTIFIC PERSONNEL
Name and address of scientist in charge: Kjetil Våge
Geophysical Institute, University of Bergen
P.O.Box 7803, N-5020 Bergen, Norway
E-MAIL: kjetil.vage@uib.no
No. of scientists: 0
8. GEOGRAPHICAL AREA IN WHICH SHIP WILL OPERATE (with reference to latitude and longitude)
The area of operations is the Greenland, Iceland, and Norwegian Seas (collectively referred to as the Nordic Seas), north of 68°N and south of 79°N, between 22°W and 10°E. The operations will be focused along repeat transects from the Greenland slope into the interior basins near 71°N, 75°N, and 78°N. Please see the attached chart at the end of the document.
9. BRIEF DESCRIPTION OF PURPOSE OF CRUISE
Autonomous underwater gliders will measure environmental conditions in the upper 1000 m of the Greenland, Iceland, and Norwegian Seas. The main objective is to better understand spatial and temporal changes in water mass transformation and circulation in the Nordic Seas.
10. DATES AND NAMES OF INTENDED PORTS OF CALL
The autonomous gliders will primarily be deployed and recovered on research cruises in Norwegian waters and each have mission durations of up to 12 months. Local research vessels and charters, such as RV Bjarni Sæmundsson from Iceland, may be used for emergency recoveries.
11. ANY SPECIAL REQUIREMENTS AT PORTS OF CALL
These sustained measurements will be collected in collaboration with partners in Iceland (Dr. Andreas Macrander, andreas.macrander@hafogvatn.is) and Greenland (Dr. John Mortensen, jomo@natur.gl). Local logistics (charters, research vessels, etc.) will be coordinated with our partners.

NOTIFICATION OF PROPOSED RESEARCH CRUISE

PART B: DETAIL

1. NAME OF RESEARCH SHIP CRUISE NO. NA

Autonomous observations in the Nordic Seas

2. DATES OF CRUISE From: 2023-12-01 To: 2026-10-01

3. a) PURPOSE OF RESEARCH

The autonomous gliders will measure environmental conditions in the Nordic Seas over long periods of time (months to years). The data will help us better understand spatial and temporal changes in water mass transformation and circulation in the Nordic Seas. The field program is linked to two projects (detailed below in Section B8a): (i) the Norwegian node for the European Multidisciplinary Seafloor and water column Observatory whose purpose is to monitor the deep ocean to gain a better understanding of its role in the broader Earth system, and (ii) the Resilient northern overturning in a warming climate project whose objective is to better understand how the overturning in the Nordic Seas may respond to climate change.

b) GENERAL OPERATIONAL METHODS (including full description of any fish gear, trawl type, mesh size, etc.)

Autonomous underwater gliders will measure water column temperature and salinity (and some gliders dissolved oxygen) in the upper 1000 m over prolonged periods (each glider mission may last 10-12 months) and at times (e.g., winter) that are difficult to replicate with research ships. The gliders are not equipped with acoustic sensors and no bathymetric mapping will be conducted. For navigation and piloting purposes, an altimeter is turned on near the bottom 100 m when the water depth is shallower than 1000 m, to avoid hitting the seafloor.

4. ATTACH CHART showing (on an appropriate scale) the geographical area of intended work, positions of intended stations, tracks of survey lines, positions of moored/seabed equipment, areas to be fished

A chart showing the planned area of operations and intended locations of repeat transect is included at the end of the document.

5. a) TYPES OF SAMPLES REQUIRED (e.g., geological/water/plankton/fish/radionuclide).

No samples will be collected.

b) METHODS OF OBTAINING SAMPLES (e.g., dredging/coring/drilling/fishing, etc. When using fishing gear, indicate fish stocks being worked, quantity of each species required, and quantity of fish to be retained on board).

NA

6. DETAILS OF MOORED EQUIPMENT

No moorings will be deployed

Dates

<u>Recovery</u>	<u>Description</u>	<u>Depth</u>	<u>Latitude</u>	<u>Longitude</u>
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7. ANY HAZARDOUS MATERIALS (chemicals/explosives/gases/radioactives, etc. (Use separate sheet if necessary)

No explosives or hazardous materials will be used.

a) Type and trade name

b) Chemical content (and formula)

c) IMO IMDG code (reference and UN no.)

d) Quantity and method of storage on board

e) If explosives give date(s) of detonation

- Method of detonation
- Position of detonation
- Frequency of detonation
- Depth of detonation
- Size of explosive charge in kg.

8. DETAIL AND REFERENCE OF

a) Any relevant previous/future cruises

Autonomous underwater gliders have been operated in the Nordic Seas through the Norwegian national facility for ocean gliders (<https://norgliders.gfi.uib.no>), in particular through the Norwegian node for the European Multidisciplinary Seafloor and water column Observatory (<https://www.uib.no/en/noremso>). The gliders measure environmental conditions in the Nordic Seas from difficult to reach regions and times. The observations are ingested into numerical weather prediction models and are critical to understand changes in water mass transformation and circulation in the Nordic Seas. The autonomous underwater gliders will also support a 2-year field program focusing on the East Greenland Current along the Greenland slope (<https://www.uib.no/fg/fysos/164420/rover>) that will commence in summer 2024 (applications for clearance will be submitted as soon as the cruise dates are finalized).

b) Any previously published research data relating to the proposed cruise

A research paper utilizing glider data from this region that documents long-term changes in water mass transformation that have taken place in the Iceland Sea and motivates further investigations was published last year:

Våge K., S. Semper, S. Jónsson, H. Valdimarsson, R.S. Pickart, and G.W.K. Moore, 2022: Water mass transformation in the Iceland Sea: Contrasting two winters separated by four decades. Deep Sea Research I, 186, <https://doi.org/10.1016/j.dsr.2022.103824>

The glider data used in the Våge et al. (2022) paper were made publicly available in 2018: <https://doi.pangaea.de/10.1594/PANGAEA.884339>

9. NAME AND ADDRESSES OF SCIENTISTS OF THE COASTAL STATE(S) IN WHOSE WATERS THE PROPOSED CRUISE TAKES PLACE WITH WHOM PREVIOUS CONTACT HAS BEEN MADE

Iceland: Dr. Andreas Macrander, Marine and Freshwater Research Institute, andreas.macrander@hafogvatn.is
Greenland: Dr. John Mortensen, Greenland Institute of Natural Resources, jomo@natur.gl

10. STATE

a) Whether visits to the ship in port by scientists of the coastal state concerned will be acceptable (Yes/No)

Yes

b) Participation of an observer from the coastal state for any part of the cruise together with the dates and the ports for embarkation and disembarkation

Yes. Deployments and recoveries will generally be from Norwegian research ships. Emergency recoveries may be organized from the nearest coastal state.

c) When research data from the intended cruise is likely to be made available to the coastal state and by what means

The data will be submitted to international databases, both raw data in real time and quality-controlled, calibrated delayed-mode data after the glider missions have been completed. The data will be publicly available and can be accessed by anyone.

PART C. SCIENTIFIC EQUIPMENT

Complete the following table

Coastal state: Greenland

Port call: None

Dates: NA

Indicate "YES or "NO"

				Distance from coast		
<u>List scientific work by function</u> e.g. Magnetometry Gravity Diving Seismics Seabed sampling Bathymetry Trawling Echo sounding Water sampling U/W TV Moored instr. Towed instr.	Water column including sediment sampling of the seabed	Fisheries research within fishing limits	Research concerning the natural resources of the continental shelf or its physical characteristics	Within 4 nm	Between 4-12 nm	Between 12 and 200 nm
Profiles of temperature, salinity, and oxygen from long-endurance underwater gliders	Yes (but no samples, all measurements are sensor-based)	No	No	No	No	Yes

Kjetil Våge
 Kjetil Våge (Principal Scientist)

Date: 29 September 2023

NB. IF ANY DETAILS ARE MATERIALLY CHANGED REGARDING DATES/AREA OF OPERATION AFTER THIS FORM HAS BEEN SUBMITTED, THE COASTAL STATE AUTHORITIES MUST BE NOTIFIED IMMEDIATELY.

PART C. SCIENTIFIC EQUIPMENT

Complete the following table

Coastal state: Iceland

Port call: None

Dates: NA

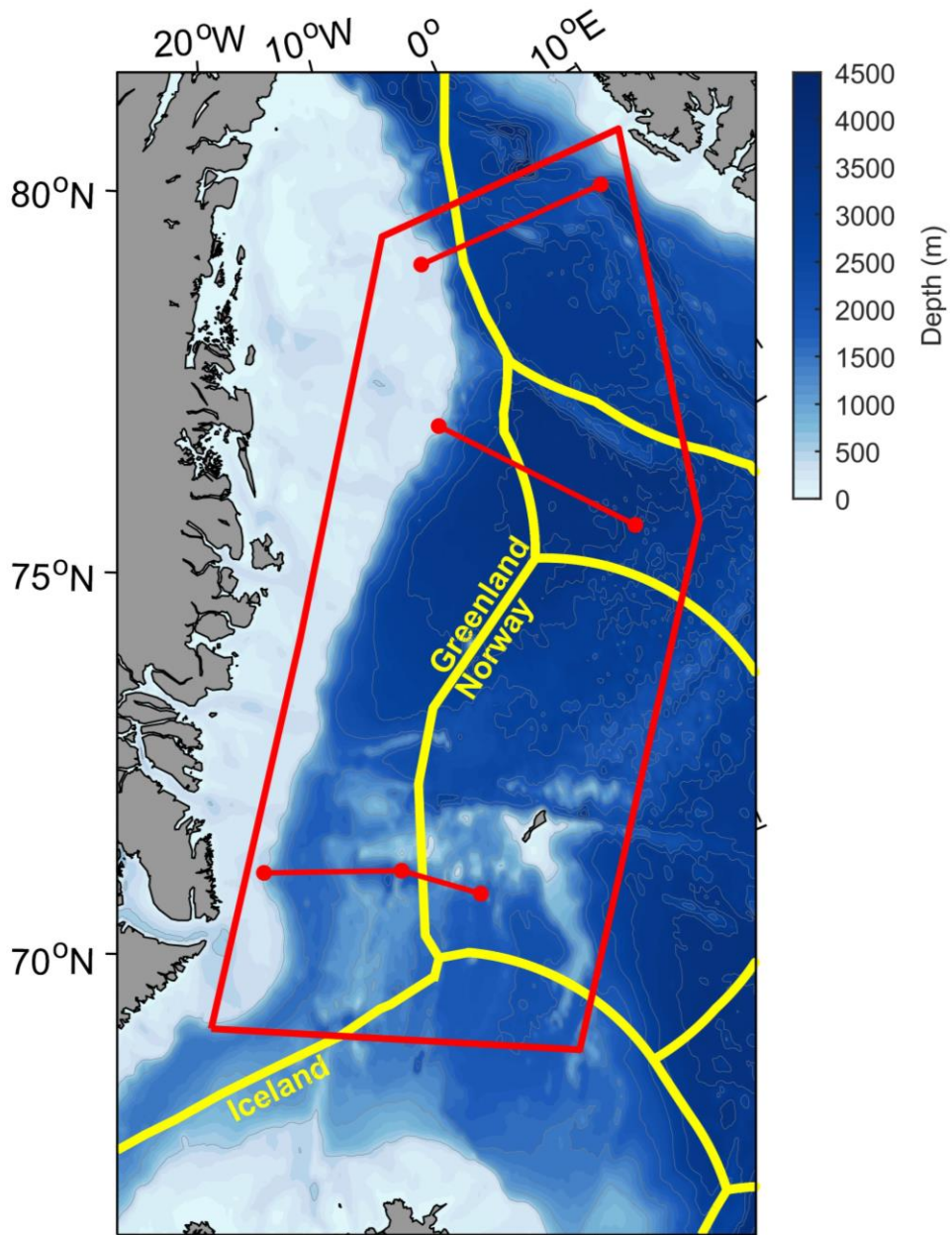
Indicate "YES or "NO"

				Distance from coast		
<u>List scientific work by function</u> e.g. Magnetometry Gravity Diving Seismics Seabed sampling Bathymetry Trawling Echo sounding Water sampling U/W TV Moored instr. Towed instr.	Water column including sediment sampling of the seabed	Fisheries research within fishing limits	Research concerning the natural resources of the continental shelf or its physical characteristics	Within 4 nm	Between 4-12 nm	Between 12 and 200 nm
Profiles of temperature, salinity, and oxygen from long-endurance underwater gliders	Yes (but no samples, all measurements are sensor-based)	No	No	No	No	Yes

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The red box delineates the area of operations, between 68°N and 79°N and between 22°W and 10°E. The operations will be focused along repeat transects from the Greenland slope into the interior basins near 71°N, 75°N, and 78°N. The yellow lines indicate borders of exclusive economic zones.