ICES form - Notification of proposed research cruise

1. **NAME OF RESEARCH SHIP:** RV Kronprins Haakon **CRUISE NO.:** 2025007002

2. **DATES OF CRUISE** **From:** 6 February 2025 **To:** 12 March 2025

3. **OPERATING AUTHORITY:** Institute of Marine Research
P.O. Box 1870 Nordnes
N-5817 Bergen, Norway
TELEPHONE: +47 55 23 85 00
E-MAIL: post@hi.no

4. **OWNER**
(if different from no. 3)

5. **PARTICULARS OF SHIP:** Name: RV Kronprins Haakon
Nationality: Norwegian
Overall length: 100 metres
Maximum draught: 8.5 metres
Net tonnage: 10900
Propulsion: Diesel electric
Call sign: 3YYQ
Registration port and number
(if registered fishing vessel):

6. **CREW** Name of master: Karl Robert Røttingen
Number of crew: 15-17

7. **SCIENTIFIC PERSONNEL:** Name and address of scientist in charge: Kjetil Våge
University of Bergen, Geophysical Institute
P.O. Box 7803
N-5020 Bergen, Norway
TELEPHONE: +47 47458339
E-MAIL: kjetil.vage@uib.no

No. of scientists: 20

8. **GEOGRAPHICAL AREA IN WHICH SHIP WILL OPERATE (with reference to latitude and longitude)**

The ship will primarily operate in the Greenland Sea (70-79°N, 25°W-5°E), but may also sample the Iceland Sea farther to the south. (See also chart near the end of the document.)

9. **BRIEF DESCRIPTION OF PURPOSE OF CRUISE**

The main purpose of the cruise is to conduct a high-resolution hydrographic/velocity/geochemical survey of the East Greenland Current between Denmark and Fram Straits. We will primarily utilize the ship's conductivity-temperature-depth (CTD) sensor and water sampler. Glider operations (1-2 deployments and/or recoveries) and Argo float deployments will also be conducted.

10. **DATES AND NAMES OF INTENDED PORTS OF CALL**

Date: 26 February 2025 **Intended port of call:** Akureyri, Iceland

11. **ANY SPECIAL REQUIREMENTS AT PORTS OF CALL**

1. Part B: Details

1. **NAME OF RESEARCH SHIP:** RV Kronprins Haakon **CRUISE NO.:** 2025007002

2. **DATES OF CRUISE** **From:** 6 February 2025 **To:** 12 March 2025

3.

a) PURPOSE OF RESEARCH:

The cruise is part of a research project that aims to determine how resilient the overturning in the Nordic Seas is to climate change, with particular focus on the impact of reduced sea-ice extent. The hypothesis is that as the sea ice recedes, increasing stretches of the boundary current system around the Nordic Seas and Arctic Ocean become exposed to the atmosphere. The resulting increased ocean heat loss in winter further densifies the water in the boundary current, which is a direct pathway supplying the lower limb of the overturning circulation. To address this hypothesis, we will mount a 2-year field campaign focused on the East Greenland Current using moorings and hydrographic/velocity/geochemical surveys.

On this cruise, we intend to conduct a late-winter high-resolution

hydrographic\velocity\geochemical survey, when convection is at its deepest and densest. The survey will provide a synoptic snapshot of water mass transformation within the current and along the marginal ice zone between Fram and Denmark Straits that provides important spatial context to the mooring array deployed across the current near 71°N in October 2024.

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

We intend to obtain physical and geochemical samples from the area of operations. The methods and instruments we will use are listed below:

- Conductivity-temperature-depth (CTD) probe with multi water-sampler
- Lowered Acoustic Doppler Current Profiler (ADCP) mounted on CTD
- Ship-mounted ADCP
- Deployment of 3 freely-drifting Argo buoys equipped with CTD
- Deployment and recovery of autonomous ocean gliders equipped with CTD

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

A chart showing the planned area of operations and mooring deployment locations is included near the end of the document.

5.

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

Seawater samples for salinity calibration and geochemical analysis.

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

CTD multi water-sampler.

6. DETAILS OF MOORED EQUIPMENT

A sub-surface mooring array consisting of 6 moorings instrumented to sample velocity, temperature, salinity, pressure, and oxygen was deployed for 2 years across the East Greenland Current near 71°N (from approximately 18 to 20°W). On this cruise we will visit the mooring location to obtain a high-resolution hydrographic transect. No new moorings will be deployed or recovered. The exact locations of the six moorings are listed below.

Mooring	Latitude N	Longitude W	Bottom depth
M0	71 08.45	19 45.74	433 m
M1	71 08.40	19 28.56	434 m
M2	71 08.22	19 11.01	596 m
M3	71 07.97	18 52.48	1211 m
M4	71 07.78	18 35.30	1535 m
M5	71 07.56	18 16.56	1535 m

7. ANY HAZARDOUS MATERIALS (chemicals/explosives/gases/radioactives, etc.)

(Use separate sheet if necessary)

A separate sheet with information about the chemicals brought aboard is included at the end.

a) Type and trade name NIL

b) Chemical content (and formula) NIL

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

d) Quantity and method of storage on board NIL

e) If explosives give dates 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

A mooring array was deployed across the East Greenland Current near 71°N in October 2024 according to permission JTHAV 24/27113. There are plans for one future cruise to recover the mooring array in late summer or early fall 2026. Furthermore, we plan to operate autonomous ocean gliders in this region, with particular emphasis on the mooring array and its offshore extension according to permission JTHAV 23/01749 granted on 27 November 2023.

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

A research paper utilizing shipboard and glider data from this region that documents water mass transformation in the East Greenland Current and motivates further investigations was published in 2018:

Våge K., L. Papritz, L. Håvik, M.A. Spall, and G.W.K. Moore, 2018: Ocean convection linked to the recent ice edge retreat along east Greenland. Nature Communications, 9, https://www.nature.com/articles/s41467-018-03468-6

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

The most important paper for determining the location of the mooring array was published in 2017:

Håvik L., R.S. Pickart, K. Våge, D.J. Torres, A.M. Thurnherr, A. Beszczynska-Möller, W. Walczowski, and W.-J. von Appen, 2017: Evolution of the East Greenland Current from Fram Strait to Denmark Strait: Synoptic measurements from summer 2012. Journal of Geophysical Research: Oceans, 122, 1974-1994, https://doi.org/10.1002/2016JC012228

The data from this survey can be obtained from:
https://kogur.whoi.edu/php/index.html#ctd

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

Dr. Andreas Macrander, Marine and Freshwater Research Institute,
andreas.macrander@hafogvatn.is

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 for embarkation and disembarkation

Yes. The cruise will depart from and arrive in Longyearbyen and there will be a port stop in Akureyri on 26 February 2025 for crew change. Observers are welcome to participate on the first leg, the second leg, or the entire cruise.

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

The data will be submitted to international databases. This includes both quality-controlled, calibrated data from the ship survey and the measurements from the moored array after it is recovered in 2026 and calibrations and quality control have been applied.

2. Part C. Scientific Equipment

Complete the following table using a separate page for each coastal state

Coastal state: Iceland Port of call: None Dates: 6 February to 12 March 2025

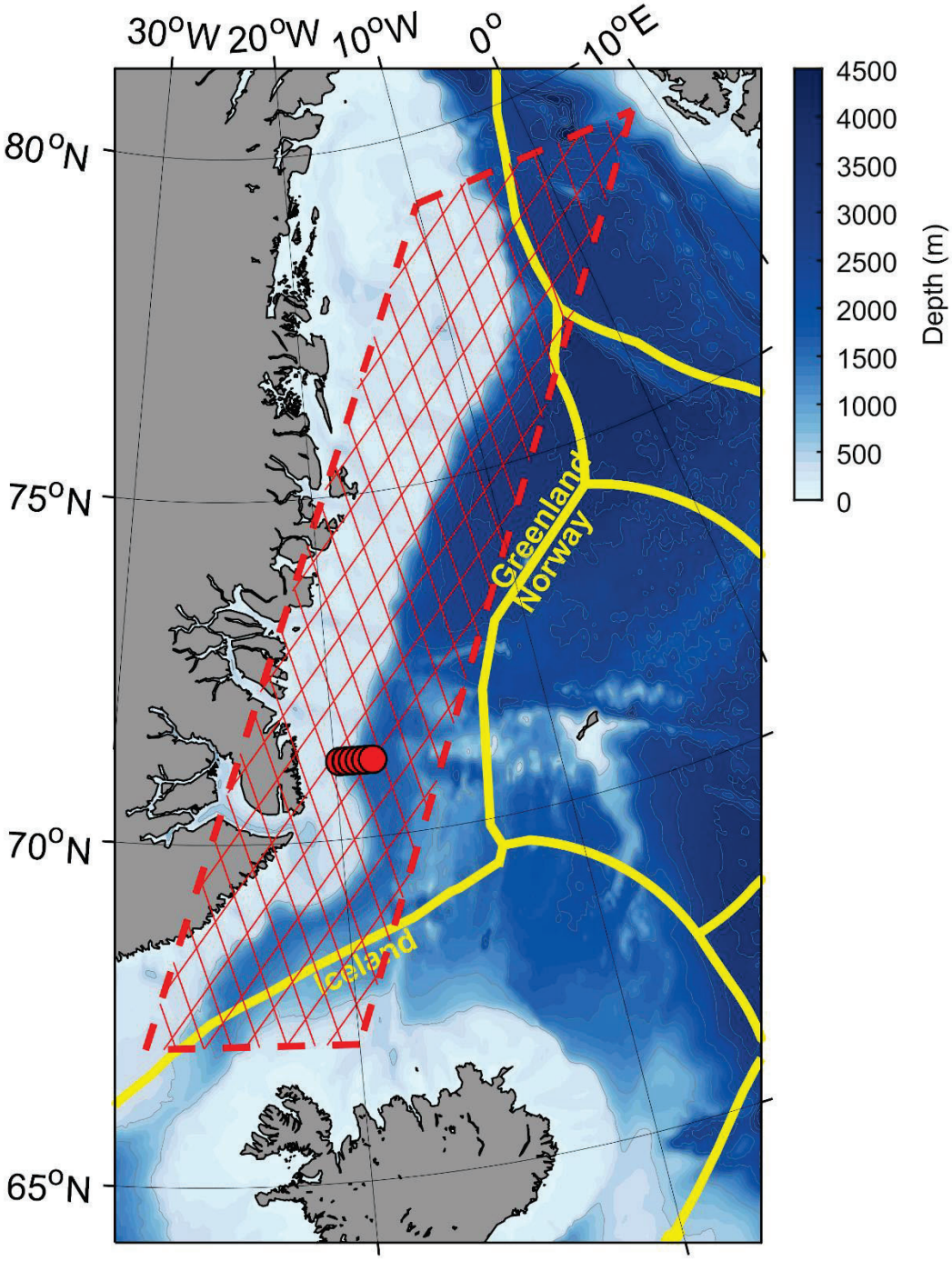
				Distance from coast		
List scientific work by function				Within	Between	Between
				4 nm	4-12 nm	12-200 nm
(example: Magnetometry	Water column including sediment sampling of seabed	Fisheries research within fishing limit	Research concerning the natural resources of the continental shelf or its physical characteristics)			
CTD	Yes	No	No	No	Yes	Yes
Water sampling	Yes	No	No	No	Yes	Yes
Underway systems	Yes	No	No	No	Yes	Yes
Echo soundings	Yes	No	No	No	Yes	Yes

(Principal Scientist)

Date: 30 October 2024

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.

4. ATTACH CHART



The hatched area indicates the area of operations and the red circles are the moorings deployed in October 2024. The yellow lines represent the borders of exclusive economic zones.

7. ANY HAZARDOUS MATERIALS (chemicals/explosives/gases/radioactives, etc.)

VARIABLE (e.g. Oxygen, DOC)	TYPE AND TRADE NAME	CHEMICAL CONTENT (AND FORMULA)	IMO IMDG code (reference and UN no.)	QUANTITY AND METHOD OF STORAGE ONBOARD
Dissolved Inorganic Carbon (DIC)	Liquid acids	Hydrochloric acid (HCl)	8 (UN1789, packing group II)	500 ml, in original box from fisher (stored in acid cabinet?)
Dissolved Oxygen	Liquid acids	Sulfuric acid (H2SO4) 5M	8 (UN1830, packing group II)	2 x 1L, in glass bottles (stored in acid cabinet?)
Dissolved Oxygen	Hazardous liquids	Manganese Chloride (MnCL2) 3M	6.1 (UN3288, packing group III)	2 x 1L, in glass bottles (stored in acid cabinet?)
Dissolved Oxygen	Hazardous liquids	Alkaline Iodide solution (NaI + NaOH)	9 (UN3077, packing group III) 8 (UN1824, packing group II)	2 x 1L, in glass bottles (stored in hazardous cabinet?)
Dissolved Oxygen	Non-Hazardous liquids	Sodium Thiosulphate (Na2S2O3, 5H2O) 0.01M	not regulated	4 x 1L, in glass bottles
Dissolved Oxygen	Non-Hazardous liquids	Potassium Iodate (KIO3) solution 0.0016M	not regulated	4 x 100ml, in glass bottles
Dissolved organic matter (DOM) molecular composition	Methanol (organic solvent)	Methanol: CH3-OH	UN1230 Methanol	Trace amounts (<5-10 mL), stored in cartridges that will be used for extraction.
DOM molecular composition	Hydrochloric acid (acid) diluted to pH2	HCl	Hydrchloric acid: UN1789 Hydrochloric Acid	HCl will be diluted in milliQ to pH of 2 (1 mL for every 1 L of seawater). The solution will be pre-prepared and brought to sea. It will be stored in a labelled polycarbonate carboy (25 L or so).