Arctic Ocean 2024
Cruise Report

19 July – 12 August 2024

Longyearbyen - Longyearbyen

Cruise ID 2024007009

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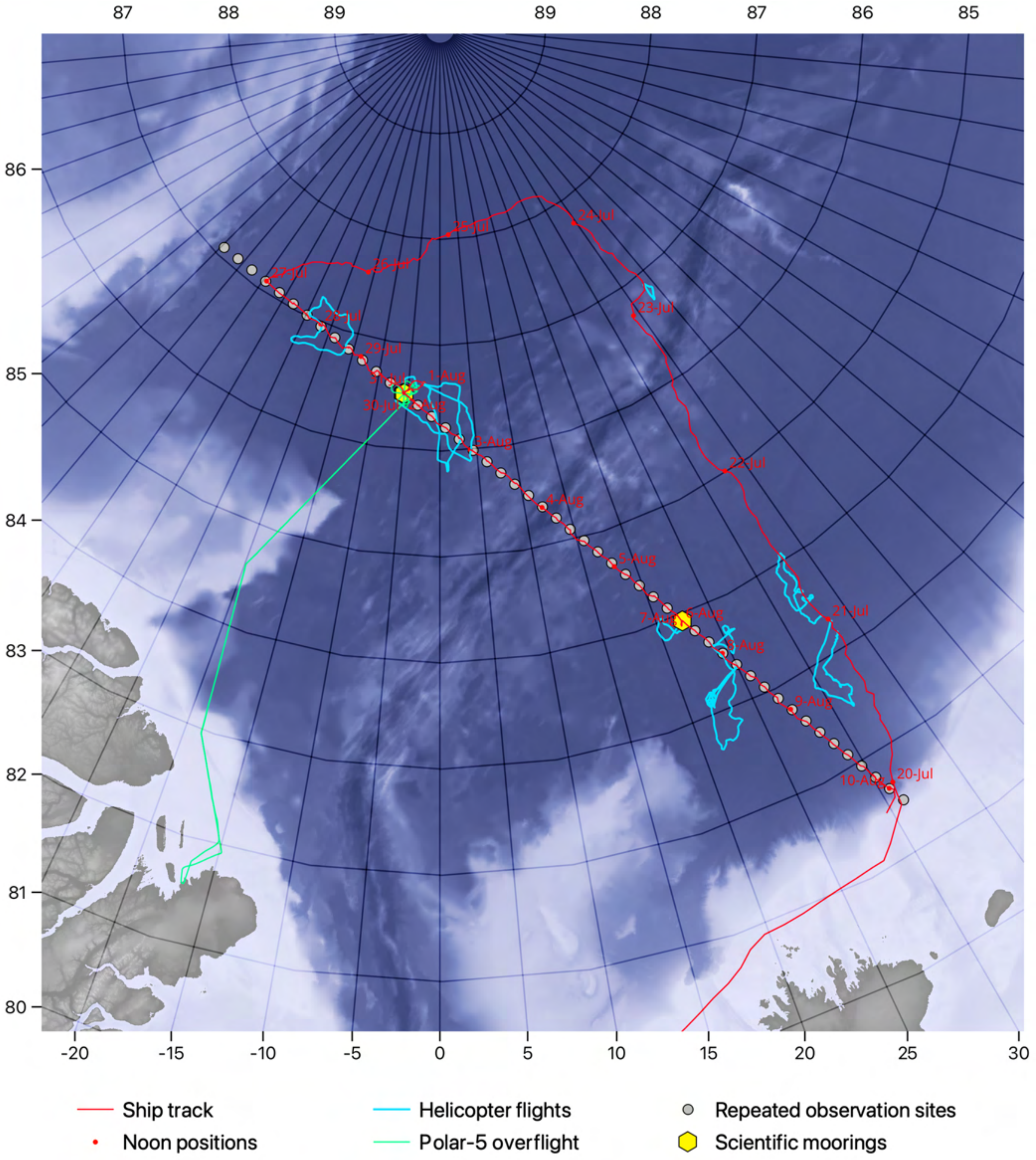
Overview



The overarching goal of the Arctic Ocean 2024 cruise (AO2024) was to collect a transect of physical, chemical, and biological observations of the ocean and sea ice across the Amundsen and Nansen Basins of the Arctic Ocean. Observations from these two central basins support research at the Norwegian Polar Institute and in external projects including Arctic PASSION (EU H2020/NPI), SUDARCO (Fram Centre/NPI), which have a common aim of providing up-to-date knowledge of the ocean and sea ice ecosystem needed for sustainable development of the central Arctic Ocean.

AO2024 was the second NPI cruise to contribute to a long-term monitoring initiative for the Nansen and Amundsen basins. The initiative began two years ago with the cruise AO2022, which established an array of 50 observation sites at 10 nautical mile increments along a great circle route beginning at 81° 30' N, 031° 00' E on a bearing of 150°. AO2024 made repeat observations at 46 of those sites and recovered two multi-disciplinary scientific moorings deployed in the central Nansen and Amundsen Basins during AO2022. New moorings were redeployed at the same sites for two more years, with recovery planned for August 2026.

Important study themes were characterizing the physical environment, especially vertical transports of heat and nutrients, mapping species present in the ecosystem, and quantifying ongoing changes in the sea ice cover. The array of study sites was designed to resolve the transition between the environments in the Nansen and Amundsen basins, capture subsurface currents flowing along the Gakkel Ridge and map the eastern extent of the Transpolar Drift.

The moorings are intended to provide year-round observations of the situation in these two central basins, isolated from the influence of peripheral currents, shelf, and slope dynamics. At both mooring locations, 24-hour sea ice stations were established, offering information about the sea ice environment above the moored instrumentation and enabling longer-term surveys of currents, turbulence, and plankton from the vessel at these key locations. A fisheries echo sounder operated throughout the cruise, and regular vertical zooplankton nets, as well as macrozooplankton net tows and fish trawls in more open areas, provided samples that can be used to characterize features evident in the resulting echogram. An aerial survey of marine mammals in both basins, conducted using an AS380 helicopter, focused on Bowhead whales and Narwhals, with the aim of attaching GPS tags and collecting tissue samples.

AO2024 was planned for 34 days but was reduced to 26 days due to shipyard delays. A combination of increasing sailing speeds in open water, conducting more operations in parallel than is usual, and favourable ice conditions allowed most of the planned activity to be completed in a reduced time. Deep observations below 2000 m were largely omitted due to time constraints, except at the mooring locations.

The cruise began with a transit leg entering the ice at 030 E and following that longitude north to 88 N to exploit generally lighter ice conditions in the eastern Nansen Basin, after which the Kronprins Haakon turned west and proceeded to the North-western end of the main transect. Scientific work was completed in a southeasterly direction with the vessel working towards the ice edge. Starting scientific work at the northwestern end of the transect allowed priority tasks in the Amundsen Basin to be completed earlier in the cruise and reduced the amount of contingency time that needed to be reserved to overcome potentially difficult ice conditions towards the end of the cruise.

Data Availability

The data collected during the cruise are made available through the Norwegian Polar Data Centre at https://data.npolar.no/dataset/60e6f94c-3ee4-44eb-9f34-f49d26029b2f. Measurements from different disciplines are published as separate datasets with separate DOIs, but all measurements from the cruise are linked with the common tag NPI-AO-2024.

Table of Contents

Participants

Organisation

1. Paul A. Dodd	Cruise leader
2. Anette Wold	Deputy cruise leader
3. Eirik Hellerud	Safety & logistics
4. Børge Sollie	Medic
5. Trine Lise Sviggum Helgerud	Communications

Mooring Operations

6. Kristen Fossan	Mooring operations
7. Yannick Kern	Mooring operations

Physical Oceanography, Biogeochemistry

8. Mats Granskog	Ocean and sea ice biogeochemistry
9. Achim Randelhoff	Physical oceanography
10. Morven Muilwijk	Physical oceanography
11. Zoe Koenig	Physical oceanography

Ocean Optics

12. Piotr Kowalczuk	Ocean optics
13. Miroslaw "Mirek" Darecki	Ocean optics

Physical properties of Sea Ice and Snow

14. Polona Itkin	Sea ice and snow

Pelagic & Sympagic Ecosystem

15. Vegard Stürzinger	Nets, catch analysis, aerial mapping by drone
16. Jakob Christensen	eDNA sample collection
17. Doreen Kohlbach	C, N, isotope ratios, contaminant sampling
18. Janne Søreide	Sympagic meiofauna, taxonomy, metabarcoding
19. Rebecca Duncan	Sympagic meiofauna, taxonomy
20. Sara Widera	Sympagic meiofauna, taxonomy
21. Eva Leu	Nutrient uptake rate experiments, FRRF
22. Fowzia Ahmed	Nutrient uptake rate experiments, FRRF
23. Lucie Goraguer	Particulate carbon, nitrogen & chlorophyll-a

Marine Mammals

24. Kit Kovacs	Marine mammal biologist
25. Christian Lydersen	Marine mammal biologist
26. Benia Nowak	Marine mammal biologist
27. Per Kristian Kongsvik	Helicopter pilot
28. Petter Nergård	Helicopter technician

Daily activities

Date	Summary of activities
18/07/24 *Day 1* *25 days remaining*	**2000: KH arrived Kullkaia** **2000: Participants joining in Longyearbyen boarded** 2015: Ship tour/interview with Svalbardposten 2030: Safety briefing 2200: Loaded ca. 20 pallets of scientific equipment. 2230: Offloaded one container
19/07/24 *Day 2* *24 days remaining*	**0012: Departed Longyearbyen** 0015: Begin transit to site X-01 in position N 82 30’, E 033 00’ 0353: Sea Glider launch (01) at N 78 8.999', E 010 51.277
20/07/24 (Saturday) *Day 3* *23 days remaining*	1925: Harstad trawl (01) at N 82 16.267', E 032 34.956 2159: X-CTD (01) at N 82 29.504', E 033 5.541
21/07/24 (Sunday) *Day 4* *22 days remaining*	0428: X-CTD (02) at N 82 59.616', E 033 5.381 0714: Helicopter flight (01) at N 83 10.158', E 033 23.374 1055: Helicopter flight (02) at N 83 22.543', E 033 2.192 1220: X-CTD (03) at N 83 29.804', E 032 51.148 1932: X-CTD (04) at N 83 59.709', E 032 55.665
22/07/24 *Day 5* *21 days remaining*	0147: X-CTD (05) at N 84 29.119', E 032 53.519 0920: X-CTD (06) at N 84 59.346', E 033 3.135 1619: X-CTD (07) at N 85 27.931', E 031 59.737 2319: X-CTD (08) at N 85 59.340', E 033 2.412
23/07/24 *Day 6* *20 days remaining*	0600: X-CTD (09) at N 86 27.769', E 034 31.256 0849: Bongo net (01) at N 86 41.672', E 033 39.351 0933: Krill trawl (01) at N 86 42.499', E 033 46.851 1607: Helicopter flight (03) at N 86 53.768', E 038 26.349 1826: X-CTD (10) at N 86 59.902', E 038 41.949
24/07/24 *Day 7* *19 days remaining*	0450: X-CTD (11) at N 87 27.693', E 036 19.274 **1116: Start Sea Ice station 01 (melosira survey) at N 87 47.678', E 034 48.007** 1141: Bongo net (02) at N 87 47.650', E 034 49.861 1213: Bongo net (03) at N 87 47.421', E 034 48.777 1603: X-CTD (12) at N 87 58.685', E 033 38.454
25/07/24 *Day 8* *18 days remaining*	Transit towards Site 47
26/07/24 *Day 9* *17 days remaining*	**0730: Start Sea Ice station 02 (SIMBA / Met buoy deployment) at N 87 37.570', W 015 45.039**

27/07/24 (Saturday) *Day 10* *16 days remaining*	0908: MSS (01) at site 47 1059: Optical Profiler (01) at site 47 1126: Optical Float (01) at site 47 1142: Optical Float (02) at site 47 1202: Multinett mammoth (01) at site 47 1324: C-OPS ROV (01) at site 47 1354: FRRF Profiler (01) at site 47 1415: 24 bottle CTD moonpool (110) at site 47 1441: 12 bottle CTD shipside (111) at site 47 **1828: Start Sea Ice Station (03) (SIMBA / Met buoy deployment) at site 46** 1833: 24 bottle CTD moonpool (112) at site 46 2214: MSS (02) at site 45 2251: 24 bottle CTD moonpool (113) at site 45 2306: FRRF Profiler (02) at site 45 2330: 12 bottle CTD shipside (114) at site 45
28/07/24 (Sunday) *Day 11* *15 days remaining*	0003: 12 bottle CTD shipside (115) at site 45 0031: Optical Profiler (02) at site 45 0104: Optical Float (03) at site 45 0307: 12 bottle CTD shipside (116) at site 45 0641: 24 bottle CTD moonpool (117) at site 44 1110: MSS (03) at site 43 1152: 24 bottle CTD moonpool (118) at site 43 1442: Optical Profiler (03) at site 43 1506: C-OPS ROV (02) at site 43 1849: 24 bottle CTD moonpool (119) at site 42
29/07/24 *Day 12* *14 days remaining*	0027: MSS (04) at site 41 0123: 24 bottle CTD moonpool (120) at site 41 0135: FRRF Profiler (03) at site 41 0158: 12 bottle CTD shipside (121) at site 41 0238: 12 bottle CTD shipside (122) at site 41 0305: Optical Profiler (04) at site 41 0348: Optical Float (04) at site 41 0418: Phytoplankton net (01) at site 41 0500: Multinett mammoth (02) at site 41 1211: 24 bottle CTD moonpool (123) at site 40 1833: MSS (05) at site 39 1910: 24 bottle CTD moonpool (124) at site 39 2014: Optical Profiler (05) at site 39
30/07/24 *Day 13* *13 days remaining*	0109: 24 bottle CTD moonpool (125) at site 38 0733: Mooring Amundsen-22 recovery operation begins. 2207: **Mooring Amundsen-22 recovered (all instruments on deck)** 2248: Multinett mammoth (03) at site 37
31/07/24 *Day 14* *12 days remaining*	0313: Bongo net (04) at site 37 0448: Multinett mammoth (04) at site 37 0621: **Start Sea Ice Station 04 (Amundsen Basin) at N 86 34.566, W 004 52.680** 1454: 24 bottle CTD moonpool (126) at site 37 1929: Multinett mammoth (05) at site 37
01/08/24 *Day 15* *11 days remaining*	0003: MIK (01) at site 37 0121: MIK (02) at site 37 0943: 12 bottle CTD shipside (127) at site 37 1015: Optical Profiler (06) at site 37 1044: 12 bottle CTD shipside (128) at site 37

	1107: C-OPS ROV (03) at site 37 1126: Optical Float (05) at site 37 1128: Bongo net (05) at site 37 1140: Phytoplankton net (02) at site 37 **2306: Mooring Amundsen-24 deployed (released) in position N 86 31.752, W 005 44.215** 2336: 24 bottle CTD moonpool (129) at site 37
02/08/24 *Day 16* *10 days remaining*	0356: MSS (06) at site 37 0705: FRRF Profiler (04) at site 37 **1445: Mooring Marie-24 deployed (released) in position N 86 31.606 W005 34.174** 1804: 24 bottle CTD moonpool (130) at site 36 2124: 24 bottle CTD moonpool (131) at site 35 2136: Optical Profiler (07) at site 35
03/08/24 (Saturday) *Day 17* *9 days remaining*	0103: 24 bottle CTD moonpool (132) at site 34 0511: MSS (07) at site 33 0555: 24 bottle CTD moonpool (133) at site 33 0603: 12 bottle CTD shipside (134) at site 33 0622: FRRF Profiler (05) at site 33 0639: 12 bottle CTD shipside (135) at site 33 0654: Optical Profiler (08) at site 33 0725: Phytoplankton net (03) at site 33 1107: 24 bottle CTD moonpool (136) at site 32 1114: Bongo net (06) at site 32 1539: 24 bottle CTD moonpool (137) at site 31 1556: MIK (03) at site 31 1615: Optical Profiler (09) at site 31 1644: Bongo net (07) at site 31 2100: 24 bottle CTD moonpool (138) at site 29
04/08/24 (Sunday) *Day 18* *8 days remaining*	0030: MSS (08) at site 29 0107: 24 bottle CTD moonpool (139) at site 29 0120: FRRF Profiler (06) at site 29 0135: 12 bottle CTD shipside (140) at site 29 0151: Optical Profiler (10) at site 29 0210: C-OPS ROV (04) at site 29 0214: 12 bottle CTD shipside (141) at site 29 0234: Phytoplankton net (04) at site 29 0248: Bongo net (08) at site 29 0550: 24 bottle CTD moonpool (142) at site 28 0847: 24 bottle CTD moonpool (143) at site 27 0902: Optical Profiler (11) at site 27 1301: 24 bottle CTD moonpool (144) at site 26 1622: MSS (09) at site 25 1700: 24 bottle CTD moonpool (145) at site 25 1712: FRRF Profiler (07) at site 25 1726: 12 bottle CTD shipside (146) at site 25 1744: Optical Profiler (12) at site 25 1750: C-OPS ROV (05) at site 25 1802: 12 bottle CTD shipside (147) at site 25 1819: Phytoplankton net (05) at site 25 1832: Bongo net (09) at site 25 1852: MIK (04) at site 25 1934: Multinett mammoth (06) at site 25
05/08/24	0110: 24 bottle CTD moonpool (148) at site 24 0425: 24 bottle CTD moonpool (149) at site 23

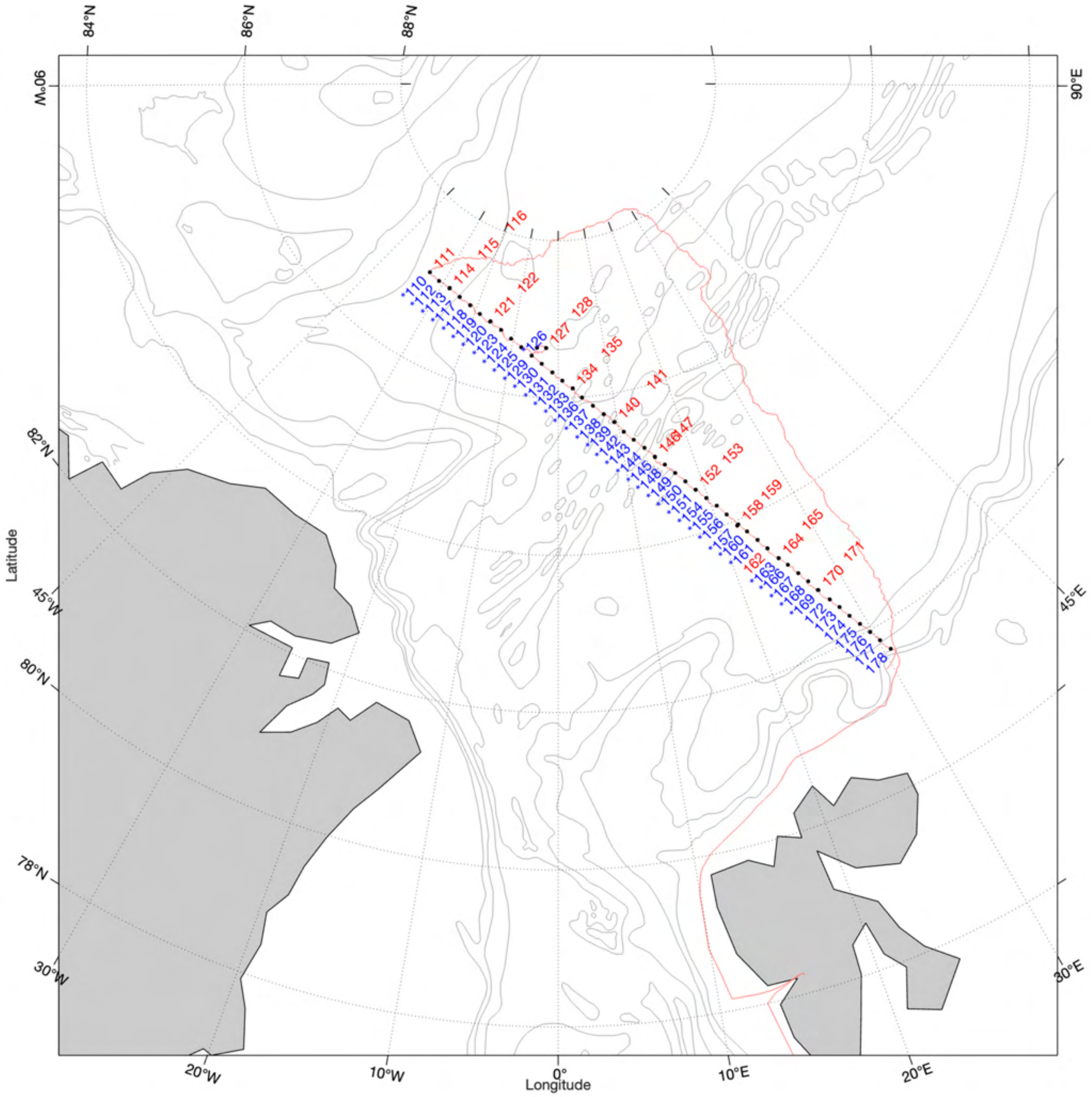
Day 19 *7 days remaining*	0502: C-OPS ROV (06) at site 23 0542: Optical Profiler (13) at site 23 0850: 24 bottle CTD moonpool (150) at site 22 1244: 24 bottle CTD moonpool (151) at site 21 1252: FRRF Profiler (08) at site 21 1311: 12 bottle CTD shipside (152) at site 21 1327: Optical Profiler (14) at site 21 1331: C-OPS ROV (07) at site 21 1350: Optical Float (06) at site 23 1403: 12 bottle CTD shipside (153) at site 21 1424: Phytoplankton net (06) at site 21 1440: Bongo net (10) at site 21 1512: MSS (10) at site 21 1559: Multinett mammoth (07) at site 21 1951: 24 bottle CTD moonpool (154) at site 20 2314: 24 bottle CTD moonpool (155) at site 19 2322: Optical Profiler (15) at site 19 2328: C-OPS ROV (08) at site 19
06/08/24 *Day 20* *6 days remaining*	0304: 24 bottle CTD moonpool (156) at site 18 0748: Rigg (58) at site 17 1240: **Start Sea Ice Station 05 (Nansen Basin) at N 83° 56.858, E 022° 10.992’** 1522: 24 bottle CTD moonpool (157) at site 17 1910: Multinett mammoth (08) at site 17
07/08/24 *Day 21* *5 days remaining*	0017: Multinett mammoth (09) at site 17 **1655: Mooring Nansen-24 deployed (released) in position N 83 57.032, E 022 15.427** 1923: MIK (05) at site 17 2013: MIK (06) at site 17 2148: Bongo net (11) at site 17 2326: 12 bottle CTD shipside (158) at site 17 2344: Optical Profiler (16) at site 17 2352: C-OPS ROV (09) at site 17
08/08/24 *Day 22* *4 days remaining*	0009: 12 bottle CTD shipside (159) at site 17 0029: FRRF Profiler (09) at site 17 0252: 24 bottle CTD moonpool (160) at site 16 0550: 24 bottle CTD moonpool (161) at site 15 0611: Optical Float (07) at site 15 0953: 12 bottle CTD shipside (162) at site 16 1449: MSS (11) at site 13 1615: MIK (07) at site 13 1725: 24 bottle CTD shipside (163) at site 13 1750: 12 bottle CTD shipside (164) at site 13 1805: Optical Float (08) at site 13 1809: C-OPS ROV (10) at site 13 1831: 12 bottle CTD shipside (165) at site 13 1901: Bongo net (12) at site 13 1911: Phytoplankton net (07) at site 13 1937: Multinett mammoth (10) at site 13 2203: 24 bottle CTD shipside (166) at site 12
09/08/24 *Day 23* *3 days remaining*	0132: 24 bottle CTD shipside (167) at site 11 0541: 24 bottle CTD shipside (168) at site 10 0833: MSS (12) at site 9 0914: 24 bottle CTD shipside (169) at site 9 0924: 12 bottle CTD shipside (170) at site 9

	0939: Optical Float (09) at site 9 0941: C-OPS ROV (11) at site 9 1001: 12 bottle CTD shipside (171) at site 9 1018: Phytoplankton net (08) at site 9 1026: Bongo net (13) at site 9 1053: Multinett mammoth (11) at site 9 1151: MIK (08) at site 9 1608: 24 bottle CTD shipside (172) at site 8 1840: 24 bottle CTD shipside (173) at site 7 2130: 24 bottle CTD shipside (174) at site 6
10/08/24 (Saturday) *Day 23* *2 days remaining*	0021: 24 bottle CTD shipside (175) at site 5 0306: 24 bottle CTD shipside (176) at site 4 0514: 24 bottle CTD shipside (177) at site 3 0728: Harstad trawl (02) at site 3 1003: 24 bottle CTD shipside (178) at site 3 1143: Harstad trawl (03) at site 2 **1230: Begin Transit to Longyearbyen**
11/08/24 (Sunday) *Day 24* *1 day remaining*	Transit to Longyearbyen
12/08/2024 *Day 25* *0 day remaining*	**0800: KH Arrived Longyearbyen (Kullkaia)** Demobilisation & cleaning 1200: Participants leave KH Crew Change on the vessel

Summary of daily activities. Times are UTC. Running numbers are assigned to repeating instances of each activity starting with 1 for the first instance, except for CTD casts where the number 110 is assigned to the first cast.

Shipboard CTD measurements

Contact: Paul A. Dodd (paul.dodd@npolar.no)
Collected by: Mats Granskog, Morven Morven Muilwijk, Zoe Koenig, Achim Randelhoff



*Location of CTD profiles. Blue numbers indicate profiles collected using the main CTD. Red numbers indicate profiles collected over the side using the auxiliary CTD. Profiles collected though the moonpool are marked **

General Approach

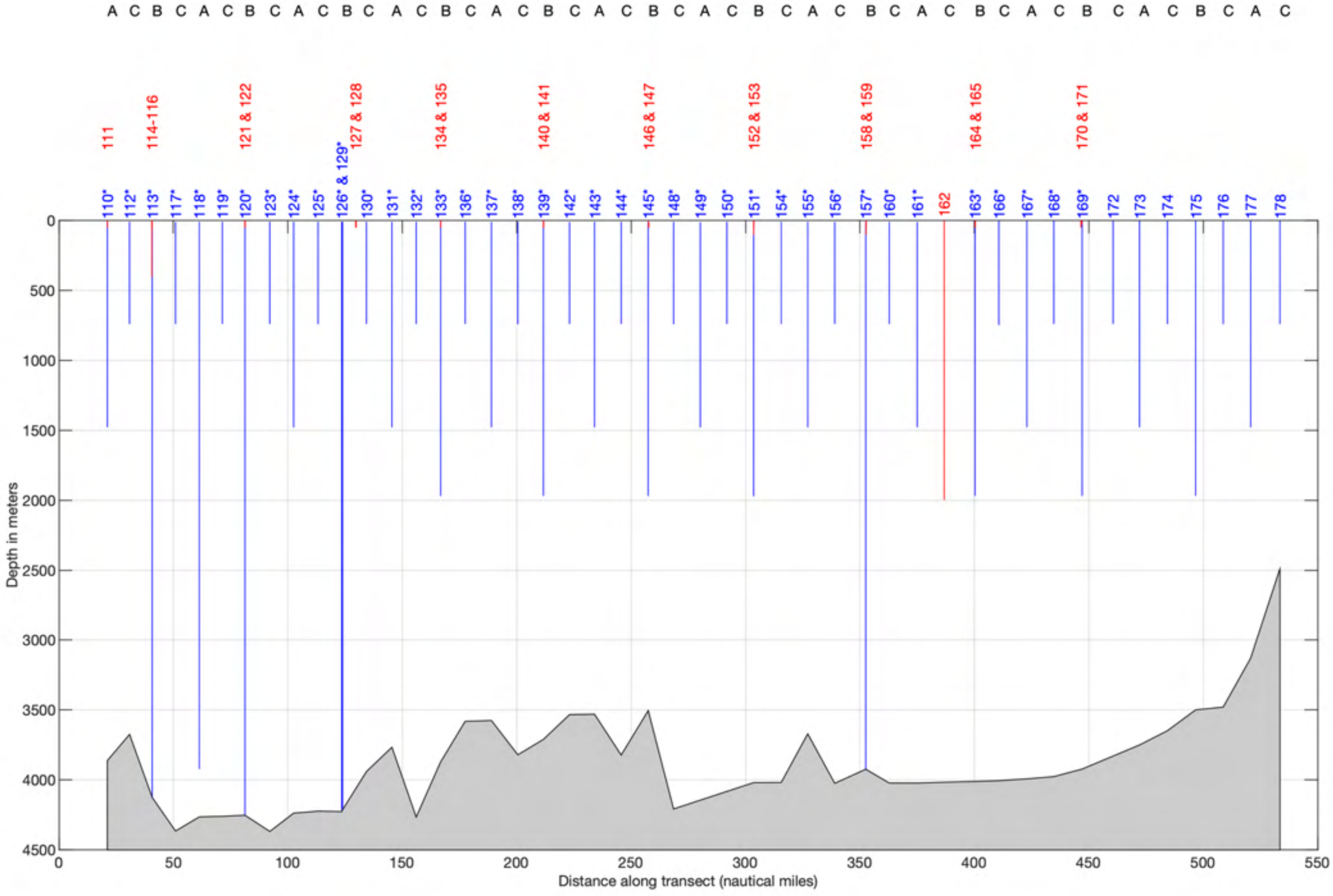
CTD profiles were collected at an array of repeated observation sites defined as 10 nm increments along a great section starting at N 81° 30', E 031° 00' and extending North-westward along an initial bearing of 150 degrees. Full depth (A), intermediate (B) and shallow (C) stations were planned in a repeating A-C-B-C pattern to provide a closer horizontal spacing at the surface and intermediate depths. However, casts at A stations west of 010 W were stopped at 2000 m due to time constraints following shipyard delays at the beginning of the cruise, except at mooring positions where a full-depth sound speed profile was required for accurate depth measurement (Figure above).
Two shipboard CTD systems were used during the cruise. The main 24-bottle CTD was lowered through the moon pool at every station. At (A) stations an auxiliary 12-bottle CTD was also lowered over the side of the vessel to

capture the upper 8-10 m which is missed by the main CTD as it emerges from the moonpool at a depth of 8 m. Note that the upper 8 m of profiles taken through the moonpool describes water trapped in the moon pool and not the natural environment. Profile segments from 0 to 8 m were removed during processing but persisted in raw data files.

The main and auxiliary CTDs were both SBE911+ units. To avoid problems with icing the T, S, and O_2 ducts were not flushed between stations – an extended surface soak was specified to account for this. At the beginning of stations, the CTD was lowered to 20 dbar and allowed to soak for minimum of 3 minutes after the pump started. After the soak was complete and sensors stabilised the CTD was brought to the surface (or moonpool aperture at 8 m) and then lowered to the desired depth. Data acquisition was initiated just before deployment with the CTD on deck and allowed to run until the CTD was back on deck at the end of the cast.
Niskin bottles were closed using the bottle fire command within the Sea-Bird acquisition software so that a .bl file was created for each deployment when bottles were fired. NMEA time and position information was fed to the acquisition computer and added to each scan line of the data files. Cast starting times were automatically added to the header of all data files.

Note that the first station completed during AO-2024 has the number 110 and not 001. The vessel operators specify numbers assigned to CTD stations. The first cast each year has the number 1 and each subsequent cast is numbered sequentially.

During the cruise a paper log sheet was completed at each CTD station listing the depths at which bottles were fired and the serial numbers of water samples taken from each bottle. Scanned images of these paper log sheets are included in appendix 1 at the end of this report.



Vertical extent of CTD profiles along the main section. Blue lines and profile numbers indicate profiles collected using the main CTD. Red lines and numbers indicate profiles collected using the auxiliary CTD. Profiles marked * were collected through the moon pool, other profiles were collected over the side.

Configuration of main (moonpool) CTD package with 24-bottle rosette

Channel	Sensor	Serial Number	Last Calibration
Frequency 1	SBE03 Temperature 1	4052	14-May-2024
Frequency 2	SBE04 Conductivity 1	3447	16-May-2024
Frequency 3	SBE09 Pressure	141603	11-December-2017
Frequency 4	SBE03 Temperature 2	2447	15-February-2024
Frequency 5	SBE04 Conductivity 2	1219	06-February-2024
A/D Voltage 0	Altimeter	48701	24-December-2017
A/D Voltage 1	SBE43 Oxygen 1	3481	14-June-2024
A/D Voltage 2	WET Labs Chl. A	1547	1-April-2016
A/D Voltage 3	Free	-	-
A/D Voltage 4	WET Labs CDOM	4531	17-December-2017 Analogue range set to 1
A/D Voltage 5	Free	-	-
A/D Voltage 6	Transmissometer	1306	20-July-2022
A/D Voltage 7	SBE43 Oxygen 2	1740	08-Sepetmber-2023 Analogue range set to 1

Main CTD package configuration

Configuration of auxiliary (Over-the-side) CTD package with 12-bottle rosette

Channel	Sensor	Serial Number	Last Calibration
Frequency 1	SBE03 Temperature 1	4311	25-October-2023
Frequency 2	SBE04 Conductivity 1	4467	31- October-2023
Frequency 3	SBE09 Pressure	1346	22- December-2017
Frequency 4	SBE03 Temperature 2	4771	16-January-2024
Frequency 5	SBE04 Conductivity 2	3234	16-May-2024
A/D Voltage 0	SBE43 Oxygen 1	3937	13-June-2023
A/D Voltage 1	Altimeter	73084	24- December-2017
A/D Voltage 2	WET Labs Chl. A	0725	01-April-2016 Analogue range set to 1
A/D Voltage 3	Free	-	-
A/D Voltage 4	Transmissometer	2003	01-October-2019
A/D Voltage 5	WET Labs CDOM	1930	25-July-2019 Analogue range set to 1
A/D Voltage 6	Free	-	-
A/D Voltage 7	Free	-	-

Auxiliary CTD package configuration

Validation of CTD salinity measurements

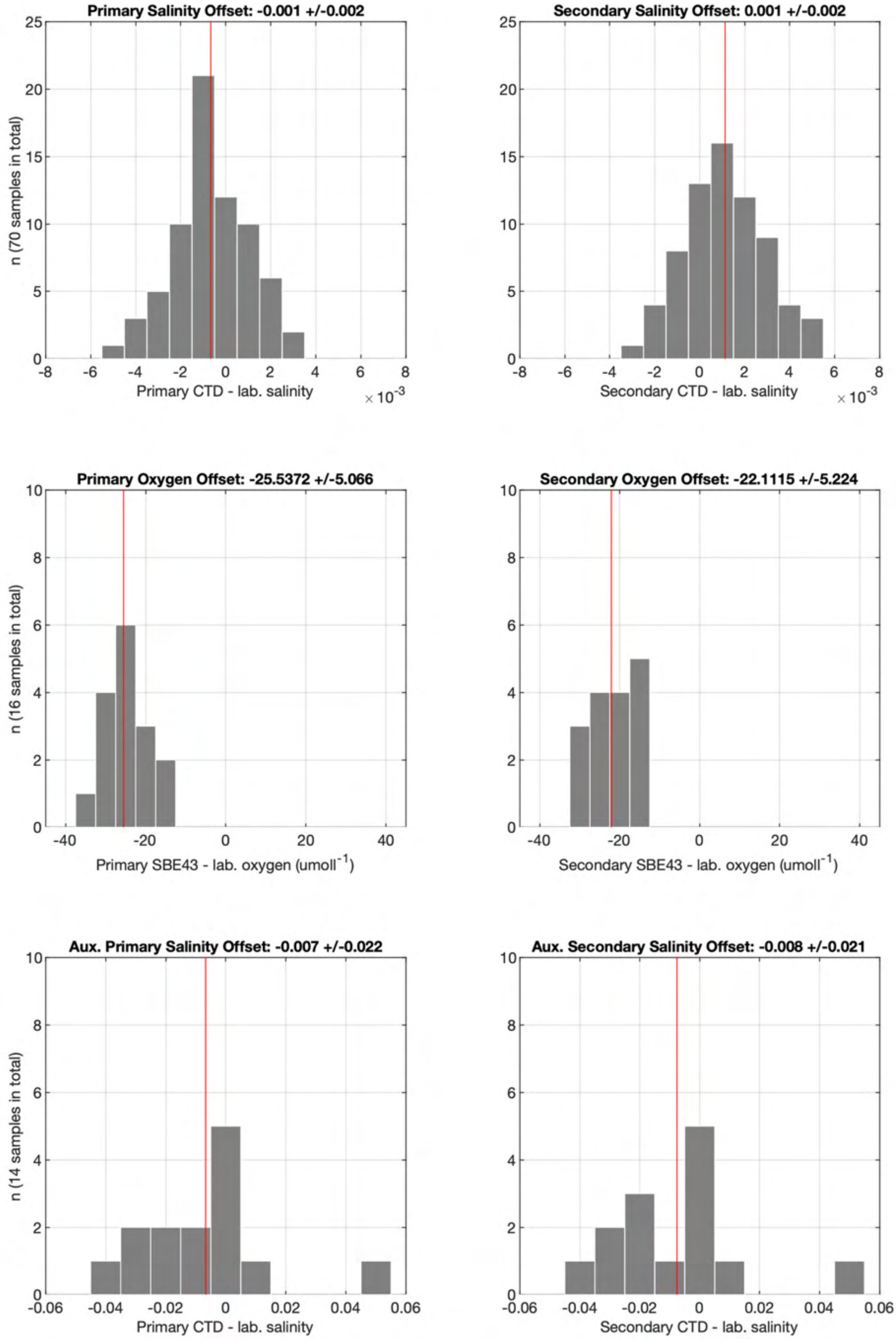
Water samples for laboratory salinity measurement were collected at all sampling depths and analysed on broad using Guildline Portasal portable salinometer

Comparison of laboratory salinity measurements and CTD-salinity measurements revealed offsets of -0.001 and +0.001 practical salinity units for the primary and secondary sensor groups of the main CTD system and offsets of -0.007 and -0.008 practical salinity units for the primary and secondary sensor groups of the auxiliary CTD system.

All sets of CTD sensors performed well during the cruise. The offsets determined relative to the laboratory salinity measurements for the primary and secondary sensors on the main CTD are insignificant considering the expected accuracy of +/- 0.003 for the laboratory salinometer. The normal distribution of sensor–laboratory differences gives additional confidence that the sensors performed consistently well. Offsets for the primary and secondary sensors on the auxiliary CTD would suggest that correction was needed if they originated from a series of deep casts with shallow gradients. However, as the auxiliary CTD was operated primarily in the upper 50 m this is not the case. Steep gradients in the upper 50 m indicates that there is a significant disparity between the properties of the water measured by the CTD and the properties of the water trapped in niskin bottles. In this environment, the -0.007 and +0.008 offsets are not large enough to justify correcting the measurements to match bottle sample values.

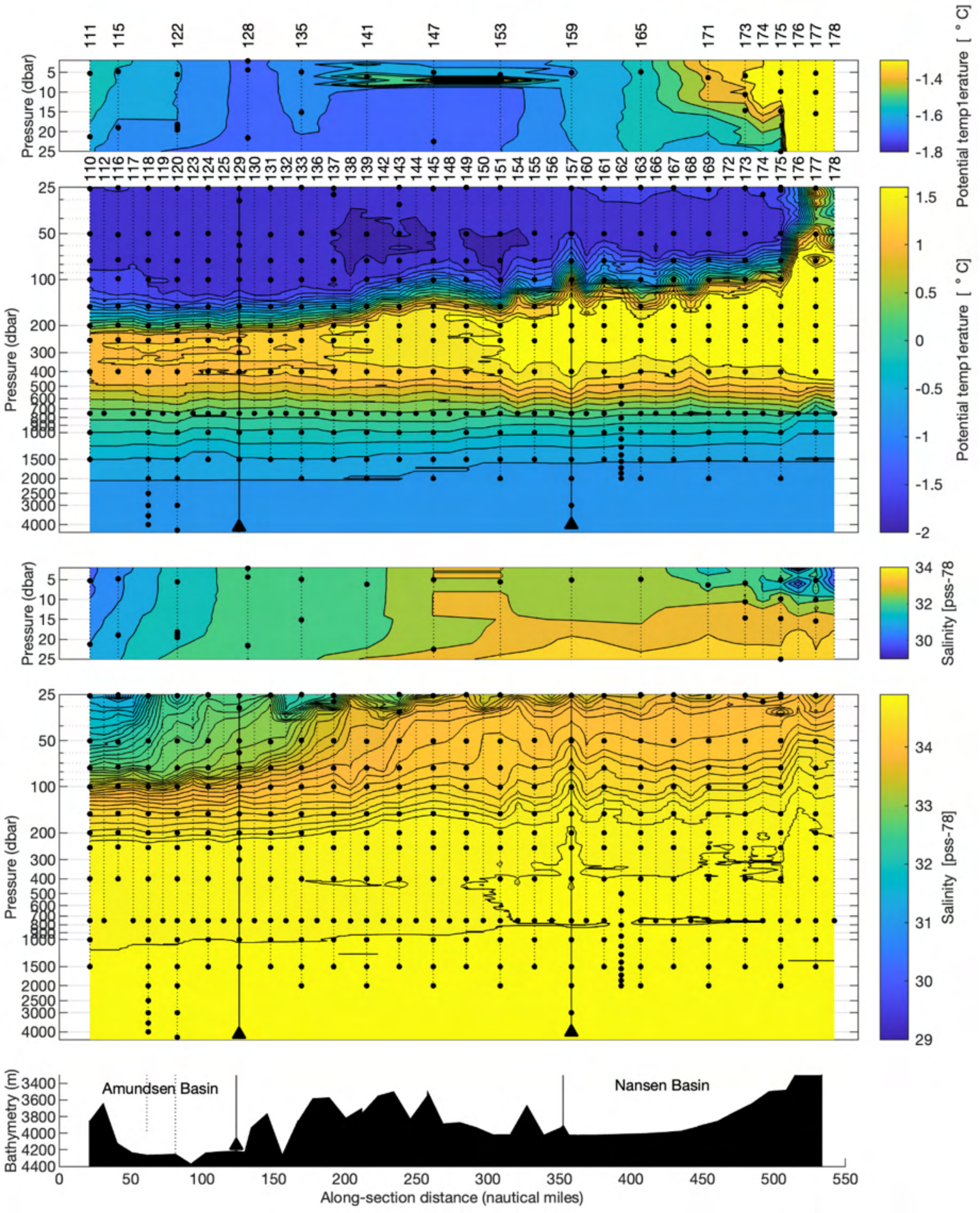
Validation of CTD dissolved oxygen measurements

Water samples for laboratory oxygen measurement were collected at A stations throughout the cruise. A comparison of dissolved oxygen measured by Winkler titration method and dissolved oxygen recorded from the CTD revealed mean offsets of -25.5 +/- 5 and -22.1 +/- 5 for the primary and secondary sensor groups of the main CTD system, these offsets are not large enough to justify correction of dissolved oxygen profiles. It was not possible to analyse enough laboratory oxygen samples onboard to track sensor drift over time, but this can be evaluated by comparing oxygen values measured in deep water masses (not shown). The primary oxygen sensor appeared to drift by approximately 6 µmol L^{-1} during the cruise, while the secondary sensor provided consistent deep water readings throughout the cruise with a drift of 3 µmol L^{-1}. These drift values are typical for SBE43 oxygen sensors. However, the slightly smaller drift of the secondary sensor makes it the preferred source for dissolved oxygen profiles.



Histograms showing the difference between the primary (left hand panels) and secondary (right hand panels) sensor groups on the CTD and laboratory salinity and dissolved oxygen measurements. Only samples deeper than 400 m are considered for salinity validation of the main CTD, due to step salinity gradients close to the surface, but all samples are included for the auxiliary CTD, which was seldom deployed deeper than 50 m.

Temperature and salinity along the main section



Temperature and salinity measurements along the main section from the main CTD (panels 2 & 3) and auxillary CTD (panels 1& 3). Station numbers are indicated above sections. Niskin closing depths are shown as black dots. Mooring locations are shown as a solid line extending from a black triangle.

Cast	Distance (Km)	Cast Depth(m)	Echo Depth(m)	Latitude	Longitude	Date & Time (UTC)	LADCP data
110	21	1479	3861	N 87.100	W 034.262	27-Jul-2024 14:19	Y
111	21	53	3813	N 87.100	W 034.251	27-Jul-2024 14:43	-
112	31	741	3674	N 87.069	W 031.143	27-Jul-2024 18:34	Y
113	41	4127	4124	N 87.051	W 027.968	27-Jul-2024 22:55	-
114	41	55	4122	N 87.052	W 027.980	27-Jul-2024 23:32	-
115	41	52	4123	N 87.053	W 027.987	28-Jul-2024 00:04	-
116	41	406	-	N 87.058	W 027.985	28-Jul-2024 03:09	-
117	51	741	4365	N 87.011	W 024.795	28-Jul-2024 06:43	-
118	61	3922	4264	N 86.966	W 021.656	28-Jul-2024 11:56	-
119	71	741	4260	N 86.906	W 018.785	28-Jul-2024 18:53	-
120	81	4259	4252	N 86.852	W 015.986	29-Jul-2024 01:25	-
121	81	51	4262	N 86.854	W 015.965	29-Jul-2024 02:00	-
122	81	51	4252	N 86.857	W 015.940	29-Jul-2024 02:39	-
123	92	741	4368	N 86.784	W 013.062	29-Jul-2024 12:13	-
124	103	1480	4237	N 86.702	W 010.488	29-Jul-2024 19:17	-
125	113	742	4223	N 86.614	W 007.983	30-Jul-2024 01:13	-
126	124	4216	4226	N 86.630	W 004.577	31-Jul-2024 14:55	Y
127	130	50	4228	N 86.634	W 002.631	01-Aug-2024 09:45	-
128	130	52	4228	N 86.633	W 002.583	01-Aug-2024 10:45	-
129	124	4203	4213	N 86.523	W 005.576	01-Aug-2024 23:52	Y
130	134	741	3940	N 86.431	W 003.358	02-Aug-2024 18:07	Y
131	145	1480	3766	N 86.326	W 001.157	02-Aug-2024 21:26	Y
132	156	742	4265	N 86.221	E 000.800	03-Aug-2024 01:04	Y
133	167	1970	3871	N 86.118	E 002.726	03-Aug-2024 05:54	Y
134	167	52	3871	N 86.118	E 002.732	03-Aug-2024 06:04	-
135	167	51	3871	N 86.120	E 002.755	03-Aug-2024 06:41	-
136	177	741	3581	N 85.996	E 004.341	03-Aug-2024 11:08	Y
137	189	1479	3575	N 85.879	E 006.175	03-Aug-2024 15:40	Y
138	200	743	3820	N 85.756	E 007.874	03-Aug-2024 21:03	Y
139	212	1969	3710	N 85.635	E 009.429	04-Aug-2024 01:09	Y
140	212	52	3715	N 85.636	E 009.452	04-Aug-2024 01:37	-
141	212	52	-	N 85.637	E 009.488	04-Aug-2024 02:16	-
142	223	741	3533	N 85.494	E 010.688	04-Aug-2024 05:51	Y
143	234	1479	3530	N 85.370	E 012.003	04-Aug-2024 08:49	Y
144	246	741	3822	N 85.239	E 013.368	04-Aug-2024 13:04	Y
145	257	1969	3504	N 85.098	E 014.568	04-Aug-2024 17:04	Y
146	258	52	3501	N 85.097	E 014.569	04-Aug-2024 17:28	-
147	258	52	3501	N 85.093	E 014.568	04-Aug-2024 18:04	-
148	269	743	4207	N 84.968	E 015.679	05-Aug-2024 01:13	Y
149	280	1480	-	N 84.829	E 016.772	05-Aug-2024 04:27	Y
150	292	741	-	N 84.689	E 017.781	05-Aug-2024 08:51	Y
151	304	1972	4019	N 84.547	E 018.742	05-Aug-2024 12:45	Y
152	304	104	4019	N 84.547	E 018.747	05-Aug-2024 13:12	-
153	304	52	4019	N 84.547	E 018.761	05-Aug-2024 14:04	-
154	316	741	4018	N 84.403	E 019.723	05-Aug-2024 19:52	Y
155	327	1480	3670	N 84.266	E 020.654	05-Aug-2024 23:17	Y
156	339	741	4024	N 84.116	E 021.419	06-Aug-2024 03:06	Y
157	353	4011	3923	N 83.936	E 022.125	06-Aug-2024 15:23	Y
158	353	103	4022	N 83.944	E 022.277	07-Aug-2024 23:29	-
159	353	52	4022	N 83.945	E 022.288	08-Aug-2024 00:10	-
160	363	742	4022	N 83.819	E 022.936	08-Aug-2024 02:54	Y
161	375	1479	4022	N 83.668	E 023.677	08-Aug-2024 05:51	Y
162	387	1998	4018	N 83.518	E 024.318	08-Aug-2024 09:58	-
163	400	1969	4010	N 83.347	E 025.005	08-Aug-2024 17:27	Y
164	400	46	4010	N 83.346	E 025.003	08-Aug-2024 17:53	-
165	400	52	4010	N 83.345	E 024.993	08-Aug-2024 18:32	-
166	411	748	4005	N 83.220	E 025.604	08-Aug-2024 22:09	Y
167	423	1479	3992	N 83.066	E 026.220	09-Aug-2024 01:40	Y
168	435	741	3976	N 82.918	E 026.773	09-Aug-2024 05:43	Y
169	447	1969	3922	N 82.759	E 027.298	09-Aug-2024 09:15	Y
170	447	30	3920	N 82.760	E 027.288	09-Aug-2024 09:26	-
171	447	51	3920	N 82.763	E 027.250	09-Aug-2024 10:02	-
172	461	741	-	N 82.587	E 027.871	09-Aug-2024 16:10	Y
173	472	1479	3750	N 82.442	E 028.369	09-Aug-2024 18:44	Y
174	484	742	3648	N 82.284	E 028.810	09-Aug-2024 21:39	Y
175	497	1969	3499	N 82.130	E 029.311	10-Aug-2024 00:26	Y
176	509	743	3479	N 81.977	E 029.751	10-Aug-2024 03:08	Y
177	521	1479	-	N 81.823	E 030.167	10-Aug-2024 05:15	Y
178	533	742	-	N 81.661	E 030.606	10-Aug-2024 10:07	Y

Summary of CTD casts. Distances for CTDs are calculated relative to the position N 87.098 W 041.227 where the first CTD profile was collected at the northwest end of the section during cruise AO2022.

Microstructure and turbulence measurements (MSS)

Contact: Achim Randelhoff (ara@akvaplan.niva.no)
Collected by: Achim Randelhoff, Zoé Koenig, Morven Muijlwijk

Microstructure profiling during the cruise was performed using an MSS90L (Microstructure Sensor Profiler, Sea & Sun Technology, Germany).

MSS configuration: Ocean microstructure measurements were made using the MSS90L profiler (SN 053), a loosely-tethered free-fall instrument equipped with two airfoil probes aligned orthogonally to each other, a fast-response thermistor (FP07), an acceleration sensor, conventional CTD sensors for precision measurements and a Chlorophyll a fluorescence sensor. The shear probes used were (for 053) SN116 (sensitivity 3.94e-04, first shear channel) and SN149 (sensitivity 3.64e-4, second shear channel). From cast 20, we used the drum with 800 m cable. For casts 20 and 21 only, the instrument was swapped for MSS046 (too short time to unmount the chlorophyll a sensor from 053). The shear probes on MSS046, used for two deep casts, were SN032 (sensitivity 4.4e-04, SHE1) and SN033 (sensitivity 4.86e-04, SHE2).

Cast	Station	Time	Lon (E)	Lat (N)	s/no
1	47	2024-07-27 11:00:00	-34.363	87.101	53
2	47	2024-07-27 11:00:00	-34.363	87.101	53
3	45	2024-07-28 00:15:00	-27.988	87.054	53
4	45	2024-07-28 00:35:00	-27.992	87.055	53
5	43	2024-07-28 13:30:00	-21.608	86.974	53
6	43	2024-07-28 13:45:00	-21.601	86.975	53
7	41	2024-07-29 02:30:00	-15.946	86.856	53
8	41	2024-07-29 02:50:00	-15.934	86.857	53
9	39	2024-07-29 20:35:00	-10.478	86.711	53
10	39	2024-07-29 21:10:00	-10.261	86.704	53
11	ice1	2024-07-31 10:50:00	-4.793	86.602	53
12	ice1	2024-07-31 11:10:00	-4.781	86.605	53
13	ice1	2024-07-31 13:00:00	-4.703	86.617	53
14	ice1	2024-07-31 13:30:00	-4.677	86.621	53
15	ice1	2024-07-31 16:15:00	-4.455	86.639	53
16	ice1	2024-07-31 16:45:00	-4.404	86.643	53
17	ice1	2024-08-01 09:15:00	-2.653	86.636	53
18	ice1	2024-08-01 09:30:00	-2.639	86.635	53
19	ice1	2024-08-01 09:45:00	-2.631	86.634	53
20	35	2024-08-02 05:50:00	-5.213	86.516	46
21	35	2024-08-02 06:30:00	-5.755	86.535	46
22	33	2024-08-03 05:50:00	2.723	86.117	53
23	33	2024-08-03 06:20:00	2.742	86.119	53
24	29	2024-08-04 02:30:00	9.501	85.638	53
25	29	2024-08-04 02:45:00	9.515	85.638	53
26	25	2024-08-04 18:28:00	14.564	85.091	53
27	25	2024-08-04 18:46:00	14.560	85.089	53
28	21	2024-08-05 17:12:00	18.960	84.534	53
29	21	2024-08-05 17:30:00	19.099	84.521	53
30	ice2	2024-08-06 16:35:00	22.118	83.933	53
31	ice2	2024-08-06 16:54:00	22.114	83.932	53
32	ice2	2024-08-06 18:24:00	22.084	83.929	53
33	ice2	2024-08-06 18:37:00	22.078	83.929	53
34	ice2	2024-08-07 08:56:00	22.004	83.908	53
35	ice2	2024-08-07 09:13:00	22.000	83.907	53
36	ice2	2024-08-07 09:32:00	21.994	83.907	53
37	ice2	2024-08-07 09:40:00	21.992	83.907	53
38	ice2	2024-08-07 09:50:00	21.990	83.907	53
39	13	2024-08-08 19:04:00	24.990	83.344	53
40	13	2024-08-08 19:19:00	24.990	83.343	53
41	9	2024-08-09 10:46:00	27.210	82.768	53
42	9	2024-08-09 11:01:00	27.198	82.770	53

The buoyancy setup adopted for most of the cruise (after some experimentation during the first 2 sets) was 5 floatation rings (incl. 2 conic ones) and 9 weight rings (5 thin, 3 medium, 1 thick), which gave 0.55 m/s fall speed for 053 and 0.65 for 046 (different sets of buoyancy rings but same weight rings). The sensors point downward when the instrument profiles vertically, and all samples at 1024 Hz. The instrument is decoupled from operation-induced tension by paying out cable at sufficient speed to keep it slack. Data are transmitted in real-time to a ship-board data acquisition system. In total 42 casts were done. Two different setups of the MSS were implemented, depending on if it was operated from the ship or the sea ice.

Profiling from the ship: The deployment of the MSS from the ship was done from the starboard side, from the "small" CTD room. A motor-driven winch was mounted on the railing and an arm was used to extend the cable from the winch to outside. The profiler was lowered into the water and retrieved by manually pulling the data transmission cable. One to two casts were performed at each station. Due to the ship's keel, the upper 12 meters of each cast were excluded from the dissipation estimates. The profiler is equipped with a sensor protection guard at its leading end.

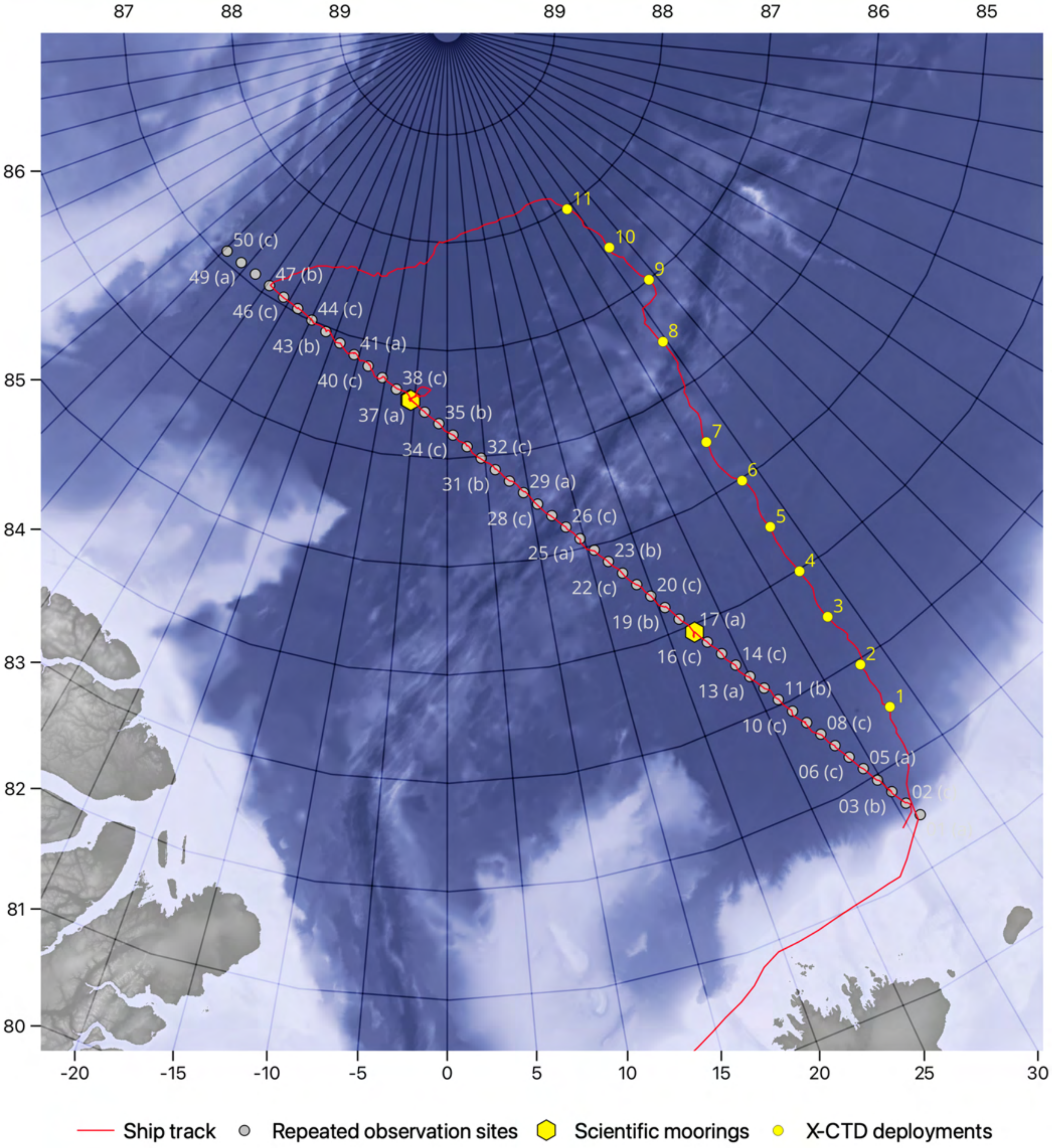
Profiling during ice stations: The MSS was operated from the sea ice during the ice stations. We deployed the MSS through an around 0.7 m x 0.7 m hole. The hole was located upstream of the ship, ensuring sampling of undisturbed waters. A manual winch was set up by the hole, and 4 to 5 sets of 2 to 3 casts each were performed dayly. See Table 5 for a total overview of the casts. The probe guard was retracted or removed for various casts to enhance data quality, and different fall speeds were tested to optimize data quality for shear and temperature microstructure probes.

Ice station #4 (Amundsen mooring site) The MSS was operated from a hole approx. 120 m from the ship. Relative current was going parallel and slightly towards the ship. The first day, strong drift was observed (>0.5 kn) due to strong winds, whereas the wind on the second day was calmer.

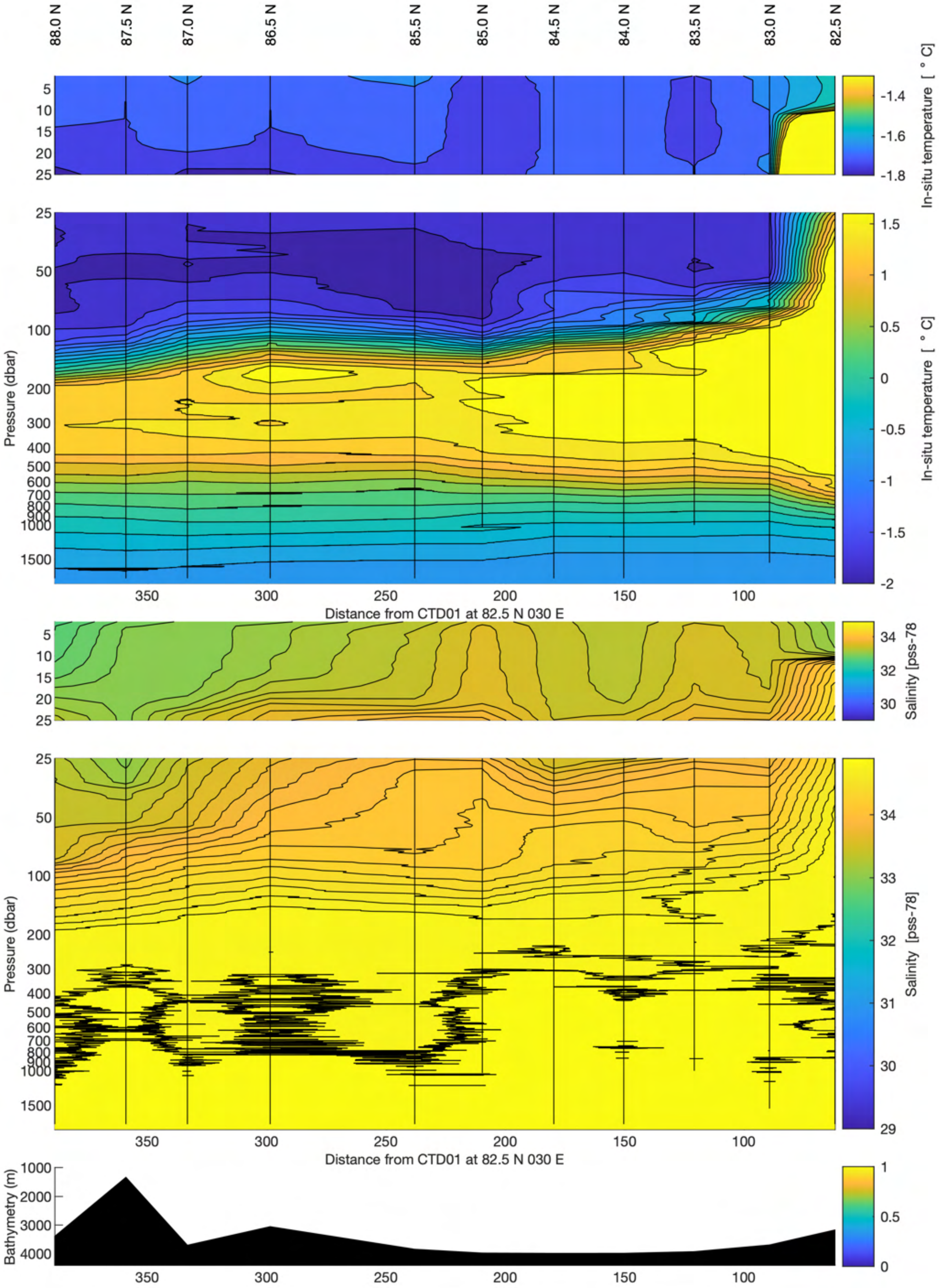
Ice station #5 (Nansen mooring site) The MSS was operated from a hole approx. 100 m from the ship. Winds were light. Slow relative current was going slightly towards the ship (0.1 kn). There were visible inertial oscillations in the drift track but no reversal of currents.

X-CTD measurements

Contact: Paul A. Dodd (paul.dodd@npolar.no)
Collected by: Achim Randelhoff, Morven Muilwijk, Zoé Koenig, Mats Granskog, Paul Dodd



X-CTD 1850 (Expendable conductivity-temperature-depth) probes (Lockheed Martin, USA) were used for a hydrographic section along approx. 30 degrees East on the Kronprins Haakon's way north.
The X-CTD probes were launched from the aft of the ship while sailing slowly (1-2 knots) in leads between ice floes. They measured conductivity and temperature while falling at a known rate, from which depth was inferred. The maximum operating depth of the probe was 1850 meters.



X-CTD section from North (left) to South (right), showing Atlantic Water at 200-400 m water depth.

s/no	Date/Time (UTC)					Lat	Lon	Measurement depth	Filename (*.edf)
	yyyy	mm	dd	hh	mm				
13031141	2024	7	20	22	0	82.492	33.091	1850	13031141
13031137	2024	7	21	4	7	83.021	31.527	1541	13031137
10079900	2024	7	21	12	30	83.520	32.809	1000	10079900
13031140	2024	7	21	19	45	84.007	32.917	1850	130331140
13031138	2024	7	22	2	1	84.487	32.897	1850	13031138
13031146	2024	7	22	9	25	84.989	33.049	1000	13031146
13031139	2024	7	22	16	25	85.468	31.997	850	13031139
N/A	2024	7	22	23	30	85.989	33.056	1850	no
13031148	2024	7	23	6	21	86.464	34.469	1850	13031148
13031145	2024	7	23	18	40	87.004	38.600	1850	13031145
13031144	2024	7	24	5	3	87.465	36.353	1850	13031144
13031147	2024	7	24	16	21	87.978	33.512	1850	13031147

Current measurements

Vessel Mounted ADCP

Contact: Paul A. Dodd (paul.dodd@npolar.no)

Acoustic Doppler current profilers provide profiles of water velocity relative to a transducer mounted in the ship's hull, by analysing the extent to which the frequency of reflected sound waves is shifted relative to the frequency of a transmitted ping at different distances from the transducer and at different angles.
The length of the profiles is dependent on the frequency of the pulse transmitted and the density of scattering particles in the water column. Lower frequencies travel further but result in a coarser vertical profile resolution. If there are few scattering particles in the water column, the strength of the reflected sound waves is reduced. This can lead to large uncertainties or data gaps if the returned signal is too weak.
Lowered ADCPs (typically attached to the CTD package) provide data over the full depth range but are dependent on the quality of data provided by an internal magnetic compass to determine direction. Close to the magnetic poles, poor data from internal magnetic compasses can limit LADCP data quality – this is not an issue with VMADCPs which determine heading from the vessels motion reference unit (MRU) based which uses a 3D-GPS system. Comparison with VMADCP profiles is one way to validate the quality of orientation information used by LADCPs. Moreover, VMADCP data is generally preferred over LADCP when studying the upper water column where coverage is available. This is both due to the more accurate heading and because VMADCP runs continuously, collecting many more hours of ping data which can be averaged to reduce noise compared with the LADCP instruments are only active during CTD casts. However, VMADCP data quality is dependent on correct alignment of the transducer relative to the vessels hull and MRU system. Poor transducer or MRU alignment and position information can result in a component of the vessel motion being included in VMADCP profiles.

		Transducer position relative to centre MRU *measured in meters*		
	Transducer Depth (ED)	**X (+FWD)**	**Y (+STB)**	**Z (+DOWN)**
ADCP 38 kHz Flush Mount	8.4	27.432	0.658	9.670
ADCP 150 kHz Flush Mount	8.4	28.789	0.661	9.661
ADCP 38 kHz Drop keel	11.8	18.46	-1.089	13.114
ADCP 150 kHz Drop keel	11.8	16.549	1.029	13.181

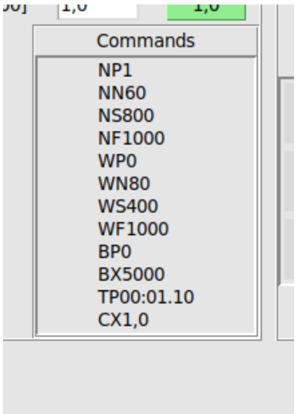
Summary of the positioning of ADCP transducers and MRU's installed on the Kronprins Haakon. This information is from the Parker Survey completed from 11 January to 25 February 2017 in La Spezia (Parker Document reference 1606090-17000028) and is needed for accurate VMADCP data processing. Positioning of ADCP transducers if relative to centre MRU (centre MRU is connected to sea path system).

The Kronprins Haakon is equipped with 150 kHz and 38 kHz VMADCPs which typically give profiles extending to 250 and 750 m respectively. Due to dense ice in the area of operation the flush-mounted transducers were used rather than transducers mounted in drop keels. The 150 kHz VMADCP was run continuously for the duration of the cruise. The 38 kHz VMADCP was not expected to collect good data while the vessel was breaking ice and operating it continuously would have reduced the quantity of fisheries echo sounder data collected at the same frequency.

150 kHz ADCP Configuration:

- The ADCP deployed was a 150 kHz RDI Ocean Surveyor
- Navigation and ping data from the ADCP were collected using the UDHAS data acquisition system and saved.

The ADCP was started with the following commands:



```
NP1
NN60
NS800
NF1000
WP0
WN80
WS400
WF1000
BP0
BX5000
TP00:01.10
CX1,0
```

Commands of the 150kHz flush-mounted ADCP during the AO2024 cruise.

Lowered-ADCP

Contact: Paul A. Dodd (paul.dodd@npolar.no)

Two LADCP-profilers (RD Instruments) were mounted on the large 24 bottle CTD rosette to obtain vertical profiles of horizontal currents. The ADCPs are 6000-m rated, 300 kHz Sentinel Workhorses. The units received power from an external battery canister with a housing identical to that of the instruments. All three units are installed on the rosette in a balanced distribution to ensure minimum tilt. Each ADCP has the LADCP option installed. The ADCPs were configured to sample in master and slave mode to ensure synchronization. The master ADCP pointed downward (SN 24474) and the slave ADCP pointed upward (SN 24472). The compass of each instrument was last calibrated in Tromsø, in their respective orientation in

2018. The resulting compass errors were less than 4°. Since the batteries are housed in an external canister, we expect the compass calibration to remain valid.
In total 38 profiles of LADCP were taken. Because of problems with the cable used to communicate with the LADCP instrument, the LADCP could not be started at all CTD casts. CTD casts where LADCP data was collected are listed in in table above. The vertical bin size (and pulse length) was set to 8 m for each ADCP. Single ping data were recorded in beam coordinates, with blank distance set to zero.

Under-ice ADCP measurements

Contact: Morven Muilwijk (morven.muilwijk@npolar.no)
Collected by: Morven Muilwijk, Achim Randelhoff & Zoe Koenig

A Signature 500 ADCP (SN100809) was deployed through a hole in the ice (4 overlapping auger holes) at two ice stations (#4 Amundsen Basin, and #5 Nansen Basin). This instrument measures ocean velocity at high frequency in the upper 50m of the water column and can provide information on under-ice mixing if data quality allows. The ADCP was mounted downward-looking in a metal frame, hanging from two chains approximately 30 cm beneath the sea ice bottom. The ship was moored to the ice floe during the whole deployment period with trusters turned off.
The instrument was configured to measure in BEAM coordinates but can transformed to XYZ coordinates (using Sig4beam_transform.m from Nortek "Signature Principles of Operation"). The ADCP's x-coordinate was aligned with the ship's heading. Given the proximity to the geographic and magnetic north pole, the compass must be treated with caution, and the ship's navigational data should, therefore, be used as a reference frame. The ADCP was configured with a single plan (burst using 5 beams). Measurements were continuous at 4Hz and cell size 0.5m down to 50m. Deployment file: AD2CP_500kHz_100809_AO2024.deploy. At ice stations #4 (Amundsen Basin) and #5 (Nansen Basin) the instrument logged for approximately 24 hours. See the ice station overview chapter for a map of the station and an overview of other measurements. NB: The instrument clock is one hour off (UTC+1 instead of UTC+2).

ADCP Signature-500 deployment at Amundsen Sea ice station. Photos: Trine Lise Sviggum Helgerud/NPI

Overview of deployments
At Ice Station #4 (Amundsen Basin), the instrument was deployed at Site 5, approximately 90 m away from the ship. The site was characterized by level ice (1.8 m) covered with multiple melt ponds and surrounded by multiple ridges in all directions. The landscape was very deformed with multiple large ridge "gardens" and leads. The ice was soft and mushy. Wind speeds during the ice station were strong (~15m/s and drift speed was also strong). Datafile: S100809A016_AO2024.ad2cp Data has been converted to MATLAB format.
At Ice Station #5 (Nansen Basin), the instrument was deployed at Site 3 (map in ice station overview chapter), approximately 100 m away from the ship. The site was characterized by thin ice (50 cm) surrounded by melt ponds and leads. No nearby ridges. Some thick ice surrounded the site (up to 1.8m), but several melt ponds were melted through. The ice was rotten and wet. Wind speeds during ice station were weak (<1m/s, and drift speeds were also weak ~0.2 knots). Datafile: S100809A0176_AO2024_NAN.ad2cp Data has been converted to MatLab format.

Deployment	Deployment Date	Deployment Time (UTC)	Recovery Date	Recovery Time (UTC)	Comments
AMU	31.07.24	08:30	01.08.24	08:00	S100809A016_AO2024_1.mat S100809A016_AO2024_2.mat

NAN	06.08.24	13.30	07.08.24	12:50	S100809A017_AO2024_NAN_1.mat S100809A017_AO2024_NAN_2.mat

Seaglider deployment

Contact: Ilker Fer (Ilker.fer@uib.no)
Deployed by: Zoe Koenig, Morven Muilwijk, Achim Randelhoff

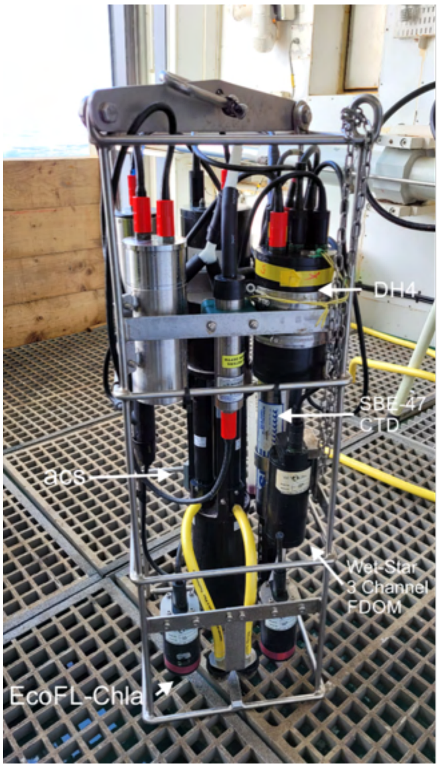
A SeaGlider was deployed over the continental slope west of Svalbard close to position N 78.15 00, E 10.8546 in about 250 m water depth at about 4 am UTC on 19 July 2024. The glider was deployed from the starboard side of the ship using a pin system around the fin at the tail. During the deployment, the ship maintained a straight course northward at about 2 knots.

Optical measurements

Profiles of inherent optical properties

Contact: Piotr Kowalczuk (piotr@iopan.pl)
Collected by: Piotr Kowalczuk, Mirosław Darecki

Optical properties of the upper ocean (down to approx. 200 m depth) were measured using an instrument package for profiling deployment. The aim is to characterize the attenuation (absorption and scattering) of visible light in the water column and relate this to the water properties (e.g. CDOM and particle absorption and scattering). The instrument package consisted of a SeaBird ac-s (IOPAN, SN 100), a SeaBird WET STAR 3-channel FDOM fluorometer (IOPAN, SN 003), Seabird ECO FL - chl-a fluorometer (IOPAN, SN 2269) and a SBE49 CTD (IOPAN, SN XX). The SeaBird ac-s measures hyperspectral absorption and attenuation from 402 to 750 nanometers, at spectral resolution 4 nm. This can be used to estimate chlorophyll and CDOM concentration with high vertical resolution, as well as the concentration of particulate matter. FDOM and chl-a fluorometers also provides DOM and chl-a estimates, based on fluorescence.
The optical profiling package was deployed at all “A” and “B” stations during the main transect., (Figure below). In total 19 profiles were recorded. First, the optical profiler was lowered to 5 meters for allowing de-bubbling of the pumped systems and stabilization of the sensors. Then, the instrument package was brought to the surface before a profiling deployment was conducted down to about 200 meters. A descent speed of 0.3 m/s was used to achieve good vertical resolution.



The optical profiler, with the different instruments and datalogger indicated (external battery pack is positioned behind the ac-s).

Instrument	Serial no.	Description
Seabird acs	SN-100	In situ absorption and attenuation meter
SeaBird WET STAR 3-channel FDOM fluorometer	SN-003	In situ FDOM fluorometer with 3 excitation and emission channels – Ch1- ex. 310 nm / em.450 nm, Ch2 - ex.280 / em.450 nm, Ch3 - ex.280 nm / em.350 nm, measuring different FDOM fractions
Seabird ECO FL - chl-a fluorometer	SN-2269	In situ chlorophyll-a fluorometer
Seabird SBE47 CTD probe	SN - 1953143	
Wetlab DH4		Data logger
Battery pack		

Summary of optical profiler configuration

Cast	Date	Time (UTC)	Latitude	Longitude	Comments
202407271059_AO24_47b.003	2024-07-27	10:59	87.100 N	34.262W	CTD 47 B, cast 110
202407280030_AO24_45a.004	2024-07-28	00:30	87.050 N	27.988 W	CTD 45 A, cast 115
202407281440_AO24_43b.005	2024-07-28	14:40	86.965 N	21.665 W	CTD 43 B, cast 118
202407290303_AO24_41a.006	29-07-2024	03:03	86.857 N	15.940 W	CTD 41 A, cast 122
202407292010_AO24_39b.007	29-07-2024	20:10	86.702 N	10.488 W	CTD 39 B, cast 124
202408011016_AO24_37a.008	01-08-2024	10:16	86.633 N	2.580 W	CTD 37 A, cast 128
202408022136_AO24_35b.009	02-08-2024	21:27	86.326 N	1.158 W	CTD 35 B, cast 131
202408030650_AO24_33a.010	03-08-2024	06:39	86.121 N	2.762 E	CTD 33 A, cast 135
202408031605_AO24_31b.011	03-08-2024	15:48	85.879 N	6.182 E	CTD 31 B, cast 137
202408040151_AO24_29a.012	04-08-2024	01:55	85.636 N	9.450 E	CTD 29 A, cast 141
202408040900_AO24_27b.013	04-08-2024	09:00	85.368 N	12.010 E	CTD 27 B, cast 143
202408041736_AO24_25a.014	04-08-2024	18:05	85.093 N	14.567 E	CTD 25 A, cast 147
202408050541_AO24_23b.015	05-08-2024	04:25	84.829 N	16.773 E	CTD 23 B, cast 149
202408051333_AO24_21a.016	05-08-2024	14:10	84.547 N	18.761 E	CTD 21 A, cast 153
202408052320_AO24_19b.017	05-08-2024	23:19	84.266 N	20.654 E	CTD 19 B, cast 155
202408072338_AO24_17a.018	08-08-2024	00:15	83.945 N	22.288 E	CTD 17 A, cast 159
202408080610_AO24_15b.019	08-08-2024	05:50	83.668 N	23.677 E	CTD 15 B, cast 161
202408081756_AO24_13a.020	08-08-2024	18:30	83.345 N	24.993 E	CTD 13 A, cast 165
202408090937_AO24_09a.021	09-08-2024	09:50	82.759 N	27.312 E	CTD 09 A, cast 171

Summary of IOP profiler deployments

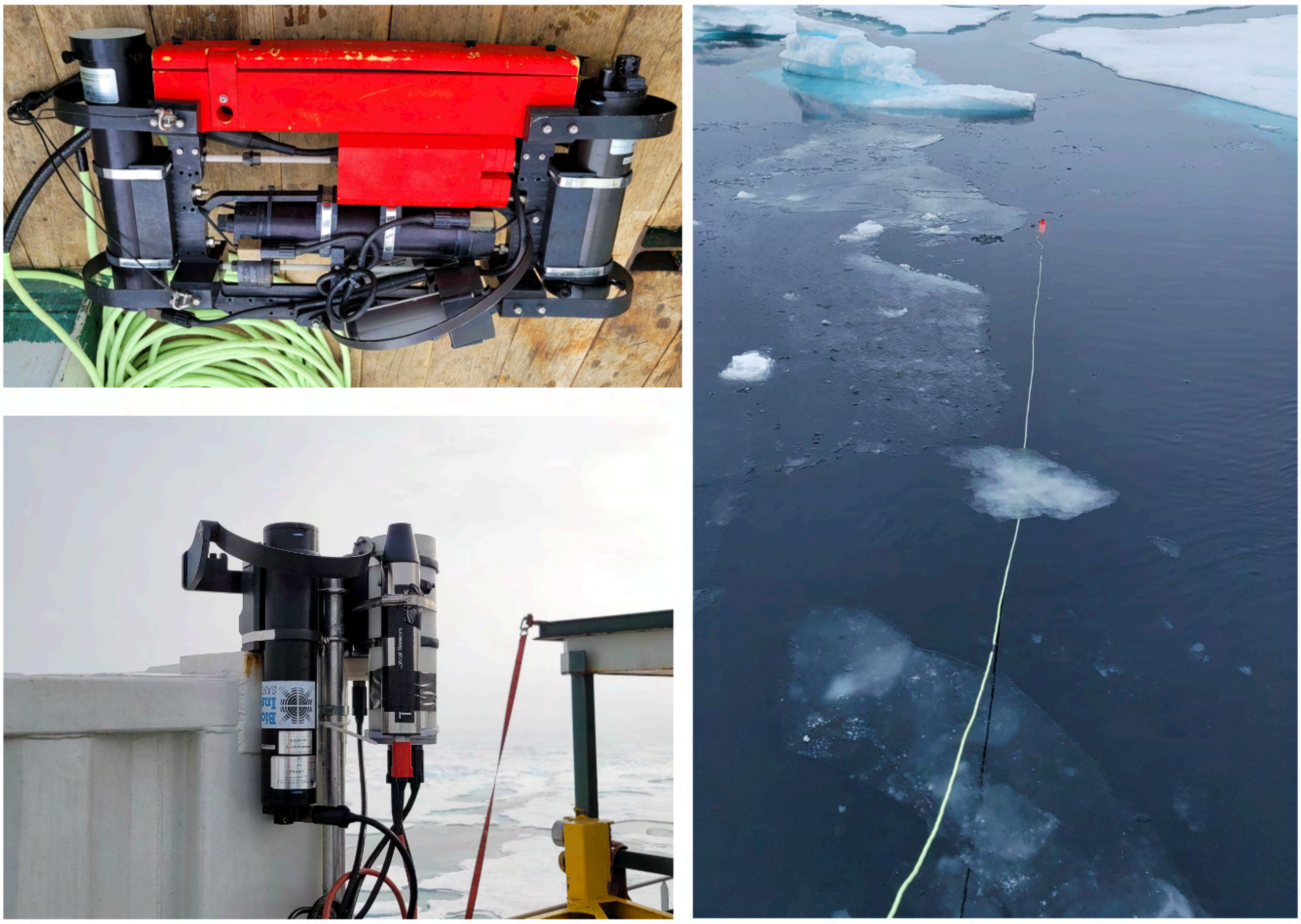
Raw data acquired during instruments deployments require post processing: calibrations, spectral corrections, temperature correction, smoothing (spikes removals) and binning. Quality controlled data set will be available approximately three months after the cruise.

Spectral measurements of upwelling and downwelling light fluxes in the water column

Contact: Miroslaw Darecki (darecki@iopan.pl)
Collected by: Miroslaw Darecki & Piotr Kowalczuk

The spectral distribution of downward solar irradiance and upward radiance as a function of depth was measured by a multispectral free fall system of submersible profiling radiometers C-PrOPS (Compact-Optical Profiling System, Biospherical Instruments Inc., USA). The system also consists of an above-water surface reference instrument, to measure the intensity of incident solar irradiance at sea level. The reference instrument is also equipped with a shadowband system, for measurements of the diffuse and direct solar radiation that is utilized in the calculation of remote sensing reflectance.

The C-PrOPS system is equipped with 19 spectral channels, 305, 340, 380, 395, 412, 443, 465, 490, 510, 532, 555, 565, 589, 625, 665, 683, 710, 765 nm and the special PAR channel. The C-PrOPS measures the profiles in free-fall mode, away from the ship's shadow (Figure below). The underwater device is equipped with remote-controlled thrusters which are used to place the instrument at the proper distance from the ship.



Top left panel: C-PrOPS underwater unit, bottom-left panel: C-PrOPS reference unit (visible also reference radiometer for hyperspectral Ramses floating system), left panel: deployment of C-PrOPS underwater unit.

Instrument	Serial no.	Description
LuZ - underwater radiance radiometer	113	measuring in-water upwelling radiance
Edz - underwater irradiance radiometer	112	measuring in-water downward irradiance
Edref - reference irradiance radiometer	111(later replaced by 114)	measuring incident irradiance in the air
Bioshade	118	shadowband assembly for making diffuse measurements
BioGPS	117	providing position and time.
ProPower - Compact-Propulsion System	420	dynamically positioning the instrument away from a ship

Summary of C-PrOPS configuration

The spectral upwelling radiance and downwelling irradiance measurements in the water column provide information about the distribution of solar energy in the water column. This information is essential for marine photosynthesis studies and assessment of solar energy supply at individual depths in the water column. In further processing, the profiles of downward irradiance will be used to calculate spectral values of the diffuse attenuation coefficient of downward irradiance. Also, remote-sensing reflectance, Rrs(l), will be calculated as the ratio of the water leaving radiance just above the water surface, Lw(l), to downwelling irradiance measured above the water, Es(l). The water-leaving radiance Lw(l) will be obtained from the upwelling radiance estimated just below the water surface and propagated through the water-air interface.

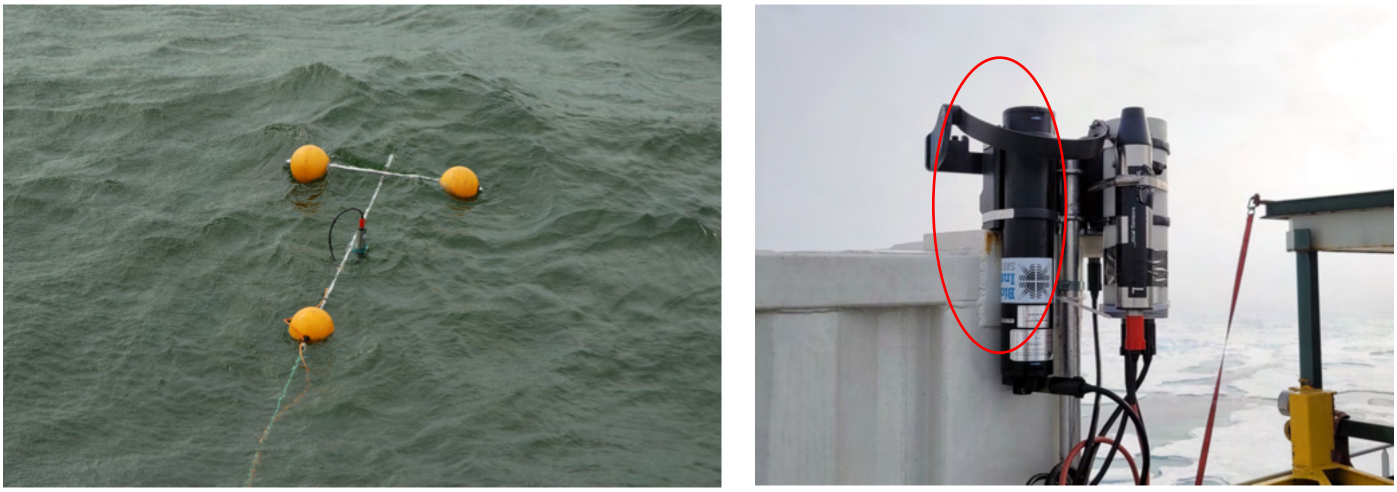
Cast	Date	Time (UTC)	Latitude	Longitude	Comments
CAST_001_240727_114311_URC.csv CAST_002_240727_114543_URC.csv	2024-07-27	11:43	87.100 N	34.262W	CTD 47 B
CAST_001_240727_132554_URC.csv CAST_002_240727_132906_URC.csv CAST_003_240727_133158_URC.csv	2024-07-27	13:25	87.100 N	34.262W	CTD 47 B
	2024-07-28	00:30	87.050 N	27.988 W	CTD 45 A
CAST_001_240728_150144_URC.csv CAST_002_240728_150718_URC.csv CAST_003_240728_150850_URC.csv	2024-07-28	14:52	86.965 N	21.665 W	CTD 43 B
CAST_001_240729_034941_URC.csv CAST_003_240729_035604_URC.csv CAST_004_240729_040019_URC.csv	29-07-2024	03:49	86.857 N	15.940 W	CTD 41 A
	29-07-2024	20:10	86.702 N	10.488 W	CTD 39 B
CAST_001_240801_110750_URC.csv CAST_002_240801_111219_URC.csv CAST_003_240801_111612_URC.csv CAST_004_240801_112035_URC.csv	01-08-2024	11:07	86.633 N	2.580 W	CTD 37 A
	02-08-2024	21:27	86.326 N	1.158 W	CTD 35 B
	03-08-2024	06:39	86.121 N	2.762 E	CTD 33 A
CAST_001_240803_161352_URC.csv CAST_002_240803_161612_URC.csv CAST_003_240803_161831_URC.csv CAST_004_240803_162252_URC.csv	03-08-2024	16:13	85.879 N	6.182 E	CTD 31 B
CAST_001_240804_020943_URC.csv CAST_002_240804_021640_URC.csv	04-08-2024	02:13	85.636 N	9.450 E	CTD 29 A
	04-08-2024	09:00	85.368 N	12.010 E	CTD 27 B
CAST_001_240804_175033_URC.csv CAST_002_240804_175348_URC.csv CAST_003_240804_175620_URC.csv	04-08-2024	17:50	85.093 N	14.567 E	CTD 25 A
CAST_001_240805_045737_URC.csv CAST_002_240805_050427_URC.csv CAST_003_240805_051123_URC.csv	05-08-2024	04:25	84.829 N	16.773 E	CTD 23 B
CAST_001_240805_133727_URC.csv CAST_002_240805_134418_URC.csv	05-08-2024	13:37	84.547 N	18.761 E	CTD 21 A
CAST_001_240805_233047_URC.csv CAST_006_240805_233704_URC.csv CAST_007_240805_234445_URC.csv	05-08-2024	23:30	84.266 N	20.654 E	CTD 19 B
CAST_001_240807_235508_URC.csv CAST_002_240808_000159_URC.csv CAST_003_240808_000811_URC.csv	08-08-2024	00:01	83.945 N	22.288 E	CTD 17 A
	08-08-2024	05:50	83.668 N	23.677 E	CTD 15 B
CAST_001_240808_181308_URC.csv CAST_002_240808_181949_URC.csv CAST_003_240808_182453_URC.csv	08-08-2024	18:13	83.345 N	24.993 E	CTD 13 A
CAST_001_240809_094458_URC.csv CAST_002_240809_094904_URC.csv CAST_003_240809_095557_URC.csv	09-08-2024	09:44	82.759 N	27.312 E	CTD 09 A

Summary of measurements collected

Hyperspectral measurements of upwelling radiance & downwelling irradiance

Contact: Miroslaw Darecki (darecki@iopan.pl)
Collected by: Miroslaw Darecki & Piotr Kowalczuk

Two hyperspectral TriOS RAMSES radiometers were used, operating in the spectral range between 320 - 950 nm and collecting information in 194 wavebands, 3.3 nm width each. The RAMSES MRC-VIS radiometer measured upwelling radiance Lu just below the sea surface. It was mounted on a frame, usually floating 15 – 20 meters from the ship. The RAMSES ACC-VIS sensor, mounted at the deck, away from the ship's superstructure, simultaneously recorded the incident solar irradiance Eref(λ). Measurements collected by radiometers allow computing the remote-sensing reflectance, Rrs(λ).

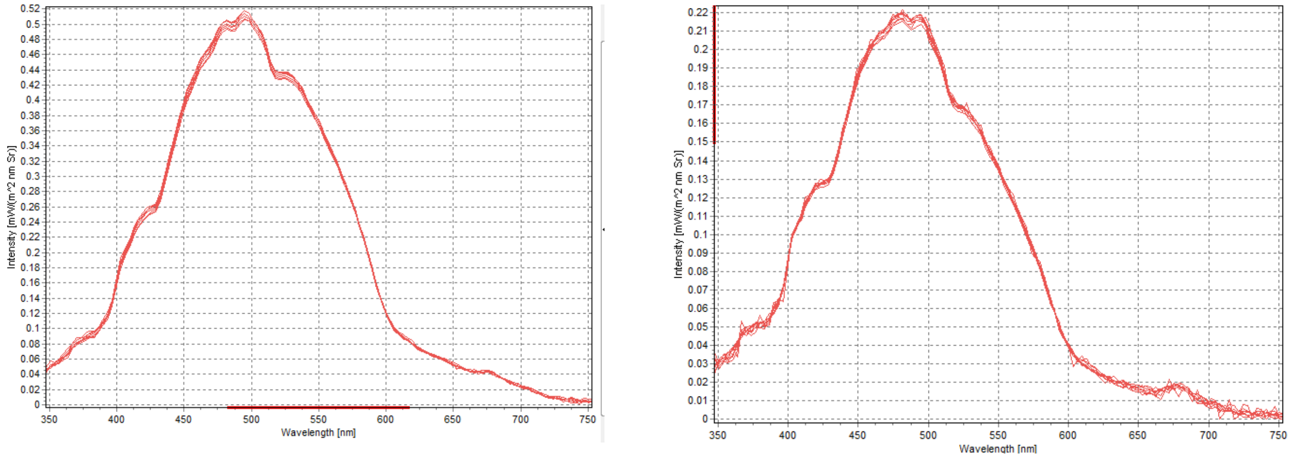


Left panel; RAMSES MRC-VIS radiometer mounted on a floating frame, right panel: RAMSES ACC-VIS irradiance reference radiometer.

Instrument	Serial no.	Description
RAMSES MRC-VIS	010-04-8169	measuring upwelling radiance in water
RAMSES ACC-VIS	010-04-816D	measuring downward reference irradiance in air

Summary of the float configuration

Rrs is a basic quantity used in remote sensing of the sea, including satellite remote sensing. Based on the analysis of spectral dependencies in the Rrs, it is possible to determine optically significant components of seawater. The measurements are also used to calibrate ocean color satellite data.



Example of water leaving radiance measured on 2024-07-27 11:30 (left) and on 2024-08-01 11:30 (right)

Due to difficulty placing the device at an appropriate distance from the ship (no drift), measurements were performed at a limited number of stations.

Cast	Date	Time (UTC)	Latitude	Longitude	Comments
4DB0_2024-07-27_11-31-54_286_053 ……	2024-07-27	11:31	87.100 N	34.262W	CTD 47 B
4DB0_2024-07-28_01-06-34_615_149 …..	2024-07-28	01:06	87.050 N	27.988 W	CTD 45 A
4DB0_2024-07-29_04-07-24_805_059 …..	29-07-2024	03:49	86.857 N	15.940 W	CTD 41 A
4DB0_2024-08-01_11-30-13_134_942 …..	01-08-2024	11:30	86.633 N	2.580 W	CTD 37 A
4DB0_2024-08-05_13-54-45_635_056 …..	05-08-2024	13:37	84.547 N	18.761 E	CTD 21 A

Summary of measurements collected

Sun photometer measurements

Contact: Alexander Smirnov (alexander.smirnov-1@nasa.gov)
Collected by: Polona Itkin

The sun photometer measurements were done to validate airborne measurements from Arctic Radiation-Cloud-Aerosol-Surface Interaction Experiment (ARCSIX, https://www-air.larc.nasa.gov/missions/arcsix) campaign based on Station Nord during the duration of our cruise.

If there were no clouds in front of the solar disc close to the solar noon, sun photometer (Microtops) measurements were taken. The observations were taken from the observation deck of the ship along with the sea ice observations. In total, there were only 3 such days during the whole duration of the cruise.

Date	Time (UTC)	Latitude	Longitude	Comments
28/07/2024	13:06	86.972	-21.6193	Very difficult to center on the sun disc from a moving ship.
02/08/2024	10:15	86.5278	-5.6113	Deploying Amundsen mooring
03/08/2024	12:54	85.9967	4.348	

Summary of measurements collected

Parameters measured from niskin bottle samples

Chlorophyll *a*

Contact: Philipp.Assmy (Philipp.Assmy@npolar.no)
Collected by: Lucie Goraguer

Chlorophyll a/Phaeophytin (Chl a) concentration (mg L^{-1}) is a proxy for biomass of primary production. The water was collected at 8 standard depths and chlorophyll max (1, 5, 10, 25, 50, 75, 100 m & Chl max using Niskin bottles attached to a rosette combined with CTD. Chlorophyll A was measured at sites: 47, 45, 41, 37, 33, 29, 25, 21, 17, 13 & 9.
Method: Seawater was sampled into a 10L container and filtered onto Whatman GF/F >0.7 µm filters. The volume filtered varied depending on the amount of biomass (filtered until visible green colour on the filter). The filter was extracted overnight in 5 ml methanol. The concentrations were measured on board using a Turner Trilogy fluorometer.

Remark: The total chlorophyll *a* concentration was low at both transect (<1.8 µg L-1), and higher concentration by the southern part of the transect (e.g. station 13A).

Dissolved inorganic carbon and total alkalinity

Contact: melissa.chierici@imr.no / agneta.fransson@npolar.no
Collected by: Mats Granskog, Zoe Koenig, Morven Muilwijk and Achim Randelhoff.

Samples for dissolved inorganic carbon (DIC) and total alkalinity (AT) we collected from the CTD casts. Samples were collected for the full water column (same standard depths as for salinity, nutrients, delta ^{18}O and CDOM, across the whole section, at A and B stations). Some additional samples were collected at shallower depths to match with biological experiments. DIC describes the sum of dissolved CO2, carbonic acid, bicarbonate- and carbonate ions in seawater, while Alkalinity is the ocean's buffering system against increasing acidity. Total alkalinity is a measure of the concentration of buffering molecules like carbonate and bicarbonate in the seawater that can neutralize acid. DIC and AT used to investigate the state of the marine carbonate chemistry and can be used to calculate pH and pCO2 of the water samples, i.e. the ocean acidification state of the water.

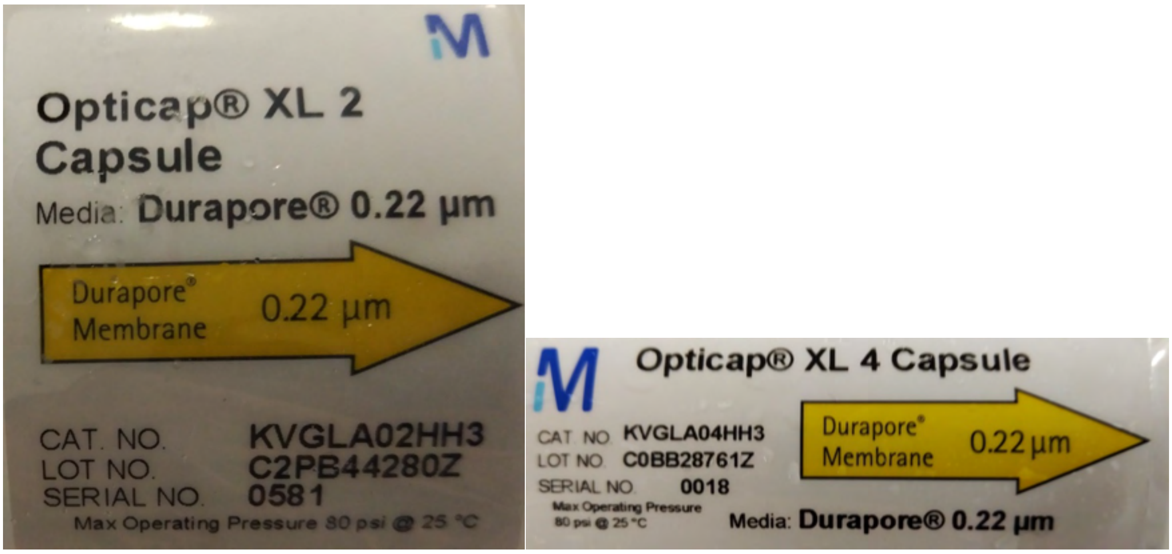
The DIC/AT samples were drawn first or after dissolved oxygen samples from the Niskin bottles, using establish techniques for sampling of gases into 250 ml glass bottles, and preserved with 50 µl Mercury Chloride and stored in the cool and dark for post-cruise analysis. Samples are analysed at the CO_2 lab, Institute of Marine Research, Fram Centre (Tromsø).

Dissolved organic matter (DOM)

Contact: Mats Granskog and Colin Stedmon (mats@npolar.no and cost@aqua.dtu.dk)
Collected by: Mats Granskog, Achim Randelhoff

DOM is a ubiquitous component of aquatic systems, present in all natural waters, representing a major carbon reservoir. During the AO2024 cruise, samples for the analysis of different fractions of the DOM-pool were collected from water samples. Those samples were destined for both quantification and characterization of DOM with optical spectroscopy. Coloured (CDOM) and fluorescent (FDOM) DOM samples were directly gravity filtered through 0.22 µm pore size membrane filter cartridges (see Figure below) into acid-washed, pre-combusted amber glass vials/bottles. CDOM is the DOM fraction that is colored (i.e., absorbs light) and can often be used as a proxy to describe the amount of DOM in natural waters (by a wavelength-specific absorption coefficient measured with a spectrophotometer). FDOM is the CDOM fraction that can further emit light at longer wavelengths (i.e., fluorescence) after excitation with ultraviolet and/or visible light. FDOM is often used to describe the composition of DOM based on the different fluorophores identified in the respective water samples (from so-called excitation-emission matrices or EEMs).

CDOM and FDOM samples were collected from type A and B CTD casts (at all standard sampling depths, at nearly all stations) and stored in the dark and cool until analysis. The plan after the cruise is to measure the samples on board FF Kronprins Haakon during the cruise following the AO2024 cruise (NPI cruise to Fram Strait, by C. Stedmon & team).



Millipore Opticap capsules were used to filter CDOM samples. SN 0018 was used for all stations before and including station 25A. SN 0581 was used after station 25A, i.e., from station 23B until the end of the cruise.

ConcentrA i. e. phytoplankton pigments (HPLC)

Contact: Joanna Stoń-Egiert, (aston@iopan.pl)
Collected by: Piotr Kowalczuk, Mirosław Darecki

Seawater samples for measurements of concentration of phytoplankton pigments were collected from CTD Niskin-bottles, and next filtered through Whatman GF/F 0.7 µm fiberglass filters (ϕ= 25 mm) under gentle vacuum (< 0.6 atm) and immediately deep frozen (-80 °C) to improve extraction efficiency and minimize pigment alterations. Water samples were collected at three standard depths at "B" stations: 10, 25 and 50 m. At "A" stations, samples were collected at three depths: 1 m, chlorophyll-a f fluorescence maximum assed from a sensor mounted on ships CTD rosette, and from 50 m. At the Amundsen and Nansen ice stations, HPLC samples were also collected from the "bulk biological ice cores. Determination of phytoplankton pigments and their quantification by liquid chromatography (HPLC) technique enables the measurement of the concentration of chlorophylls and carotenoids in the water and the analysis of phytoplankton biomass, its taxonomic structure, and the physiological state of algal cells. It can also be used to analyse the distribution of underwater light fields and their use through photosynthesis in the primary production process.
In total 57 HPLC samples were collected and filters with retained suspended particles will be analysed in the Institute of Oceanology Polish Academy of Sciences in Sopot, Poland by Joanna Stoń-Egiert according to adopted HPLC

methodology described in: Stoń-Egiert J., Kosakowska A., 2005, *RP-HPLC determination of phytoplankton pigments – comparison of calibration results for two columns*, Mar. Biol., 147, 251-260.

Station/Cast no.	Date	Time	Latitude	Longitude	Depth (m)	Sample no.	
						apl	HPLC
CTD 47 B, cast 110	2024-07-27	10:59	87.100 N	34.262 W	10	apl1	hplc1
					25	apl2	hplc2
					50	apl3	hplc3
CTD 45 A, cast 115	2024-07-28	00:30	87.050 N	27.988 W	1	apl4	hplc4
					18	apl5	hplc5
					50	apl6	hplc6
CTD 43 B, cast 118	2024-07-28	14:40	86.965 N	21.665 W	10	apl7	hplc7
					25	apl8	hplc8
					50	apl9	hplc9
CTD 41 A, cast 122	29-07-2024	03:03	86.857 N	15.940 W	1	apl10	hplc10
					18	apl11	hplc11
					50	apl12	hplc12
CTD 39 B, cast 124	29-07-2024	20:10	86.702 N	10.488 W	10	apl13	hplc13
					25	apl14	hplc14
					50	apl15	hplc15
CTD 37 A, cast 128	01-08-2024	10:16	86.633 N	2.580 W	1	apl16	hplc16
					22	apl17	hplc17
					50	apl18	hplc18
CTD 35 B, cast 131	02-08-2024	21:27	86.326 N	1.158 W	10	apl19	hplc19
					25	apl20	hplc20
					50	apl21	hplc21
CTD 33 A, cast 135	03-08-2024	06:39	86.121 N	2.762 E	1	apl22	hplc22
					15	apl23	hplc23
					50	apl24	hplc24
CTD 31 B, cast 137	03-08-2024	15:48	85.879 N	6.182 E	10	apl25	hplc25
					25	apl26	hplc26
					50	apl27	hplc27
CTD 29 A, cast 141	04-08-2024	01:55	85.636 N	9.450 E	1	apl28	hplc28
					25	apl29	hplc29
					50	apl30	hplc30
CTD 27 B, cast 143	04-08-2024	09:00	85.368 N	12.010 E	10	apl31	hplc31
					25	apl32	hplc32
					50	apl33	hplc33
CTD 25 A, cast 147	04-08-2024	18:05	85.093 N	14.567 E	1	apl34	hplc34
					22	apl35	hplc35
					50	apl36	hplc36
CTD 23 B, cast 149	05-08-2024	04:25	84.829 N	16.773 E	10	apl37	hplc37
					25	apl38	hplc38
					50	apl39	hplc39
CTD 21 A, cast 153	05-08-2024	14:10	84.547 N	18.761 E	1	apl40	hplc40
					36	apl41	hplc41
					50	apl42	hplc42
CTD 19 B, cast 155	05-08-2024	23:19	84.266 N	20.654 E	10	apl43	hplc43
					25	apl44	hplc44
					50	apl45	hplc45
CTD 17 A, cast 159	08-08-2024	00:15	83.945 N	22.288 E	1	apl46	hplc46
					39	apl47	hplc47
					50	apl48	hplc48
CTD 15 B, cast 161	08-08-2024	05:50	83.668 N	23.677 E	10	apl49	hplc49
					25	apl50	hplc50
					50	apl51	hplc51
CTD 13 A, cast 165	08-08-2024	18:30	83.345 N	24.993 E	1	apl52	hplc52
					45	apl53	hplc53
					50	apl54	hplc54
CTD 09 A, cast 171	09-08-2024	09:50	82.759 N	27.312 E	1	apl55	hplc55
					25	apl56	hplc56
					50	apl57	hplc57

Summary of collected particulate absorption and HPLC samples

$\delta^{18}O$

Contact: Paul A. Dodd (paul.dodd@npolar.no)
Collected by: Mats Granskog, Zoe Koenig, Morven Muilwijk and Achim Randelhoff.

The parameter $\delta^{18}O$ describes the ratio of ^{18}O to ^{16}O isotopes in the H_2O molecule. $\delta^{18}O$ is a tracer for water which has at some point evaporated and is useful to separate sea ice meltwater from river input & precipitation. Seawater $\delta^{18}O$ samples will be measured ashore using a dual-inlet mass spectrometer.

Dissolved argon and nitrogen

Contact: Magdalena Diak (mdiak@iopan.pl)
Collected by: Piotr Kowalczuk

Direct measurements of dissolved nitrogen (N_2) and argon (Ar) can enable the global nitrogen fixation. Discrete samples (12 ml) of seawater were collected without headspace from surface water via the Rosette sampler in triplicates and kept in a fridge. Samples were collected on "B" stations at three depths: 10, 50 and 1000 m. For nitrogen fixation assessment ancillary data on temperature and salinity, wind direction and speed are needed at each station. All collected samples, N_2 and Ar will be measured at the Institute of Oceanology Polish Academy of Sciences. Concentration of dissolved nitrogen (N_2) and argon (Ar) will be measured via membrane inlet mass spectrometer (MIMS). Nitrogen fixation is a substantial process carried out by N_2-fixing prokaryotic microorganisms that convert atmospheric dinitrogen gas (N_2) to bioavailable ammonia. Recent studies show that NF can occur not only in high temperatures but also in colder (< 10°C) waters at high and mid-latitudes. The obtained data will be used to assess the importance of global nitrogen fixation and contribution of high and mid-latitudes to this process. In total 30 samples were collected.

Station/Cast no.	Date	Time	Latitude	Longitude	Sampled depth	Sample no.
						Argon
CTD 47 B, cast 110	2024-07-27	10:59	87.100 N	34.262 W	10	Ar3
					50	Ar2
					100	Ar1
CTD 43 B, cast 118	2024-07-28	14:40	86.965 N	21.665 W	10	Ar6
					50	Ar5
					100	Ar4
CTD 39 B, cast 124	29-07-2024	20:10	86.702 N	10.488 W	10	Ar9
					50	Ar8
					100	Ar7
CTD 35 B, cast 131	02-08-2024	21:27	86.326 N	1.158 W	10	Ar10
					50	Ar11
					100	Ar12
CTD 31 B, cast 137	03-08-2024	15:48	85.879 N	6.182 E	10	Ar13
					50	Ar14
					100	Ar15
CTD 27 B, cast 143	04-08-2024	09:00	85.368 N	12.010 E	10	Ar16
					50	Ar17
					100	Ar18
CTD 23 B, cast 149	05-08-2024	04:25	84.829 N	16.773 E	10	Ar19
					50	Ar20
					100	Ar21
CTD 19 B, cast 155	05-08-2024	23:19	84.266 N	20.654 E	10	Ar22
					50	Ar23
					100	Ar24
CTD 15 B, cast 161	08-08-2024	05:50	83.668 N	23.677 E	10	Ar25
					50	Ar26
					100	Ar27
	09-08-2024	09:50	82.759 N	27.312 E	10	Ar28

CTD 09 A, cast 171					50	Ar29
					100	Ar30

Summary of collected dissolved nitrogen and dissolved argon concentration samples

Dissolved oxygen

Contact: Paul A. Dodd (paul.dodd@npolar.no)
Collected by: Mats Granskog, Zoe Koenig, Morven Muilwijk and Achim Randelhoff.

Laboratory dissolved oxygen measurements are used to validate and (if necessary) calibrate the dissolved oxygen sensors on the CTD. Samples were collected at selected depths and stations. Triplicate samples were collected from each sampling depth in 3 x 125 ml volume-calibrated glass sample bottles. Samples were immediately preserved with Winkler reagents, stored under water, and in the dark for > 24 hours before potentiometric titration with Sodium Thiosulphate using a Metrohm 916 Ti-touch titrator. A laboratory standard 0.01 M NaI solution was prepared by diluting a concentrated solution contained in a sealed ampoule (supplied as a kit to aid Winkler analysis) at the beginning of the cruise. This standard was measured before each set of 24 samples. The dilution was done in two steps, first by making the unknown volume of solution in the ampoule up to a volume of 1000 ml using milliQ water at ca 22° C and a bench scale accurate to +/- 0.3 g. In a second step 100 ml of the diluted solution (measured by weight, using the same scale) was transferred to a new container and again made up to 1000 ml (be weight) using milliQ water at ca 22° C.

Flow Cytometry

Contact: Gunnar Bratbak (Gunnar.Bratbak@uib.no.)
Collected by: Lucie Goraguer

FCM parameter for abundance of bacteria, virus, pico, and nano-plankton by flow cytometry

Sea water was sampled directly from Niskin bottle. Triplicate samples of 1.8 ml were added to the cryo vial and fixed with 38 µl of Glutaraldehyde. The sample was kept in the fridge for 2 hours before freezing at -80°C. The samples will be analysed in Bergen.

The water was collected at 8 standard depths and chlorophyll max (1, 5, 10, 25, 50, 75, 100 m & Chl max) using Niskin bottles attached to a rosette combined with CTD. FCM was measured at sites 47, 45, 41, 37, 33, 29, 25, 21, 17, 13 & 9.

eDNA

Contact: Kim Præbel (kim.praebel@uit.no)
Collected by: Jacob Max Christensen

Environmental DNA (eDNA) was collected for the SUDARCO project working package 4. Working package 4 aims to study/map the biodiversity and distribution of all living organisms (from bacteria to marine mammals) in the Central Arctic Ocean, focusing on the Amundsen and Nansen basins. Due to the vastness of the Arctic Ocean and inhospitable conditions making surveys difficult, eDNA from water samples is being used to create a baseline of the biodiversity in the region.

Sampling was conducted at all A station sites along the transects (Table Below). When possible, water samples were taken at five depths (surface, chlorophyll max, 200m, 400m, and bottom). Due to time restraints and equipment availability, bottom sampling was not possible at all stations.
eDNA sampling protocol:

1) Water was collected from Niskin bottles on the CTD. Each bottle was sterilized with 10% bleach prior to descent.
2) After the retrieval of the CTD, approximately 8 L of water was taken from each sample depth.
3) Each collection of water was split into three two-liter replicates (A, B, and C) and run through 0.22 µM Sterivex filters using a peristaltic pump.
4) Two liters of milli-Q water was filtered as a blank for each station.

5) The used filters were labeled according to station number and depth (e.g. ST37-200-A), sealed in a sterile container, and stored at -80°C.
6) The filters were transported to UiT to be processed by the Research Group for Genetics.

Station	Latitude	Longitude	Date	ID	Running #	Depth (M)
47	87.0996	-34.2511	27.07.24	ST47-SUR	1	1
47	87.0996	-34.2511	27.07.24	ST47-CLM	2	21
47	87.0998	-34.2644	27.07.24	ST47-200	3	200
47	87.0998	-34.2644	27.07.24	ST47-400	4	400
45	87.0523	-27.9796	28.07.24	ST45-SUR	5	1
45	87.0523	-27.9796	28.07.24	ST45-CLM	6	19
45	87.0508	-27.9674	28.07.24	ST45-200	7	200
45	87.0508	-27.9674	28.07.24	ST45-400	8	400
41	86.8543	-15.9660	29.07.24	ST41-SUR	9	1
41	86.8543	-15.9660	29.07.24	ST41-CLM	10	18
41	86.8519	-15.9867	29.07.24	ST41-200	11	200
41	86.8519	-15.9867	29.07.24	ST41-400	12	400
41	86.8519	-15.9867	29.07.24	ST41-BOT	13	4252
37	86.6344	-2.6319	01.08.24	ST37-SUR	14	1
37	86.6344	-2.6319	01.08.24	ST37-CLM	15	22
37	86.6302	-4.5788	31.07.24	ST37-200	16	200
37	86.6302	-4.5788	31.07.24	ST37-400	17	400
37	86.6302	-4.5788	31.07.24	ST37-BOT	18	4226
33	86.1183	2.7317	03.08.24	ST33-SUR	19	1
33	86.1183	2.7317	03.08.24	ST33-CLM	20	15
33	86.1178	2.7269	03.08.24	ST33-200	21	200
33	86.1178	2.7269	03.08.24	ST33-400	22	400
33	86.1178	2.7269	03.08.24	ST33-2000	23	2000
29	85.6362	9.4507	04.08.24	ST29-SUR	24	1
29	85.6362	9.4507	04.08.24	ST29-CLM	25	25
29	85.6354	9.4274	04.08.24	ST29-200	26	200
29	85.6354	9.4274	04.08.24	ST29-400	27	400
29	85.6354	9.4274	04.08.24	ST29-2000	28	2000
25	85.0966	14.5691	04.08.24	ST25-SUR	29	1
25	85.0966	14.5691	04.08.24	ST25-CLM	30	22
25	85.0987	14.5683	04.08.24	ST25-200	31	200
25	85.0987	14.5683	04.08.24	ST25-400	32	400
25	85.0987	14.5683	04.08.24	ST25-2000	33	2000
21	84.5471	18.7468	05.08.24	ST21-SUR	34	1
21	84.5471	18.7468	05.08.24	ST21-CLM	35	36
21	84.5471	18.7420	05.08.24	ST21-200	36	200
21	84.5471	18.7420	05.08.24	ST21-400	37	400
21	84.5471	18.7420	05.08.24	ST21-2000	38	2000
17	83.9440	22.2761	08.08.24	ST17-SUR	39	1
17	83.9440	22.2761	08.08.24	ST17-CLM	40	39
17	83.9361	22.1250	06.08.24	ST17-200	41	200
17	83.9361	22.1250	06.08.24	ST17-400	42	400
17	83.9361	22.1250	06.08.24	ST17-BOT	43	3923
13	83.3462	25.0029	08.08.24	ST13-SUR	44	1
13	83.3462	25.0029	08.08.24	ST13-CLM	45	45
13	83.3473	25.0051	08.08.24	ST13-200	46	200
13	83.3473	25.0051	08.08.24	ST13-400	47	400
13	83.3473	25.0051	08.08.24	ST13-2000	48	2000
9	82.9297	27.3133	09.08.24	ST9-SUR	49	1
9	82.9297	27.3133	09.08.24	ST9-CLM	50	28

9	82.9322	27.4227	09.08.24	ST9-200	51	200
9	82.9322	27.4227	09.08.24	ST9-400	52	400
9	82.9322	27.4227	09.08.24	ST9-2000	53	2000

Summary of eDNA sampling. SUR = surface. CLM = chlorophyll max. BOT = bottom.

Nutrients

Contact: Melissa Chierici (melissa.chierici@hi.no)
Collected by: Mats Granskog, Zoe Koenig, Morven Muilwijk and Achim Randelhoff

Samples for determination of the inorganic nutrients nitrate, nitrite, phosphate and silicate in seawater were collected at A and C stations. Samples were preserved with 250 µl Chloroform and kept cool and dark for further post cruise analysis.

Particulate absorption

Contact: Piotr Kowalczuk (piotr@iopan.pl)
Collected by: Piotr Kowalczuk and Mirosław Darecki

Particulate absorption measurements were collected by filtering water from CTD Niskin-bottles, through GF/F, 0.7 µm filters (diameter 25 mm). Here, particulate absorption is the absorption of visible light due to particles in the water and is linked to water constituents like phytoplankton and non-algal particles. Water samples were collected at three standard depths at “B” stations: 10, 25 and 50 m. At “A” stations, samples were collected at three depths: 1 m, chlorophyll-a f fluorescence maximum assed from a sensor mounted on ships CTD rosette, and from 50 m. In total, 57 particulate absorption filters were collected. Filters with particulate material retained on them were immediately deep frozen (-80 °C). Particulate absorption measurements will be done in the Institute of Oceanology Polish Academy of Sciences in Sopot, Poland, after the cruise. The transmission and reflection technique will be applied with the use of the spectrophotometer equipped with an integration sphere to measure the particulate absorption and non-algal particle absorption (and the difference gives the absorption by pigments). The summary of collected particulate absorption is given in the table together with HPLC samples.

Phytoplankton taxonomy

Contact: Philipp.Assmy (Philipp.Assmy@npolar.no)
Collected by: Lucie Goraguer

Community composition and concentration (cells L^{-1}) of phytoplankton.

Seawater (190 ml) was collected directly from Niskin and fixed with 0.8 ml GLA 25% + 10 ml hexamine-buffered formaldehyde 20%. The taxonomy samples will be analysed using an inverted microscope at IOPAN (Sopot, Poland).

Both niskin bottles and a phytoplankton net with 10 um mesh-size was used to collect water for phytoplankton taxonomy samples. From the niskin attached to the rosette, water was collected at 8 standard depths and chlorophyll max (1, 5, 10, 25, 50, 75, 100 m & Chl max using. The phytoplankton net was deployed from 50-0m. Phytoplankton taxonomy was sampled at sites: 47, 45, 41, 37, 33, 29, 25, 21, 17, 13 & 9.

POC/PON

Contact: Philipp.Assmy (Philipp.Assmy@npolar.no)
Collected by: Lucie Goraguer

POC/PON is a proxy for organic biomass in the water column. The results will be given as absolute values (µg PON & µg POC) & and as δ15N & δ14C [‰].

Niskin bottles, phytoplankton net (net onboard 10 um mesh-size). The water was collected at 8 standard depths and chlorophyll max (1, 5, 10, 25, 50, 75, 100 m & Chl max using Niskin bottles attached to a rosette combined with CTD. POC/PON was measured at sites: 47, 45, 41, 37, 33, 29, 25, 21, 17, 13 & 9.

Seawater was sampled into a 10L container and filtered onto pre-combusted Whatmann GF/F >0.7 µm filters. The filters were dried at 60˚C for approximately 24 hours on Pall petri-slides. All filters from one station were packed together in aluminum foil to protect them from light. Hermanni Kaartokallio will analyse the samples with continuous-flow mass spectrometry (CF-IMRS) at the Finnish Environment Institute (SYKE).

Salinity

Contact: Paul A. Dodd (paul.dodd@npolar.no)
Collected by: Mats Granskog, Zoe Koenig, Morven Muilwijk and Achim Randelhoff.

Laboratory salinity measurements are used to validate and (if necessary) calibrate conductivity sensors on the CTD. Salinity samples were collected at all depths on all casts (where multiple nicking were closed only one was sampled). 250 ml glass sample bottles were filled from Niskin bottles and analysed onboard using a Guildline Portasal salinometer (SN 70177). The air temperature remained at 19 +/- 2 °C for the duration of the cruise and the bath temperature was set at 21 degrees for the entire cruise. Samples were stored next to the salinometer for at least 24 hours before analysis and the salinometer was standardised with OSIL P-Series reference seawater before and after each batch of 24 samples.

Silicification in pelagic diatoms

Contact: Rebecca Duncan (rebecca.duncan@uts.edu.au)
Collected by: Rebecca Duncan

Diatoms are a significant contributor to marine primary production, and their silica-based structure aids their export to the deep ocean making them an important player in marine carbon cycling. The degree of diatom silicification determines their sinking rates and zooplankton grazing rates, which influences the duration of algal blooms, nutrient transfer through food webs, and carbon export. Determining which species contribute most to silica production and species-specific rates of silicification, in conjunction with identifying key nutrient-rich taxa, is important to build a more complete picture of biomineralization and carbon cycling in Arctic marine ecosystems.
During this cruise, samples of pelagic phytoplankton were collected to investigate (1) species-specific silicification rates, (2) species-specific silica content, (3) species-specific biomolecular (nutritional) content, (4) total biogenic silica content and (5) functional (silicification) gene expression.

Water samples (30L) were collected from the CTD-A stations from Chlorophyll-a maximum. Of this, 10 L was filtered in triplicates onto Sterivax filters and stored at -80°C to investigate functional gene expression. The remaining 20L was filter concentrated (3 µm Isopore PC Membrane, Millipore) to 1 L. From this concentrate, 3 x 1.8 ml aliquots were removed for species-specific silica content (X-Ray fluorescence XFM microscopy) and fixed in 2% glutaraldehyde and a further 3 x 1.8 ml aliquots were taken for species-specific biomolecular content (Fourier transform infrared FTIR microspectroscopy - fixed in 5% formaldehyde), and 100 ml was taken for community composition (fixed in 2% glutaraldehyde). The remaining concentrate was divided into four incubation bottles (150 ml total vol.) to investigate species-specific silicification rates using fluorescence microscopy. A fluorescent marker (PDMPO; 0.125uM final conc.) was added in triplicate, and the fourth acted as a control (DMSO; 0.125uM final conc.) The bottles were incubated for 24 hr at 1 °C with light set at ~20 µmol m^{-2} s^{-1}, with periodic mixing. After 24 hours, 6 x 1.8 ml aliquots were removed from each and fixed in 2% glutaraldehyde for later analysis. The remaining volume was filtered (0.8 µm Nuclepore Membrane, Whatman) for total biogenic silica content, and filters were frozen at -80°C until analysis.

Samples will be analysed at the University Technology Sydney and ANSTO's Australian Synchrotron

Cast	Bottle #	Date	Time	Latitude	Longitude	Site
Cast 111		27.7.24	14:40	87.0996	-34.2511	CTD 47-B, sampled to Chl-a max (21m)
Cast 116	2,3,4	28.7.24	23:30	87.0523	-27.9796	CTD 45-A, sampled to Chl-a max (18m)
Cast 121	2,3,4	29.7.24	2:00	86.8543	-15.9660	CTD 41-A, sampled to Chl-a max (18m)
Cast 127	2,3,4	1.8.24	9:45	86.6344	-2.6319	CTD 37-A, sampled to Chl-a max (22m)
Cast 134	2,3,4	3.8.24	6:00	86.1183	2.7317	CTD 33-A, sampled to Chl-a max (15m)
Cast 140	2,3,4	4.8.24	1:35	85.6362	9.4507	CTD 29-A, sampled to Chl-a max (25m)
Cast 146	2,3,4	4.8.24	17:30	85.0966	14.5691	CTD 25-A, sampled to Chl-a max (25m)
Cast 152	2,3,4	5.8.24	13:10	84.5471	18.7468	CTD 21-A, sampled to Chl-a max (36m)

Cast 158	2,3,4	7.8.24	23:30	83.9440	22.2761	CTD 17-A, sampled to Chl-a max (39m)
Cast 164	2,3,4	8.8.24	17:50	83.3447	24.9933	CTD 13-A, sampled to Chl-a max
		10.8.24				CTD 5-A, sampled to Chl-a max (28m)

Summary of samples collected

Phytoplankton and sea ice algal photophysiology measured by fast repetition rate fluorometry (FRRF)

Contact: Eva Leu (eva.leu@akvaplan.niva.no)
Collected by: Eva Leu

To gain more detailed information about the physiological state of the different phytoplankton and ice algal communities we encountered on the cruise, water samples from the Niskin bottles, *Melosira* assemblages, and algal lumps from melt ponds (Nansen Basin Ice station) were analysed by Fast Repetition Rate Fluorometry using the FastOcean sensor with the Act2 system from Chelsea Instruments. This technique allows to measure in a controlled benchtop-approach maximum photosynthetic yield of dark-acclimated microalgae, which gives indications about potential stress and photosynthetic efficiency. In addition, Fast Light Curves (FLC) were measured, which provide information about the photoacclimation state of algae.

CTD #	Site	Date	Time (UTC)	Long	Lat	Depth [m]	Sample	Type
Ice Stn. 1		23.07.2024		86.7179	34.1213			Melosira community
Ice Stn. 2		24.07.2024	11:16	87.7946	34.8001			Melosira community
111	47B	27.07.2024	12:41	87.0996	-34.2511	1	1	Water
111	47B	27.07.2024	12:41	87.0996	-34.2511	5	2	Water
111	47B	27.07.2024	12:41	87.0996	-34.2511	Chl max 21m	3	Water
115	45A	27.07.2024	23:30	87.0535	-27.9868	1	4	Water
115	45A	27.07.2024	23:30	87.0535	-27.9868	5	5	Water
114	45A	27.07.2024	23:30	87.0523	-27.9796	Chl max 18m	6	Water
122	41A	29.07.2024	02:38	86.8568	-15.9404	1	7	Water
122	41A	29.07.2024	02:38	86.8568	-15.9404	5	8	Water
121	41A	29.07.2024	01:58	86.8543	-15.966	Chl max 18m	9	Water
128	37A	01.08.2024	10:44	86.633	-2.5838	1	10	Water
128	37A	01.08.2024	10:44	86.633	-2.5838	5	11	Water
127	37A	01.08.2024	09:43	86.6344	-2.6319	Chl max 22m	12	Water
135	33A	03.08.2024	06:39	86.1202	2.7544	1	13	Water
135	33A	03.08.2024	06:39	86.1202	2.7544	5	14	Water
134	33A	03.08.2024	06:03	86.1183	2.7317	Chl max 15m	15	Water
141	29A	04.08.2024	02:14	85.6362	9.4507	1	16	Water
141	29A	04.08.2024	02:14	85.6362	9.4507	5	17	Water
140	29A	04.08.2024	01:35	85.6362	9.4507	Chl max 25m	18	Water
147	25A	04.08.2024	18:02	85.0935	14.5678	1	19	Water
147	25A	04.08.2024	18:02	85.0935	14.5678	5	20	Water
146	25A	04.08.2024	17:26	85.0966	14.5691	Chl max 25m	21	Water
153	21A	05.08.2024	14:03	84.5468	18.7607	5	22	Water
152	21A	05.08.2024	13:11	84.5471	18.7468	Chl max 36m	23	Water
151	21A	05.08.2024	12.44	84.5471	18.742	Chl max 50m	24	Water
151	21A	05.08.2024	12.44	84.5471	18.742	Chl max 75m	25	Water
157	17A	06.08.2024	15:22	83.9361	22.125	50m	26	Water
Ice Stn. 4	17A	07.08.2024				Meltpond		Algae lump
Ice Stn. 4	17A	07.08.2024				Meltpond		Algae lump
Ice Stn. 4	17A	07.08.2024				Meltpond		Algae lump

Ice Stn. 4	17A	07.08.2024				Meltpond		Algae lump
159	17A	08.08.2024	00:09	83.9447	22.2876	1	27	Water
159	17A	08.08.2024	00:09	83.9447	22.2876	5	28	Water
158	17A	07.08.2024	23:26	83.944	22.2761	Chl max 39m	29	Water
165	13A	08.08.2024	18:31	83.3447	24.9933	1	30	Water
165	13A	08.08.2024	18:31	83.3447	24.9933	5	31	Water
163	13A	08.08.2024	17:25	83.3473	25.0051	Chl max 45m	32	Water

Summary of measurements collected

Analyses of phytoplankton samples were carried out at A stations, usually from three different depths: 1m, 5m, and Chl max. On two occasions during the cruise, FRRF measurements were done on loosely attached *Melosira* assemblages collected from a basket with a bucket (First station) or through a core hole during a small boat excursion. At the Nansen Basin ice station algal lumps from melt ponds were collected and measured as well. Data will be analysed further, including FLC-curve fitting and put into the context of the natural environment, primarily with respect to light and nutrient availability.

In situ vertical profiles of photosynthetic yield (FRRF casts)

Contact: Rolf Gradinger (rolf.gradinger@uit.no)
Collected by: Eva Leu

To complement the measurements of maximum photosynthetic yield (Fv/Fm) that were carried out from CTD water samples and ice algal communities, continuous vertical profiles of photosynthetic yield under ambient conditions were recorded by deploying a downward looking FRRF (FastOcean, Chelsea, Fast Repetition Rate Fluorometer) at all A stations. The FRRF was mounted in a frame together with a CASTAWAY CTD. Recordings were done ca every 0.5m depth over the uppermost 80m of the water column. These measurements provide information about the physiological state of the microalgae in their respective environment.

Further data exploration will include linking the ambient FRRF measurements with water column hydrography, in-situ irradiance, nutrient concentrations, algal diversity, and algal activity measurements using onboard FRRF and productivity incubations. Due to technical issues with the instrument, data are only available from stations 29, 25, 21, and 17.

Station #	Date	Time	Latitude	Longitude	Comments	Event #
29A	04.08.2024	01:20	85.6358	9.4380	Down to 90m	46
25A	04.08.2024	17:12	85.0977	14.5686	Down to 80m	50
21A	05.08.2024	12:52	84.5471	18.7435	Down to 80m	53
17A	08.08.2024	02:30	83.9451	22.2942	Down to 80m	62

Carbon and nitrogen uptake rate measurements (primary production)

Contact: Eva Leu (eva.leu@akvaplan.niva.no)
Collected by: Eva Leu, Fowzia Ahmed

To measure carbon- and nitrogen-uptake rates natural communities of sea ice algae and phytoplankton were incubated with enriched stable isotope compounds, $NaH^{13}CO_3$, and $Na^{15}NO_3$. Phytoplankton samples were collected with Niskin bottles on the CTD rosette from the depth of Chl a max. Sea ice algae samples were collected by scraping off the skeletal layer at the sea ice-water interface with a knife, or as the lowermost 1-3 cm of an ice core, mechanically chopped into small pieces and diluted in filtered surface seawater (only at ice station in Amundsen Basin). At the Nansen Basin ice station, the lowermost 0-3cm section of seven ice cores was pooled and thawed overnight at 4°C in darkness after the addition of filtered seawater. Phytoplankton and sea ice algae incubations were run for 24 hours. Both setups used 7 different light intensities, including one dark control. All samples were spiked with $NaH^{13}CO_3$, and in addition $Na^{15}NO_3$ (Table below). At the end of the incubation period, samples were filtered onto pre-combusted GF/F filters and stored frozen for analyses of POC/PON and stable isotopes. All samples measured in these incubations were initially characterized physiologically by fast repetition rate fluorometry (FRRF, see own paragraph).

In combination with the sea ice algae incubations, we also collected samples for intracellular nutrients (from a separate scrape sample from another ice core), as well as macromolecular composition by FTIR. For each sea ice algae and phytoplankton incubation, a sample for nutrient concentrations was taken, filtered through a pre-combusted GF/F filter using an acid-washed syringe with a swinnex, and frozen at -20 degrees. Samples will be analysed at the University of Manitoba.

Cast #	Site	Date	Lat.	Lon.	Depth	Type of Sample
111	47B	27.07.2024	87.0996	-34.2511	21m	Pelagic (Niskin)
114	45A	27.07.2024	87.0523	-27.9796	18m	Pelagic (Niskin)
121	41A	29.07.2024	86.8543	-15.966	18m	Pelagic (Niskin)
127	Ice stn 4	01.08.2024	86.6344	-2.6319	22m	Pelagic (Niskin)
140	29A	04.08.2024	85.6362	9.4507	25m	Pelagic (Niskin)
146	25A	04.08.2024	85.0966	14.5691	22m	Pelagic (Niskin)
152	21A	05.08.2024	84.5471	18.7468	36m	Pelagic (Niskin)
159	17A	08.08.2024	83.9447	22.2876	39m	Pelagic (Niskin)
164	13A	08.08.2024	83.3462	25.0029	45m	Pelagic (Niskin)
175	5A	10.08.2024	82.1304	29.3117	26m	Pelagic (Niskin)
n/a	Ice stn 1	23.07.2024	86.7197	34.1213		*Melosira*
n/a	Ice stn 2	24.07.2024	87.7946	34.8001		*Melosira*
33	Ice stn 4	31.07.2024	86.5761	-4.8779		Algae
59	Ice stn 5	07.08.2024	83.941	22.1252		Algae
59	Ice stn 5	08.08.2024	83.941	22.1252		Algae
n/a	incubation	02.08.2024	n/a	n/a		*Melosira culture*
n/a	incubation	07.08.2024	n/a	n/a		Unident. Pennate
n/a	incubation	09.08.2024	n/a	n/a		*Attheya longicornis*
n/a	incubation	09.08.2024	n/a	n/a		*Nitzschia frigida*

Intracellular nutrients and culture experiments

Contact: Fowzia Ahmed (ahmedf6@myumanitoba.ca)
Collected by: Fowzia Ahmed

Nutrient availability influences the growth, taxonomy, and composition of sea ice algae in different environmental conditions. It is hypothesized that sea ice algae are able to store intracellular nutrients, like benthic algae when nutrients are available in the environment. This luxury uptake is beneficial, helping to survive periods of darkness and anoxic and/or nutrient-limited conditions. However, no concrete evidence has been shown on ice algal storage capacity. Therefore, controlled laboratory experiments with different nutrient levels are needed to help improve our understanding of ice algal intracellular nutrient storage capacity.

Intracellular nutrients: The skeletal layer of the bottom ice core was scraped off using a stainless-steel knife. The ice as placed into a Nalgene bottle containing 300 mL of filtered sea water. Immediately upon return to the ship, this sample was filtered through GF/F. The filter was then exposed to boiling MQ water, and the filtrate was collected for post-field analysis of intracellular nutrients. A MQ blank is taken for each measurement. Samples were stored at -20°C for later analysis at University of Manitoba (Seal analytical autoanalyzer). Completed at ice stations at the Amundsen Basin and Nansen Basin.

Culture experiments: Two different sets of experiments were conducted by using *Nitzschia frigida* and *Attheya longicornis* stock cultures. L1 culture media of two different nitrate concentrations (2.5 µM and 25 µM) was prepared by modifying the amount of $NaNO_3$. Other nutrients, trace metals, vitamins and salinity were added at normal L1 concentrations and equal across treatments. 15 ml subsample of stock culture transferred into culture flasks containing experimental L1 media (N high and N low). Flasks were placed on a shaker table at 0ºC temperature and light intensities of 30 µmol m^{-2} s^{-1}. Triplicate flasks were collected from each treatment at each nutrient in a regular time interval (4 hours, 12 hours, 24 hours, 48 hours, 5 days, 7 days). Samples were collected to measure ambient and intercellular storage of nitrate concentrations, chl *a* concentration, particulate organic carbon (POC) and nitrogen

(PON) concentrations, and photosynthesis yield at each time interval. Nutrient and POC/N concentration will be analysed at University of Manitoba

Station	**Date**	**Time**	**Latitude**	**Longitude**	**Comments**
Ice station 1 (Amundsen Basin)	26/7/2023	10:00	87.6261	-15.2459	2 ice cores were collected for intracellular nutrients

Summary of sample collection for intracellular nutrients

Metabarcoding (DNA) of protists & prokaryotes in sea ice & water

Contact: Anna Vader (annav@unis.no), Janne E. Søreide (jannes@unis.no)
Collected by: Janne E. Søreide, Sara Widera

Genetic identification of community composition of protists and prokaryotes (Metabarcoding) were collected from distinct depths at the mooring stations 37A and 17A, and at depth (4000m) at station 42 C where a deep CTD cast to 4000m was done to test CTD cable (for details see below). Further ice cores were collected for the same purpose at stations 31A and 17A.

Water 10-20L from selected depths were collected with the large CTD deployed in the moonpool. The water was transferred into clean large containers (rinsed with distilled water) light protected with black plastic bags. A small rinse with the sample water was conducted before water was collected using silicone tubes (also cleaned with distilled water prior to sampling). The water was stored in the cold room until further processing (within 1-3 hrs after sampling) in the ecotoxicology lab where all eDNA filtering took place during the cruise.
Sea ice cores were collected with a 9 cm KOVACS ice drill in the location where the other cores for various biological parameters were sampled (see Sea ice overview by P. Dodd). Three ice cores were collected and pooled for metabarcoding: 3 x 0-3 cm and 3 x 3-10 cm. At Ice station 1 (37A) was the lower 10 cm (0-3 cm and 3-10 cm sections) sampled, while at Ice station 2 (17A) the lower 10 cm was sampled at the "thin ice" site and the lower 20 cm (0-3 cm; 3-10 cm and 10-20 cm) at the "thick ice" site. Ice cores were slowly melted in the dark at 4 °C after adding 100 ml 0.2 filtered seawater (FSW) per cm ice core height (e.g. 900 ml FSW to the 3x 0-3 cm pooled sections) to reduce osmotic stress for the organisms present. The 0-3 cm sections were melted after 24 hr, while the 3-10 and 10-20 cm sections after 48 hrs.
Sterivex filtration: The lab benches and tubes connected to the pumps used were cleaned with 10% bleach and thereafter rinsed with MilliQ water (made onboard KPH) followed by a small flow-through of the sample water before the sterivex filter was attached and the sampling started. See Table below for details on volume filtered and number of samples.

Station	**Date**	**Time**	**Sample nr**	**Depth**	**Volume (L)**	**Comments**
CTD 42C	28.07.2024	04:00	DNA#1	4000	16	sampled to 4000m (test CTD cast)*
CTD 42 c	28.07.2024	04:00	DNA#2	4000	10.5	sampled to 4000m (test CTD cast)*
37A ice	31.07.2024	14:00	DNA#3	0-3 cm x 3	1.3	Site 3
37A ice	31.07.2024	14:00	DNA#4	3-10 cm x 3	3.3	Site 3
Blank	31.07.2024	14:00	DNA#5	0.2 um FSW	1.4	
37A (cast 129)	01.08.2024	03:45	DNA#6	30	15	Chlorophyll a max
37A (cast 129)	01.08.2024	03:45	DNA#7	60	15	Depth of RAS
37A (cast 129)	01.08.2024	03:45	DNA#8	300	15	Atlantic layer
37A (cast 129)	01.08.2024	03:45	DNA#9	4200	20	bottom
Blank	06.08.2024		DNA#10	MilliQ	2	Ship MIlliQ produced water
17A ice	06.08.2024	08:00	DNA#11	3 x 0-3 cm	1.0	Thin ice; site 2
17A ice	06.08.2024	08:00	DNA#12	3 x 3-10 cm	4.0	Thin ice; site 2
17A ice	07.08.2024	16:00	DNA#13	3 x 3-10 cm	1.5	Thick ice; site 1
17A ice	07.08.2024	16:00	DNA#14	3 x 10-20 cm		Thick ice; site 1
17A ice	07.08.2024	16:00	DNA#15	3 x 20-30 cm		Thick ice; site 1
Blank	07.08.2024		DNA#16	0.2 um FSW	2	Blank
17A Cast 174	08.08.2024	17:50	DNA#17	39	8	Chlorophyll a max; small CTD
17A Cast 163	08.08.2024	17:24	DNA#18	50	6.4	
17A Cast 163	08.08.2024	17:24	DNA#19	250	6.3	
17A Cast 163	08.08.2024	17:24	DNA#20	bottom	5	
5A	10.08.2024	17:24	DNA#21	26	1.45	Chlorophyll a max

Overview of water and sea ice sampled for metabarcoding

The DNA samples will be stored at UNIS at -80 °C until analyses). The DNA extraction will be conducted at UNIS, and the samples sent to sequencing to UiT, Tromsø or Oslo (to be decided).

Trophic structure and pollution burden

Contact: Doreen Kohlbach (doreen.kohlbach@awi.de)
Collected by: Doreen Kohlbach, Anette Wold

To elucidate trophic relationships and dependencies within the lower trophic food web of the CAO, samples of the base of the food web, *i.e.*, Ice-associated Particulate Organic Matter (IPOM; representative of ice algae) and Pelagic Particulate Organic Matter (PPOM; representative of phytoplankton), as well as their consumers, *i.e.*, zooplankton and fish, have been collected for analysis of their trophic marker content. IPOM samples of the bottom 10 cm of the ice (ice-water interface) were obtained with 9 cm ice corers at two ice stations (Table below). Ice core sections were melted with the addition of filtered seawater and filtered through GF/F filters. For PPOM samples, seawater was collected at 13 stations at the chlorophyll *a* maximum from CTD Niskin bottles and filtered onto GF/F filters. Zooplankton and fish were collected at 10 stations using a Harstad Trawl, MIK net and Bongonet. Collected animals were sorted to genus or species level. At many stations, the copepod *Calanus hyperboreus* dominated the net catch. All samples were frozen at -80°C aboard.

Subsequently, the relative composition of fatty acids and highly branched isoprenoids, and isotopic ratios of bulk organic material (δ^{15}N, δ^{13}C) as well as δ^{13}C of fatty acids and amino acids will be analysed. The main objective is to quantify the dependency of the food web on ice algae *vs.* phytoplankton and trace the transfer of these carbon (energy) sources to zooplankton and fish.

To simultaneously identify the pollution burden of the lower trophic food web, major contaminants (POPs, PFAS, microplastics) will be identified and quantified in the same species sampled from the same nets. Additionally, ice core sections (top and bottom 10 cm) were collected at both ice stations and kept frozen at -20°C to investigate the presence of microplastics in the sea ice.

Trophic marker and pollutant analyses will be carried out at the Alfred Wegener Institute in Bremerhaven, Germany, and other collaborating research institutions.

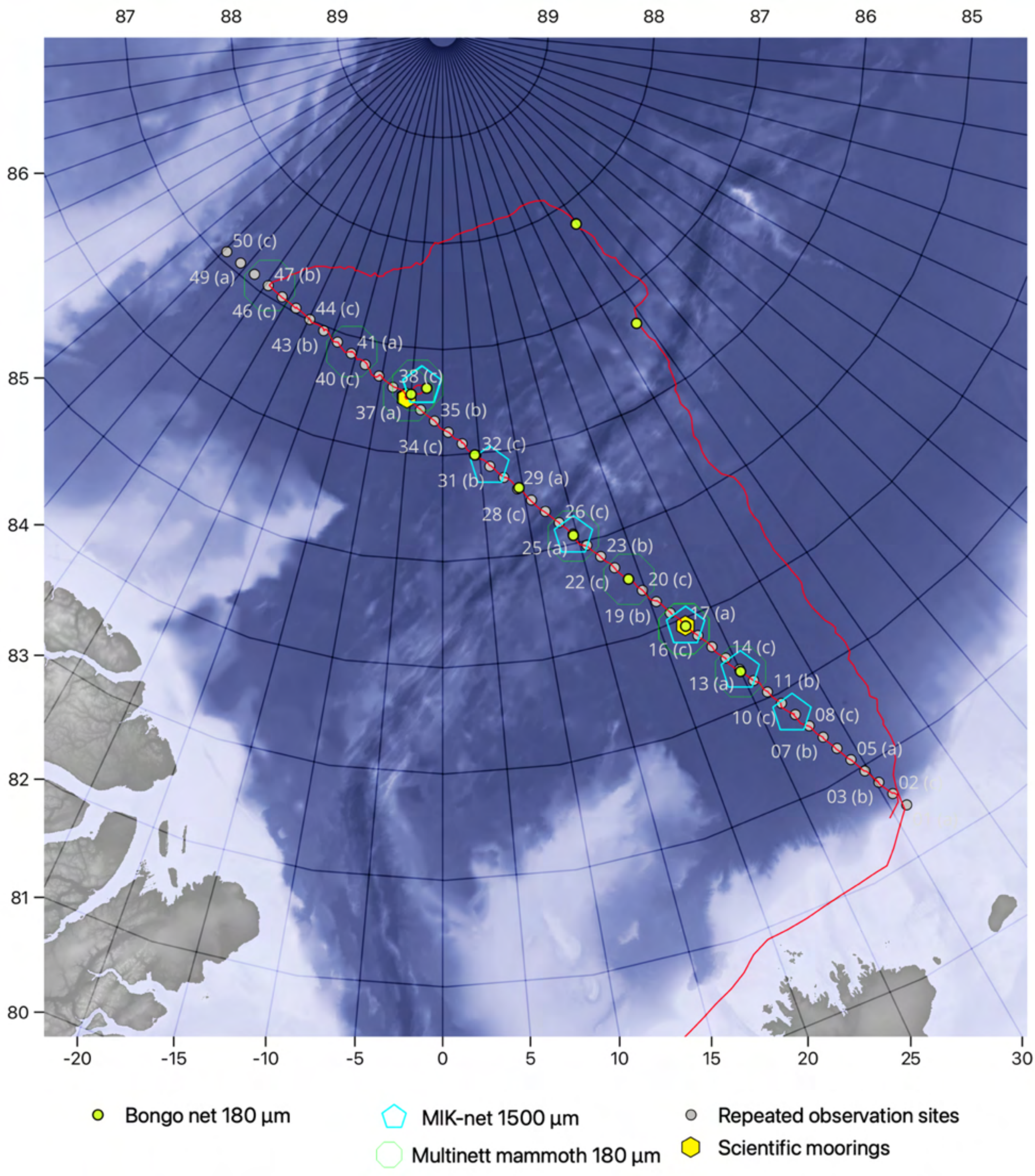
Sample type	**Date**	**Time**	**Latitude**	**Longitude**	**Comments**
Trophic marker samples					
IPOM	26/07/24	07:30:28	87,6262	-15,2494	Ice station 1, 6 bottom 0-10 cm ice sections, 8 samples
	06/08/24	12:40:09	83,9410	22,1252	Ice Station 2, 7 bottom 0-10 cm ice sections, 8 samples
PPOM	27/07/24	14:41:25	87,0996	-34,2511	Station 47, sampled at 21 m, 6 samples
	28/07/24	03:07:47	87,0579	-27,9848	Station 45, sampled at 19 m, 6 samples
	29/07/24	02:38:40	86,8568	-15,9404	Station 41, sampled at 18 m, 8 samples
	01/08/24	10:44:22	86,6330	-2,5838	Station 37, sampled at 22 m, 7 samples
	03/08/24	06:39:57	86,1202	2,7544	Station 33, sampled at 15 m, 6 samples
	03/08/24	15:39:20	85,8786	6,1747	Station 31, sampled at 28 m, 4 samples
	04/08/24	08:47:45	85,3699	12,0036	Station 27, sampled at 32 m, 3 samples
	04/08/24	18:02:31	85,0935	14,5678	Station 25, sampled at 22 m, 6 samples
	05/08/24	14:03:18	84,5468	18,7607	Station 21, sampled at 36 m, 6 samples
	08/08/24	00:09:29	83,9447	22,2876	Station 17, sampled at 39 m, 6 samples
	08/08/24	18:31:16	83,3447	24,9933	Station 13, sampled at 45 m, 6 samples
	09/08/24	10:01:46	82,7634	27,2510	Station 9, sampled at 27 m, 6 samples
	10/08/24	00:21:52	82,1304	29,3117	Station 5, sampled at 26 m, 6 samples
Zooplankton and fish	20/07/24	19:25:25	82,2711	32,5826	Harstad Trawl (380 m to surface), 63 samples: mostly *Themisto* spp. (amphipods), *Thysanoessa* spp. (krill) and *Meganyctiphanes norvegica* (krill)
	23/07/24	09:33:02	86,7083	33,7809	Harstad Trawl (Krill trawl; 20 m to surface), 38 samples: mostly *Themisto* spp., *Calanus hyperboreus* (copepods) and *Paraeuchaeta* spp. (copepods) and *Clione limacina* (pteropods)

	01/08/24	01:21:49	86,6513	-3,2923	MIK 1500 µm (200 m to surface), Station 37, 29 samples: mostly *Calanus hyperboreus*
	03/08/24	16:44:05	85,8823	6,2590	Bongonet 180 µm (200 m to surface), Station 31, 19 samples: mostly *Calanus hyperboreus* and *Oikopleura* spp. (appendicularians)
	04/08/24	18:52:18	85,0887	14,5585	MIK 1500 µm (400 m to surface), Station 25, 31 samples: mostly *Calanus hyperboreus* and *Sagitta maxima (*chaetognaths)
	05/08/24	14:40:02	84,5463	18,7736	Bongonet 180 µm (200 m to surface), Station 21, 12 samples: mostly *Calanus hyperboreus*
	07/08/24	19:23:56	83,9420	22,2434	MIK 1500 µm (500 m to surface), Station 17, 34 samples: mostly *Calanus hyperboreus, Themisto spp.* and *Sagitta maxima*
	08/08/24	16:15:25	83,3517	24,9975	MIK 1500 µm (600 m to surface), Station 13, 38 samples: mostly *Calanus hyperboreus, Themisto spp.* and *Sagitta maxima*
	09/08/24	11:51:06	82,7768	27,1631	MIK 1500 µm (600 m to surface), Station 9, 40 samples: mostly *Calanus hyperboreus, Themisto spp.* and *Sagitta maxima*
	10/08/24	07:28:22	81,8287	30,1424	Harstad Trawl (360 to surface), close to Station 4, 43 samples: mostly *Themisto* spp., *Thysanoessa* spp. and *Meganyctiphanes norvegica*
Pollutant samples					
Ice core sections	26/07/24	07:30:28	87,6262	-15,2494	Ice station 1, 2 top 0-10 cm ice sections and 2 bottom 0-10 cm ice sections
	06/08/24	12:40:09	83,9410	22,1252	Ice Station 2, 2 top 0-10 cm ice sections and 2 bottom 0-10 cm ice sections
Zooplankton and fish	20/07/24	19:25:25	82,2711	32,5826	Harstad Trawl (380 m to surface), 22 samples: mostly *Themisto* spp. and *Thysanoessa* spp.
	23/07/24	09:33:02	86,7083	33,7809	Harstad Trawl (Krill trawl; 20 m to surface), 13 samples: mostly *Calanus hyperboreus*
	01/08/24	01:21:49	86,6513	-3,2923	MIK 1500 µm (200 m to surface), Station 37, 7 samples: mostly *Calanus hyperboreus*
	04/08/24	18:52:18	85,0887	14,5585	MIK 1500 µm (400 m to surface), Station 25, 6 samples: mostly *Calanus hyperboreus* and *Oikopleura* spp.
	07/08/24	19:23:56	83,9420	22,2434	MIK 1500 µm (500 m to surface), Station 17, 3 samples: *Calanus hyperboreus* and *Sagitta maxima*
	08/08/24	16:15:25	83,3517	24,9975	MIK 1500 µm (600 m to surface), Station 13, 6 samples: mostly *Calanus hyperboreus* and *Sagitta maxima*
	09/08/24	11:51:06	82,7768	27,1631	MIK 1500 µm (600 m to surface), Station 9, 4 samples: *Calanus hyperboreus* and *Sagitta maxima*
	10/08/24	07:28:22	81,8287	30,1424	Harstad Trawl (360 to surface), close to Station 4, 35 samples: *Themisto* spp., *Thysanoessa* spp. and *Meganyctiphanes norvegica*

Meso- and macrozooplankton taxonomy/abundance, metabarcoding, biomass, *Calanus* phenology and barcoding

Contact: Anette Wold (anette.wold@npolar.no) & Janne Søreide (jannes@unis.no)
Collected by: Anette Wold & Janne Søreide

Overview



The main objective of the work was to collect samples to study the zooplankton community in terms of taxonomic composition, abundance and biomass. Further, *Calanus* phenology on individual level was studied across the Amundsen- Nansen Basin transect (A-stations) and at the northernmost point of this cruise (87 N; 33 E). Mesozooplankton was sampled with MultiNet type Mammoth, and a BongoNet. Macrozooplankton was sampled with the MIK net. Here we present an overview of all zooplankton sampling.

Figure 1. a) Multinet Mammoth 180 µm, b) Bongonet 180 µm and c) MIK net

Multinet mammoth 180 µm

Depth-stratified samples for mesozooplankton were collected using the Multinet Mammoth (Hydro-Bios Kiel, 9 nets, opening: 1.0 m2, net length: 550 cm, mesh size: 180 µm) from the following standard depths: Bottom, 2000m, 1500m, 1000m, 600m, 200m, 100m, 50m, 20m, and 0m at the mooring stations (st. 37 and st.17) and down to 600 m at all other stations (600m, 200m, 50m, 20-0m; Table 1). Each sample was divided into two parts using a Metodo box-type plankton sample splitter:

One sample for morphological taxonomy (1/2 of the sample, preserved in in 4% acid-free formaldehyde)
One sample for metabarcoding (1/2 of the sample preserved with EtOH)

Bongo net 180 µm

Mesozooplankton was also sampled using a BongoNet (HydroBios, Kiel, 2 nets, opening: 0.2827 m² opening, mesh size: 180 µm). One sample of the upper 50 m was collected at all A stations while an additional sample for the upper 1000 m was sampled at the mooring stations (st. 37 and st. 17). All samples were divided in two using a Metodo box-type plankton sample splitter:
Net 1 split into: Taxonomy (1/2 of the sample) & Metabarcoding (1/2 of the sample)
Net 2 split into: Biomass (1/2 of the sample) & various sorting: Calanus phenology and zooplankton barcoding (1/2 of the sample)

MIK net 1.5 mm

Macrozooplankton was sampled using a MIK net (opening: 3.14 m2, net length: 13 m, mesh size: 1.5 mm and 500 µm last meter). The MIK net was deployed down to a maximum depth of 1000 m. All gelatinous species from the net catch were removed, sorted into taxa/taxonomic groups, and stored at 3 °C for later identification (see below). The remaining sample was split into two parts using a Metodo box-type plankton sample splitter.
One sample for taxonomy (1/2 sample, preserved in 4% acid-free formaldehyde)
One sample for metabarcoding (1/2 of the sample preserved with EtOH)

Taxonomy/Abundance

Contact: Anette Wold (anette.wold@npolar.no)

Morphological taxonomy samples from Multinet, BongoNet and MIK net was preserved in 4% acid-free formaldehyde immediately after sampling. The analysis will be conducted at the Plankton Ecology Laboratory at the Institute of Oceanology (IO PAN) in Sopot, Poland and the results will be published at https://data.npolar.no.

Metabarcoding

Contact: Janne E. Søreide (janne.soreide@unis.no)

The metabarcoding sample processing and DNA extraction will be done at the University Centre in Svalbard (UNIS) and sequenced in Oslo, Norway. The result (OTU tables) will be published as own doi. files.
The results of the metabarcoding analysis will be compared and complement the morphological taxonomy analysis to evaluate the consistency of the faunal findings between these two methods. This is to evaluate if it is reasonable to establish a biodiversity monitoring program less independent of the taxonomical competence of the analyser. A program that also have the potential to detect rare (invasive) species and cryptic biodiversity. Cryptic, or sibling, species are discrete species that are difficult, or sometimes impossible, to distinguish morphologically. These are often incorrectly classified as a single taxon.

Biomass

Contact: Janne E. Søreide (janne.soreide@unis.no)

Biomass was taken from all BongoNet hauls (1/2 sample) and stored in 50 ml pre-weighed centrifuge tubes. These will be brought back to UNIS and freeze-dried to obtain the dry weight of the zooplankton community. These samples will be stored and can be used for different biochemical analyses, such as carbon and nitrogen content, stable 13C and 15N isotopes, fatty acid composition, etc., if of interest.

Calanus phenology

Contact: Janne E. Søreide (janne.soreide@unis.no)

There was detected an upper 50 m dense layer of zooplankton on the X-CTD transect northwards which primarily comprised of large *Calanus hyperboreus* females and *C. glacialis* females. We decided to follow this denser zooplankton layer and to study *Calanus* fitness and phenology by taking individual images of all Calanus specimens (minimum 30 individuals) from a known fraction of the Bongo net sample. All individual was identified to species level and developmental stage, photographed, and quickly rinsed in distilled water to remove salt and put in pre-weighed tin cups for later dry weight measurements at UNIS. *C. glacialis* egg production was measured at selected stations (Northernmost station; Amundsen basin and Nansen basin mooring stations).

The North Atlantic Calanus finmarchicus was detected at 86.7083N, 33.7809 (1 individual, female), but not in Amundsen Basin. In Nansen Basin, C. finmarchicus became numerous at CTD station 25A. *Calanus glacialis* females were not actively producing eggs (only one female laid eggs). The *C. glacialis* females were in overall good condition (fat) and we assume they have not yet produced eggs (most likely food-limited). Females of *C. hyperboreus* were actively feeding (seen by their green guts). They were generally thin (small lipid sacs), suggesting that they were building up their lipid reserves after egg production to prepare for reproducing a second time (i.e., iteroparous). They produce their eggs in winter (November-March). Females of *C. glacialis* are assumed to die after finishing egg production (i.e. semelparous).

Females of Calanus hyperboreus *(upper), C. glacialis (middle), and C. finmarchicus collected at 86.7083 N, 33.7809E. All three specimens are in good condition (all with big oil sacs). Notice the differences in body sizes.*

Taxonomy and metabarcoding of gelatinous zooplankton

All gelatinous individuals were removed from the MIK net sample prior to any processing. All individuals were photographed individually on a light table. Individuals were picked up using a metal spoon with holes and excess water was removed by blotting using a paper towel under the spoon. The individuals were then weighted and afterwards stored in 96% EtOH at -20°C for genetic analysis by Sanna Majaneva at Akvaplan-niva/NTNU.

Net	Date	Time	Station	Latitude	Longitude	Depth intervals	Sample types
Bongo net 180 µm	23/07/24	08:49:49		86.6945	33.6559	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus* phenology
Bongo net 180 µm	24/07/24	11:41:59		87.7942	34.8310	50-0m	Taxonomy; Metabarcoding; Biomass;
Bongo net 180 µm	24/07/24	12:13:30		87.7904	34.8129	200-0m	Taxonomy; Metabarcoding; Biomass; *Calanus* phenology
Multinett mammoth 180 µm	27/07/24	12:02:06	47	87.1015	-34.3401	600-200-50-20m	Taxonomy; Metabarcoding
Multinett mammoth 180 µm	29/07/24	05:00:07	41	86.8634	-15.8803	600-200-50-20m	Taxonomy; Metabarcoding
Multinett mammoth 180 µm	30/07/24	22:48:49	37	86.5508	-5.3379	4300-2500-2000-1500-1000-600-200-50-20-0m	Taxonomy; Metabarcoding
Bongo net 180 µm	31/07/24	03:13:59	37	86.5663	-4.9831	1000-0m	Taxonomy; Metabarcoding; Biomass;
Multinett mammoth 180 µm	31/07/24	19:29:08	37	86.6561	-4.0248	4300-2500-2000-1500-1000-600-200-50-20-0m	Taxonomy; Metabarcoding
MIK-net 1.5 mm	01/08/24	00:04:00	37	86.6534	-3.3985	1000-0m	Taxonomy; Metabarcoding
Bongo net 180 µm	01/08/24	11:28:02	37	86.6330	-2.5609	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus* phenology
Bongo net 180 µm	03/08/24	11:14:02	32	85.9960	4.3432	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus*
Bongo net 180 µm	04/08/24	02:48:17	29	85.6379	9.5187	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus*
Bongo net 180 µm	04/08/24	18:32:33	25	85.0907	14.5629	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus*
Multinett mammoth 180 µm	04/08/24	18:52:18	25	85.0887	14.5585	600-200-50-20m	Taxonomy; Metabarcoding
Bongo net	05/08/24	14:40:02	21	84.5463	18.7736	50-0m	Taxonomy; Metabarcoding; Biomass;
Multinett mammoth 180 µm	05/08/24	15:59:00	21	84.5439	18.7972	600-200-50-20-0m	Taxonomy; Metabarcoding
Multinett mammoth 180 µm	06/08/24	19:10:23	17	83.9274	22.0645	3975-2500-2000-1500-1000-600-200-50-20-0m	Taxonomy
Multinett mammoth 180 µm	07/08/24	00:17:47	17	83.9219	21.9905	3978-2500-2000-1500-1000-600-200-50-20-0m	Metabarcoding
MIK-net 1.5 mm	07/08/24	20:13:58	17	83.9419	22.2497	1000-0m	Taxonomy; Metabarcoding
Bongo net 180 µm	07/08/24	21:48:35	17	83.9426	22.2595	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus*
Bongo net 180 µm	08/08/24	19:01:54	13	83.3438	24.9903	50-0m	Taxonomy; Metabarcoding; Biomass; *Calanus*
Multinett mammoth 180 µm	08/08/24	19:37:44	13	83.3428	24.9867	600-200-50-20-0m	Taxonomy; Metabarcoding

Fisheries survey

EK80 Fisheries echosounder

Contact: Ole Arve Misund (ole.arve.misund@npolar.no)
Collected by: Vegard Stürzinger

R/V “Kronprins Haakon” is equipped with state-of-the-art instruments for acoustic surveying of the water column along the ship track. With the chosen survey track from Longyearbyen – west and north of Svalbard – to the ice edge – 88°N – southwest to the transect, approximately midway between the North Pole and the northern tip of Greenland– then southeast along the transect – and return to Longyearbyen, this gave the opportunity to survey the pelagic ecosystem in the entire Atlantic sector of the Polar Ocean. This was done by continuous recordings of the hull-mounted transducers of the Simrad EK80 echo sounder (Table 1). The backscatter (sv) at the 18, 38, 70, 120, 200, and 333 kHz frequencies was recorded from the surface to 500 m depth and stored for subsequent post-processing.

The echo sounder recordings were post-processed using the Large-Scale Survey System (LMS). The 38 kHz recordings were chosen as the main source for the post-processing. The post-processing was done by setting a lower detection threshold to a volume backscattering strength (sv) of – 82 dB, as recommended for traditional fisheries acoustic surveys. The recordings were integrated to obtain an area backscattering strength (SA). This was done over distances of five nautical miles using adequate depth layers from the surface to 750 m depth. During this process, a nautical area backscattering coefficient for every five nautical miles sailed (nasc/5 nm) was obtained.
Recordings from the other frequencies were also used in the scrutinizing process when appropriate. The 18 kHz recordings were especially useful for identifying and sorting out recordings of false bottom, and the 70, 120, and 200 kHz recordings were used to distinguish plankton recordings from near-surface noise.

To ensure the integrity of survey data, it is standard procedure to allocate based on trawl catch results. However, due to time constraints, we were able to complete only a single trawl during our northward transit. And two trawls when exiting the marginal ice zone after the southwards transect. All trawls consisted mainly of macrozooplankton, and few fish. The fish were small or juveniles of different species. Consequently, the reliability of the survey data extending to the ice edge and partially into the polar basin is low, with fish allocations based on historical data from previous years. As a result, the allocation quality is of low confidence, as the acoustic backscatter signals were not verified.

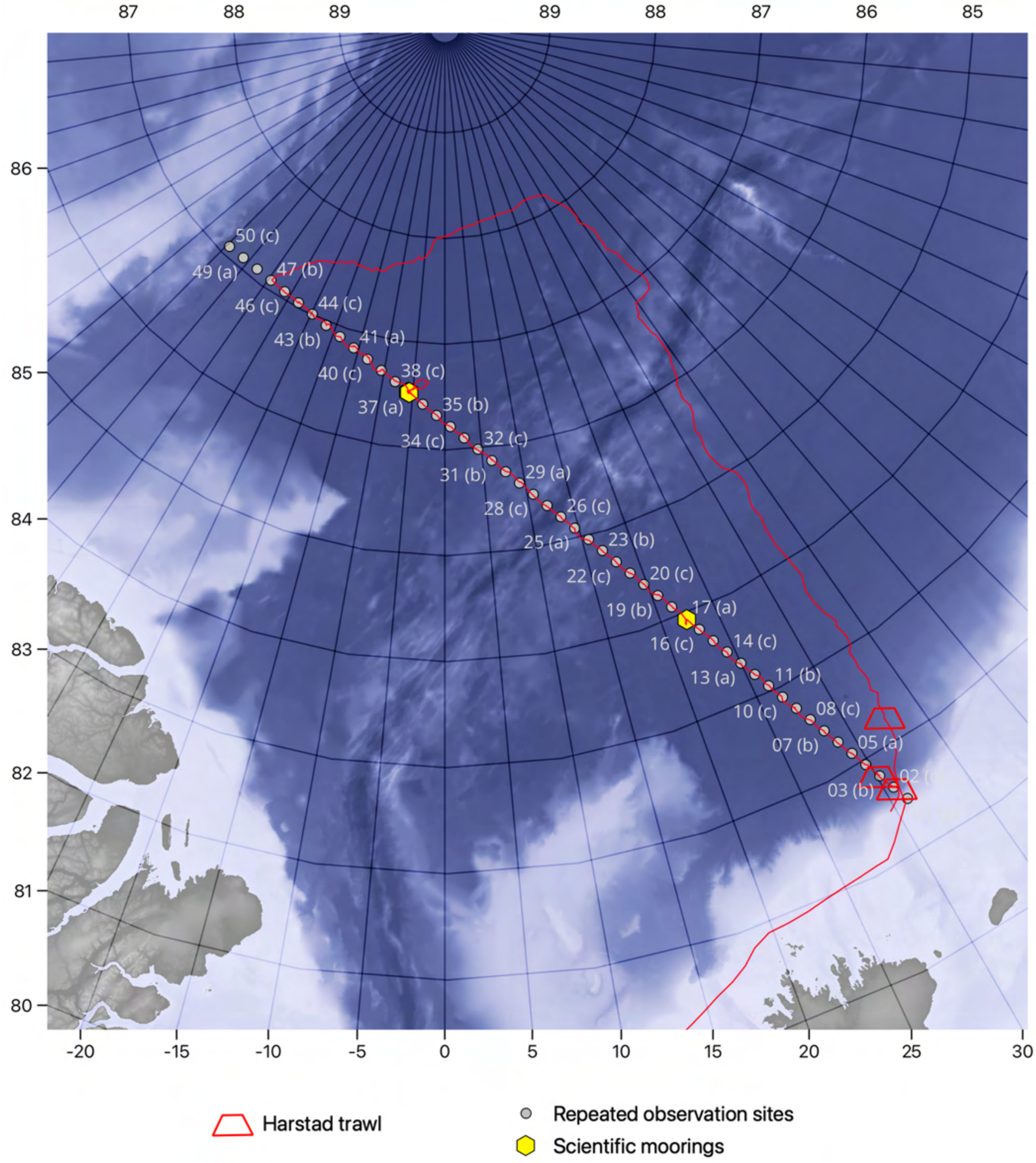
After entering the polar basin, a layer at approximately 50 meters depth was detected and attributed to plankton, supported by verification through trawl hauls and zooplankton nets. In the polar basin, backscatter signals were generally weak, suggesting a scarcity or absence of pelagic fish within the surveyed depth layer.
During icebreaking operations upon entering sea ice, echosounder readings became obscured by noise, rendering the detection of any layers indiscernible. Extended sections of icebreaking activity caused significant noise interference, necessitating the use of the LSSS function to either delete noise or exclude affected portions of the survey from the dataset. Consequently, several sections, each spanning five nautical miles, had to be removed due to excessive noise.

Channel	Frequency (kHz)	Beam width (°)	Pulse type	Pulse duration (ms)	Power (W)	Ramping
ES18	18	11°	cw	1.024	1600	fast
ES38B	38	7°	cw	1.024	2000	fast
ES70	70	7°	cw	1.024	750	fast
ES120	120	7°	cw	1.024	250	fast
ES200	200	7°	cw	1.024	150	fast
ES333	333	7°	cw	1.024	50	fast

Operational characteristics of the hull mounted Simrad ES80 echo sounder onboard F/F “Kronprins Haakon” during the Arctic Ocean survey July – August 2024.

Pelagic trawl sampling

Contact: Haakon Hop (Haakon.hop@npolar.no)
Collected by: Vegard Stürzinger



Pelagic trawl sampling was conducted to validate the observations recorded by the Simrad EK80 echo sounder. Due to the cruise's planned route through predominantly ice-covered waters, the Harstad pelagic trawl was selected for sample collection. This trawl was chosen for its lightweight design and ease of operation, which are advantageous under challenging conditions. The primary objective was to capture larger and faster organisms, which could not be effectively sampled using the Multinet or MIK net. The trawl was rigged and operated according to the standard procedures outlined for the Harstad pelagic trawl. During each tow, the trawl depth was continuously monitored using the Scanmar Scanbas system, which also provided some real-time data on the catch.

As the vessel progressed towards the northern end of the transect, a single sample was obtained using the Harstad trawl (**Error! Reference source not found.**). The catch predominantly consisted of krill (*Thysanoessa* spp.), amphipods (*Themisto* spp.), and large copepods (*Calanus hyperboreus* and *Paraeuchaeta* spp.), with only three *Benthosema glaciale* specimens being recorded. Due to the composition of the catch, the sample was subsequently transferred to the zooplankton and ecotoxicology teams for further analysis. For the fish specimens collected, both length and weight were recorded prior to handing over the samples.
After completing the transect to the south, we conducted two trawl hauls within the marginal ice zone. The trawl depths were adjusted to 380 and 400 meters in response to detecting several weak fish signals on the echosounder. The hauls predominantly yielded microzooplankton, such as krill and amphipods. However, a limited number of fish were also captured, including several *Benthosema glaciale*, four juvenile *Boreogadus saida*, a juvenile Herring (*Clupea harengus*), and a juvenile wolffish (*Anarhichas* sp.). The total biomass collected in each trawl haul was less than one kilogram.

Trawl type	Floats	Weight (kg)	Warp length (m)	Warp tension (tons)	Towing depth (m)	Towing speed (kn)	Vertical opening (m)
Harstad pelagic trawl	4 x 9.5”	80 x 2	291 – 962	6.1 – 8.8	180 - 402	2.8 – 3.3	9 - 12

Harstad trawl specifications on the 2024 Arctic Ocean cruise

Cast	Date	Time (UTC)	Latitude	Longitude	Catch description
Trawl 1	23/07/24	09:33:02	86.7083	33.7809	Mostly macrozooplankton
Trawl 2	10/08/24	07:28:22	81.8287	30.1424	Mostly macrozooplankton
Trawl 3	10/08/24	11:43:07	81.6429	30.7674	Mostly macrozooplankton

Overview over trawl locations

Narwhal survey

Little is known regarding the distribution of narwhal in the Barents Region, and nothing is known about their habitat use or diving/foraging behaviour. We do know from genetics studies that the narwhal found in Svalbard belong to the same genetic population as animals in Northeast Greenland, which are separate from mid- and Southeastern Greenland. We also know from acoustics data that the northern Barents Sea narwhal remain in deep, offshore areas with high ice concentrations year-round, unlike other narwhal populations that come into coastal areas in summer.

Our aim for the expedition was to deploy instruments on narwhals in the northern ice to study their movement and foraging ecology using «Limpet» tags that provide Fastlock ARGOS positions and detailed diving behaviour.

Date	**Lat/Long**	**Flight Hrs**	**Faunal observations**
21.07.24	82 N 30 E	4.5	2 polar bears (female with 2-year old – both in good condition) 19 single bearded seals on edges of large floes, or on small floe ice 40 ringed seals concentrated in old ice with melt holes, some in small groups, some alone 1 hooded seal
23.07.234	84 N 20 E	0.5	-
28.07.24	85 N 10 E	2.5	No animal observations
01.08.24	86 N 01 W	4.5	2 hooded seals (one male, one female)
06.08.24	84 N 21 W	2	3 single bearded seals 1 ringed seal 1 blueback hooded seal
08.08.24	83 N 25 E	6	**31 narwhal – 13 males (1-5 individuals), 9 females & 9 attended calves)** 1 polar bear (ok condition) 2 single bearded seals 1 hooded seal 4 harp seals in a tight cluster around a melt hole on a large floe 6 unidentified seals (seen swimming underwater)

Summary of helicopter flights

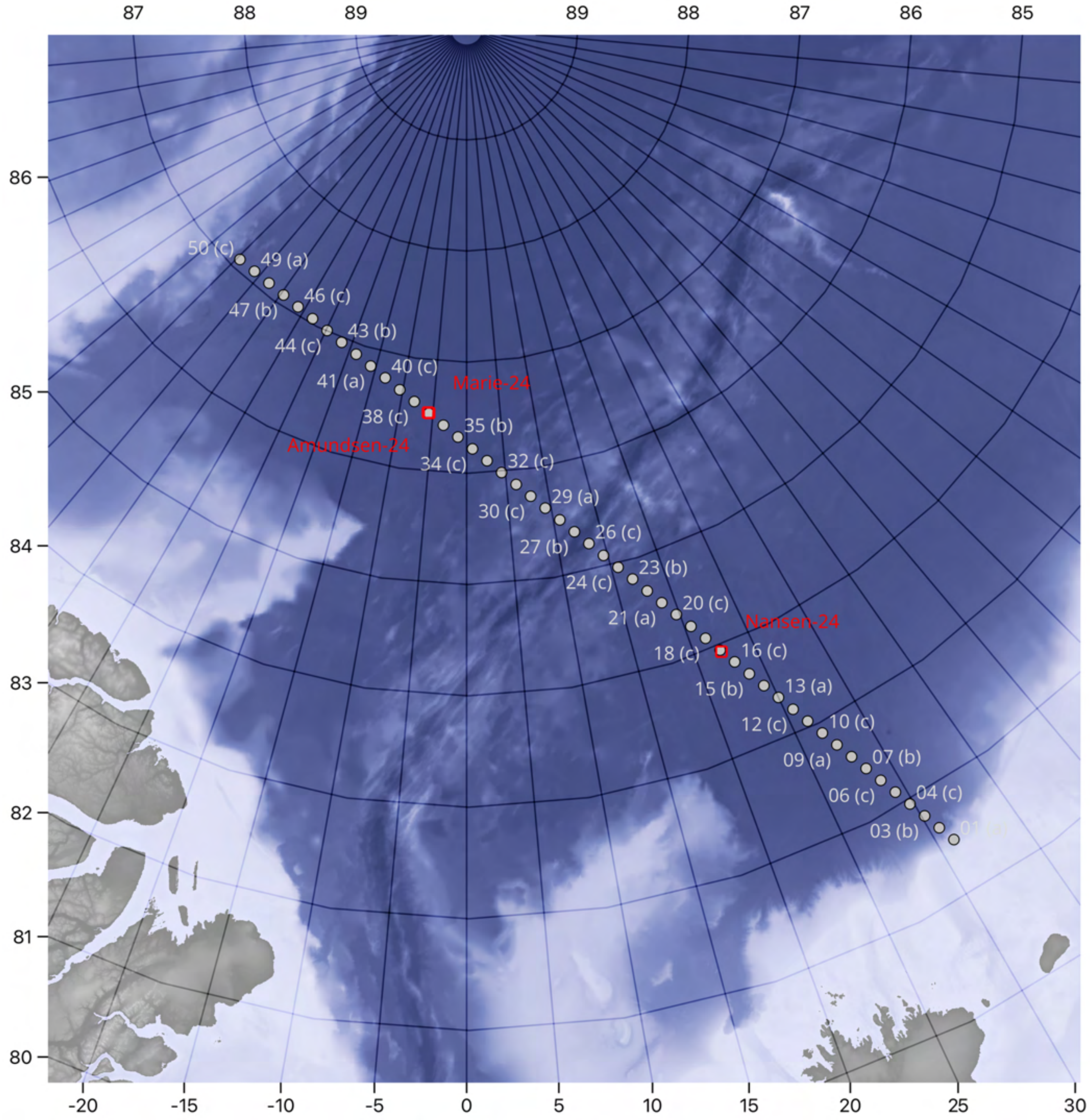
Although flight time was extremely limited on this expedition, there was a marked difference in the marine mammal presence deep in the ice, where little life was seen, versus closer to the marginal ice zone, which had greater densities of animals. The number of bearded seals seen in deep (3000-4000 m) water areas was surprising, given that this species' normal feeding habits involve benthic foraging.

On a single day when flying was possible south of 83°N, narwhals were encountered on two of three helicopter trips. Diffuse, mixed-sex groups were encountered on both flights, which were both focused on an area of circa 10^2 kilometers. All females had attending calved (N = 9). Mothers and calves were close to other animals but not traveling adjacent to others. Some males occurred as singlets (N = 5) but others were in tight all-male groups swimming synchronously (group of 3, group of 5). A total of 31 individuals were seen.

Weather conditions were a serious impediment to flying virtually throughout this expedition. Fog predominated virtually daily, sometimes accompanied by strong winds. Only a few hours of the flying that was achieved occurred with optimal sighting conditions (calm and clear). No narwhals were successfully instrumented on this expedition.

Mooring operations

Overview



The location of the Amundsen-1 and Nansen-1 moorings deployed in the Central Arctic Ocean. Grey dots show the array of repeated observation sites.

Two moorings, **Amundsen-22** and **Nansen-22** with nearly identical instrumentation were deployed in the central Amundsen and Nansen basins during the cruise AO2022 for an initial deployment period of two years. These moorings were recovered during AO2024 and similar moorings were redeployed for a new 2-year period with only minimal changes to the configuration of instruments.

The near-identical instrument set-up is intended to facilitate comparison between the two basin environments in the central Amundsen and Nansen Basins. Most of the instruments are placed in the upper 500 meters to capture the characteristics of the upper water column, subject to the largest variability, but some sensors and a sediment trap were placed at greater depths, see the mooring diagrams in this section. The 2022-2024 and 2024-2026 deployments are indented to be the first steps in a new long-term monitoring initiative and the configuration of instruments deployed has been kept as constant as possible.

Parameters measured include the thickness and transport of sea ice (IPS/ADCP), water temperature and salinity (CTD), ocean currents and circulation (ADCP), nitrate and carbon (CO_2) levels within the surface layer/photic zone (SBE16ECO/SUNA/ SAMI), underwater noise (AURAL), and export of carbon and nitrate towards the seabed (Sediment traps). A complete list of the scientific instruments deployed is given in the sections describing each mooring.

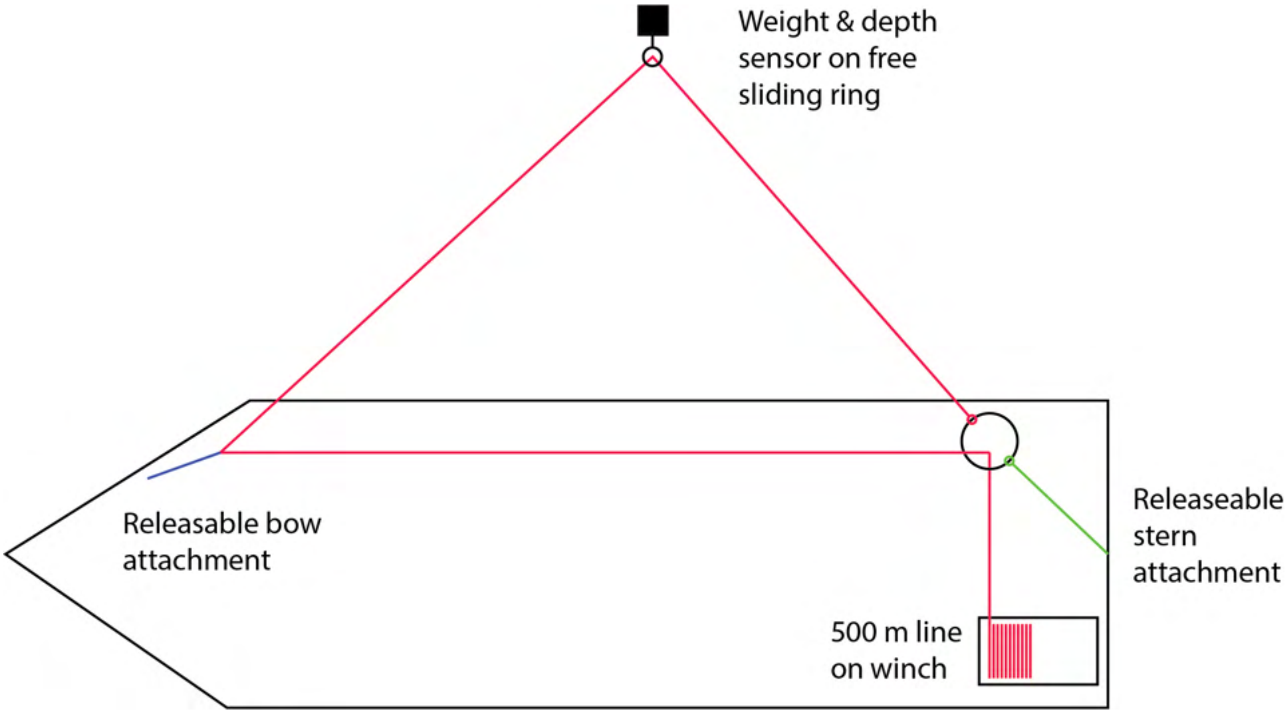
Water samplers (deployed from 2022-2024) collected samples for analyses of eDNA and freshwater tracers during 2022 and 2023. The samples remained in the samplers until recovery in 2024. The samplers were not redeployed in 2024.

An additional mooring **Marie-24** equipped with a McLane moored profiler operating between 50 and 500 m was deployed close to the Amundsen-24 mooring in 2024. A separate mooring was required to support this profiler, which would be unable to pass instrumentation fixed at depth between 50 and 500 on the Amundsen-24 mooring. Deployments are named after the year in which gear was deployed. Amundsen-22 was deployed from 2022 to 2024 and Amundsen-24 was deployed at the same site in 2024 (with a planned recovery in 2026). The same convention applies to Nansen-22 and Nansen-24.

The configuration of moorings **Amundsen-22** and **Nansen-22** is described in the AO2022 cruise report. The configuration of moorings **Amundsen-24** and **Nansen-24** is described in the following sections of this report.

Recovery of mooring Amundsen-22

Amundsen-22 was recovered on 30 July 2024. The recovery process began with an attempt to release a top float attached to a coil of rope in a container at 50 m by communicating with an acoustic release at 50 m. The acoustic release at 50 m allowed the mooring to be precisely located and floats could be identified on the echo sounder. The 50 m release activated, but the rope failed to uncoil as intended, and the float did not surface. Attempts were then made to release the anchor by communicating with a second acoustic release mechanism at 4200 m. These attempts were initially unsuccessful.



Snare arrangement used to recover mooring Amundsen-22

A weighted 'snare' was arranged with a single, 500 m length of line led from a winch on the aft deck, through the middle of a ring attached to the aft of the vessel, forwards though a releasable attachment at the bow and back to the ring.

A weight and depth sensor was attached to the snare between the releasable hook and the ring so that a long line fell below the vessel as the line was paid out from the winch. The line was paid out until the weight and depth sensor reached a depth of 120 m. At this point the vessel thrusted sideways with the intention that the line would be drawn over the mooring and catch beneath instruments deployed at a depth of 100 m. The line was monitored for tension by hand.
When the line drew tight, a releasable hook released the line from the bow (blue line in the diagram), and the vessel continued to thrust sideways so that the slack was taken up. When the line drew tight for a second time, the line attaching the ring to the aft (green line in the diagram) was released so that the snare tightened around the mooring. The snare skipped over several instruments during the tightening process but eventually closed below the upper instrument group.

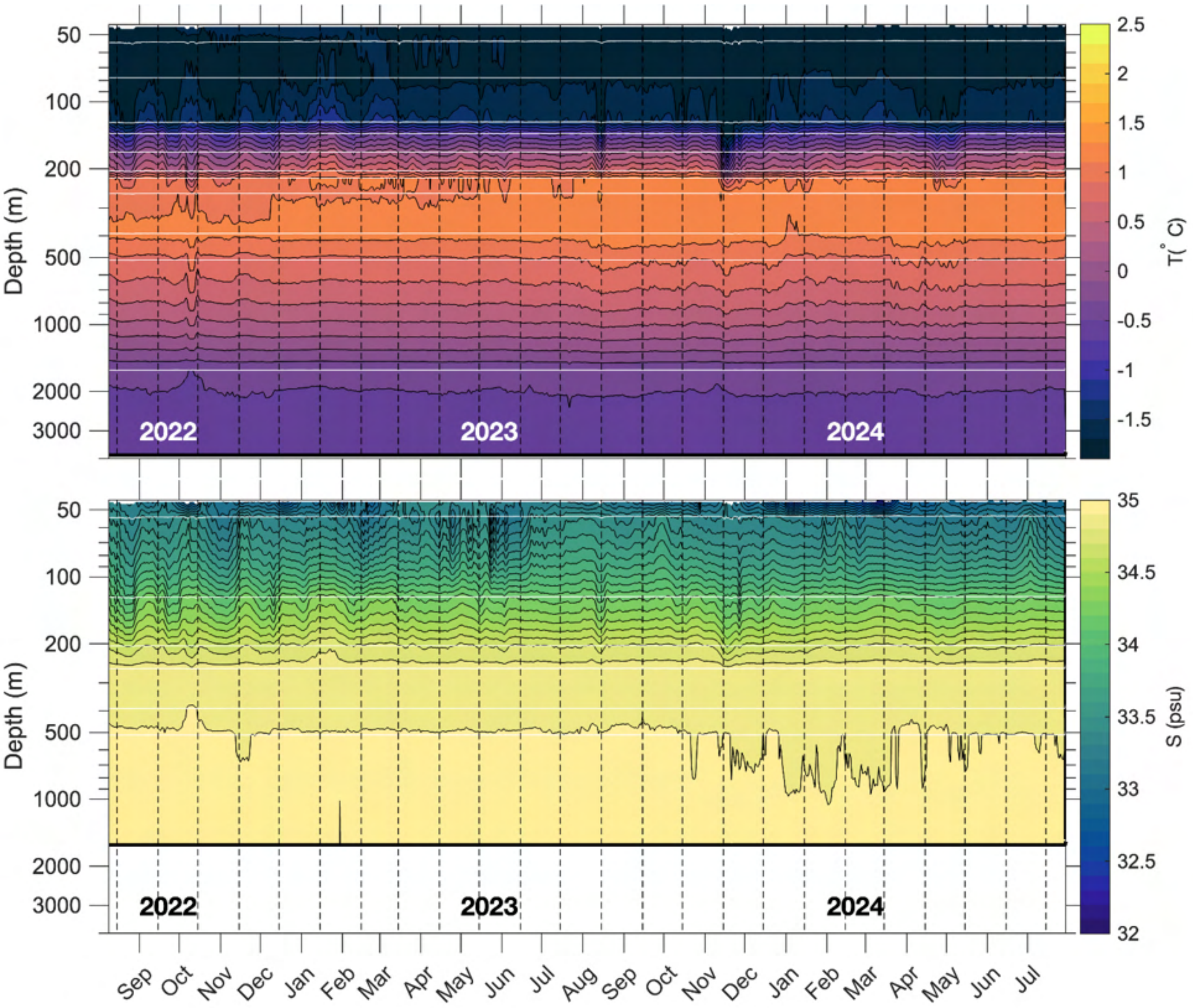
With the snare closed, a line was taken up on the winch to recover the mooring. Release commands were sent to the lower acoustic release throughout the recovery process. No release confirmation was received on deck, but at some point, the lower release mechanism opened. The anchor was no longer present when the mooring was brought on deck.

Amundsen-22	**Latitude**	**Longitude**	**Anchor Depth (m)**	**Depl. time (UTC)**
Amundsen Basin	**86°31.582' N**	**005°36.575' W**	**4215**	**2022.08.07, 15:35**

Instrument	**Serial No.**	**Depl. depth (m)**	**Time difference**
ASL Env. Sci. IPS5	51064	48	21.5 min delayed
RBR Concerto	60593	49	20 s early
NORTEK Signature250 ADCP, upward looking (narrow bandwidth)	103608	54	25 s delayed
Seabird SBE16 w/ WetLabs ECO	50240	55	ok
Sunburst Sensors SAMI	209	56	20 min delayed
Seabird SUNA V2 Nitrate Sensor	1909	57	ok
Remote Access Sampler (48 bottles)	ML12852-02	66	Date correct
Seabird SBE56	1225	88	14 s delayed
RBR Concerto	60599	118	31 s early
Seabird SBE56	1226	148	10 s delayed
Seabird SBE56	1227	188	ok
MTE AURAL-M3	MTEAU00YYYLF313	208	Out of battery
RBR Concerto	204982	212	25 s delayed
Seabird SBE56	1228	232	30 s delayed
RBR Concerto	205985	262	28 s delayed
RBR Concerto	204986	382	28 s delayed
NORTEK Signature55 3-beam ADCP, upward looking (narrow bandwidth)	200181	512	ok
RBR Concerto	201401	514	5 s early
RBR Concerto	201147	1595	25 s delayed
Seabird SBE37	8680	3114	No contact to instrument
McLane ParFlux Sediment trap (PST21)	ML12289-02	3821	Date correct
RBR Duet	211709	3825	ok

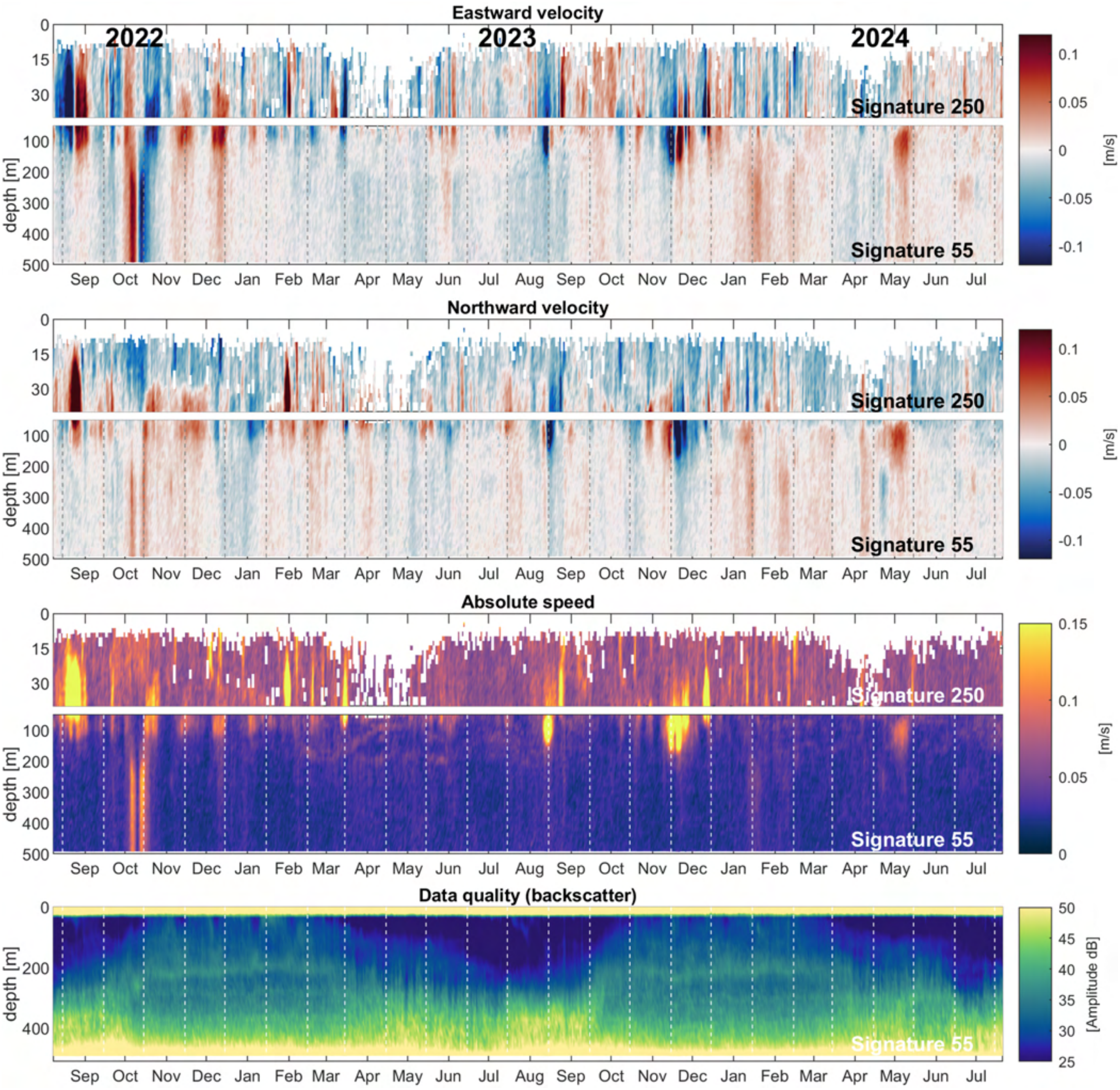
Summary of instruments recovered from mooring Amundsen-22 and associated clock drifts estimates

Temperature and salinity measurements from Amundsen-22



Hovmoller plots showing temperature (upper panel) and salinity (lower panel) measurements for the Amundsen-22 deployment.

Current measurements from Amundsen-22



Hovmoller plots showing velocity, speed and backscatter measurements for theAmundsen-22 deployment.

Recovery of mooring Nansen-22

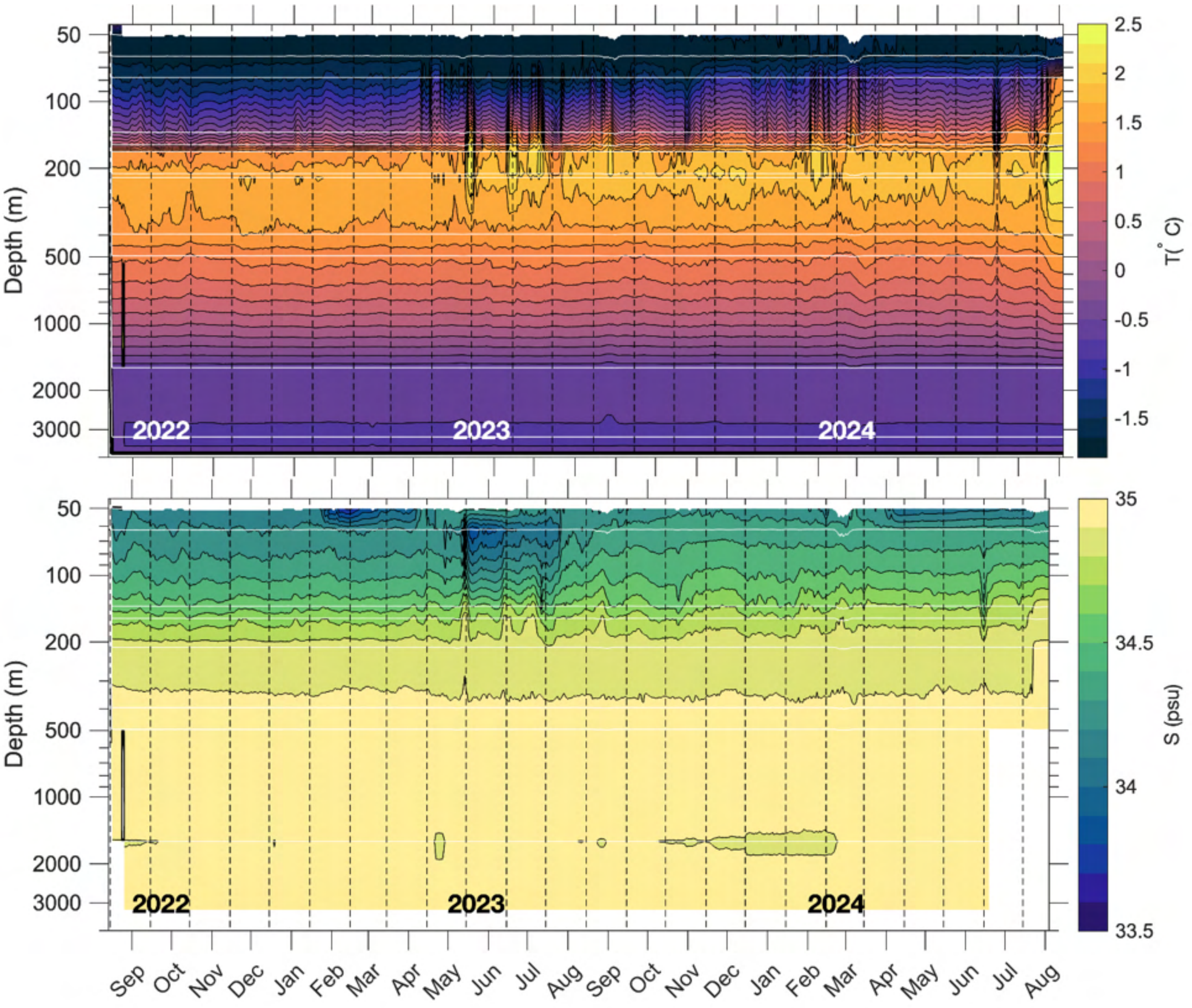
Nansen-22 was recovered on 6 August 2024. The recovery was achieved by releasing a float attached to a coil of rope in a container at a depth of 50 m by communicating with an acoustic release at 50 m. The float surfaced quickly and was used to bring the mooring on deck. Attempts to communicate with a second acoustic release at 4025 m were unsuccessful so the anchor was brought on deck together with the mooring. There was a relatively small margin between the 3000 kg breaking load of the mooring line and the 2000 kg pull required to release the anchor from the seabed.

Nansen-22	**Latitude:**	**Longitude:**	**Anchor Depth (m)**	**Depl. time (UTC)**
Nansen Basin	**83°56.566' N**	**022°15.038' E**	**4025**	**2022.08.15, 16:54**

Instrument	**Serial No.**	**Depl. depth (m)**	**Time difference**
ASL Env. Sci. IPS5	51127	46	28 min delayed
RBR Concerto	60596	47	12 s early
Teledyne RDI Workhorse Sentinel 300 4-beam ADCP, upward looking	24485	52	11 min 22 s delayed
Seabird SBE16 w/ WetLabs ECO	50296	56	25 s early
Sunburst Sensors SAMI	210	57	21 min delayed
Seabird SUNA V2 Nitrate Sensor	1618	58	17 seconds ahead
Remote Access Sampler (48 bottles)	ML12852-01	64	Date correct
Seabird SBE56	1230	88	37 s delayed
RBR Concerto	60590	118	3 s early
RBR Concerto	60594	148	10 s early
Seabird SBE56	1232	178	17 s delayed
MTE AURAL-M3	MTEAU00YYYLF314	198	Out of battery
RBR Concerto	60601	202	17 s delayed
Seabird SBE56	1234	227	28 s delayed
RBR Concerto	204979	395	22 s delayed
NORTEK Signature55 3-beam ADCP, upward looking (narrow bandwidth)	200188	493	16 s delayed
RBR Concerto	201407	494	35 s delayed
RBR Concerto	201146	1575	11 s early
Seabird SBE37	8761	3195	1 min 24 s early
McLane ParFlux Sediment trap (PST21)	ML14449-02	3796	Date correct
RBR Duet	211710	3798	1 min 25 s early

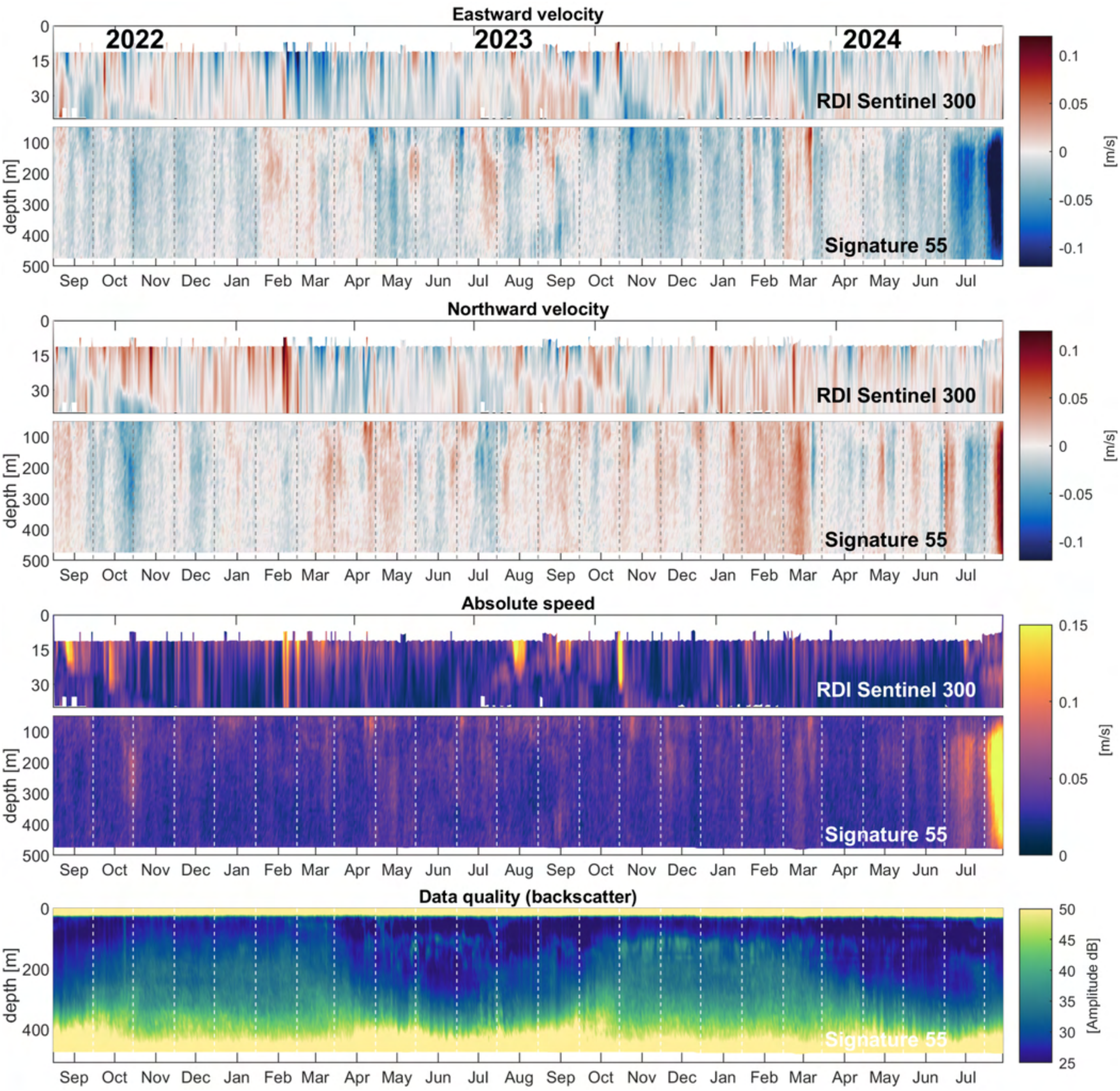
Summary of instruments recovered from mooring Amundsen-22 and associated clock drifts estimates

Temperature and salinity measurements at Nansen-22



Hovmoller plots showing temperature (upper panel) and salinity (lower panel) measurements for the Nansen-22 deployment

Current measurements at Nansen-22



Hovmoller plots showing velocity, speed and backscatter measurements for the Nansen-22 deployment.

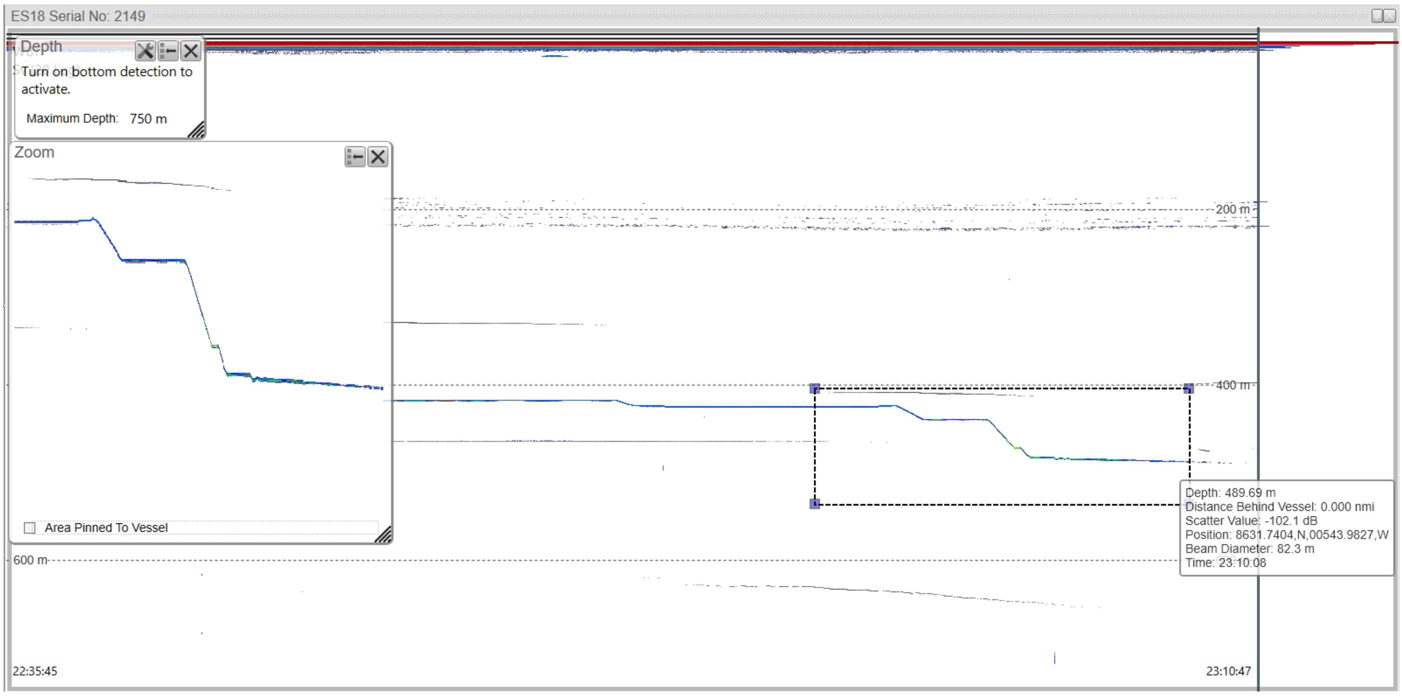
Deployment of Amundsen-24

Deployment details for Amundsdesn-24 are summarised below. The mooring was deployed anchor first and the depth of the upper instrument group was verified using a calibrated line attached to an acoustic release mechanism attached to the top of the mooring before it was released. Due to stretch and accumulation of measurement error in the 4200 m mooring line, approximately 30 m of line had to be removed after a trial deployment in order to place the upper instruments at the correct depth.

Amundsen-24	**Latitude**	**Longitude**	**Sea Depth**	**Deployed (UTC)**
	86 31,752N	005 44,215W	**4217**	**01-AUG-2024, 23:05**

Instrument	**Serial No.**	**Depth (m)**	**Sampling Interval**
ASL Env. Sci. IPS5	51064	45	Continuous w/ 2 sec ping period, in target detection mode
RBR Concerto	232543	47	20 min
NORTEK Signature250 ADCP, upward looking (narrow bandwidth)	103608	52	1 hr (ensembles of 20 pings over 1 min) NoCells=54;CellSize=2m;BlankDist=0.5m
RBR Concerto Chl-a, PAR	204992	54	1 hrs
Seabird SUNA V2 Nitrate Sensor	1238	56	4 hours (15 light frames, periodic mode)
Seabird SBE56	1225	90	5 min
RBR Concerto	232544	122	20 min
Seabird SBE56	1226	155	5 min
MTE AURAL-M3	MTEAU00YYYLF304	200	10 min recording every 60 min
RBR Concerto	232547	203	20 min
Seabird SBE56	1228	230	5 min
RBR Concerto	232548	260	20 min
RBR Concerto	232549	380	20 min
NORTEK Signature55 3-beam ADCP, upward looking (narrow bandwidth)	200181	504	1.5 hr (ensembles of 50 pings over 5 min); NoCells=70; CellSize=12m;BlankDist=2m
RBR Concerto	232511	506	20 min
RBR Concerto	201147	1597	20 min
RBR Concerto	232512	3116	20 min
McLane ParFlux Sediment trap (PST21)	ML12289-02	3827	1x500 ml sample every 2-4th week (in total 21 sampling events)
RBR Duet	211709	3827	1 min

Scientific instrumentation on Amundsen-24 with serial numbers, estimated deployment depth, and programmed sampling interval.



Turn on bottom detection to activate.

Maximum Depth: 750 m

Depth: 489.69 m
Distance Behind Vessel: 0.000 nmi
Scatter Value: -102.1 dB
Position: 8631.7404,N,00543.9827,W
Beam Diameter: 82.3 m
Time: 23:10:08

Echogram showing depth of float groups on Amundsen-24 after release.

Amundsen-24

Satt ut 1.8-24 , kl 23:05
86 31,752N
005 44,215W

		Dyp:	Fra bunn:	Ned i vann:
IPS	Snr. 51064	45	4172	23:00
RBR Concerto	Snr. 232543	47	4170	23:00
5 m Kevlar				
Signature 250	Snr: 103608	52	4165	23:00
RBR Concerto	Snr: 204992	54	4163	22:55
SUNA	Snr: 1238	56	4161	22:55
0,5m Kjetting Galv.				
2 m Kevlar				
AR861 R1	SNR: 0192, ARM: 35E1, Rel: 3555	58	4159	22:55
Oppdrift med 100 m kevlartau				
2 m Kevlar				
Oppdriftskule		62	4155	
1 Glasskuler i 2 m galv. kjettingr				
SBE56	SNR: 1225	90	4127	22:46
RBR Concerto	SNR: 232544	122	4095	22:43
SBE56	SNR: 1226	155	4062	22:38
100 m Kevlar				
AURAL	SNR: MTEAU00YYYLF 304	200	4017	22:35
2 m Kevlar				
0,5m Kjetting Galv.				
RBR Concerto	SNR: 232547 (ved Aural)	203	4014	21:07
SBE56	SNR: 1228	230	3987	20:59
RBR Concerto	SNR: 232548	260	3957	20:58
RBR Concerto	SNR: 232549	380	3837	20:53
304 m (197+97+10) Kevlar				
Signature 55	SNR: 200181	504	3713	20:49
0,5m Kjetting Galv.				
RBR Concerto	SNR: 232551 (rett under SIG55)	506	3711	20:45
RBR Concerto	SNR: 201147	1597	2620	20:23
RBR Concerto	SNR: 232512	3116	1001	19:52
3294m Kevlar (478+474+480+504+504+504+189+97+49+10+5)				
3 m Kevlar				
Sedimentfelle	SNR: 12289-02	3823	394	
2 m Kevlar				
0,5m Kjetting Galv.				
RBR Duet	SNR: 211709 (ved Sedimentfelle)	3827	390	19:42
378 m Kevlar (189+189)				
4 Glasskuler		4205	12	19:28
2 m Kjetting Galv.				
Svivel				
AR861	SNR. 3313 Arm: 1CF9 Release: 1C55 Ping on: 1C47			
5 m Kevlar				
2 m Kjetting				
ANKER 1000(850) kg		4217	0	

Configuration of the Amundsen-24 mooring.

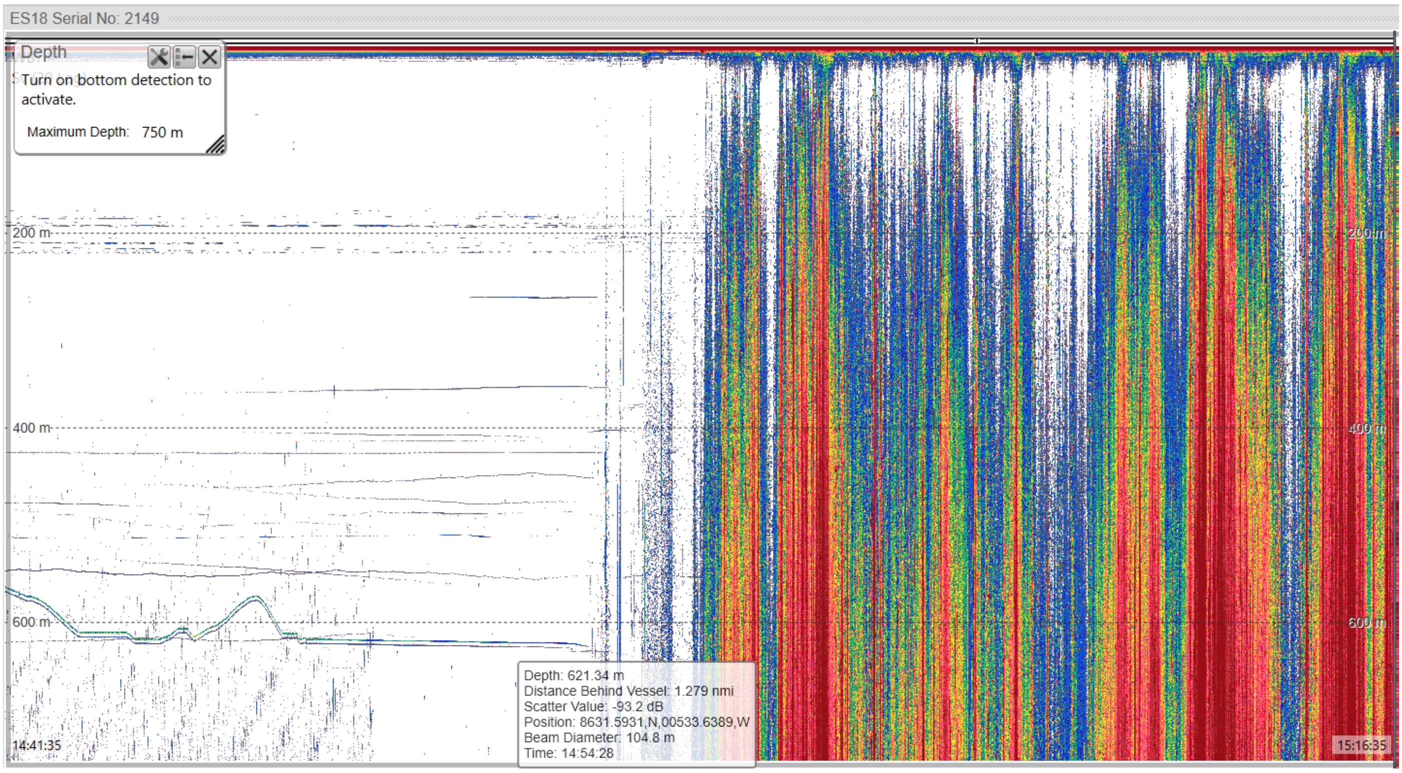
Deployment of Marie-24

Deployment details for Marie-24 are summarised below. The mooring was deployed anchor first and the depth of the upper instrument group was verified using a calibrated line attached to an acoustic release mechanism attached to the top of the mooring before it was released. Due to stretch and accumulation of measurement error in the 4200 m mooring line, the length of the mooring line had to be reduced by approximately 50 m after a trial deployment in order to place the upper instruments at a precise depth.

Marie-24	**Latitude**	**Longitude**	**Sea Depth**	**Deployed (UTC)**
	86 31.605’ N	005 34.174W	4216	2024.08.02, 14:46

Instrument	**Serial No.**	**Depth (m)**	**Sampling Interval**
Seabird SBE37	20773	44	15 min
McLane Moored Profiler	ML15532-01D	47-594	1 x up and 1 x down paired profile every 48 hours
Seabird SBE37	9293	594	15 min

Scientific instrumentation on Marie-24 with serial numbers, estimated deployment depth, and programmed sampling interval.



Turn on bottom detection to activate.

Maximum Depth: 750 m

Depth: 621.34 m
Distance Behind Vessel: 1.279 nmi
Scatter Value: -93.2 dB
Position: 8631.5931,N,00533.6389,W
Beam Diameter: 104.8 m
Time: 14:54:28

Echogram showing depth of float groups on Marie-24 after release.

Marie-24
Satt ut 2.8.2024 , kl 14:46
Tatt opp

86 31.605 N
005 34.174W

			Dyp:	Fra bunn:	Ut:
Oppdriftskule + 225			37	4179	14:44
AR861 R1	SNR:3315 Arm: 1CFB, Rel: 1C55				
Oppdriftskule + 160 med kevlartau			40	4176	14:44
0,5 m Kjetting galv.					
SBE37	SNR.20773		44	4172	14:40
McLane Moored Profiler	14:30				
550 m 5/16 vaier - 117 kg					
0,5 m Kjetting galv.					
SBE37	SNR. 9293		594	3722	14:30
200 +100(104) + 50(52) m Kevlar					
500 (532) m Kevlar					
500 (532) m Kevlar					
2 GLASSKULER			2015	2201	11:30
AR861Li	SNR. 1220	Arm : Release:	0897 0855		
0,5 m Kjetting galv.					
500(532) m Kevlar					
500 (530) m Kevlar					
500 (537) m Kevlar.					
500 (531) m Kevlar					
2 m Kjetting galv.					
ANKER	1000/850)kg		4216	0	11:00

Configuration of the Marie-24 mooring.

Deployment of Nansen-24

Deployment details for Amunsdesn-24 are summarised below. The mooring was deployed anchor first and the depth of the upper instrument group was verified using a calibrated line attached to an acoustic release mechanism attached to the top of the mooring before it was released. Due to stretch and accumulation of measurement error in the ca. 4000 m mooring line, the length of the mooring line had to be reduced by approximately 40 m after a trial deployment in order to place the upper instruments at an precise depth.

Nansen-24	**Latitude**	**Longitude**	**Anchor Depth (m)**	**Deployed (UTC)**
	83 56.866’ N	022 14.875 E	4022	07-Aug-2024 18:56

Instrument	**Serial No.**	**Depth (m)**	**Sampling Interval**
ASL Env. Sci. IPS5	51127	46	Continuous w/ 2 sec ping period, in target detection mode
RBR Concerto	232539	47	10 min
RDI ADCP 300	24485	52	1 hr (ensembles of 20 pings over 1 min) NoCells=54; CellSize=2m;BlankDist=0.5m
Seabird SUNA V2 Nitrate Sensor	1909	56	4 hours (15 light frames, periodic mode)
Seabird SBE56	1230	67	5 min
Seabird SBE16 w/ WetLabs ECO	50240	68	4 hrs
RBR Concerto	232535	97	10 min
RBR Concerto	204982	127	10 min
Seabird SBE56	1232	158	5 min
MTE AURAL-M3	MTEAU00YYYLF313	178	10 min recording every 60 min
RBR Concerto	204985	182	10 min
Seabird SBE56	1234	1234	5 min
RBR Concerto	204986	386	10 min
NORTEK Signature55 3-beam ADCP, upward looking (narrow bandwidth)	200188	486	1.5 hr (ensembles of 50 pings over 5 min); NoCells=70; CellSize=12m; BlankDist=2m
RBR Concerto	201401	479	10 min
RBR Concerto	232510	1570	10 min
Seabird SBE37	8761	3195	15 min
McLane ParFlux Sediment trap (PST21)	ML14449-02	3795	1x500 ml sample every 2-4th week (in total 21 sampling events)
RBR Duet	211710	3797	1 min

Scientific instrumentation on Nansen-24 with serial numbers, estimated deployment depth, and programmed sampling interval.

ES18 Serial No: 2149

Depth

Turn on bottom detection to activate.

Maximum Depth: 750 m

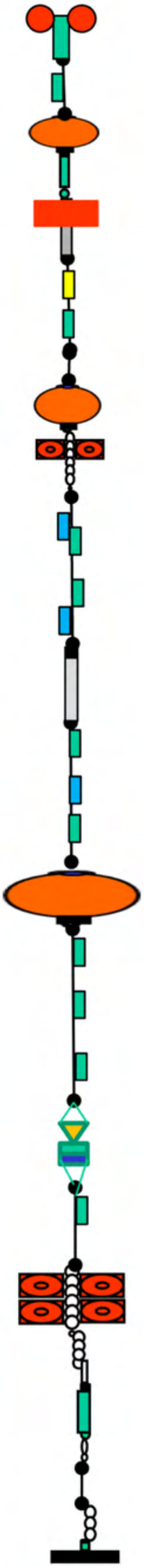
Depth: 489.69 m
Distance Behind Vessel: 0.000 nmi
Scatter Value: -94.4 dB
Position: 8357.0330,N,02215.2831,E
Beam Diameter: 82.3 m
Time: 18:57:25

Echogram showing depth of float groups on Nansen-24 after release.

Nansen-24

Satt ut 7.08.2024 kl 18:56

83 56.866 N
022 14.875 E



		Dyp:	Fra bunn:	Ned i vann:
IPS	Snr. 51127	46	3976	18:52
RBR Concerto	Snr. 232539	47	3975	18:52
5 m Kevlar				
ADCP 300	SNR: 24485	52	3970	18:52
AR861 R5	SNR:0056 Arm: 3539, Rel: 3555			
Oppdrift med 100 m Kevlar				
SUNA	Snr. 1909	56	3966	18:52
SBE16/ECO	Snr. 50240	68	3964	18:52
2 m Kevlar				
Oppdriftskule		61	3961	
	0,5m Kjetting Galv.			
2 Glasskuler				
2,5m Kjetting Galv.				
SBE56	SNR: 1230	67	3955	17:54
RBR	SNR: 232535	97	3925	17:52
100 m Kevlar (100)				
RBR	SNR: 204982	127	3895	17:50
SBE56	SNR: 1232	158	3864	17:49
AURAL	SNR: MTEAU00YYYLF313	178	3844	17:43
2 m Kevlar				
0,5m Kjetting Galv.				
RBR	SNR: 204985	182	3840	17:43
290 m Kevlar (200+50+40)				
SBE56	SNR: 1234	213	3809	17:40
RBR	SNR: 204986	386	3636	17:36
Signature 55	SNR: 200188	486	3536	17:33
0,5m Kjetting Galv.				
RBR Concerto	SNR: 201401	479	3543	14:33
RBR Concerto	SNR: 232510	1570	2452	17:01
SBE37	SNR: 8761	3195	827	16:40
3252 m Kevlar (503+502+503+502+503+502+211+19+5)				
Sedimentfelle		3795	226	16:27
0,5m Kjetting Galv.				
RBR Duett	SNR: 211710	3797	224	16:27
215 m Kevlar (202+10+5)				
4 Glasskuler		4011	11	16:15
2 m Kjetting Galv.				
Svivel				
AR861	SNR. 3193 Arm: 1CBC Release: 1C55 Ping on: 1C47			
5 m Kevlar				
2 m Kjetting				
ANKER 1000(850) kg		4022	0	

Configuration of the Nansen-24 mooring.

Water samples recovered from samplers on Amundsen-22 & Nansen-22

Contact d18o samples: (paul.dodd@npolar.no)
Contact nutrient samples: (philipp.assmy@npolar.no)
Contact phytoplankton taxonomy samples: (philipp.assmy@npolar.no)
Contact eDNA samples: (jannes@unis.no)
Instrument setup: Yannick Kern, Paul A. Dodd

Two McLane Remote Access Samplers (RAS-500) were deployed at a target depth of 60 m on the moorings Amunsdesn-22 and Nansen-22. For the preparation the 48 sampling tubes on each sampler were primed with artificial seawater (Milli-Q water + NaCl) at a salinity of approximately 35 g/kg. A blank sample for eDNA of the priming water was taken for reference in later analysis. Each sample bag was prepared with 0.7 ml saturated $HgCl_2$ as a preservative. Post-sample flushing with acid was enabled and the acid bag was filled with 500 ml of 10% HCl acid.

The sampling schedule plan and configuration of each RAS-500 sampler is summarised in the table below. Three 500 ml bags were filled at each sampling event to provide sufficient sample volume for all planned analyses.

Nansen-22	Amundsen-22	Bags filled
16.08.2022	08.08.2022	1-3
30.08.2022	30.08.2022	4-6
15.09.2022	15.09.2022	7-9
01.10.2022	01.10.2022	10-12
02.11.2022	02.11.2022	13-15
04.12.2022	04.12.2022	16-18
05.01.2023	05.01.2023	19-21
06.02.2023	06.02.2023	22-24
02.03.2023	02.03.2023	25-27
03.04.2023	03.04.2023	28-30
05.05.2023	05.05.2023	31-33
21.05.2023	21.05.2023	34-36
06.06.2023	06.06.2023	37-39
22.06.2023	22.06.2023	40-42
08.07.2023	08.07.2023	43-45
24.07.2023	24.07.2023	46-48

Sample bags were removed from the sampler as soon as the instrument was brought on deck. Each bag was capped, dried and weighed, before the contents was transferred to sample containers by means of squeezing the sample bag with the connecting tube directed towards the sample container. Sub-samples for nutrients and the oxygen isotope ratios d18O were taken from the first bag filled at each sampling event, and the remainder was transferred to the container for the eDNA sample. The entirety of the second and third bags filled at each sampling event was transferred to the eDNA sample container. Thereafter a subsample from the eDNA bottle was taken into a smaller bottle for phytoplankton taxonomy.

eDNA sample containers were 1.5 litre wide-mouth Nalgene bottles which had been rinsed with 10 % bleach and thereafter rinsed 3 times with milliQ water and dried in a clean lab.
Paper log sheets completed at the times samples were collected are attached to the end of this report as appendix 2.
Electronic logs from the samplers can be obtained from paul.dodd@npolar.no or yannick.kern@npolar.no

Moored sediment traps

Contact: Janne E. Søreide (jannes@unis.no) and Malin Daase (malin.daase@uit.no)
Collected by: Janne E. Søreide, Yannick Kern

McLaren long-term sediment traps equipped with sequential automated McLane ParFlux 21-cups sediment trap (PST21) were deployed at deeper depths on both the Amundsen and the Nansen basins moorings to collect down-falling particles through the water column in 2022 and 2024. The sediment trap sample cups collect everything that settles during the time interval set (integrative sampling).

The two sediment traps deployed in 2022 were recovered and redeployed successfully during the AO 2024 cruise.

Both recovered sediment traps had good battery capacity left after two years deployment, and the read-out files showed that both traps had functioned according to the programmed intervals (see Tables 17 and 18, cruise report 2022 for interval details). The Amundsen basin trap (at 3821 m) was retrieved 30th July in evening and the Nansen Basin trap (3796 m) the 6th August in the morning. The sediment traps had collected very little material, but some more materials could be seen at the bottom of the sample bottles for the summer (July-August) period. In total 20 samples per trap (traps recovered before last sample bottle 21 was scheduled sampling) were capped, stored in the fridge and transported to the University Centre in Svalbard where the samples will be stored cold (+4C) until further analyses. Due to use of wrong buffer in the 22-deployments, using hexamine, containing some carbon, we can only measure total Particulate Organic Matter (POM) correctly. For the 2024 sediment trap deployment the correct buffer has been used (borax; see below).

Left: Amundsen-22 recovery, centre: Nansen-22 recovery, Right, Trap recovered from Nansen-22 showing many "empty" bottles with more material collected in 15 to 17 (19 July'23 to 1 Jan'24) and bottle 20 (21 Jun'24- 30 Jul'24).

The Amundsen-2024 (AMU-24) trap (yellow model) was redeployed the 2nd of August at the final depth of 3823 m with scheduled start 3rd August by midnight (00:00 UTC). The Nansen-2024 (NAN-24) sediment trap (white model) was redeployed the 7th of August at the final depth of 3795 m with scheduled start 9th August by midnight (00:00 UTC). The scheduled sampling intervals correspond to the intervals for the Amundsen-2022 and Nansen-2022 sediment trap intervals (see tables below and AO2022 cruise report 2022) and the monthly sediment trap intervals used in Svalbard with finer resolution during the productive season (see KROP – Mare Incognitum).

Pre-deployment preparation procedure: Both traps are powered by internal battery packs. New batteries were loaded (14 alkaline c-cell batteries). After the change of batteries, the date was set according to US-date format (mm/dd/yy, 24-hour format, UTC). A diagnostics test was run to confirm battery voltage, temperature, and rotator alignment. Extra care was done to get the alignment correctly since some small misalignment was seen for the Amundsen-2022 mooring. The sampling schedule was set according to tables below, following the same sample interval schedule as last deployment.

Amundsen-24		
Lat: 86.5391 N	Lon: 5.9315 W	Sample bottle ID
Event 1*	08/03/2024 00:00	AMU-24#1
Event 2	08/15/24 00:00	AMU-24 #2
Event 3	09/01/2024 00:00	AMU-24 #3
Event 4	09/15/24 00:00	AMU-24 #4
Event 5	10/01/2024 00:00	AMU-24 #5
Event 6	11/01/2024 00:00	AMU-24 #6
Event 7	12/01/2024 00:00	AMU-24 #7
Event 8	01/01/2025 00:00	AMU-24 #8
Event 9	02/01/2025 00:00	AMU-24 #9
Event 10	03/01/2025 00:00	AMU-24#10
Event 11	04/01/2025 00:00	AMU-24 #11
Event 12	05/01/2025 00:00	AMU-24 #12
Event 13	06/01/2025 00:00	AMU-24 #13
Event 14	06/21/25 00:00	AMU-24 #14
Event 15	07/05/2025 00:00	AMU-24 #15
Event 16	07/19/25 00:00	AMU-24 #16
Event 17	08/01/2025 00:00	AMU-24 #17
Event 18	08/15/25 00:00	AMU-24 #18
Event 19	09/01/2025 00:00	AMU-24 #19
Event 20	09/15/25 00:00	AMU-24 #20
Event 21	09/15/26 00:00	AMU-24 #21

* rotation from open hole (zero port) to first bottle

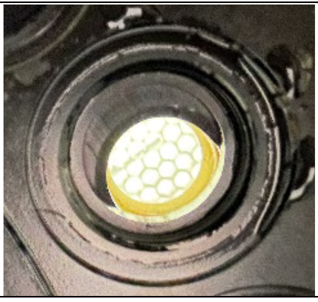
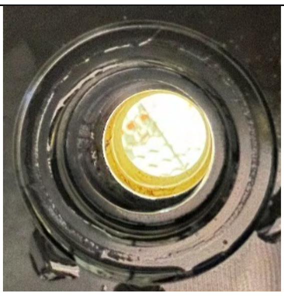
Nansen-24		
Lat: 83.9536 N	Lon: 22.2109 E	Sample bottle ID
Event 1*	08/09/2024 00:00	NAN-24 #1
Event 2	08/15/24 00:00	NAN-24 #2
Event 3	09/15/24 00:00	NAN-24 #3
Event 4	09/01/2024 00:00	NAN-24 #4
Event 5	10/01/2024 00:00	NAN-24 #5
Event 6	11/01/2024 00:00	NAN-24 #6
Event 7	12/01/2024 00:00	NAN-24 #7
Event 8	01/01/2025 00:00	NAN-24 #8
Event 9	02/01/2025 00:00	NAN-24 #9
Event 10	03/01/2025 00:00	NAN-24 #10
Event 11	04/01/2025 00:00	NAN-24 #11
Event 12	05/01/2025 00:00	NAN-24 #12
Event 13	06/01/2025 00:00	NAN-24 #13
Event 14	06//21/25 00:00	NAN-24 #14
Event 15	07/05/2025 00:00	NAN-24 #15
Event 16	07/19/25 00:00	NAN-24 #16
Event 17	08/01/2025 00:00	NAN-24 #17
Event 18	08/15/25 00:00	NAN-24 #18
Event 19	09/01/2025 00:00	NAN-24 #19
Event 20	09/15/25 00:00	NAN-24 #20
Event 21	09/15/26 00:00	NAN-24 #21

* rotation from open hole (zero port) to first bottle

Each cup/bottle (500 ml) was new from the manufacturer and were filled with the same seawater-fixative solution (in total 22L) made from 0.2 um filtered sea water from 4000 m depth (CTD station xx) added 37% formaldehyde (Sigma Aldrich 1.04003.2500), borax-buffer (di-sodium tetraborate, VWR) and fine sea salt (without iodine) to a final formaldehyde-seawater solution of approx. 3% formaldehyde, pH ~8.0 and ~36% salinity. The start position for the turntable was set to zero port under the funnel. The bottles were marked with ID #1-#21, see Tables below. At each sampling, one 500 ml bottle will rotate into place underneath the funnel to collect depositing particles integrative until the next bottle rotation.

Pressure sensors attached along the mooring line will help verify the final deployment depth for the sediment traps at recovery.

Trap Alignment: Both sediment traps sampling holes were misaligned with the funnel when recovered (see table below). They were most likely deployed misaligned in 2022. Alignment was corrected before redeployment.

Sediment trap	After recovery	After adjusting for redeployment
ML12289-02		
ML14449-02		

View from below the sediment traps through the sample hole.

Moored seawater nitrate concentration measurements

Contact: Achim Randelhoff (ara@akvaplan.niva.no)
Collected by: Achim Randelhoff, Marius Bratrein, Kristen Fossan
The SUNA V2 (Seabird Electronics, USA) is a spectrophotometer measuring light absorption at ultraviolet wavelengths. Using known absorbance spectra for seawater, we infer the UV absorbance due to seawater nitrate content and, hence, nitrate concentrations.

Nitrate is an essential macronutrient for primary production in the ocean and a component for the calculation of some water mass tracers.

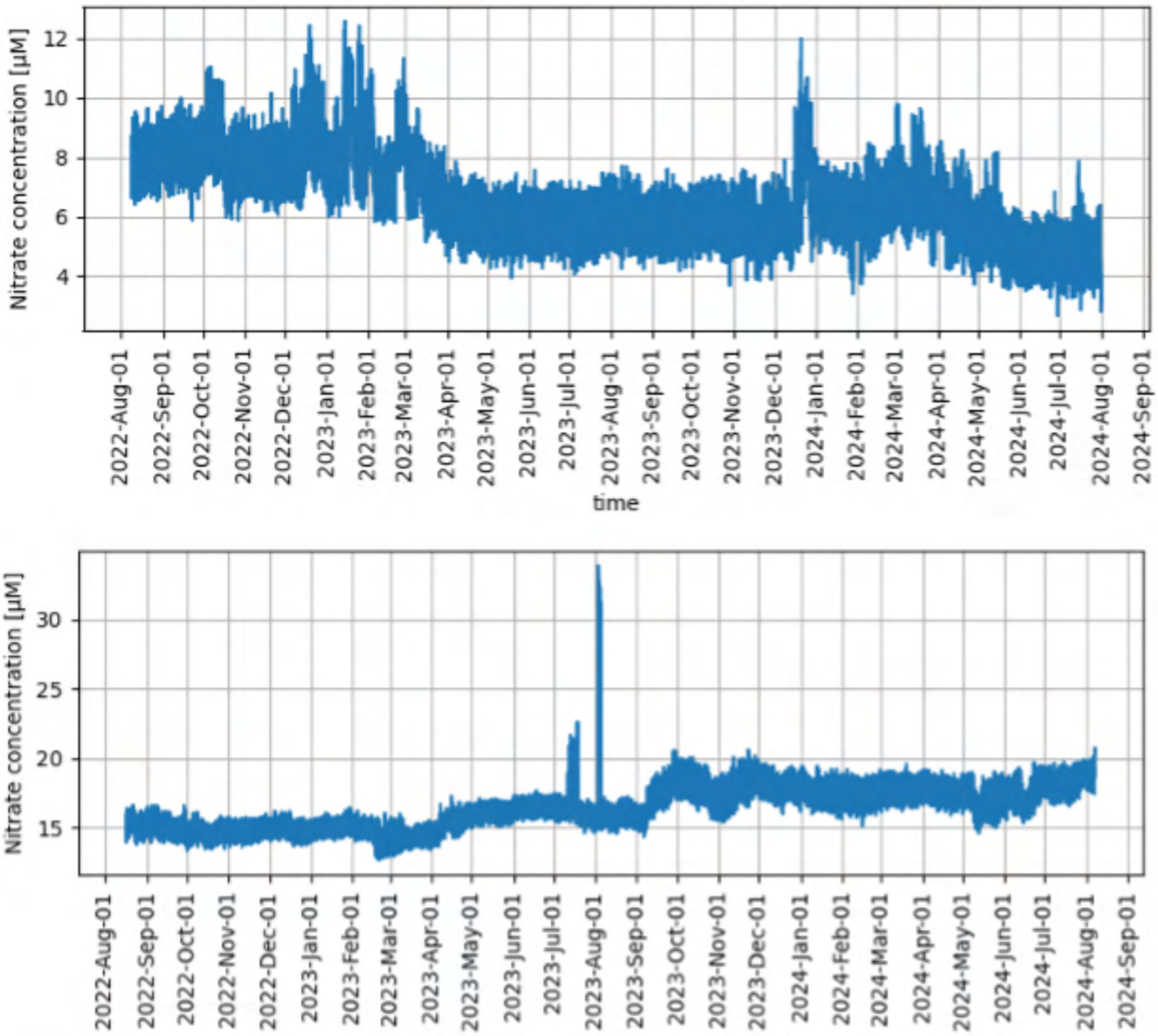
Recovered instruments: The SUNA had been deployed together with a 60 D-cell battery pack on a steel frame. 15-20 absorption spectra were measured every 4 hours, with concomitant dark spectra for reference.

Mooring	Years	Comments
Amundsen-22	2022-2024	S/NO 1909 (Akvaplan-niva)
Nansen-22	2022-2024	S/NO 1618 (NPI)

Deployed instruments:

Mooring	Years	Comments
Amundsen-24	2024-2026?	S/NO 2096 (NPI)
Nansen-24	2024-2026?	S/NO 1909 (Akvaplan-niva)

Data will be post-processed using temperature and salinity time series from the CTD sensor moored at approximately the same depth, and any remaining bias will be calibrated using bottle samples from CTD rosette casts made at mooring deployment and recovery.



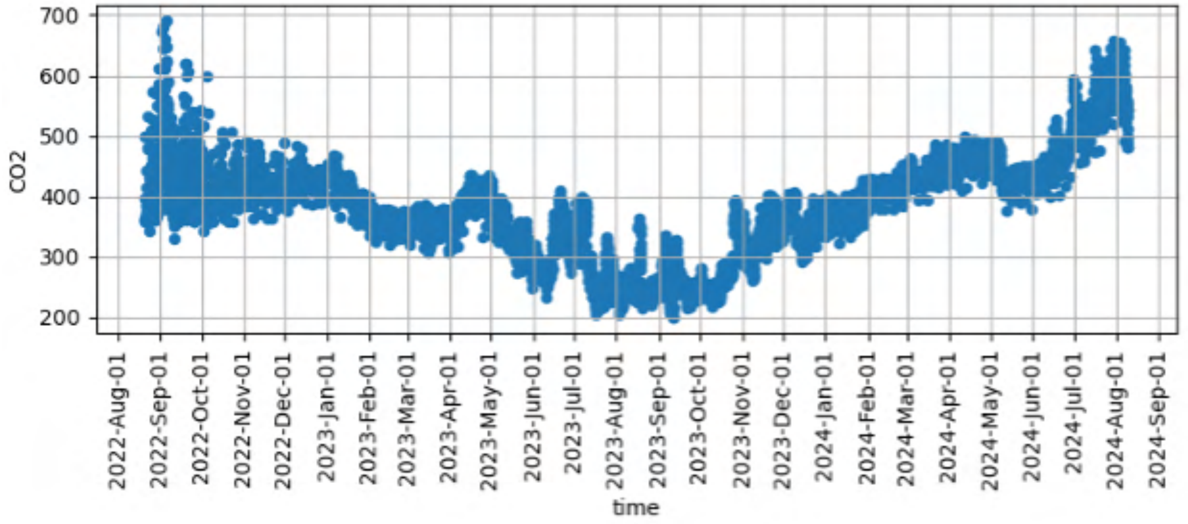
Raw nitrate concentration at Amundsen-22 (upper panel) and Nansen-22 (Lower panel) as logged by SUNA instruments (no correction for known seawater salinity, temperature, or nitrate bottle samples).

Moored pCO_2 measurements

Contact: Agneta Fransson (agneta.fransson@npolar.no)
Collected by: Kristen Fossan

The SAMI instrument sampled partial CO_2 pressure at approx. 50 meters depth on both Amundsen-22 and Nansen-22 moorings. The instrument recovered from the SAMI deployed at the Amundsen mooring recorded data, but the data did not represent realistic values when converted into engineering units. Further investigation is required to determine whether this is a software/configuration issue that can be remedied or if the raw data are affected. The sensor deployed and Nansen-22 appeared to collect good measurements.

Site	Years	Comments
Amundsen-22	2022-2024	S/NO 0050
Nansen-22	2022-2024	S/NO 0014



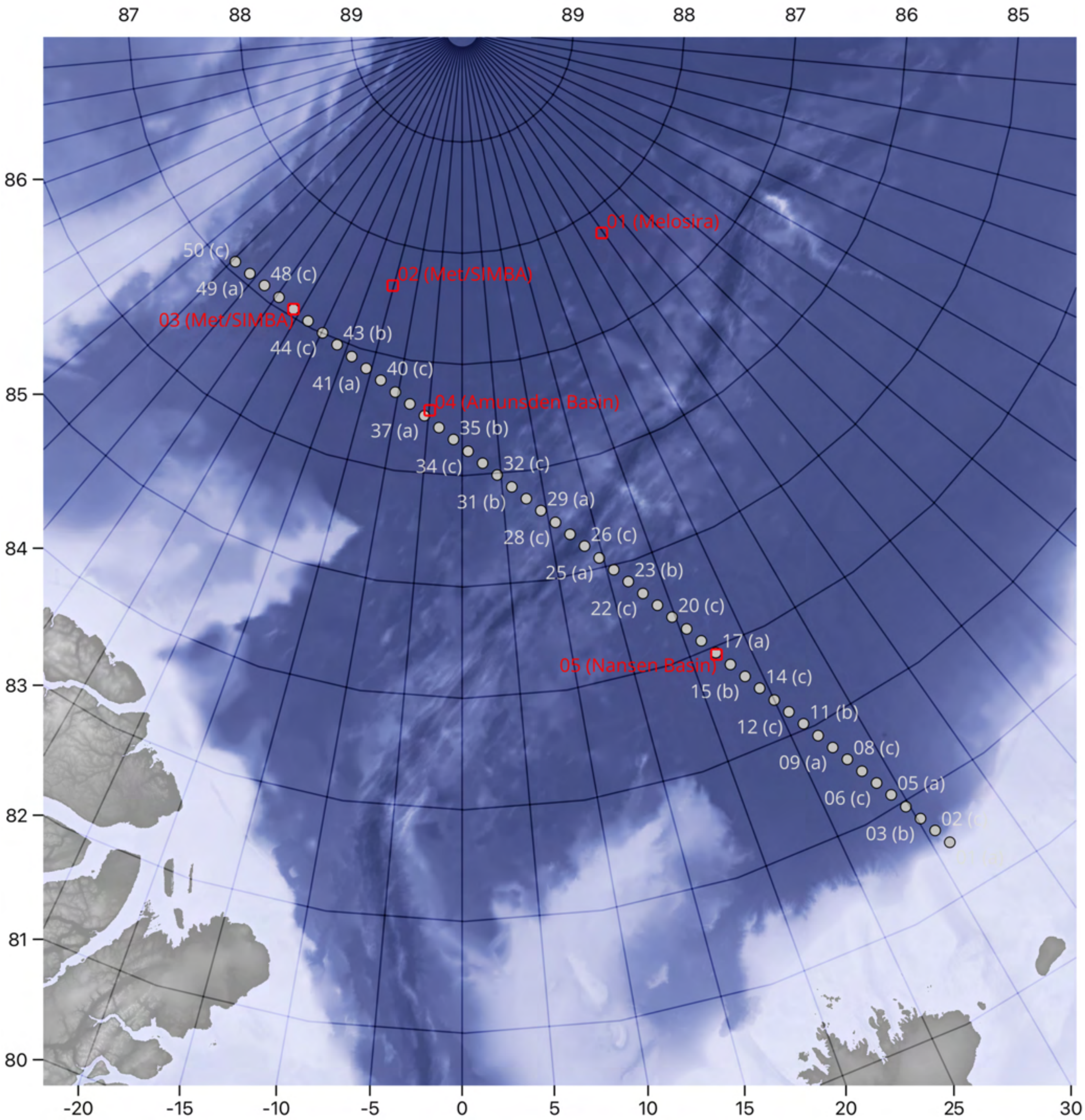
CO_2 measurements from the SAMI deployed at Nansen-22

Moored Passive Acoustic Recorders

Two AURAL recorders were recovered from the moorings Amundsen-22 and Nansen-22. These Passive Acoustic Monitoring (PAM) devices record sounds across a broad range of frequencies, including the songs and calls of bowhead whales and the calls and echolocation signals of narwhal. The instrument deployed from Nansen-22 had recorded data from deployment until April 2023, but did not successfully move to the next mini-drive for data storage. Thus, only one quarter of the expected data was captured. The instrument deployed from Amundsen-22 has a similar amount of data recorded. But, with the software on board the ship we are unable to reach the data to find out the time-line covered. Because of the file size, we believe that the same malfunction occurred in both instruments, so expect the time-line of data recorded to be similar for both PAM devices.

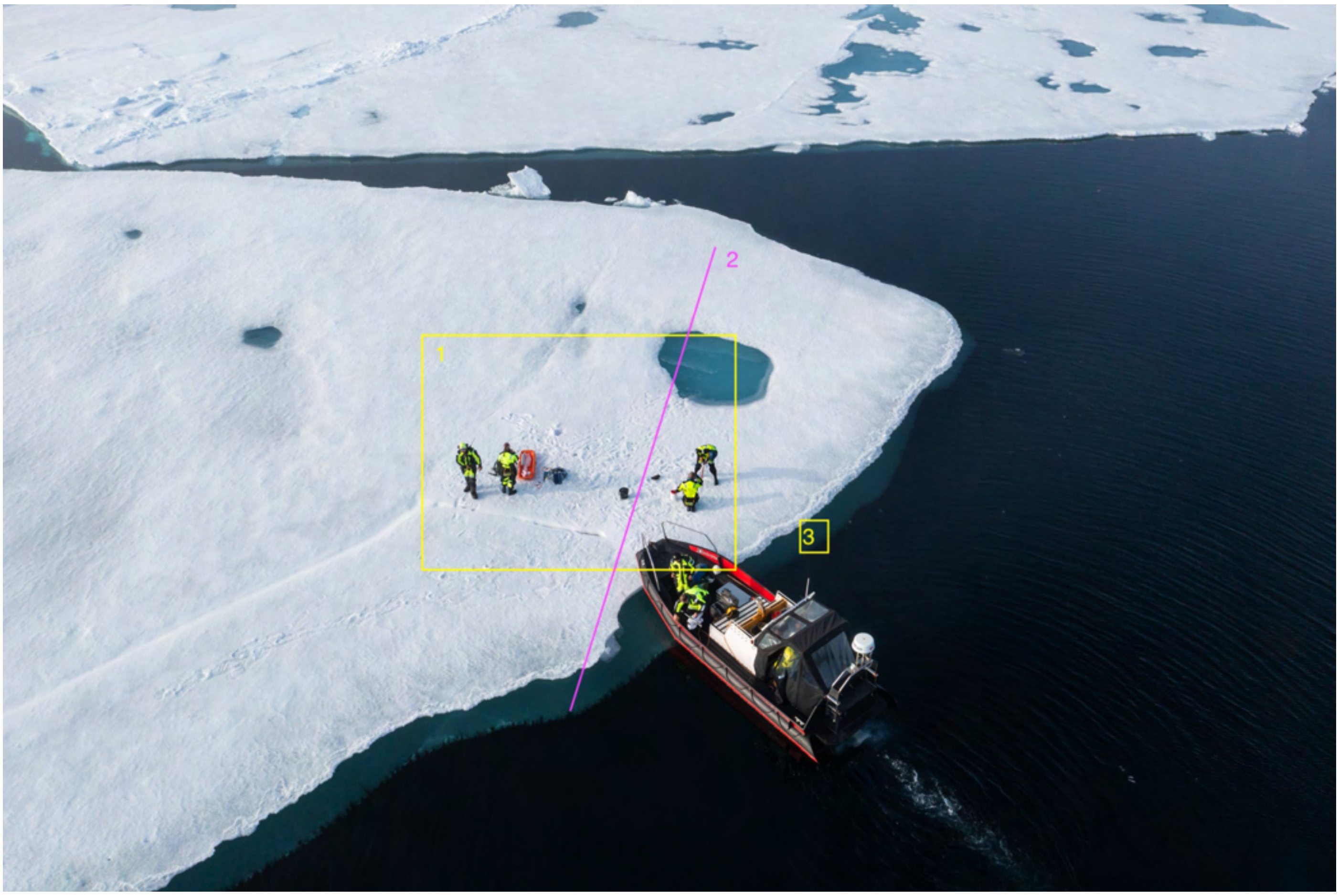
Sea ice stations

Overview



Sea Ice Station #	Start time	Start position
#1 Melosira ROV survey	24-Jul-2024 12:16 UTC	N 87° 47,515’ W 34° 38,3976’
#2 Met. station & SIMBA deployment	26-Jul-2024 07:26 UTC	N 87° 37.568’ W 015° 14.755’
#3 Met. station & SIMBA deployment	27-Aug-2024 18:28 UTC	N 87° 04.452 W 031° 13.701
#4 Amundsen Basin mooring Site (24 hours)	31-Aug-2025 06:21 UTC	N 86 34.566’, W 004 52.680’
#5 Nansen Basin mooring Site (24 hours)	06-Aug-2022 12:40 UTC	N 83° 56.858, E 022° 10.992’

Summary of activity at ice station #1 (*Melosira* ROV survey)

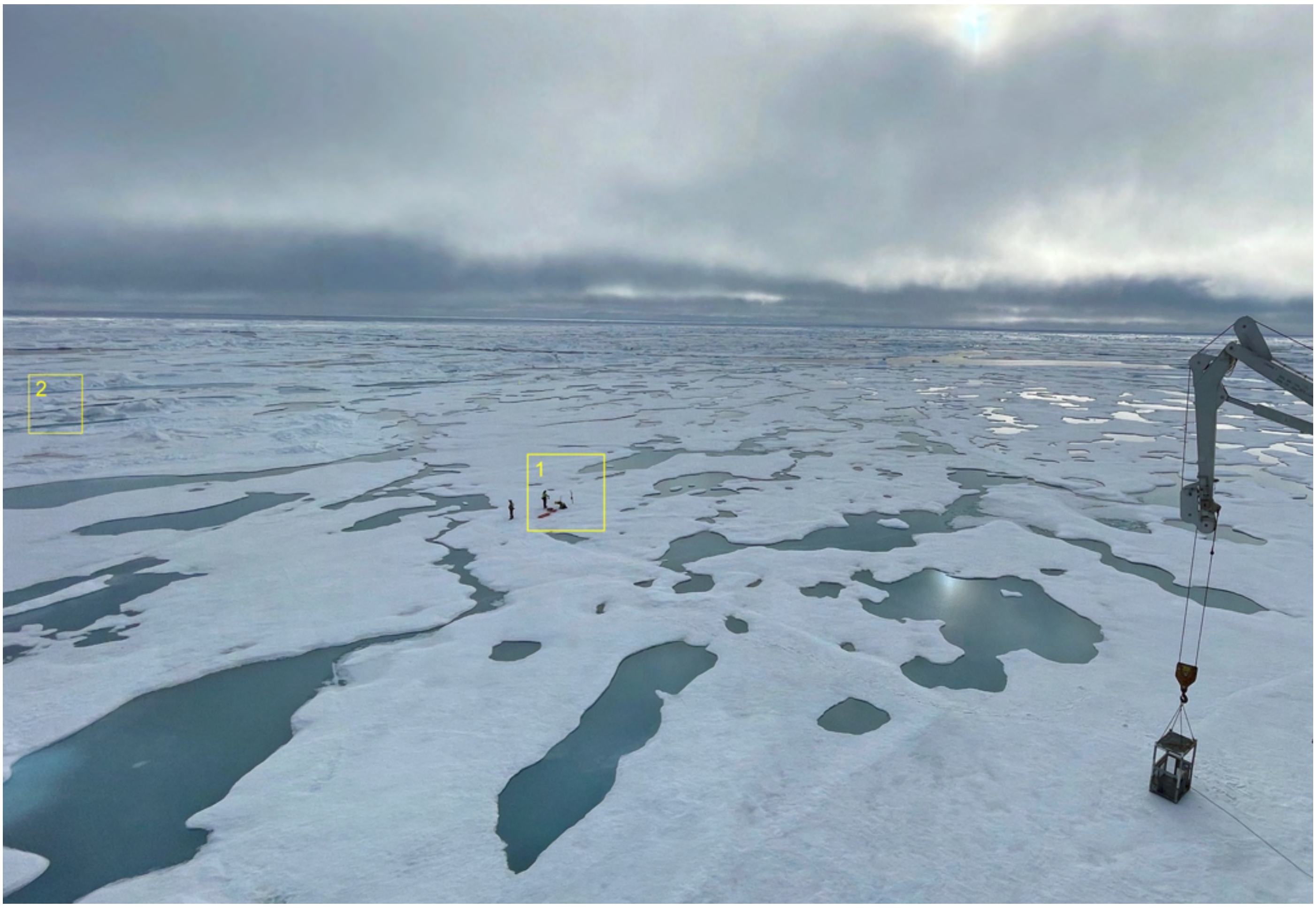


Ariel image showing work area on at Ice Station 01 (Near X-CTD 12). Yellow boxes: work sites magenta line: ROV transect. Image provided by Trine Lise Sviggum Helgerud.

	Site	Date	Notes / Configuration	Contact
Ice cores				
Salinity, d18O, nutrients core and Ice algae taxonomy core	1	24-Jul		Polona Itkin
Snow				
Snow Water Equivalent Measurement	1	24-Jul	Single measurement	Polona Itkin
Water Samples				
Nutrients, Particle absorption, HPLC	3	24-Jul	1 sample of surface water	Eva Leu
Cameras / Imagers				
ROV Video	2	24-Jul	Pink line on image	Paul A. Dodd
ROV under-ice irradiance measurement	2	24-Jul	Pink line on image	Paul A. Dodd

Summary of activity at ice station 1. Times and dates are UTC ‘start’ times when equipment began logging or transects/casts were started. See the image for site locations. Absolute positions may be extracted from the vessel position log.

Summary of activity at ice station #2 (Met. station & SIMBA deployment)

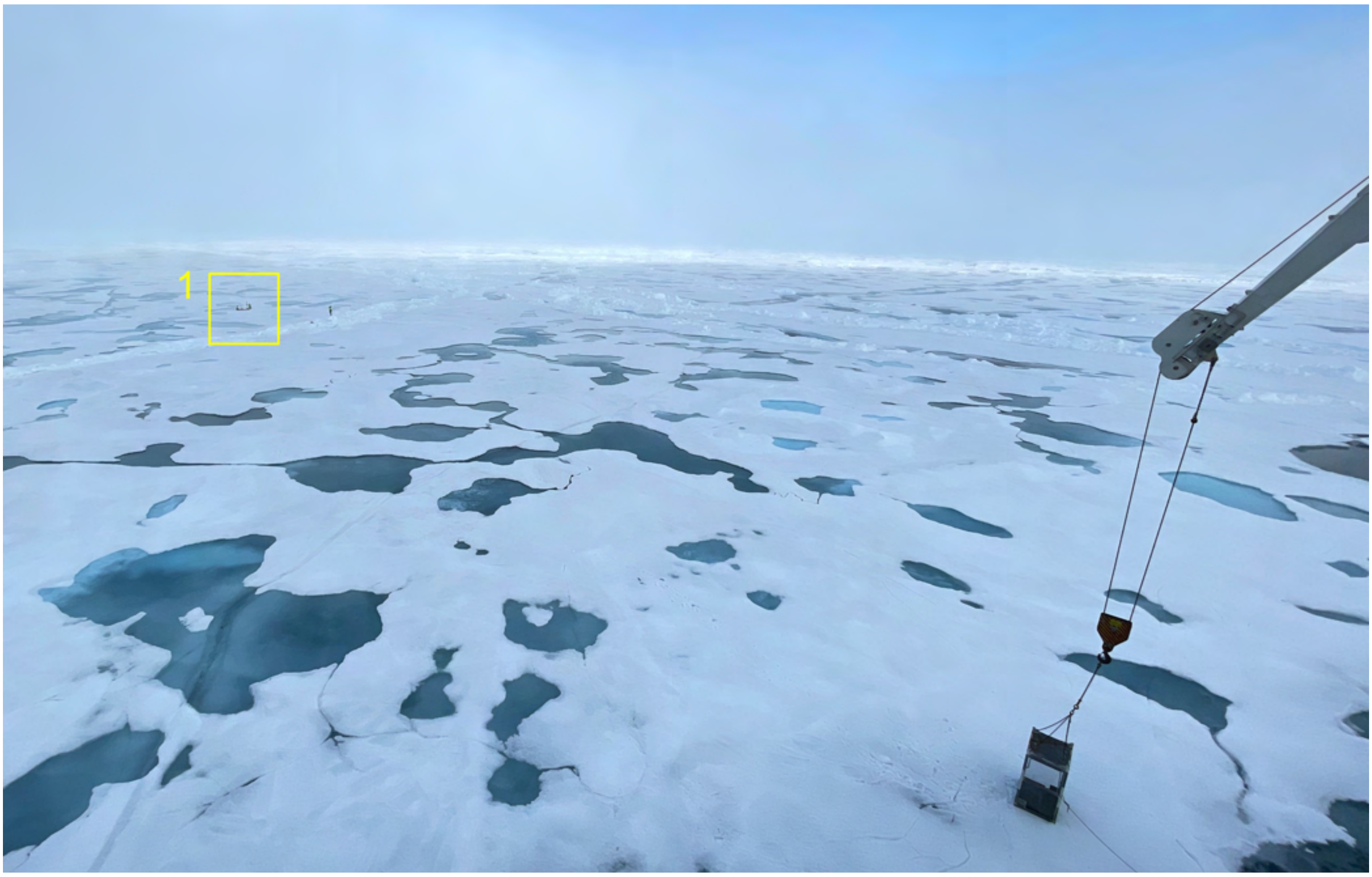


Photograph taken from the bridge showing work area on at Ice Station 02). Yellow boxes: work sites. Image provided by Paul A. Dodd.

	Site	Date	Notes / Configuration	Contact
Drifting Platforms				
Met Station	1	26-July	IMEI: 300534065853570	Polona Itkin
SIMBA Buoy	1	26-July	IMEI: 300534061787870	Polona Itkin
Ice Cores				
Salinity, d18o, nutrients & Taxonomy	1	26-July		Polona Itkin
Sediment sample	2	26-July		Polona Itkin

Summary of activity at ice station 2. Times and dates are UTC 'start' times when equipment began logging or transects/casts were started. See the image for site locations. Absolute positions may be extracted from the vessel position log.

Summary of activity at ice station #3

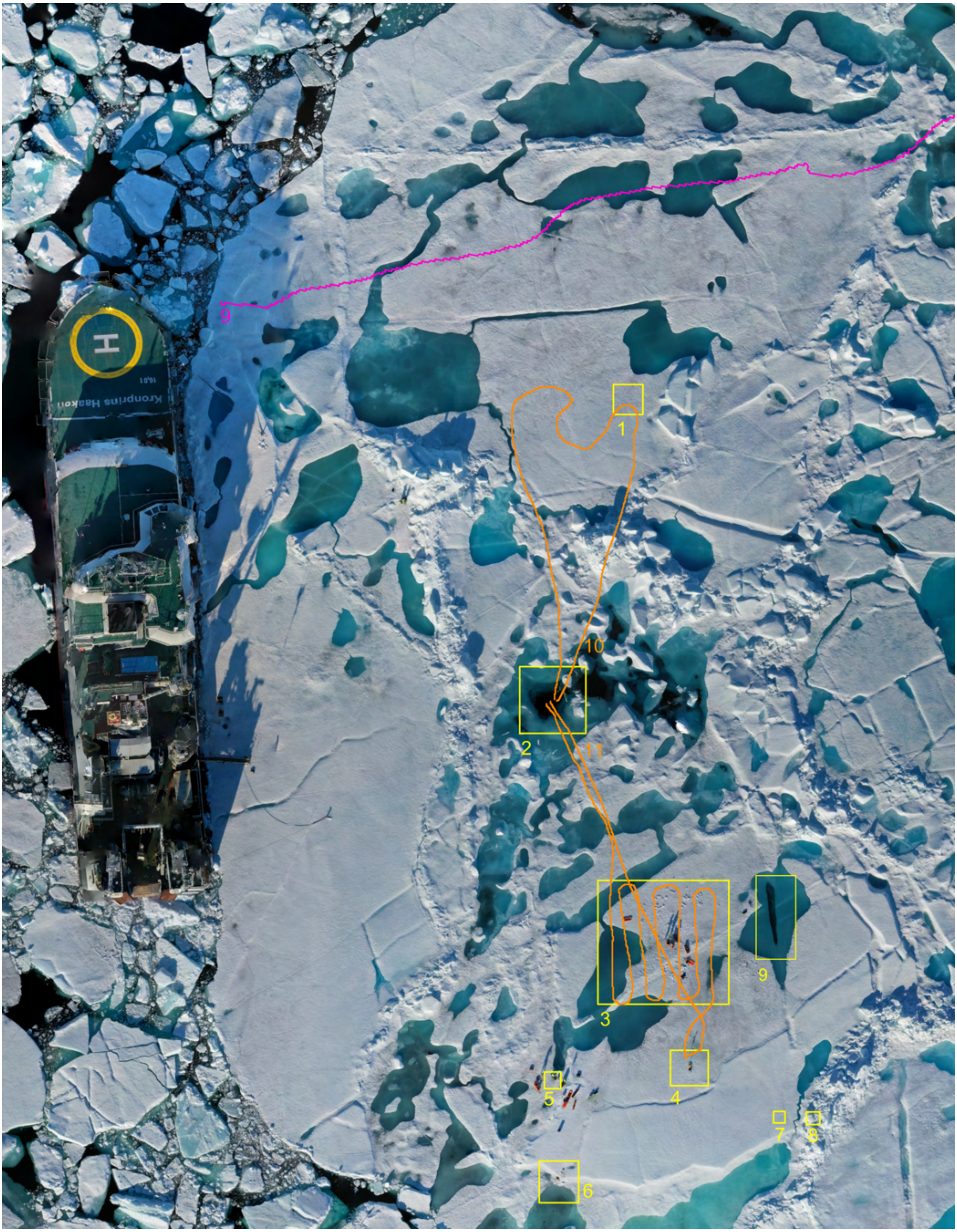


Ariel image showing work area on Ice Station 03 Yellow boxes: work sites. Image provided by Paul A. Dodd.

	Site	Date	Time (UTC)	Notes / Configuration	Contact
Drifting Platforms					
Met Station	1	27-July	07:00	IMEI: 300534065858580	Polona Itkin
SIMBA Bouy	1	27-July	07:00	IMEI: 300534063255480	Polona Itkin
Ice Cores					
Salinity, d18o, nutrients & Taxonomy	1	27-July	08:00		Polona Itkin
Sediment sample	2	27-July	08:15		Polona Itkin

Summary of activity at ice station 3. Times and dates are UTC ‘start’ times when equipment began logging or transects/casts were started. See the image for site locations. Absolute positions may be extracted from the vessel position log.

Summary of activity at ice station #4 (Amundsen Basin mooring site)

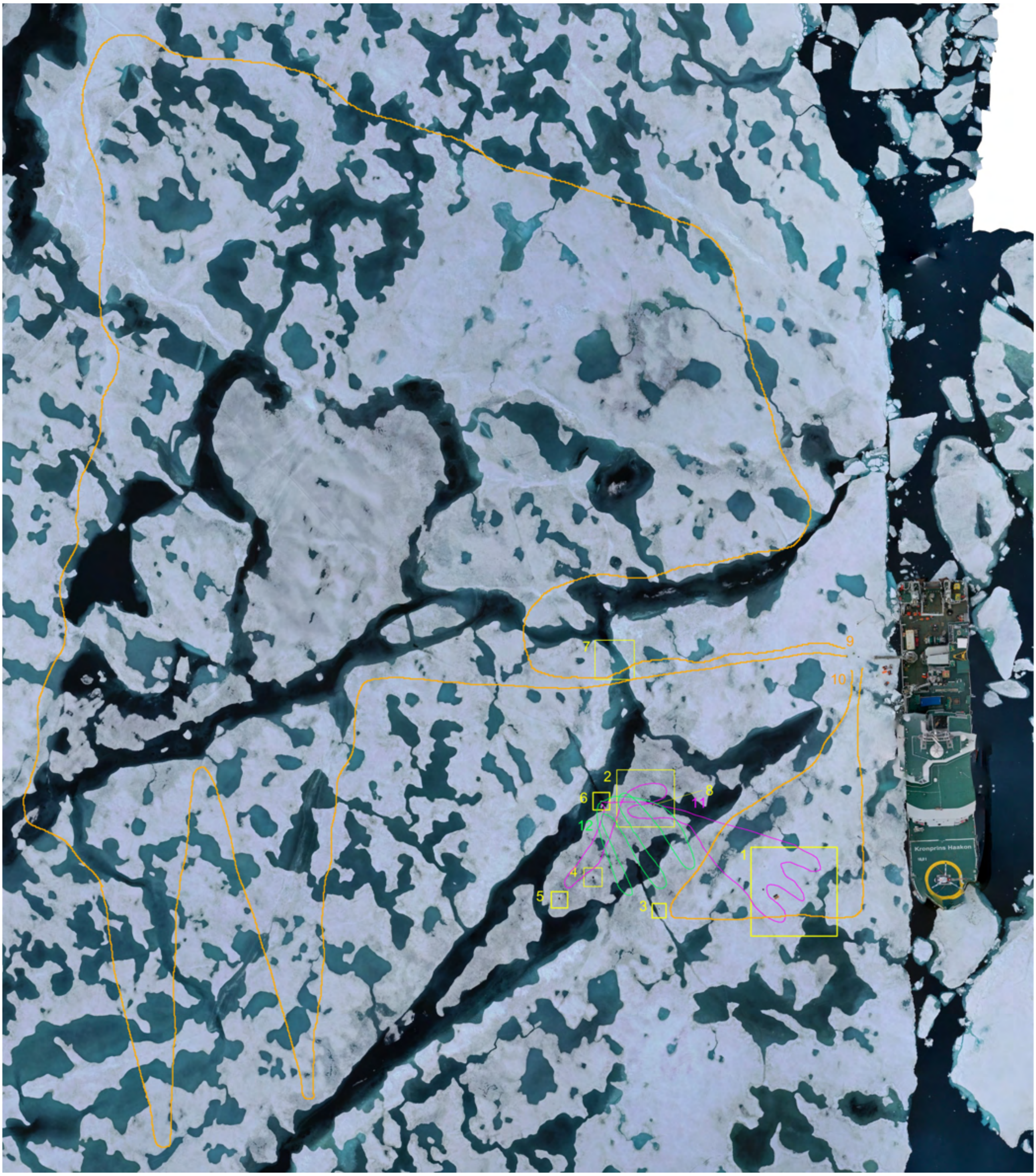


Ariel image showing work area on at Ice Station 01 (Near X-CTD 12). Yellow boxes: work sites magenta line: ROV transect. Image provided by Vegard Stürzinger.

	Site	Date	Notes / Configuration	Contact
Ice cores				
Temperature & Salinity , d18o) (1 core)	1	31-Jul	5cm then every 10 (top down)	Polona Itkin
Density & Stratigraphy (1 core)	1	31-Jul		Polona Itkin
Density & Stratigraphy & salinity & d18O (1 core)	1	31-Jul		Polona Itkin
Archive Core (1 core)	1	31-Jul		Polona Itkin
Nutrients, Altalkinity DIC, (1 core)	1	31-Jul		Agneta Fransson
Nutrients (1 core)	3	31-Jul		Eva Leu
Intracellular Nutrients (1 core)	3	31-Jul		Eva Leu
Intracellular Nutrients (1 core)	3	31-Jul		Fowzia Ahmed
Primary Production (6 cores)	3	31-Jul		Fowzia Ahmed
Ice algae (4 cores)	3	31-Jul	(1x full core, 3x 0-30 cm from bot.)	Philipp Assmy
Meiofauna (7 cores)	3	31-Jul	sections (cm from bot.): 0-3. 3-10, 10-20, 20-30	Sara Widera
Silica (7 cores)	3	31-Jul	sections (cm from bot.): 0-5	Rebecca Duncan
Metabarcoding (3 cores)	3	31-Jul	sections (cm from bot.): 0-3, 3-10	Janne Søreide
Trophic Markers (5 cores)	3	31-Jul	sections (cm from bot.) 0-10	Doreen Kohlbach
Microplastics (1 core)	3	31-Jul	sections (cm from bot.): 0-10, 122-132	Doreen Kohlbach
Pollutants (1 core)	3	31-Jul	sections (cm from bot.): 0-10, 129-139	Doreen Kohlbach
Water Samples				
Nutrients, Particle absorption, HPLC	3	31-Jul	1 sample of surface water	Polona Itkin
Phytoplankton Net	3	31-Jul	Cast under ice 0-15 m	Janne Søreide
Melt pond water (CHL-A, Algae, POC)	3	31-Jul	melt pond	Janne Søreide
Under ice water (CHL-A, Algae, POC)	3	31-Jul	0.5 m under ice	Janne Søreide
Ice and snow thickness transect	9	31-Jul	GEM2, Magna Probe	Polona Itkin
Snow Water Equivalent Measurement	4	31-Jul	Single measurement	Polona Itkin
Snow Water Equivalent Measurement	7	31-Jul	Single measurement	Polona Itkin
Snow Water Equivalent Measurement	8	31-Jul	Single measurement	Polona Itkin
Snow Pits				
Simple snow pit grain characteristic	1	31-Jul	Single measurement	Polona Itkin
Simple snow pit grain characteristic	7	31-Jul	Single measurement	Polona Itkin
Drifting Platforms				
Met Station	1	27-Jul	IMEI: 300534065857570	Polona Itkin
SIMBA Bouy	1	27-Jul	IMEI: 300534063484560	Polona Itkin
Optics				
Spectral Downwelling Light	5	31-Jul	2 profiles	Piotr Kowalczuk
Spectral Downwelling Light	5	01-Aug	2 profiles	Piotr Kowalczuk
Flat & Bulb PAR sensors & temp	3	31-Jul	(below Ice)	Janne Søreide
Flat & Bulb PAR sensors & temp	9	31-Jul	(In meltpond)	Janne Søreide
Flat PAR sensor in AIR		3	31-Jul Logging for majority of period	Janne Søreide
L-ARM PAR measurement	3	31-Jul	Under ice	Eva Leu
L-ARM PAR measurement	3	01-Aug	Under ice	Eva Leu
Cameras / Imagers				
ROV Video	10	31-July	Orange line	Paul A. Dodd
ROV under-ice irradiance measurement	11	31-July	Orange line	Paul A. Dodd
Instruments installed temporarily				
ADCP-signature 500	6	31-July	30 cm below ice/water interface down-looking.	Morven Muilwijk
Profiling instrument casts from ice				
MSS session 1	5	31-July	2 casts to 200m (mrd 11&12)@ 08:50	Morven Muilwijk
MSS session 2	5	31-July	2 casts to 200m (mrd 13&14)@ 11:00	Morven Muilwijk
MSS session 3	5	31-July	2 casts to 200m (mrd 15&16)@ 14:15	Morven Muilwijk
MSS session 4	5	01-Aug	3 casts to 200m (mrd 17,18,19)@ 07:30	Morven Muilwijk
CTD under ice	3	31-July	(RBR TS-turbidity, fluorescence, PAR) 0-30 m	Janne Søreide

Summary of activity at ice station 4. Times and dates are UTC ‘start’ times when equipment began logging or transects/casts were started. See the aerial image for site locations. Absolute positions may be extracted from the vessel position log.

Summary of activity at ice station #5 (Nansen Basin mooring site)



Ariel image showing work area on at Ice Station 01 (Near X-CTD 12). Yellow boxes: work sites magenta line: ROV transect. Image provided by Vegard Stürzinger.

	Site	Date	Notes / Configuration	Contact
Ice cores				
Temperature & Salinity , d18o) (1 core)	1	07-Aug	5cm then every 10 (top down)	Polona Itkin
Temperature & Salinity, d18o (1 core)	2	07-Aug		Polona Itkin
Density & Stratigraphy (1 core)	1	07-Aug		Polona Itkin
Density & Stratigraphy (1 core)	2	07-Aug		Polona Itkin
Archive Core (1 core)	1	07-Aug		Polona Itkin
Archive Core (1 core)	2	07-Aug		Polona Itkin
Nutrients, Alkalinity DIC, (1 core)	1	07-Aug		Agneta Fransson
Nutrients, Alkalinity DIC, (1 core)	2	07-Aug		Agneta Fransson
biobullk (chl-A) (2 cores)	2	07-Aug		Philipp Assmy
Ice algae (4 cores)	1	07-Aug	(1x full, 3x 0-30cm bottom up)	Philipp Assmy
Nutrients (1 core)	2	07-Aug	sections (cm from bot.): 0-3. 3-10	Eva Leu
Primary Production (7 cores)	1	07-Aug	sections (cm from bot.): 0-3	Eva Leu
Meiofauna (4 cores)	1	06-Aug	sections (cm from bot.): 0-3. 3-10, 10-20, 20-30	Sara Widera
Meiofauna (6 cores)	2	07-Aug	sections (cm from bot.): 0-3. 3-10, 10-20, 20-30	Sara Widera
Silica (9 cores)	1	07-Aug	sections (cm from bot.): 0-5	Rebecca Duncan
Silica (9 cores)	2	07-Aug	sections (cm from bot.): 0-5	Rebecca Duncan
Metabarcoding (3 cores)	1	07-Aug	sections (cm from bot.): 0-3, 3-10, 10-20	Janne Søreide
Metabarcoding (3 cores)	2	07-Aug	sections (cm from bot.): 0-3, 3-10	Janne Søreide
Trophic Markers (7 cores)	2	07-Aug	sections (cm cm from bot.0-10	Doreen Kohlbach
Microplastics (1 core)	2	07- Aug	sections (cm from bot.): 0-10, 58-68(top)	Doreen Kohlbach
Pollutants (1 core)	2	07- Aug	sections (cm from bot.): 0-10, 53-63(top)	Doreen Kohlbach
Physical Measurements of Ice and Snow				
Ice and snow thickness transect	9	06-Aug	GEM, Magna probe with basked adapted for pond depth	Polona Itkin
Ice and snow thickness transect	10	06-Aug	GEM, Magna probe with basked adapted for pond depth	Polona Itkin
Snow Water Equivalent Measurement	1	07-Aug	Single measurement	Polona Itkin
Snow Water Equivalent Measurement	2	07-Aug	Single measurement	Polona Itkin
Simple snow pit grain characteristic	1	07- Aug		Polona Itkin
Simple snow pit grain characteristic	2	07- Aug		Polona Itkin
Water Samples				
Melt pond water (CHL-A, Algae, POC)	1	06-Aug	melt pond	Polona Itkin
Under ice water (CHL-A, Algae, POC)	4	06-Aug	0.5 m	Polona Itkin
Optics				
Spectral Downwelling Light	4	06-Aug	2 profiles	Piotr Kowalczuk
Spectral Downwelling Light	4	07-Aug	2 profiles	Piotr Kowalczuk
L-arm PAR	2	07-Aug	Through hole under ice	Eva Leu
Flat & Bulb PAR sensors & temp	1	06-Aug	(below Icw)	Janne Søreide
Flat & Bulb PAR sensors & temp	2	06-Aug	(In meltpond)	Janne Søreide
Flat PAR sensor in AIR	1	07-Aug	Logging for whole period	Janne Søreide
Cameras / Imagers				
ROV Video	11	06-Aug	Blue-eye ROV	Paul A. Dodd
ROV Video	12	06-Aug	Blue-eye ROV	Paul A. Dodd
Flat PAR sensor on ROV	12	07-Aug	Mounted on Blue-eye ROV	Eva Leu
Instruments installed temporarily				
ADCP-signature 500	5	06-Aug	30 cm below ice/water interface down-looking started 12:30	Morven Muilwijk
Profiling instrument casts from ice				
MSS session 1	4	06-Aug	2 casts to 200m (mrd 30&31) @ 14:35	Morven Muilwijk
MSS session 2	4	06-Aug	2 casts to 200m (mrd 32&33) @16:24	Morven Muilwijk
MSS session 3	4	07-Aug	2 casts to 200m (mrd 34-38) @06:56	Morven Muilwijk
CTD under ice	4	06-July	(RBR TS-turbitidy, flourecnece, PAR) 0-30 m	Janne Søreide
Nets / Traps				
Amphipod Trap	3	06-Aug		Janne Søreide
Amphipod Trap	6	06-Aug		Janne Søreide
Amphipod Trap	8	06-Aug		Janne Søreide
Phytoplankton Net	4	06-Aug	Cast under ice 0-15 m	Janne Søreide
Algal lump collection melt pond	7	07-Aug		Eva Leu

Summary of activity at ice station 5. Times and dates are UTC 'start' times when equipment began logging or transects / casts were started. See the aerial image for site locations. Absolute positions may be extracted from the vessel position log.

Salinity measurements from ice cores

Contact: Polona Itkin (polona.itkin@npolar.no)
Collected by: Polona Itkin

The sea ice salinity profiles are used to determine the sea ice age and melt stage of the ice, since ice that has survived a melting period desalinates. As the ice melts, brine channels connect to increase porosity until the brine is flushed from the ice and replaced by snow-melt water or air. Along with the oxygen isotope measurements and sea ice back trajectories, salinities will help us classify the samples of sea ice into second-year (SYI) and first-year ice (FYI).
The cores were collected into a bag, frozen to -20C on board and only then sectioned at 5-10 cm intervals. This should prevent the complete loss of the brine in the very porose warm ice typical for summer. Once frozen, some brine was collected separately from the bag (cores leaked some brine), and the salinity of this fluid was measured separately. The bulk salinity of melted sections was measured using a conductivity meter Cond 3110 SET3 S/N 11400491. Salinity is reported on the practical salinity scale (dimensionless). A part of the sample was preserved for the oxygen isotope analysis. One or two salinity cores were collected at every sea ice station. At the Amundsen basin mooring (ice station 4) and at the Nansen basin mooring station (ice station 5), we also collected cores for temperature (same core as for salinity), stratigraphy, density, nutrients, archive, and snow pits. In addition, some salinity samples were taken in snow pits (surface scattering layer, not snow). Additional metadata about the cores and snow pits is stored in the NPI sea ice physics ice station spreadsheets.

Location	Date	Time (UTC)	Latitude	Longitude	Comments
Ice Station 1	24-07-2024	12:16	87.79192	34.63996	Small boat, melosira sampling (ice core) Likely FYI.
Ice Station 2	26-07-2024	07:00	*87.62649*	*-15.23082*	SIMBA deployment from basket (ice core and snow pit). Likely SYI.
Ice Station 3	27-07-2024	07:00	87.07005	-31.11737	SIMBA deployment from basket (snow pit)
Ice Station 4	31-07-2024	17:12	86.59438	-4.82983	Main coring site (ice core). Likely SYI.
Ice Station 4	31-07-2024	07:52	86.58445	-4.85467	SIMBA deployment site (snow pits)
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	Main coring site (snow pit). Likely SYI.
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	ROV site (snow pit). Likely SYI.
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	Main coring site (ice core). Likely SYI.
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	ROV site (ice core). Likely SYI.

Temperature measurements from ice cores

Contact: Polona Itkin (polona.itkin@npolar.no)
Collected by: Polona Itkin

The sea ice temperature profiles are used to reconstruct sea ice density, gas volume, and other parameters that will be measured on sea ice cores after freezing. Sea ice temperature is the only ice core parameter measured *in situ*. The measurement was taken as soon as possible after core extraction (finalized within minutes).
The sampling holes to insert the temperature probe were drilled at the top and bottom of the core at 10 cm intervals. The core was then melted for salinity and oxygen isotope analysis.

We also collected cores for stratigraphy, density, nutrients, and archive at the Amundsen basin mooring (ice station 4) and the Nansen basin mooring station (ice station 5). Additional metadata about the cores and snow pits is stored in the NPI sea ice physics ice station spreadsheets.

Location	Date	Time (UTC)	Latitude	Longitude	Comments
Ice Station 4	31-07-2024	17:12	86.59438	-4.82983	Main coring site
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	Main coring site
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	ROV site

Oxygen isotope samples collected from ice cores

Contact: Mats Granskog (mats.granskog@npolar.no)
Collected by: Polona Itkin

The parameter $\delta^{18}O$ describes the ratio of ^{18}O to ^{16}O isotopes in the H_2O molecule. $\delta^{18}O$ is a tracer for water that has evaporated at some point. Sea ice $\delta^{18}O$ samples will be measured ashore. This will help to identify ice layers that have contributions from snow to the mass balance or ice of different origins.
The samples are collected from the salinity cores sectioned at 5-10 cm intervals. One or two such cores were collected at every sea ice station. At the Amundsen basin mooring (ice station 4) and at the Nansen basin mooring station (ice station 5), we also collected cores for temperature, stratigraphy, density, nutrients, archives, and snow pits. In addition, some samples were taken from salinity samples from snow pits (surface scattering layer, not snow). The metadata about the cores and snow pits is stored in the NPI sea ice physics ice station spreadsheets (Excel).
In total, 95 samples from 9 locations at 5 different ice stations were collected.

Location	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
Ice Station 1	24-07-2024	12:16	87.79192	34.63996	S1, Small boat, *Melosira* sampling
Ice Station 2	26-07-2024	07:00	*87.62649*	*-15.23082*	S2, SIMBA deployment from basket
Ice Station 3	27-07-2024	07:00	87.07005	-31.11737	S3, SIMBA deployment from basket
Ice Station 4	31-07-2024	17:12	86.59438	-4.82983	S4, Main coring site (ice core)
Ice Station 4	31-07-2024	07:52	86.58445	-4.85467	S5, SIMBA deployment site (snow pits)
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	S6, Main coring site (snow pit)
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	S7, ROV site (snow pit)
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	S8, Main coring site (ice core)
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	S9, ROV site (ice core)

Nutrient samples collected from ice cores

Contact: Agneta Fransson (agneta.fransson@npolar.no)
Collected by: Polona Itkin

Ice cores were collected for the determination of dissolved nitrate, nitrite, phosphate, and silicate. At ice stations at the Amundsen basin mooring (ice station 4), we collected one core for analysis of nutrients, and at the Nansen basin mooring station (ice station 5), we collected two such cores. The cores were bagged and stored at -20C. Additional metadata about the cores is stored in the NPI sea ice physics ice station spreadsheets that also include ice core data for temperature, salinity, oxygen isotope, stratigraphy, density, and snow pits.

Cast	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
Ice Station 4	31-07-2024	17:12	86.59438	-4.82983	Main coring site
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	Main coring site
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	ROV site

Meiofauna in ice cores

Contact: Janne Søreide (JanneS@UNIS.no) / Sara Widera (108549@student.unis.no
Collected by: Sara Widera, Janne Søreide, Rebecca Duncan, Doreen Kohlbach, Fowzia Ahmed, Lucie Goraguer

Sympagic ("ice-associated") meiofauna lives inside the brine channels of the sea ice. They are usually between 20 µm and 500 µm in body size and comprise mostly larvae of pelagic or benthic species that temporarily use the sea ice as a nursery habitat when ice algae are plentiful. However, there are also some taxa (nematodes and small harpacticoid and cyclopoid copepods) that are believed to be 100% ice-dependent. There is very limited research on these tiny ice-living critters, especially so far north into the Arctic Ocean pack ice, so any data collected on this cruise is of high value. Samples were analysed live onboard Kronprins Haakon since it is much easier to detect these tiny specimens when they move.

The cores were taken with the Kovacs ice corer (9 cm diameter) cut into 0-3 cm, 3-10 cm, 10-20 cm and 20-30 cm sections with a saw on a cutting board, whereby 0 cm is at the ice-water interface. Sections from two ice cores were pooled per sample to reduce the effect of patchiness. Core length (CL), ice thickness (IT), snow depth (SD) and freeboard (FB) were noted down for each core. Usually three replicates (in total 6 cores) were taken if time allowed. For melting, 100 ml of filtered seawater were added per 1 cm section to avoid taxa to burst due to osmotic shock. Samples were filtered through a 20 µm sieve and taxa identified and counted under a stereomicroscope (1-11x magnification), placed in a cold lab.

At Ice station 4 in Amundsen basin, some nematodes were found (**Error! Reference source not found.**), while at the Ice station 5 in Nansen basin a different community was found with plenty of harpacticoid and cyclopoid copepods

Left: Harpacticoid with eggs, Centre-left: Cyclopoid, Center-right: An acoela found at ice station 5
Right: A nematode was found at ice station 4

Core	Date	Time	Latitude	Longitude	Comments
1_Meio	2024-07-24	11:16	87.7946	34.8001	Reused physical core (site 1, approached by boat)
13_Meio	2024-07-26	07:30	87.6262	-15.2494	Reused physical core (at SIMBA deployment site)
37_Meio_A+A	2024-07-31	15:45	86.5761	-4.8779	Station 37; two cores pooled to one (site 3)
37_Meio_B+B	2024-07-31	16:15	86.5761	-4.8779	Station 37; two cores pooled to one (site 3)
37_Meio_C+C	2024-07-31	17:00	86.5761	-4.8779	Station 37; two cores pooled to one (site 3)
17_Meio_A+A	2024-08-06	15:45	83.9410	22.1252	Station 17; two cores pooled to one; (site 1, thicker ice)
17_Meio_B+B	2024-08-06	16:00	83.9410	22.1252	Station 17; two cores pooled to one; (site 1, thicker ice)
17_Meio: C+C+C	2024-08-06	13:00	83.9410	22.1252	Station 17; three cores pooled to one; (site 1, thicker ice); Originally used for DNA metabarcoding, therefore only borrowed for counting
17_Meio_D+D	2024-08-07	10:30	83.9410	22.1252	Station 17; two cores pooled to one; (site 2, thinner ice)
17_Meio_E+E	2024-08-07	10:45	83.9410	22.1252	Station 17; two cores pooled to one; (site 2, thinner ice)
17_Meio_F+F	2024-08-07	14:30	83.9410	22.1252	Station 17; two cores pooled to one; (site 2, thinner ice)

Metadata for meiofauna ice cores. The plus in the name indicates that two cores were pooled. All cores were cut into the following sampling sections in cm from water-ice interface to top: 0-3, 3-10, 10-20, 20-30.

All samples were preserved in >80% ethanol after being counted, whereby a few individuals were photographed and collected for optional DNA barcoding at UNIS (University Centre in Svalbard), using the hot shot extraction method. Integrative abundance in ind./m^2 was calculated from the counts for each of the cores, to compare species distribution, community composition and taxonomy in-between stations.

Silicification in sympagic diatoms

Contact: Rebecca Duncan (rebecca.duncan@uts.edu.au)
Collected by: Rebecca Duncan

Diatoms are a significant contributor to marine primary production. Typically, sea ice associated diatoms contribute to total primary production less than pelagic phytoplankton, however, the divergence in timing and distribution means that the sea ice microalgae subsist as an important source of nutrients and energy for the marine food web. The degree of diatom silicification determines their grazability and sinking rates, which influences the duration of algal blooms, zooplankton grazing rates, nutrient transfer through food webs and carbon export. Determining which species contribute most to silica production and species-specific rates of silicification, in conjunction with identifying key nutrient rich taxa, is important to build a more complete picture of biomineralization and carbon cycling in Arctic marine ecosystems.

During this cruise, samples of sea-ice algae were collected to investigate (1) species-specific silicification rates, (2) species-specific silica content, (3) species-specific biomolecular content, (4) total biogenic silica content and (5) functional (silicification) gene expression.

Methods: At each sampling site, six ice cores were extracted ~0.5–1-m apart, using a Kovacs core barrel (9 cm diameter; Kovacs Enterprise, Oregon, USA). The bottom 5 cm (at the ice–water interface) of each core was retained only, and 100 ml of filtered seawater (0.2 µm Millipore) was added for every centimeter of the core to minimize osmotic stress, after which the samples were allowed to melt in darkness for 24 h at 4°C. Three cores were filtered in triplicates onto Sterivex filters and stored at -80°C to investigate functional gene expression. From the three remaining cores, 3 x 1.8 ml aliquots were removed for species-specific silica content (X-Ray fluorescence XFM microscopy) and fixed in 2% glutaraldehyde and a further 3 x 1.8 ml aliquots were taken for species-specific biomolecular content (Fourier transform infrared FTIR microspectroscopy - fixed in 5% formaldehyde), and 100 ml was taken for community composition (fixed in 2% glutaraldehyde). The remaining concentrate was divided into four incubation bottles (150 ml total vol.) to investigate species-specific silicification rates using fluorescence microscopy. A fluorescent marker (PDMPO; 0.125uM final conc.) was added in triplicate, and the fourth acted as a control (DMSO; 0.125uM final conc.) The bottles were incubated for 24 hr at 1 °C with light set at ~20 µmol m^{-2} s^{-1}, with periodic mixing. After 24 hours, 6 x 1.8 ml aliquots were removed from each and fixed in 2% glutaraldehyde for later analysis. The remaining volume was filtered (0.8 µm Nuclepore Membrane, Whatman) for total biogenic silica content, and filters were frozen at -80°C until analysis.

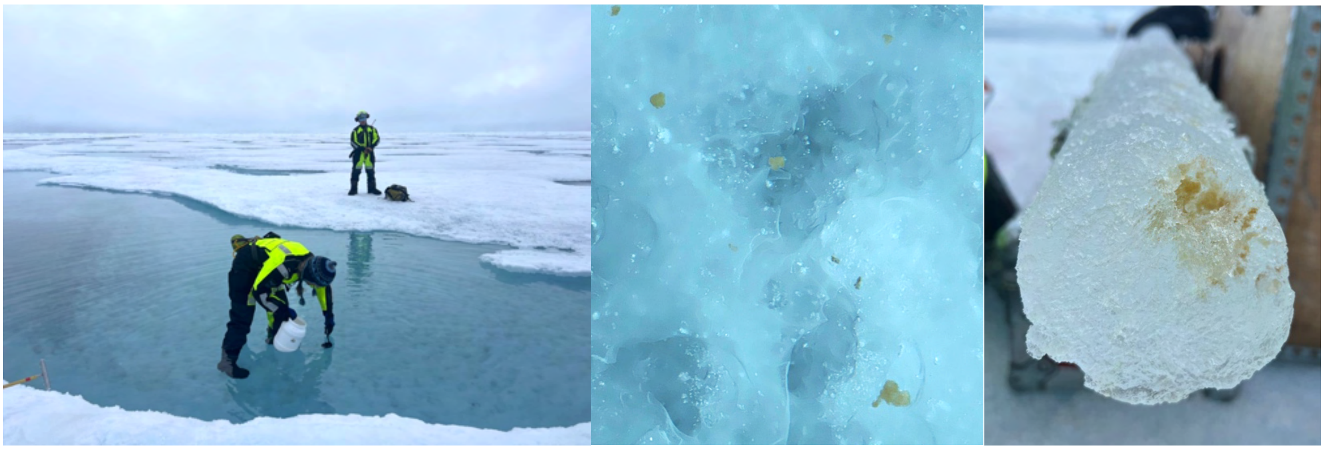
At the Amundsen Basin ice station (Ice Station 03), 6 cores were taken for the silicification parameters and 3 cores were taken for functional gene expression. Some of the cores had visible algal lumps (Fig. 1), whilst some had no distinct colouration. At the Nansen Basing ice station (Ice Station 04), there was a substantial difference in ice thickness over a small spatial area. For this reason, 9 cores (6 for silicification parameters and 3 for functional gene expression) were taken from the thin ice, and another 9 from the thick ice.

In addition to the ice-coring sites, two opportunistic sampling events were performed by taking lumps of visible algae. The first event involved using the Rib Boat to obtain visible lumps of *Melosira arctica* growing underneath the ice. Incubations were performed on this material for 24 h, as above, under high light (~80 µmol m^{-2} s^{-1}) and low light (~5 µmol m^{-2} s^{-1}) conditions, and then fixed for later analysis as above. The second event was at the Nansen Basin ice station and involved taking visible brown lumps of material from two melt ponds (Fig 2-3). Incubations were performed on this material for 24 h, as above, under available light conditions (~60 µmol m^{-2} s^{-1}) and then fixed for later analysis as above.

Samples will be analyzed at the University Technology Sydney and ANSTO's Australian Synchrotron.

Number of Cores	**Date**	**Time**	**Latitude**	**Longitude**	**Site**	**Analysis**
Grab	24.7.24	11:15	N 87° 47,515'	W 34° 38,3976'	Rib-Boat sampling of visible *Melosira* spp. lumps Ice Station 01	Species-specific Silica Content and Functional Gene Expression
6	31.7.24	9:30	N 86 34.566'	W 004 52.680'	Amundsen Basin Ice Station 03, Site 3	Species-specific Silica Content
3	31.7.24	11:00	N 86 34.566'	W 004 52.680'	Amundsen Basin Ice Station 03, Site 3	Functional Gene Expression
6	8.8.24	8:30	N 83° 56.858	E 022° 10.992'	Nansen Basin Ice Station 04, Site 1, Thin Ice (~60cm)	Species-specific Silica Content
3	8.8.24	9:30	N 83° 56.858	E 022° 10.992'	Nansen Basin Ice Station 04, Site 1, Thin Ice (~60cm)	Functional Gene Expression
6	8.8.24	11:30	N 83° 56.858	E 022° 10.992'	Nansen Basin Ice Station 04, Site 2, Thick Ice (~180cm)	Species-specific Silica Content
3	8.8.24	14:30	N 83° 56.858	E 022° 10.992'	Nansen Basin Ice Station 04, Site 2, Thick Ice (~180cm)	Functional Gene Expression
Grab	8.8.24	15:30	N 83° 56.858	E 022° 10.992'	Nansen Basin Ice Station 04, Site 1, Melt Pond Lumps	Species-specific Silica Content and Functional Gene Expression

Summary of samples collected



Left: Collecting visible algal lumps from melt pond. Center: close up of the visible lumps floating in the melt pond. Right: Visible algal lumps present on some cores from Amundsen Basin coring site (Photos: Rebecca Duncan)

Algae taxonomy, Chlorophyll-A, Phaeopigment, POC/PON & Flow Cytometry

Contact person: Philipp Assmy (philipp.assmy@npolar.no)
Contact person for flow cytometry: Gunnar Brakbak (gunnar.bratbak@uib.no)
Collected by: Lucie Goraguer

The total chlorophyll a, POC/PON was measured by GF/F filter (1 filter per ice section) for the following ice sections: 0-3, 3-10, 10-20, 20-40 cm, and every 20 cm section to top, by pulling 4 ice core bio bulk together (0-20cm section). FCM in triplicate for 0-40 cm (0-3, 3-10, 10-20, 20-40) ice core section.

Sea-ice algae taxonomy samples were taken from 4 ice core sections (0-3, 3-10, 10-20, 20-40). The samples (90 ml) were fixed with 0.4 ml of glutaraldehyde (0.1 % final concentration) and 10 ml of hexamine-buffered formaldehyde (1% final concentration) and packed for further microscopic analysis at IOPAN (Sopot, Poland). A phytoplankton hand-net 20 um under the ice 20 m bottom at both Amundsen and Nansen sea-ice station, combined with CTD measurement down to 30 m (+turbidity, PAR sensor). UIW 0,5m: Under the ice water sampling with Ruttner bottle for Chla, POC/PON, FCM, taxonomy Meltpond: water sampling with bucket: Chl *a*, POC/PON, FCM, taxonomy.

#core	Core name	Parameters
1	Bio-bulk 1 (full core)	Chl a, POC/PON, FCM, HPLC, taxonomy
2	Bio-bulk 2 (0-3, 3-10, 10-20)	Chl a, POC/PON, FCM, HPLC, taxonomy
3	Bio-bulk 3 (0-3, 3-10, 10-20)	Chl a, POC/PON, FCM, HPLC, taxonomy
4	Biobulk 4 (0-3, 3-10, 10-20)	Chl a, POC/PON, FCM, HPLC, taxonomy

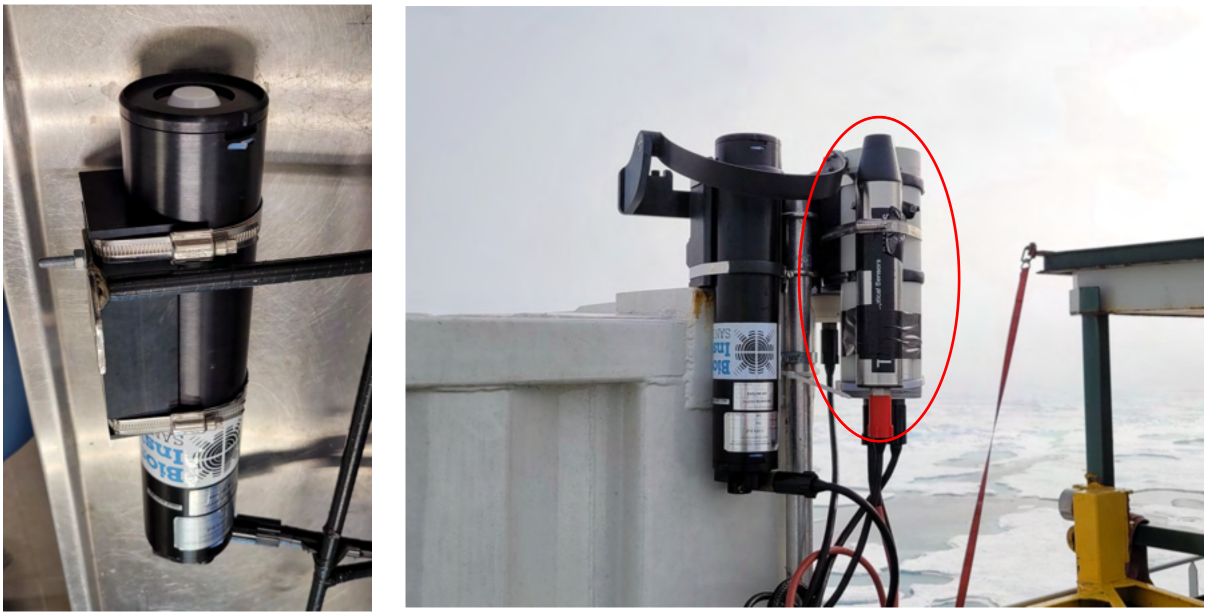
Ice cores sampled for Algae taxonomy, Chlorophyll-A, Phaeopigment, POC/PON & FCM at the Amundsen and Nansen stations

The ice core length at Amundsen ice station was 157 cm and Nansen ice station 150 cm for the thick ice and approx. 50 for shallower ice thickness. At the Nansen ice station: 2 coring sites (thick and shallow ice). For the 2nd and shallow ice core site: 2 biobulk cores pulled together and analysed for Chl a, POC/PON, Taxonomy and FCM: 0-3, 3-10, 10-20, 20-30 cm ice sections.

Spectral measurements downwelling light fluxes under ice

Contact: Miroslaw Darecki (darecki@iopan.pl)
Collected by: Miroslaw Darecki & Piotr Kowalczuk

The spectral distribution of downward solar irradiance as a function of depth was measured under the ice by a multispectral profiling radiometer (Biospherical Instruments Inc., USA). The measurements were supported by in-air irradiance measurements made with the use of the RAMSES ACC-VIS sensor. The in-water radiometer is equipped with 12 spectral channels, 305, 340, 380, 412, 443, 490, 555, 625, 665, 683, 710nm and the special PAR channel. The reference sensor operates in the spectral range between 320 - 950 nm, in 194 wavebands, 3.3 nm width each.



Left: underwater unit. Right RAMSES ACC-VIS irradiance reference radiometer..

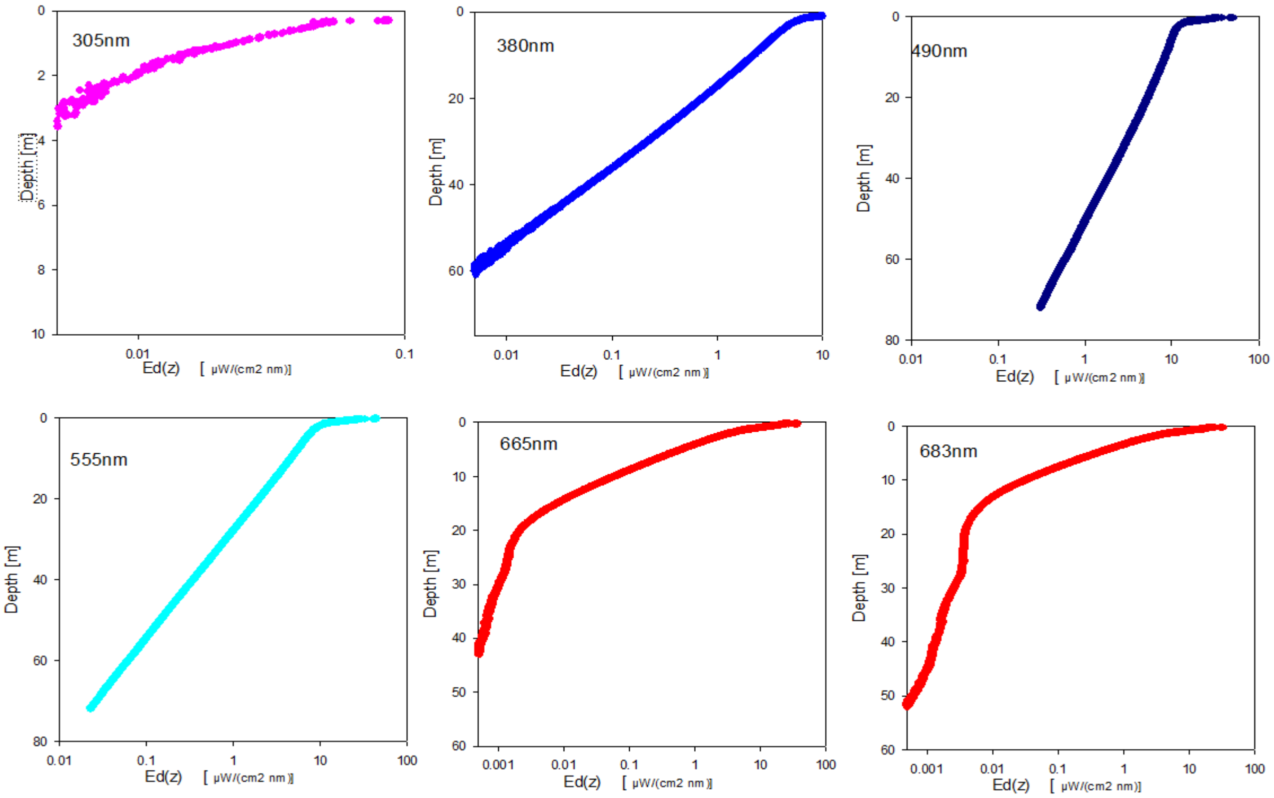
Instrument	**Serial no.**	**Description**
Euz - underwater irradiance radiometer	114	Measuring in-water downward irradiance
RAMSES ACC-VIS	010-04-816D	Measuring downward reference irradiance in air

Summary of the under-ice system configuration

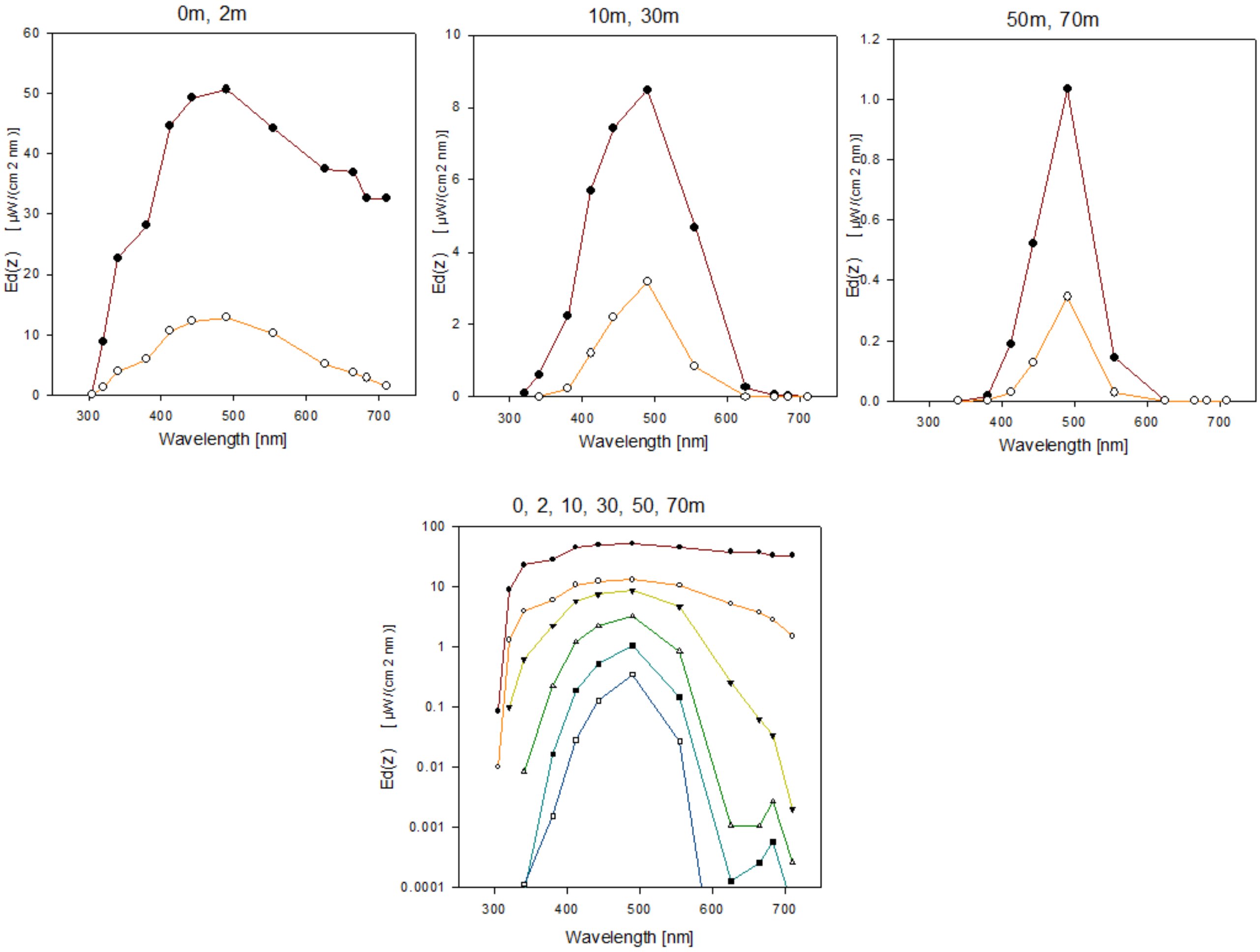
The spectral downward irradiance measurements in the water column provide information about the distribution of solar energy in the water column. It is essential information for marine photosynthesis studies and assessment of solar energy supply at individual depths in the water column. In the processing the profiles of downward irradiance will be used to calculate spectral values of the diffuse attenuation coefficient of downward irradiance.

Cast	Date	Time (UTC)	Latitude	Longitude	Comments
CAST_001_240731_103357_URC.csv CAST_002_240731_103436_URC.csv CAST_003_240731_104342_URC.csv CAST_004_240731_104928_URC.csv CAST_005_240731_105709_URC.csv	2024-07-31	10:33	86.352763	-4.511386	Ice station 1
CAST_001_240801_070241_URC.csv CAST_002_240801_070406_URC.csv CAST_003_240801_071314_URC.csv	2024-08-01	07:02	86.385973	-2.517944	Ice station 1
CAST_001_240806_155615_URC.csv CAST_002_240806_155700_URC.csv CAST_003_240806_160320_URC.csv	2024-08-06	15:56	83.560811	22.073969	Ice station 2
CAST_001_240807_120327_URC.csv CAST_002_240807_120355_URC.csv CAST_003_240807_121115_URC.csv	2024-08-07	12:03	83.543683	21.583827	Ice station 2

Inventory of measurements collected



Example of profiles of the downward irradiance for selected spectral bands measured under the ice on 2024/08/07 at 12:05 UTC



Example of spectra of the downward irradiance at selected depths measured under the ice on 2024/08/07 at 12:05 UTC

Sea ice thickness measurements

Contact: Polona Itkin (polona.itkin@npolar.no)
Collected by: Polona Itkin

At sea ice stations 4 and 5 we measured sea ice thickness by electromagnetic induction (EM) method. These in-situ measurements will be used for the validation of the airborne and satellite remote sensing data, validation of the ASISST sea ice observations from the ship, for the upscaling of single point measurements from e.g. ice coring, light measurements, and calibration of the sea ice topography from drone orthophoto images and ROV surveys.
The sea ice thickness was measured along transect lines of ~1km length with sampling rate 1Hz. The transect was walked at a relatively slow pace to ensure sufficient overlap of the measurement footprint. The measurement footprint is approximately 4-times the sea ice thickness. The instrument used was a multifrequnecy EM device GEM-2 by Geophex Ltd. The raw EM measurements of the strength of the secondary magnetic field generated in the conductive sea water under the sea ice were calibrated to sea ice thickness (distance between the device and sea water) by drilling holes and stepladder calibration. Preliminary results show that sea ice thickness on the level ice in Station 4 was about 1.5m. On Station 5 level sea ice thickness was more variable with sections about 0.5 and 1 m thick.

The GEM-2 antenna was placed into a pulk and pulled by a rope. The pulk floats on melt ponds. Simultaneously with the GEM-2 measurements, melt pond depth was measured by an adapted Magnaprobe. Both measurements will be corrected for sea ice drift and overlayed. Then, melt pond depth can be subtracted from the ice thickness.

Cast	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
Ice Station 4	31-07-2024	10:42	86.601783	-4.80666	A short straight transect line perpendicular to the ship bow, 350 m long, crossing thick deformed SYI at the main coring site and transitioning of the thinned heavily ponded FYI until the floe edge. Bad visibility due to fog.
Ice Station 5	06-08-2024	15:59	83.934478	22.11941	Longer transect of approximately 1.5 km. Some ponds had no bottom and only shallow ponds could be sampled.

Snow and melt pond depth

Contact: Polona Itkin (polona.itkin@npolar.no)
Collected by: Polona Itkin

At sea ice stations 4 and 5 we measured snow (surface scattering layer) and melt pond depth. These in-situ measurements will be used for the validation of the airborne and satellite remote sensing data, validation of the ASSIST sea ice observations from the ship, and for the upscaling of single point measurements from, e.g., snow pits and ice coring. The surface scattering layer (SSL) is a melting desalinated ice surface that has a very high gas content (is very porous) such that it scatters the light and appears white. It is commonly mistaken for snow. On this cruise, some remaining snow cover was only observed in the pressure ridges.

The snow depth was measured along transect lines of ~1km length with measurement spacing of ~1m. The measurements were done with an automated snow probe/logger called Magnaprobe. The Magnaprobe was fitted with a float on the measurement basket, such that it floated on top of the water surface in the melt ponds. In such a way, the melt pond depth was measured. To mark the beginning and the end of each of the melt ponds, one maximal measurement (120 cm) was taken. The measurement lines were designed in a way that they crossed melt ponds in several directions, capturing their geometries. Melt ponds have anisotropic geometries.
Simultaneously with the Magnaprobe measurements, the EM induction device (GEM-2) measured sea ice thickness. Both measurements will be corrected for sea ice drift and overlayed. Then, they can be used to validate topography derived from the drone orthophotography.

Cast	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
Ice Station 4	31-07-2024	10:42	86.601783	-4.80666	A short straight transect line perpendicular to the ship bow, 350 m long, crossing thick deformed SYI at the main coring site and transitioning of the thinned heavily ponded FYI until the floe edge. Bad visibility due to fog.
Ice Station 5	06-08-2024	15:59	83.934478	22.11941	Longer transect of approximately 1.5 km. Some ponds had no bottom and only shallow ponds could be sampled.

Snow pits

Contact: Polona Itkin (polona.itkin@npolar.no)
Collected by: Polona Itkin

There was very little snow left unmelted along our course, but we sampled some melting snow in the ridges and some surface scattering layer (very porose ice surface layer that looks white and resembles snow). The properties of this surface layer containing large quantities of air and non-circular grains have large effects on the microwave properties of snow and the interpretation of microwave satellite remote sensing data.

We did five simple snow pits on the 3-8 cm of the sea ice surface layer (SSL) and melting snow in the ridges. We have measured bulk density, salinity and grain properties. The bulk salinity of melted sections was measured using a conductivity meter Cond 3110 SET3 S/N 11400491. Salinity is reported on the practical salinity scale (dimensionless). A part of the sample was preserved for the oxygen isotope analysis. The snow pit data is stored in the NPI sea ice physics ice station spreadsheets. SSL is too thin and too hard to measure its density with the classical snow density cutter. Likewise, is this layer too fragile to be preserved during coring? Instead, we used a snow water equivalent (SWE) cylinder to probe and sample the SSL and melting snow. In total 11 samples were taken. The typical density of the SSL was close to 600kg/m^3, while the density of the melting snow in the ridges was higher (wet snow) and close to 800 kg/m^3.

Location	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
Ice Station 2	26-07-2024	07:00	*87.62649*	*-15.23082*	SIMBA deployment from basket
Ice Station 3	27-07-2024	07:00	87.07005	-31.11737	SIMBA deployment from basket
Ice Station 4	31-07-2024	07:52	86.58445	-4.85467	SIMBA deployment site
Ice Station 5	07-08-2024	10:30	83.90572	21.97431	Main coring site
Ice Station 5	07-08-2024	10:52	83.90585	21.96626	ROV site

Meteorological buoy deployments

Contact: Jack Landy (jack.c.landy@uit.no)
Deployed by: Polona Itkin

During the AO2024 expedition two types of autonomous systems were co-deployed. Namely three ice mass balance buoys and three weather stations on behalf of UiT – The Arctic University of Norway. These systems will provide long time series of the melt and freeze-up season over the Transpolar drift sea ice current. The deployments were only in the most NW part of the cruise track to ensure the longest possible longivety of the buoys.
The MetBuoys measure air temperature, pressure, relative humidity and GPS position every 30 minutes. The information is transmitted over Iridium.

Buoy	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
300534065 853570	26.7.2024	07:00	87.62649	-15.23082	Co-deployed with a SIMBA NPOL 0806 (Meereisportal buoy 2024T127), the thermistor string had a failure at deployment. The ice core was collected.
300534065 858580	27.7.2024	07:00	87.07005	-31.11737	Co-deployed with a SIMBA NPOL 0901 (Meereisportal buoy 2024T128). Only a snow sample was collected.
300534065 857570	31.7.2024	07:52	86.58445	-4.85467	Co-deployed with a SIMBA NPOL 0902 (Meereisportal buoy 2024T126). This was. Amundsen Basin sea ice station.

Sea ice mass balance buoys deployments

Contact: Mats Granskog (mats@npolar.no)
Deployed by: Polona Itkin and Mats Granskog

During the AO2024 expedition, two types of autonomous systems were co-deployed: three ice mass balance buoys and three weather stations on behalf of UiT—The Arctic University of Norway. These systems will provide long-term time series of the melt and freeze-up season over the Transpolar drift sea ice current. The deployments were only in the most NW part of the cruise track to ensure the longest possible longevity of the buoys.

The ice mass balance buoys were of the SIMBA type (produced by SAMS) and have a 5 m long thermistor string that is deployed through the snow and ice and measures temperature every 2 cm. Once a day, the string is in heating mode when the thermistors are heated, and the time it takes for them to cool to ambient temperature can be measured. This aids in the interpretation of whether the string is in air, snow, ice, or water. The data (including the position and barometric pressure) from the SIMBAs is relayed in near-real time via iridium and is available at the Meereisportal. The buoys are, in part, supplied through the H2020 Arctic Passion programme. Full deployment details are included as an appendix to this report.

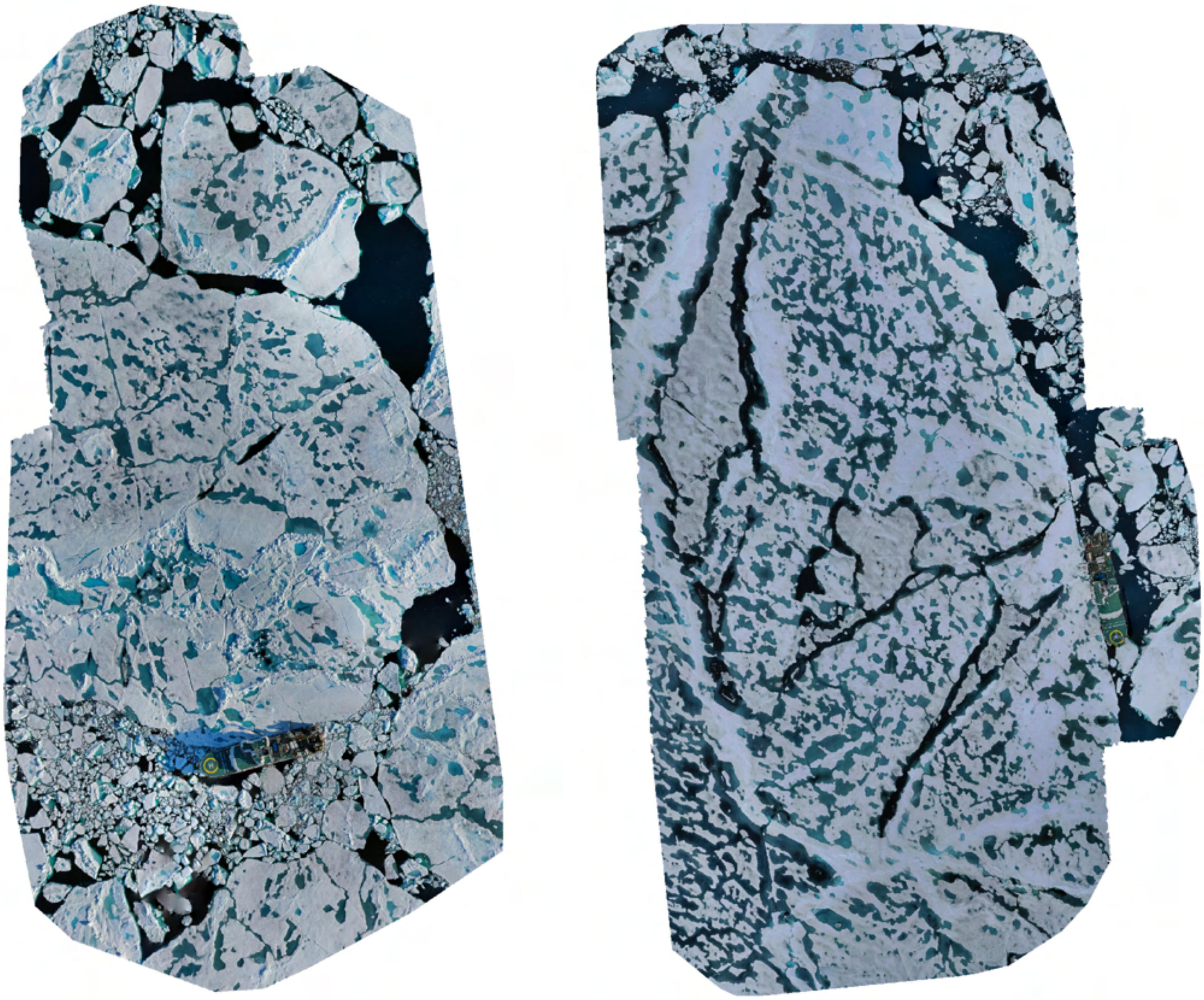
Buoy	**Date**	**Time (UTC)**	**Latitude**	**Longitude**	**Comments**
SIMBA NPOL 08 06	26.7.2024	07:00	87.62649	-15.23082	Meereisportal buoy 2024T127, thermistor string had a failure at deployment. Ice core was collected.
SIMBA NPOL 09 01	27.7.2024	07:00	87.07005	-31.11737	Meereisportal buoy 2024T128. Only snow sample was collected.
SIMBA NPOL 09 02	31.7.2024	07:52	86.58445	-4.85467	Meereisportal buoy 2024T126. Amundsen Basin sea ice station.

Aerial mapping of ice floes

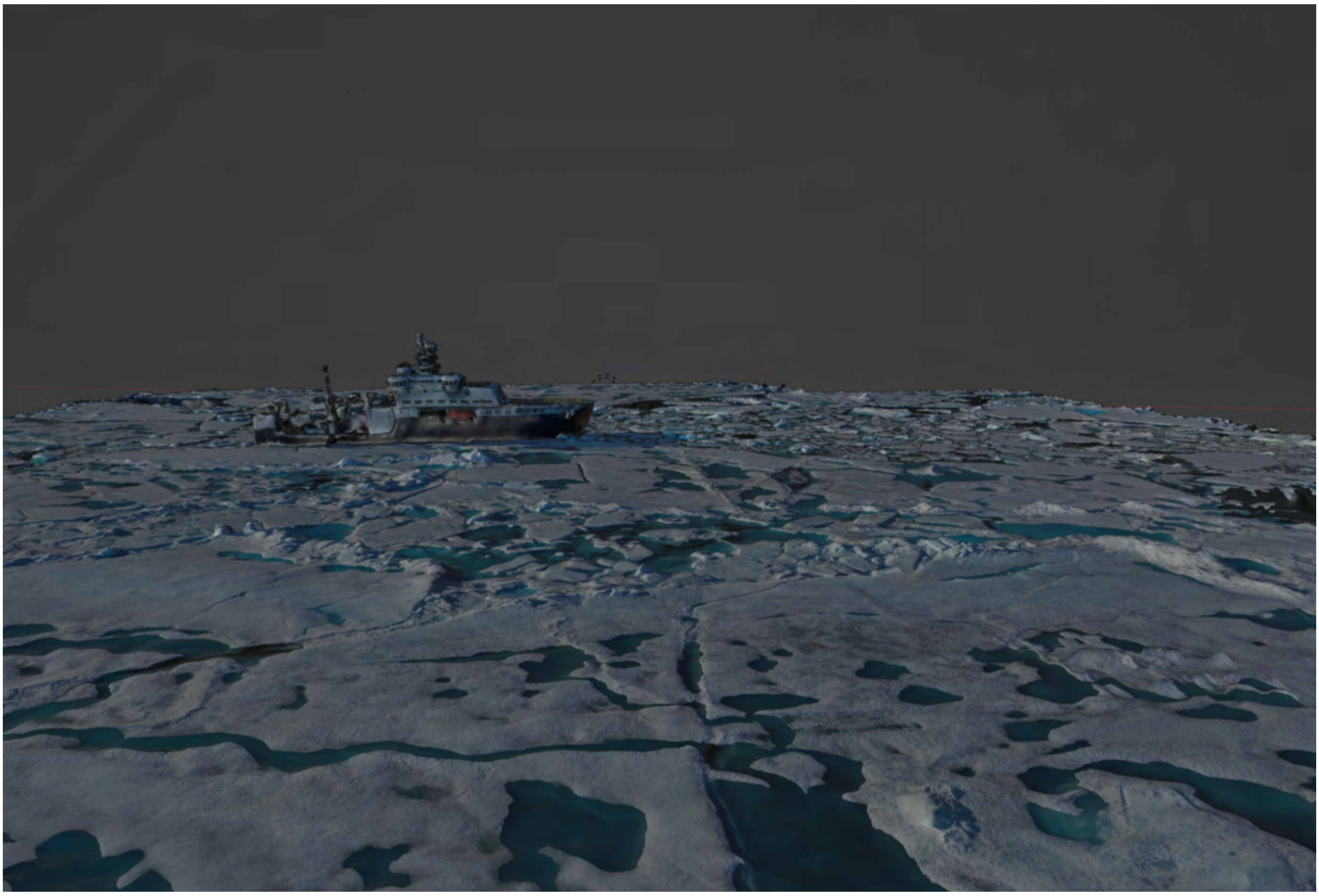
Contact: Paul A. Dodd (paul.dodd@npolar.no)
Collected by: Vegard Stürzinger

At each ice station, a photogrammetric survey was conducted using the DJI Mavic Pro 2 equipped with a built-in Hasselblad 24mm f/2.8 lens. Data was collected to create a photomosaic reconstruction of the ice floe selected for scientific work (**Error! Reference source not found.**), which can also be used for a 3D reconstruction of the sampled area (**Error! Reference source not found.**).
Due to Ice Station 1 being out of bounds for the map in the DJI Pilot app, the transects were manually flown at an altitude of 100 meters. The combination of the DJI Pilot app and the DJI Mavic Pro 2 is only possible using the DJI Smart Controller (Gen. 1). For Ice Station 2, a programmed track with 80% vertical and 60% horizontal overlap was flown, resulting in a higher quality dataset. The camera angle during the main transects was set to 90° downwards. For objects of interest, four sides were captured with a camera angle of 45° to effectively visualize vertical faces in 3D models.

Images were post-processed using the open-source WebODM. The settings used are described in Table 1, although these are not necessarily optimal, and further work should be done to tweak the results. Although the output is georeferenced, due to ice drift and the lack of ground control points (GCP), this is not entirely accurate. Higher accuracy can potentially be achieved using several GCPs with coordinates recorded simultaneously.



Photomozaic reconstruction of ice station 4 (left) and ice station 5 (right).



3D reconstruction of ice station 4.

Setting	Orthophoto	3D model
auto-boundary	true	
dem-resolution	2.0	
dsm	true	
orthophoto-resolution	2.0	
pc-quality	high	high
resize-to		2048
skip-band-alignment		True
skip-orthophoto		True
skip-report		True
texturing-keep-unseen-faces		True

Settings used for the Orthography and 3D model, settings not shown are left on default selection.

Cast	**Date**	**Time**	**Latitude**	**Longitude**	**Comments**
Aerial 1	31.07.2024	09:00			Fly time: 47 minutes, area covered: 377,433.73 m^2, average GSD: 5.98 cm
Aerial 2	07.08.2024	14:00			Flight time 37 minutes, area covered: 352,605.16 m^2, average GSD: 2.28 cm

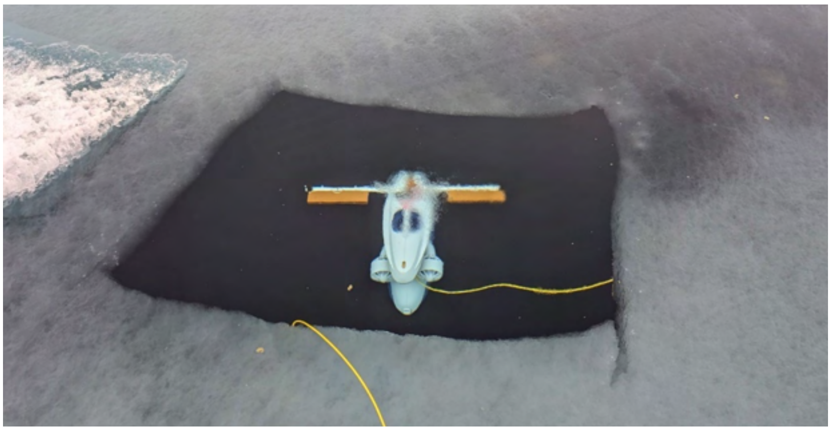
Photogrammetry missions.

Blueye ROV operations

Contact: Polona Itkin (polona.itkin@npolar.no)
Conducted by: Yannick Kern, Vegard Stürzinger

The Blueye ROV was used to get an overview of the sea ice from below whenever there was sea-ice work. In the beginning of every sea-ice station the images helped to define the coring site. In addition, under-ice surveys were conducted. For those a horizontal arm was mounted to the ROV (see picture below) that could hold two upward-facing cameras for the collection of images for photogrammetry and an upward-facing light sensor.

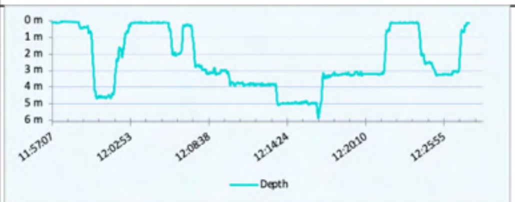
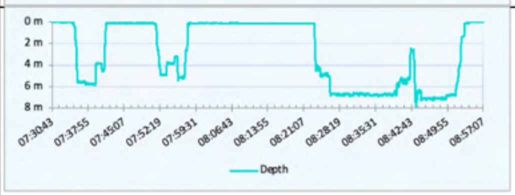
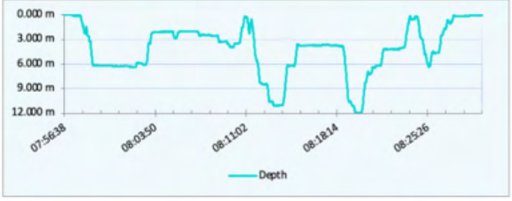
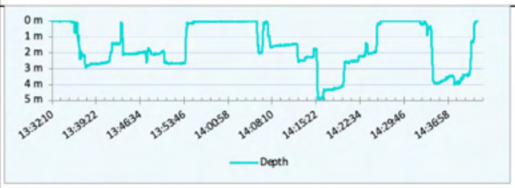
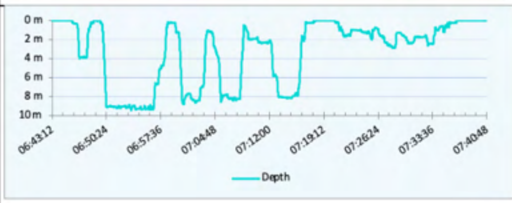
Photogrammetry picture collection was done in 5 s intervals and at a minimal distance from the ice sufficient enough to reach 80% overlap between the two cameras according to the equation below



Blueye ROV setup with horizontal arm for upward-facing cameras (missing in the picture) and light sensor. (picture: Polona Itkin)

$$a = \frac{d}{2 \cdot \tan\left(\frac{\pi\left(45 - \frac{90 \cdot p}{2}\right)}{180}\right)}$$

a : minimal distance from ice
p : overlap percentage [0-1]
d : distance between cameras

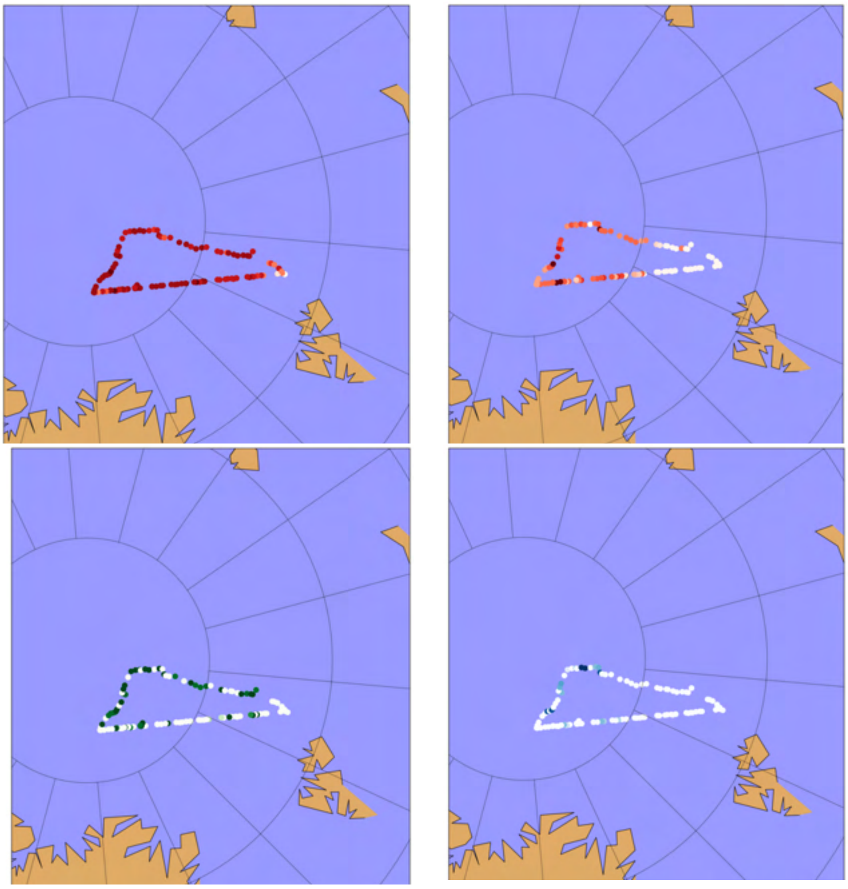
Dive #	Date	Dive profile	Comment
1	24/07/2024		Ice station #1
2	31/07/2024		Ice Station #4
3	01/08/2024		
4	06/08/2024		Ice Station #5
5	07/08/2024		

Sea ice observations from the vessel

Contact: Polona Itkin (polona.itkin@npolar.no)
Collected by: Polona Itkin, Mats Granskog, Zoe Koenig

Regular sea ice observations using ASSIST protocol (see https://cryo.met.no/en/icewatch) while RV KPH was in the ice/covered waters. These observations will be used for upscaling of the point and transect data measured at the ice stations. The weakness of these observations is that the ship deliberately seeks the easiest path through the ice, avoiding larger and thicker floes to conserve fuel and time. The observations may, therefore, not be representative of the wider region.

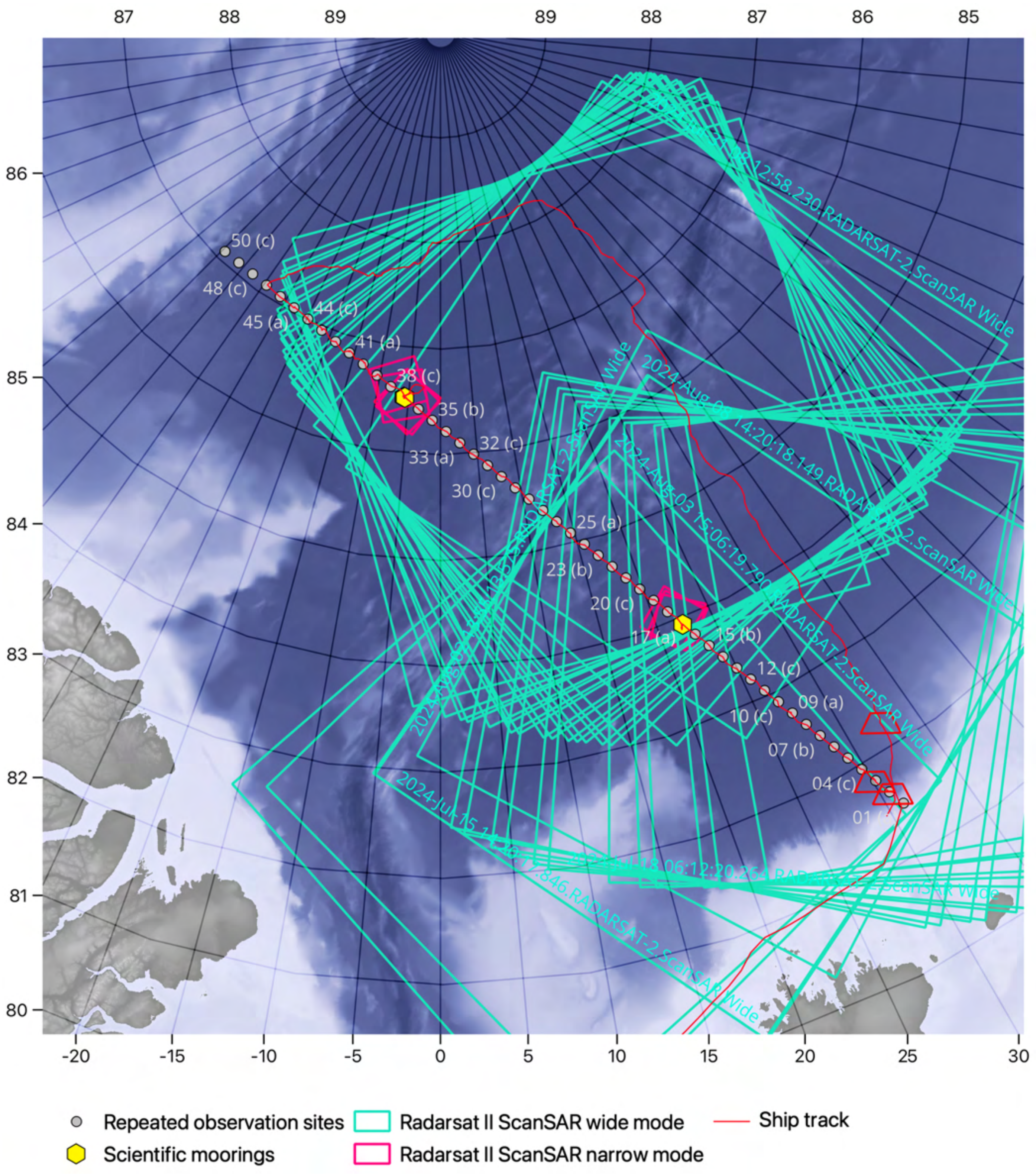
Sea ice conditions were observed every three hours, except for the night-time between midnight and 6:00, from the observation deck of RV KPH. Various sea ice parameters, including sea ice types, floe sizes, snow cover, ridges, melt ponds, etc, were recorded along with the meteorological data (visibility) and sediment and algae concentration. Most of the observations were collected by the same observer which guaranties some consistency. In total 120 observations were made during the cruise while RV KPH was in the ice zone.
The ship's forward-looking surveillance camera was set to store the images of sea ice at the ship's bow every minute. Ship radar screen dumps were stored at 10-minute frequency. These data can be used in combination with the manually recorded ice observations.



Changes in observed sea ice concentration (top left) and thickness (top right) along the cruise track suggest the heaviest ice conditions in the Amundsen basin. Observations of ice algae (bottom left) and sediment concentrations (bottom right) show their highest abundance in the northernmost part of the cruise.

Radarsat II SAR images acquired

A comprehensive set of Radarsat II ScanSAR images was ordered to coincide with the times and positions of planned activities, aid navigation, and put in-situ ice and snow measurements into a broader context. Images were processed at NPI in Tromsø and sent to the KPH via an email link within a few hours of acquisition so that they could also be used for navigation.



Overview of images acquired during AO2024. Daily ScanSAR wide images were acquired over both the northern and southern parts of the work area from 15-july until 24-july providing a complete overview and allowing the best route through the ice to the northwest end of the main transect area to be evaluated. After 24-july single images were acquired, each day covering only the part of the work area where the ship was expected to be. Daily narrow mode images acquired over the moorings sites for 4 days prior to mooring recovery operations provided a detailed view revealing individual ice floes and allowed assessment of conditions and advanced planning of mooring recovery operations.

Outreach

Contact: Trine Lise Sviggum Helgerud (trine.lise.helgerud@npolar.no)

Norway's and the Norwegian Polar Institute's Strategic focus on the Arctic Ocean, as well as the importance of the SUDARCO program, has made outreach a priority for the NPI Arctic Ocean Cruise 2024. The communication efforts have been consistently aligned with the overarching goals and strategies of SUCDARCO, the Norwegian Polar Institute, and NPI's Arctic Ocean Program.

Description

The main objective has been to highlight why NPI and Norway are present in the Arctic Ocean and the significance of the SUDARCO program. To achieve this, the outreach has emphasized the importance of the recovery of the instrument moorings, ecosystem mapping, and an explanation of why these are crucial for future management.

Additionally, the outreach has focused on physical oceanography by preparing the dissemination of upcoming scientific publications to maximize our initial impact in the first phase of the project (as part of the SUDARCO strategy), and to highlight process studies that enhance knowledge of, for example, the connections between the ocean, sea ice, and atmosphere (in line with the NPI's Arctic Ocean Program strategy).

Examples include the Nature Communications study (Muilwijk 2024) and the upcoming publication based on CTD data from the NPI Arctic Ocean Cruise 2022. Furthermore, the outreach emphasized that CTD data from the expedition will be available immediately after the expedition ends, and why it is important that everyone uses the same dataset.
We have also prioritized delivering content to partners, as NPI, in collaboration with other governmental agencies, is expected to contribute to the coordination and sharing of knowledge. We have provided content to the EU project Eurocean HiAOOS, to partners in SUDARCO and the Norwegian Polar Institute, as well as to Akvaplan-niva, UNIS, Framsenteret, and Artsdatabanken.

NPI's channels, both web page, intranet, and social channels, were updated during the cruise and also shared in channels of Fram Centre, Akvaplan-niva, and UNIS.

We aimed to make the cruise valuable to the media, and we actively provided videos and photos for the press. This resulted in extensive media coverage, especially related to the retrieval of the Amundsen mooring. We were featured in NRK web and radio, Svalbardposten, High North News, the Barents Observer, and Forskning.no.

More outreach about the cruise and SUDARCO will be produced ashore. Videos and photos will be archived in NPI's official archives for future internal, external, and media coverage.

Appendix – Scans of paper log sheets

Cast	110	Lat :	87 ° 5.99		
Echo	3861	Lon :	34 ° 15.73	W	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP	✓	Date	27/7/24	Pmax:	
12/24	24	UTC Time	14:20	Alt:	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		1	1	× 1		× 1	× 1							ARGON					1
2	☐	1000	*	2	2	× 2		× 2	× 2												2
3	☐	750		3	3	× 3		× 3	× 3												3
4	☐	400	×	4	4	× 4		× 4	× 4					–							4
5	☐	400	—	—	—	—	—	—	—									4 *			5
6	☐	250		5	5	× 5		× 5	× 5												6
7	☐	200		6	6	× 6		× 6	× 6												7
8	☐	200	—	—	—	—	—	—	—									3 *			8
9	☐	150		7	7	× 7		× 7	× 7												9
10	☐	100	×	8	8	× 8		× 8	× 8							AR-1					10
11	☐	100	—	—	—	—	—	—	—	×1,2,3		× 1	× 1		× 1						11
12	☐	75	—	—	—	—	—	—	—	×4,5,6		× 2	× 2		× 2						12
13	☐	75		9	9	× 9		× 9	× 9												13
14	☐	50		10	10	× 10		× 10	× 10												14
15	☐	50	—	—	—	—	—	—	—	×7,8,9		× 3	× 3		× 3						15
16	☐	50	—	—	—	—	—	—	—							AR-2	3 *				16
17	☐	25	—	—	—	—	—	—	—								2 *				17
18	☐	25	—	—	—	—	—	—	—	×10,11,12		× 4	× 4		× 4						18
19	☐	25		11	11	× 11		× 11	× 11												19
20	☐	15		12	12	× 12		× 12	× 12												20
21	☐	10		13	13	× 13		× 13	× 13												21
22	☐	10	—	—	—	—	—	—	—	×13,14,15		× 5	× 5		× 5						22
23	☐	10	—	—	—	—	—	—	—							AR-3	1 *				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

4+5 B+ shallow

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	111	Lat :	87 °05.975
Echo	3863	Lon :	34 °15.065

~~MP~~	S	Date	27/7
12 ~~24~~	12	UTC Time	14:41
Pmax :	50	Alt :	—

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity (ship)	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	SIL ~~HPLC~~ SIL	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	21	—	—	—	—	—	—	1568	—	—	—	—	—				2 *			1
2	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	—						Sifa 1 X	2
3	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	—						Sifa 2 *	3
4	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	—						Sifa 3 *	4
5	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	*4							5
6	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	*4							6
7	☐	" 21	—	*14	*14	—	—	—	—	*22, 23, 24	*3	*8	*8	—	*8						7
8	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	—	—				*1		8
9	☐	" 21	—	—	—	—	—	—	—	—	—	—	—	—	—				*1		9
10	☐	5 *	—	—	—	—	—	—	—	*16, 17, 18	*2	*6	*6	—	*6						10
11	☐	1		*15	*15	*14		*14	*14	*19, 20, 21	*1	*7	*7	—	*7						11
12	☐	1	—	—	—	—	—	—	—	—	—	—	—	—	—			1 *			12
13	☐																				13
14	☐			Dubious		whether		5m		closed		at 5~~18~~m ?									14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		.	WIN	AT	NUT	CD	OD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

UTC

Cast	112	Lat :	87 ° 04,14	MP	V	Date	27.07.2024	Pmax :	
Echo	3674	Lon :	031 ° 08.64	12 /24	—	UTC Time	18:38	Alt :	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
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23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIPA	

45 A station - deep cast

Cast	113	Lat :	87° 03,0540		MP	✓	Date	27/7/24	Pmax :	4212
Echo	4124	Lon :	27° 58,09 W		12/24		UTC Time	·22:57	Alt :	10

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

	Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
bunn	1	☐	4212	10,11,12	*16	*16	*15	—	*15	*15	—	—	—	—	—	—	—	—	—	—	—	1
	2	☐	4212	—	—	—	—	—	—	—									*			2
(7)	3	☐	3000		17	17	16		16	16												3
(8)	4	☐	2000		18	18	17		17	17												4
(9)	5	☐	1500		19	19	18		18	18												5
(10)	6	☐	1000	13,14,15	20	20	19		19	19												6
(11)	7	☐	750		21	21	20		20	20												7
	8	☐	400	—	—	—	—	—	—	—									*			8
	9	☐	400		22	22	21		21	21												9
	10	☐	250		23	23	22		22	22												10
	11	☐	200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*			11
	12	☐	200		24	24	23		23	23												12
	13	☐	150		25	25	24		24	24												13
	14	☐	100	—	—	—	—	—	—	—	*		*	*		*						14
	15	☐	100		26	26	25		25	25												15
	16	☐	75		—	—	—	—	—	—	*		*	*		*						16
	17	☐	75		27	27	26		26	26												17
	18	☐	50	—	—	—	—	—	—	—	*		*	*		*						18
	19	☐	50		28	28	27		27	27												19
	20	☐	25	—	—	—	—	—	—	—	*		*	*		*						20
	21	☐	25		29	29	28		28	28												21
	22	☐	15		30	30	29		29	29												22
	23	☐	10	—	—	—	—	—	—	—	×		×	×		×						23
	24	☐	10		31	31	30		30	30												24
				WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Bottles malfunctioned
new sheet for 45A
cast 113!

chl max < 20m

454 Weep

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	113	Lat :	87°03,0540		
Echo	4124	Lon :	27 °58,09 W		
MP	✓	Date	27/7/24	Pmax :	4212
12 /24		UTC Time	22:57	Alt :	10

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	4212	10,11,12✓	16✓	16✓	15✓		15✓	15✓												1
2	☐	1500		17✓	17✓	16✓		16✓	16✓												2
3	☐	1000		18✓	18✓	17✓		17✓	17✓												3
4	☐	750	13,14,15✓	19✓	19	18✓		18✓	18✓												4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐			New sheet because bottles failed																	11
12	☐																				12
13	☐			Only 4 closed.																	13
14	☐																				14
15	☐			additional CTD added. (to 400 m over-the-side)																	15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

[illegible] - shallow + ~12 flasks

45

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	114	87 Lat :	03 ° M
Echo	4122	27 Lon :	27° 56,79 W

MP		Date	27/7/24	Pmax :	
12 /24	12	UTC Time	23:33	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~ SIL	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☑	18	—	32*	32*	—	—	—	156g (Skip?)	—	—	—	—	—	—	—	—	—	—	—	1
2	☑	〃18												4*							2
3	☑	〃18	—											4*							3
4	☑	〃18	—							—	—	—	—	4*							4
5	☑	〃18	—				—	—		—	—	—	—	—	—	—	—	—	*V2		5
6	☑	〃18	—				—	—		—	—	—	—	—	—	—	—	—	*V2		6
7	☑	〃18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*V2		7
8	☑	〃18	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	*V2		8
9	☑	〃18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9*			9
10	☑	↓	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

#10 no water
closed in air!

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	115	Lat:	87 ° 03.22 61
Echo	4123	Lon:	27 ° 59.25 W

MP		Date	28/7/24	Pmax:	
12/24	12	UTC Time	00:06	Alt:	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	✓	50	—	—	—	—	—	—	1570								*6				1
2	✓	19	—	—	—	—	—	—	—								*5				2
3	✓	19	—	—	—	—	—	—	—	*37,38,39	*6	*16	*16		*~~16~~17						3
4	✓	19	—	—	—	—	—	—	—											*5	4
5	✓	19	—	—	—	—	—	—	—											*6	5
6	✓	19	—	—	—	—	—	—	—											*7	6
7	✓	19	—	—	—	—	—	—												*8	7
8	✓	5	—	—	—	—	—	—	—	*40,41,42	*5	*14	*14		*~~14~~16						8
9	☐	~~1~~	—	—	—	—	—	—	—	*43,44,45	*4	*15	*15		*~~15~~16						9
10	☐	~~1~~							—								*				10
11	☐	1	—	*33	*33	*31		*31	*31		*						*4				11
12	☐	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*5			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CO	OXY	SAL	FCM	FRRF	PHY	CHl	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

no water

9 & 10 no water! But closed.

Used bucket to get samples from 1m

45 400m xtra cast ?

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	116	87 Lat :	03 °48
Echo		27 Lon :	59°,10 W

MP		Date	28.07 24	Pmax :	
12 /24		UTC Time	03:09	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Jaleo's Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	400		—	—	—	—	—	—									8 *			1
2	☐	400		20	20	19		19	19												2
3	☐	250		21	21	20		20	20												3
4	☐	200		—	—	—	—	—	—									7*			4
5	☐	200		22	22	21		21	21												5
6	☐	150		23	23	22		22	22												6
7	☐	100		24	24	23		23	23	25,26,27		9	9		10 10						7
8	☐	75		25	25	24		24	24	28,29,30		10	10		11 11						8
9	☐	50		26	26	25		25	25	31,32,33		11	11		12 12						9
10	☐	25		27	27	26		26	26	34,35,36		12	12		13 13						10
11	☐	15		28	28	27		27	27			13	13		14 14						11
12	☐	~~10~~															Did not fire				12
13	☐																				13
14	☐																				14
15	☐			IMR Salinity																	15
16	☐																				16
17	☐																				17
18	☐														Extra cast due						18
19	☐														to bottle firing						19
20	☐														issue on big						20
21	☐														rosette.						21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

44C - 750 m

UIC

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	117	Lat :	87 ° 0.678 N	MP	✓	Date	28/7 - 24	Pmax :	750
Echo	4365	Lon :	24 ° 47.78 W	12 /24	—	UTC Time	06 : 41	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	750																			1
2	☐	750																			2
3	☐	750																			3
4	☐	750																			4
5	☐	750																			5
6	☐	750																			6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHI	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

4515 - 4000m

Cast 118
Echo 4264
Lat: 86 ° 57.967
Lon: 21 ° 39.217 W

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP √
12/24
Date 28/7/24
UTC Time 12:01
Pmax: 4000
Alt:

Testing (Niskin 1–11)

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☑	4000														Argon					1
2	☑	4000																			2
3	☑	4000																			3
4	☑	3500																			4
5	☑	3500																			5
6	☐	3000																			6
7	☐	3000																			7
8	☐	2500																			8
9	☐	2500																			9
10	☐	2000																			10
11	☐	2000																			11
12	☐	1500		x29	x29	x28		x28	x28												12
13	☐	1000	[illegible]	x30	x30	x29		x29	x29												13
14	☐	750		x31	x31	x30		x30	x30												14
15	☐	400	[illegible]	x34	x34	x32		x32	x31												15
16	☐	250		x35	x35	x33		x33	x33												16
17	☐	200		x36	x36	x34		x34	x34												17
18	☐	150		x37	x37	x35		x35	x35												18
19	☐	100	[illegible]	x38	x38	x36		x36	x36							x4					19
20	☐	75		x39	x39	x37		x37	x37												20
21	☐	50		x40	x40	x38		x38	x38							x5	9 x				21
22	☐	25		x41	x41	x39		x39	x39								8 x				22
23	☐	15		x42	x42	x40		x40	x40												23
24	☐	10		x43	x43	x41		x41	x41							x6	7 x				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHI	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Cast	119	Lat :	86 ° 54.36
Echo	4260	Lon :	18 °47.07 W

42 C CTD only +50

○ ○

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP	V	Date	28/7/24	Pmax :	
12 /24		UTC Time	19:00	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐							KUN CTD!													6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHF	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Cast	120	Lat :	86 ° 51 ,1342		
Echo	4252	Lon :	15 ° 59.1755 W		

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP	✓	Date	29/7/24	Pmax :	4349
/24		UTC Time	01 : 26	Alt :	10

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	btm		44	44	42		42	42												1
2	☐	btm																13*			2
3	☐	3000		45	45	43		43	43												3
4	☐	2000		46	46	44		44	44												4
5	☐	1500		47	47	45		45	45												5
6	☐	1000		48	48	46		46	46												6
7	☐	750		49	49	47		47	47												7
8	☐	400																12*			8
9	☐	400		50	50	48		48	48												9
10	☐	250		51	51	49		49	49												10
11	☐	200																11*			11
12	☐	200		52	52	73		50	50												12
13	☐	150		53	53	51		51	51	49,50,51											13
14	☐	100		54	54	52		52	52												14
15	☐	100								52,53,54		17	17		18						15
16	☐	75										18	18		19						16
17	☐	75		55	55	53		53	53												17
18	☐	50		56	56	54		54	54												18
19	☐	50								55,56,57		19	19		20						19
20	☐	25								58,59,60		20	20		21						20
21	☐	25		57	57	55		55	55												21
22	☐	15		58	58	56		56	56												22
23	☐	10								61,62,63		21	21		22						23
24	☐	10		59	59	57		57	57												24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

41A Shallow #1

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	121	Lat :	86 °51,293 N	MP		Date	29/7-24	Pmax :	
Echo	4252	Lon :	15 °57.614 W	12 /24		UTC Time	01:58	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	SIL ~~HPLC~~	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	18		*60	*60				ship 1572												1
2	☐	18												5 *							2
3	☐	18												5 *							3
4	☐	18												5 *							4
5	☐	18									9								3 *		5
6	☐	18																	3 *		6
7	☐	18																	3 *		7
8	☐	18																	3 *		8
9	☐	18																10 *			9
10	☐	1																9 *			10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		.	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

41A shallow #2

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: J22
Echo: 4252
Lat: 86°51.41 N
Lon: 15°56.42 W
MP:
12/24
Date: 29/7-24
UTC Time: 02:39
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							1573 ship								x12				1
2	☐	chla 18															x11				2
3	☐	" 18																		x8	3
4	☐	" 18																		x9	4
5	☐	" 18																		x10	5
6	☐	" 18																		x11	6
7	☐	" 18								x ~~64,65,66~~ 70,71,72		x24	x24		x25						7
8	☐	5								x 64,65,66	x8	x22	x22		x22						8
9	☐	1								x 67,68,69	x7	x23	x23		x24						9
10	☐	1															x10				10
11	☐	1		x61	61	x58		x58	x58												11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

40C - 750M

only CTD

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	123	Lat :	86 ° 47.050
Echo	4368	Lon :	13 ° 03.71 W

MP	✓	Date	29/7/24	Pmax :	
12 /24		UTC Time	12:20	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

5915 - 1500M

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	124	Lat :	86° 42.13		
Echo	4237	Lon :	10° 99.~~2~~29 W		
MP	✓	Date	29/7/24	Pmax :	
~~12~~ /24		UTC Time	19:25	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		62	62	59		59	59							Argon					1
2	☐	1000		63	63	60		60	60												2
3	☐	750		64	64	61		61	61												3
4	☐	400		65	65	62		62	62												4
5	☐	250		66	66	63		63	63												5
6	☐	200		67	67	64		64	64												6
7	☐	150		68	68	65		65	65												7
8	☐	100		69	69	66		66	66							*7					8
9	☐	75		70	70	67		67	67												9
10	☐	50		71	71	68		68	68												10
11	☐	50		—	—	—	—	—								*8	*15				11
12	☐	25		—	—	—	—	—									*14				12
13	☐	25		72	72	69		69	69												13
14	☐	15		73	73	70		70	70												14
15	☐	10		74	74	71		71	71												15
16	☐	10		—	—	—	—	—	—							*9	*13				16
17	☐																				17
18	☐																				18
19	☐			Lot of ice slush in moonpool, flushed with water																	19
20	☐			before deployment																	20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHI	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

S8C ○ only CTD ○

750 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	125	Lat :	007° 58.95	MP		Date	30.07.24	P_{max} :	
Echo	4223	Lon :	86 °3682	12 /24	24	UTC Time	01:10	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHF	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

37A deep

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	126	Lat :	86 °37.815 N
Echo	4226	Lon :	4 °34.726 W

MP		Date	31/7-24	Pmax:	4304
12/24		UTC Time	14:54	Alt :	10

Niskin	Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1 ☐	btm		75	75	72		72	72												1
2 ☐	btm																* 18			2
3 ☐	3000		76	76	74		73	73												3
4 ☐	2000		77	77	75		74	74												4
5 ☐	1500		78	78	76		75	75												5
6 ☐	1000		79	79	77		76	76												6
7 ☐	750		80	80	78		77	77												7
8 ☐	400																* 17			8
9 ☐	400		81	81	79		78	78												9
10 ☐	250		82	82	80		79	79												10
11 ☐	200																* 16			11
12 ☐	200		83	83	81		80	80												12
13 ☐	150		84	84	82		81	81												13
14 ☐	100		85	85	83		82	82												14
15 ☐	100								* 73, 74, 75		* 25	* 25		* 26						15
16 ☐	75								* 76, 77, 78		* 26	* 26		* 27						16
17 ☐	75		86	86	84		83	83												17
18 ☐	50		87	87	85		84	84												18
19 ☐	50								* 79, 80, 81		* 27	* 27		* 28						19
20 ☐	25								* 82, 83, 84		* 28	* 28		* 29						20
21 ☐	25		88	88	86		85	85												21
22 ☐	15		89	89	87		86	86												22
23 ☐	10								* 85, 86, 87		* 29	* 29		* 30						23
24 ☐	10		90	90	88		87	87												24
		WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHF	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

OTA shallow #1

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	127	Lat :	86 ° 38.06	MP		Date	01/08/24	Pmax :	
Echo	4228	Lon :	2 ° 37.22 W	12 /24	12	UTC Time	09:50	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	SK ~~HPLC~~	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☑	22		91	91				ship 1574												1
2	☑	22												* 6							2
3	☑	22												* 6							3
4	☑	22												* 6							4
5	☑	22									*12								* 4		5
6	☑	22																	* 4		6
7	☑	22																	* 4		7
8	☑	22																	* 4		8
9	☑	22																* 15			9
10	☑	1																* 14			10
11	☑																				11
12	☑																				12
13	☑																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

STN SHALLOW #2

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	128	Lat :	86 ° 37,978	MP		Date	01/08/24	Pmax :	
Echo	4228	Lon :	2 ° 34,82 W	12 /24	12	UTC Time	10:50	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☑	50							Trips								x 18				1
2	☑	22															x 17				2
3	☑	22																		x 12	3
4	☑	22																		x 13	4
5	☑	22																		x 14	5
6	☑	22																		x 15	6
7	☑	22								x 100, 101, 102		x 32	x 32		x 33						7
8	☑	5								x 94 95, 96	x 11	x 30	x 30		x 31						8
9	☑	1								x 97 98, 99	x 10	x 31	x 31		x 32						9
10	☑	1															x 16				10
11	☑	1		92	92	89		88	88												11
12	☑																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

57A - after mooring deployment

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

additional cast at transect line

Cast	129	Lat:	86° 31.385	MP	V	Date	01/08/24	Pmax:	4290
Echo	4213	Lon:	005° 34.37 W	~~12~~ 24		UTC Time	23:57	Alt:	10

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	Janne ~~HPLC~~	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	4289							ship												1
2	☐	4289												x							2
3	☐	4289												x							3
4	☐	1500		93	93	90		106	89												4
5	☐	1000		94	94	91		107	90												5
6	☐	750		95	95	92		108	91												6
7	☐	400		96	96	93		109	92												7
8	☐	300												x							8
9	☐	300												x							9
10	☐	250		97	97	94		110	93												10
11	☐	200		98	98	95		111	94												11
12	☐	150		99	99	96		112	95												12
13	☐	100		100	100	97		113	96												13
14	☐	75		101	101	98		114	97					x							14
15	☐	60												x							15
16	☐	60																			16
17	☐	50		102	102	99		115	98												17
18	☐	30												x							18
19	☐	30												x							19
20	☐	25		103	103	100		116	99												20
21	☐	15		104	104	101		117	100												21
22	☐	10		105	105	102		118	101												22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Cast 130 | Lat : 86 ° 25.85
Echo 3940 | Lon : 3 ° 21.36W 36C

CTD only 750m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP ✓ | Date 2/8/24 | Pmax :
/24 | UTC Time 18:10 | Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	750							ship.												1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	131	Lat:	86 ° 19.549	35B	MP	✓	Date	2/18/24	Pmax:	
Echo	3766	Lon:	001 ° 09.45 W		/24		UTC Time	21:27	Alt:	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		106	106	103		119	102	+ship						Argon					1
2	☐	1000		107	107	104		120	103												2
3	☐	750		108	108	105		121	104												3
4	☐	400		109	109	106		122	105												4
5	☐	250		110	110	107		123	106												5
6	☐	200		111	111	108		124	107												6
7	☐	150		112	112	109		125	108												7
8	☐	100		113	113	110		126	109							12					8
9	☐	75		114	114	111		127	110												9
10	☐	50		115	115	112		128	111												10
11	☐	50														11	21				11
12	☐	25															20				12
13	☐	25		116	116	113		129	112												13
14	☐	15		117	117	114		130	113			bottle 15, small leake									14
15	☐	10		118	118	115		131	114												15
16	☐	10														10	19				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

750 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	132	Lat :	066 °48.02	34C	MP		Date	02.08.24	Pmax : 750
Echo	4265	Lon :	86 °13.25		12 /24		UTC Time	01:05	Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐							Only CTD !													5
6	☐											0									6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AE	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

33A deep

2000 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	133	Lat :	86 °07.170	MP		Date	3/8-24
Echo	3874	Lon :	2 ° 44.768E	12 /24		UTC Time	07 : 56

Pmax: 2000

Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000	x 40,41,42	x 119	x 119	x 116		x 132	x 115												1
2	☐	2000																x 23			2
3	☐	1500		x 120	x 120	x 117		x 133	x 116												3
4	☐	1000	x 43,44,45	x 121	x 121	x 118		x 134	x 117												4
5	☐	750		x 122	x 122	x 119		x 135	x 118												5
6	☐	400																x 22			6
7	☐	400	x 46,47,48	x 123	x 123	x 120		x 136	x 119												7
8	☐	250		x 124	x 124	x 121		x 137	x 120												8
9	☐	200																x 21			9
10	☐	200		x 125	x 125	x 122		x 138	x 121												10
11	☐	150		x 126	x 126	x 123		x 139	x 122												11
12	☐	100								x 115, 116, 117		x 35	x 33		x 45						12
13	☐	100	x 49,50,51	x 127	x 127	x 124		x 140	x 123												13
14	☐	75								x 118 119, 120		x 36	x 34		x 46						14
15	☐	75		x 128	128	x 125		x 141	x 124												15
16	☐	50								x 121 122, 123		x 37	x 35		x 47						16
17	☐	50		x 129	129	x 126		x 142	x 125												17
18	☐	25								x 124, 125, 126		x 38	x 36		x 48						18
19	☐	25		x 130	130	x 127		x 143	x 126												19
20	☐	20		x 131	131	x 128		x 144	x 127												20
21	☐	10								x 127 128, 29		x 39	x 37		x 49						21
22	☐	10		x 132	x 132	x 129		x 145	x 128												22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

'33A
Shallow #1

Cast	134	Lat :	86 °7.152 N
Echo	3871	Lon :	2 °44576 E

MP		Date	3/8-24	Pmax :	50
12 /24		UTC Time	06:03	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	SIL ~~HPLC~~	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	chla/5		*133	*133				Ship 576												1
2	☐	〃												x 8							2
3	☐	〃												x 8							3
4	☐	〃												x 8							4
5	☐	〃									✓15								x 5		5
6	☐	〃																	x 5		6
7	☐	〃																	x 5		7
8	☐	〃																	x 5		8
9	☐	〃																x 20			9
10	☐	1																x 19			10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

33A Shallow #2

Cast	135	Lat :	86 °7.252		
Echo	3871	Lon :	2 °456905		
MP		Date	3/8-24	Pmax:	50
⑫/24		UTC Time	06:39	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							~~157~~								×24				1
2	☐	chla															×23				2
3	☐	" 15																		×16	3
4	☐	" 15																		×17	4
5	☐	" 15																		×18	5
6	☐	" 15																		×19	6
7	☐	" 15								×136 137, 138		×42	×38,39		×52						7
8	☐	5								×130 131, 132	×14	×40	×60		×50						8
9	☐	1								×133 134, 135	×13	×41	×41		×51						9
10	☐	1															×22				10
11	☐	1		×134	×134	×130		×146	×129												11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

CTD only 750 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	136	Lat :	85 ° 59,75		MP	✓	Date	3/8/24	Pmax :	
Echo	3581	Lon :	4 ° 20,57 E 32C		12 24		UTC Time	11 : 10	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐								skip												1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUI	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHI	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

E31B

Cast: 137
Lat: 85° 52.74
Echo: 3575
Lon: 16° 10.93
MP: V
~~12~~ /24
Date: 3/8/24
UTC Time: 15:48
Pmax: 1500
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		135	135	131		147	130							Argon					1
2	☐	1000		136	136	132		148	131												2
3	☐	750		137	137	133		149	132												3
4	☐	400		138	138	134		150	133												4
5	☐	250		139	139	135		151	134												5
6	☐	200		140	140	136		152	135												6
7	☐	150		141	141	137		153	136												7
8	☐	100		142	142	138		154	137							×15					8
9	☐	75		143	143	139		155	138												9
10	☐	50		144	144	140		156	139												10
11	☐	50														×14	27*				11
12	☐	28																		20*	12
13	☐	28																		21*	13
14	☐	25															26*				14
15	☐	25		145	145	141		157	140												15
16	☐	15		146	146	142		158	141												16
17	☐	10		147	147	143		159	142												17
18	☐	10														×13	25*				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

750m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

WCTD 30C

Cast: 138
Echo: 3820
Lat: 85 ° 45.36
Lon: 7 ° 52.52
MP: ✓
12/24:
Date: 3/8/24
UTC Time: 21:08
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐								only CTD												3
4	☐																				4
5	☐								30m chla max peak ~ 0.70												5
6	☐									(more than so far on the cruise!)											6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

2000 m

Cast	139	Lat :	85 ° 38.13	29A	
Echo	3710	Lon :	9 ° 25.87E	Deep	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP	✓	Date	4/8/24	Pmax :	
12/24		UTC Time	01:15	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000	*52,53,54	148	148	144		160	143												1
2	☐	2000																*28			2
3	☐	1500		149	149	145		161	144												3
4	☐	1000	*55,56,57	150	150	146		162	145												4
5	☐	750		151	151	147		163	146												5
6	☐	400																*27			6
7	☐	400	58,59,60	152	152	148		164	147												7
8	☐	250		153	153	149		165	148												8
9	☐	200																*26			9
10	☐	200		154	154	150		166	149												10
11	☐	150		155	155	151		167	150												11
12	☐	100								*139 140 141		*43	*42		*54						12
13	☐	100	61,62,63	156	156	152		168	151												13
14	☐	75								*142 143 144		*44	*43		*55						14
15	☐	75		157	157	153		169	152												15
16	☐	50								*145 46 147		*45	*44		*56						16
17	☐	50		158	158	154		170	153												17
18	☐	25								*148 149 150		*46	*45		*57						18
19	☐	25		159	159	155		171	154												19
20	☐	15		160	160	156		172	155												20
21	☐	10								*151 152 153		*47	*46		*58						21
22	☐	10		161	161	157		173	156												22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 140
Echo: 3715
Lat: 85 ° 38.18
Lon: 9 °27. E
29A
Shallow #7
MP: ⑫ 724
Date: 04/08/24
UTC Time: 01:40
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	SIC ~~HPLC~~	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	25		*162	*162				7h19 1598												1
2	☐	25												x 9							2
3	☐	25												x 9							3
4	☐	25												x 9							4
5	☐	25									x 18								x 6		5
6	☐	25																	x 6		6
7	☐	25																	x 6		7
8	☐	25																	x 6		8
9	☐	25																x 25			9
10	☐	1		10 did not close!														~~[illegible]~~			10
11	☑	1																x 24			11
12	☑	1																			12
13	☐			11 & 12 closed just in case (11 closed only when 12 was closed)																	13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

29 A

Shallow #2

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 141
Echo:
Lat: 85°38.18
Lon: 9°27 E
MP
12/24
Date: 04/08/24
UTC Time:
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							mip 1579								x 30				1
2	☐	25															x 29				2
3	☐	25																		~~x~~	3
4	☐	25																		~~x~~	4
5	☐	25																		~~x~~	5
6	☐	25																		~~x~~	6
7	☐	25								x 160 161 162		x 50	x 47		x 61						7
8	☐	5								x 154 155 156	x 17	x 48	x 48		x 59						8
9	☐	\								x 157, 158, 159	x 16	x 49	x 49		x 60						9
10	☐	\																x 24			10
11	☐	\		x 163	x 163	x 158		x 174	x 157								x 28				11
12	☐	\															x	x			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

28c

Cast	142	Lat :	85 °29.66	MP	✓	Date	04.08.24	Pmax :	
Echo	3533	Lon :	10 °4407 E	12 /24		UTC Time	06:26	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐								Only		CTD										4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		.	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

27B
1500m

Cast	143	Lat :	010 ° 01.27 E
Echo	3550	Lon :	85 ° 22.05

MP	✓	Date	04.08.2024	Pmax :	
12 /24		UTC Time	0900	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		164	164	159		175	158							Argon					1
2	☐	1000		165	165	160		176	159												2
3	☐	750		166	166	161		177	160												3
4	☐	400		167	167	162		178	161												4
5	☐	250		168	168	163		179	162												5
6	☐	200		169	169	164		180	163												6
7	☐	150		170	170	165		181	164												7
8	☐	100		171	171	166		182	165							18 ×					8
9	☐	75		172	172	167		183	166												9
10	☐	50		173	173	168		184	167												10
11	☐	50														17 ×	× 33		Green		11
12	☐	chla 32																		× 22	12
13	☐	chla 32																		× 23	13
14	☐	chla 32																		× —	14
15	☐	25															× 32				15
16	☐	25		175	175	173		186	169												16
17	☐	15		176	176	174		187	170	NB!											17
18	☐	10		177	177	175		188	168												18
19	☐	10														16 ×	× 31				19
20	☐																				20
21	☐						NB!														21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

26C 750m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 144
Lat: 85° 14.37
Echo: 3822
Lon: 13° 22.08 E
MP:
12 /24
Date: 04/08/24
UTC Time: 13:10
P_{max}:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐								CTD only												5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

2000 m

Cast	145	Lat :	85°5.861 N
Echo	3504	Lon :	14 °34.115 E

25A deep

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP		Date	4/8-24	Pmax:	2000
12 /24		UTC Time	17:10	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000		178 ×	178	176		189	171												1
2	☐	2000	—	—	—	—	—	—	—									33×			2
3	☐	1500		179	179	177		190	172												3
4	☐	1000		180	180	178		191	173												4
5	☐	750		181	181	179		192	174												5
6	☐	400	—	—	—	—	—	—	—									32×			6
7	☐	400		182	182	180		193	175												7
8	☐	250		183	183	181		194	176												8
9	☐	200	—	—	—	—	—	—	—									31×			9
10	☐	200		184	184	182		195	177												10
11	☐	150		185	185	183		196	178												11
12	☐	100		186	186	184		197	179												12
13	☐	100	—	—	—	—	—	—	—	× 163 164, 165		× 51	× 50		× 62						13
14	☐	75	—	—	—	—	—	—	—	× 166 167, 168		× 52	× 51		× 63						14
15	☐	75		187	187	185		198	180												15
16	☐	50		188	188	186		199	181												16
17	☐	50	—	—	—	—	—	—	—	× 169 170, 171		× 53	× 52		× 64						17
18	☐	25	—	—	—	—	—	—	—	× [illegible]	—	× —	× —	—	× —	—	not sampled				18
19	☐	25		189	189	187		200	182												19
20	☐	15		190	190	188		201	183												20
21	☐	10		191	191	189		202	184												21
22	☐	10	—	—	—	—	—	—	—	× 175 176, 177		× 55	× 53		× 66						22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #1

Arctic Ocean 2024

CTD & Water Sampling Log Sheet

Cast: 146
Lat: 85 °5.773 N
Echo: 3501
Lon: 14 °34.151 E
25A

MP:
12/24
Date: 4/8-24
UTC Time: 17:26
Pmax: 50
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~ SIL	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	chl		x192	x192				ship 1580												1
2	☐	22												10 x							2
3	☐	22												10 x							3
4	☐	22												10 x					~~uptake~~		4
5	☐	22																		x 7	5
6	☐	22																		x 7	6
7	☐	22																		x 7	7
8	☐	22																		x 7	8
9	☐	chl																x30			9
10	☐	1																x 29			10
11	☐	1																			11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #2

Arctic Ocean 2024

CTD & Water Sampling Log Sheet

25A

Cast	147	Lat :	85 °05.59
Echo	3501	Lon :	014 °34.64 E

MP		Date	04.08.24	Pmax :	
12/24	12	UTC Time	18:05	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							ship 1581								36 x				1
2	☐	chl 22															35 x				2
3	☐	22																		24 x	3
4	☐	22																		25 x	4
5	☐	22																		26 x	5
6	☐	22																		27 x	6
7	☐	chl 22								x 172 x 173,174		x 54	x 54		x 65						7
8	☐	5								x 178 179,180	x 20	x 56	x 55		x 67						8
9	☐	1								x 181 x 182,183		x 57	x 56		x 68						9
10	☐	1															34 x				10
11	☐	1		174 x	174 x	169 x		185 x	185 x												11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

CTD 750 m

Cast	148	Lat :	84 ° 58,10
Echo	4267	Lon :	15 ° 40,[illegible] E

24C

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP		Date	05.08.2024	P$_{max}$:	
12 /24	24	UTC Time	0 : 10	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ^{18}O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		.	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	149	Lat :	84 ° 49.768 N	MP		Date	5/8-2024
Echo		Lon :	16 ° 46. 403 E 23B	12 /24		UTC Time	04 : 25
						Pmax :	1500
						Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		x 193	193	190		203	186							Argon					1
2	☐	1000		x 194	194	191		204	187												2
3	☐	750		x 195	195	192		205	188												3
4	☐	400		x 196	196	193		206	189												4
5	☐	250		x 197	197	194		207	190												5
6	☐	200		x 198	198	195		208	191												6
7	☐	150		x 199	199	196		209	192												7
8	☐	100		x 200	200	197		210	193							21 ✓					8
9	☐	75		x 201	201	198		211	194												9
10	☐	50		x 202	202	199		212	195												10
11	☐	50														20 x	39 *				11
12	☐	25															38 *				12
13	☐	25		x 203	203	200		213	196												13
14	☐	15		x 204	204	201		214	197												14
15	☐	10		x 205	205	202		215	198												15
16	☐	10														19	37 *				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Cast	151	Lat :	84 ° 32.83	21 A	
Echo	4019	Lon :	18 °44.57E	Deep 2000	2000m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP	✓	Date	5/8/24	Pmax :	
12 (24)		UTC Time	12:49	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000	76,77,78	206	206	203		216	199												1
2	☐	2000	–															x38			2
3	☐	1500		207	207	204		217	200												3
4	☐	1000	79,80,81	208	208	205		218	201												4
5	☐	750		209	209	206		219	202												5
6	☐	400																x37			6
7	☐	400	82,83,84	210	210	207		220	203												7
8	☐	250		211	211	208		221	204												8
9	☐	200																x36			9
10	☐	200		212	212	170		222	205												10
11	☐	150		213	213	171		223	206												11
12	☐	100	85,86 87	214	214	172		224	207												12
13	☐	100								x184-186		x58	x57		x69						13
14	☐	75								x187-189	25	x59	x58		x70						14
15	☐	75		215	215	209		225	208												15
16	☐	50		216	216	210		226	209												16
17	☐	50								x190-192	24	x60	x59		x71						17
18	☐	25								x193-195		x61	x60		x72						18
19	☐	25		218	217	211		227	210												19
20	☐	15		219	218	212		228	211												20
21	☐	10		220	219	213		229	212												21
22	☐	10								x196-198		x62	x61		x73						22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #1
Arctic Ocean 2024
CTD & Water Sampling Log Sheet

21A

Cast	152	Lat :	84 ° 32,83
Echo	4019	Lon :	18 °44,84E

~~MP~~		Date	5/8/24	Pmax :	
⑫ /24		UTC Time	13:15	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~ SIL	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	36		22[illegible]	220				mio 1582												1
2	☐	36												x 11							2
3	☐	36												x 11							3
4	☐	36												x 11							4
5	☐	36									23								x 8		5
6	☐	36																	x 8		6
7	☐	36																	x 8		7
8	☐	36																	x 8		8
9	☐	36																x 35			9
10	☐	1																x 34			10
11	☐	1																x			11
12	☐	1																x	Backup.		12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHF	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #2

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 153
Echo: 4019
Lat: 84 ° 32.81
Lon: 18 ° 45.65 E
21A

~~MP~~ ✓
⑫ /24
Date: 5/8/24
UTC Time: 14:10
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							ship 1583								x42				1
2	☐	36															x41				2
3	☐	36																		x28	3
4	☐	36																		x29	4
5	☐	36																		x30	5
6	☐	36																		x31	6
7	☐	36								x 205-207		x65	x62		x76						7
8	☐	5								x 199-201	x22	x63	x63		x74						8
9	☐	1								x 202-204		x64	x64		x75						9
10	☐	1															x40				10
11	☐	1		222	221	214		230	213												11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

750 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast 154
Echo 4018
Lat : 84 ° 24.1860
Lon : 19 ° 43.39 E
20C
MP ✓
12 [✓ /24]
Date 5/8/24
UTC Time 19:58
Pmax :
Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

chl max @
~50 m
distinct peak

1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	155	Lat :	84 ° 15, 9352	MP	V	Date	5/8/24	P_{max} :	
Echo	3670	Lon :	20 ° 39, 22E	12 (124)		UTC Time	23:19	Alt :	

19B

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~ Argon	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500	—	223	222	215		231	214												1
2	☐	1000		224	223	216		232	215												2
3	☐	750		225	224	217		233	216												3
4	☐	400		226	225	218		234	217												4
5	☐	250		227	226	219		235	218												5
6	☐	200		228	227	220		236	219												6
7	☐	150		229	228	221		237	220												7
8	☐	100		230	229	222		238	221							24					8
9	☐	75		231	230	223		239	222												9
10	☐	50		232	231	224		240	223												10
11	☐	50														23	45				11
12	☐	25															44				12
13	☐	25		233	232	225		241	224												13
14	☐	15		234	233	226		242	225												14
15	☐	10		235	234	227		243	226												15
16	☐	10														22	43				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

750m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast 156
Echo 4024
Lat : 84°6.976 N
Lon : 21°25.188 E
18C
MP
12/24
Date 6/8-2024
UTC Time 03:10
Pmax: 750
Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	750							ship												1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

bottom!

Arctic Ocean 2024

CTD & Water Sampling Log Sheet Nansen moorings

Cast	157	Lat :	83 ° 56.152	17A	MP	V	Date	6/8/24	Pmax :	4093
Echo	3923	Lon :	22 ° 7.492 E		12/24		UTC Time	15:29	Alt :	10

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	btm	88, 89, 90	x 236	235	228		260	227												1
2	☐	btm																x 43			2
3	☐	3000		x 237	236	229		261	228												3
4	☐	2000		x 238	237	230		262	229												4
5	☐	1500		x 239	238	231		263	230												5
6	☐	1000	91, 92, 93	x 240	239	232		264	231												6
7	☐	750		x 241	240	233		265	232												7
8	☐	400																x 42			8
9	☐	400	94, 95, 96	x 242	241	234		266	233												9
10	☐	250		x 243	242	235		267	234												10
11	☐	200																x 41			11
12	☐	200		x 244	243	236		268	235												12
13	☐	150		x 245	244	237		269	236												13
14	☐	100	97, 98, 99	x 246	245	238		270	237												14
15	☐	100								x 214-216		x 67	x 65		x 79						15
16	☐	75								x 217-219		x 68	x 66		x 80						16
17	☐	75		x 247	246	239		271	238												17
18	☐	50		x 248	247	240		272	239												18
19	☐	50								x 220-222	x 26	x 69	x 67		x 81						19
20	☐	25								x 223-225		x 70	x 68		x 82						20
21	☐	25		x 249	248	241		273	240												21
22	☐	15		x 250	249	242		274	241												22
23	☐	10		x 251	250	243		275	242												23
24	☐	10								x 226-228		x 71	x 69		x 83						24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #1

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 158
Echo: 4022
Lat: 83 ° 56.646
Lon: 22 ° 16.66
E 17A
~~MP~~
12 /24
Date: 7/8/24
UTC Time: 23:34
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~ SIL	POC & PON	~~Total Suspended Matter~~ Jane	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	39		*252	*251				ship 1584												1
2	☐	39												13							2
3	☐	39												13	12						3
4	☐	39												13 x							4
5	☐	39									*29								9 x		5
6	☐	39																	9 x		6
7	☐	39																	9 x		7
8	☐	39																	9 x		8
9	☐	39														*11					9
10	☐	39																*40			10
11	☐	1																*39			11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #2

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	159	Lat :	83 ° 56.68		
Echo	4022	Lon :	22 ° 17.28	E	17A

~~MR~~		Date	8/8/24	Pmax :	100
⑫ /24		UTC Time	00:15	Alt :	—

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50	—						Ship 1585								× 48				1
2	☐	39 chl max															× 47				2
3	☐	39 chl max																		× 32	3
4	☐	39 chl																		× 33	4
5	☐	39 chl																		× 34	5
6	☐	39 chl																		× 35	6
7	☐	39 chl								× 232-234	×	× 66	× 71		× 85						7
8	☐	5								×	×	×	×		×		not	sampled			8
9	☐	1								× 229-231	× 27	× 72	× 72		× 84						9
10	☐	1															× 46				10
11	☐	1	—	× 253	× 252	× 244		× 276	× 248												11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

5 bottles still open at sfc.
#8 thus not sampled
9-12 closed with delay at sfc.

1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 161
Echo: 4022
Lat: 83 °40.060 N
Lon: 23 °40.6[illegible]E
15B
MP:
12/24: 24
Date: 8/8 -24
UTC Time: 05:50
Pmax: 1500
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		254	253	245		277	249							Argon					1
2	☐	1000		255	254	246		278	250												2
3	☐	750		256	255	247		279	251												3
4	☐	400		257	256	248		280	252												4
5	☐	250		258	257	249		281	253												5
6	☐	200		259	258	250		282	254												6
7	☐	150		260	259	251		283	255												7
8	☐	100		261	260	252		284	256							×27					8
9	☐	75		262	261	253		285	257												9
* 10	☐	50		263	262	254		286	258												10
* 11	☐	50														×26	× [illegible] 51				11
12	☐	25															× [illegible] 50				12
13	☐	25		264	263	255		287	259												13
14	☐	15		265	264	256		288	260												14
15	☐	10		266	265	257		289	261												15
16	☐	10														×25	× [illegible] 49				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIIA	

Callibration 12 bott.

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 162
Echo: 4018
Lat: 83 ° 31,11
Lon: 24 ° 19,08 E
14C
MP 6 /24
Date: 08.08.2024
UTC Time: 10:55
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000	* 100, 101, 102						*262												1
2	☐	1850							263												2
3	☐	1700	* 103, 104, 105						264												3
4	☐	1550							265												4
5	☐	1400	106, 107, 108						266												5
6	☐	1250							267												6
7	☐	1100	* 109, 110, 111						268												7
8	☐	950							269												8
9	☐	800	* 112, 113, 114						270												9
10	☐	650							271												10
11	☐	650	* 115, 116, 117						272												11
12	☐	500	* 118, 119, 120						273												12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHF	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

both same depth

Deep

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 163
Echo: 4010
Lat: 83 ° 20831 N
Lon: 25 °0.325 E
13A

MP: 12/24 24
Date: 8/8-24
UTC Time: 17:28
Pmax: 2000
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000	100 101 102	267	266	258		290	279												1
2	☐	2000																x 48			2
3	☐	1500	103 104 105	268	267	259		291	275												3
4	☐	1000		269	268	260		292	276												4
5	☐	'750		270	269	261		293	277												5
6	☐	400																x 47			6
7	☐	400	106 107 108	271	270	262		294	278												7
8	☐	250		272	271	263		295	279												8
9	☐	200																x 46			9
10	☐	200		273	272	264		296	280												10
11	☐	150		274	273	265		297	281												11
12	☐	100	109 110 111	275	274	266		298	282												12
13	☐	100								x 235 237		x 73	x 76		x 86						13
14	☐	75								x 238 240		x 74	x 77		x 87						14
15	☐	75		276	275	267		299	283												15
16	☐	50		277	276	268		300	284												16
17	☐	50								x 241 242 243		x 75	x 78		x 88						17
18	☐	25								x 244 245 246		x 76	x 79		x 89						18
19	☐	25		278	277	269		301	285												19
20	☐	15		279	278	270		302	286												20
21	☐	10		280	279	271		303	287	x 247 248 249		x 77	x 80	x	x 90						21
22	☐	10																			22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow # 1

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 164
Echo: 4010
Lat: 83 °20.73
Lon: 25 °00,6 E
13A
MP: ⑫ 724
Date: 08.08.2024
UTC Time: 17:50
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~ SIL	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	chla		281	280				ship 1586												1
2	☐	chla												x 13							2
3	☐	chla												x 13							3
4	☐	chla												x 13							4
5	☐	chla									x32								x 10		5
6	☐	chla	45 km																x 10		6
7	☐	chla																	x 10		7
8	☐	chla																	x 10		8
9	☐	chla																			9
10	☐	chla																x 45			10
11	☐	1																x 44			11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #2

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

13A

Cast	165	Lat :	°		
Echo		Lon :	°		

MP		Date		Pmax :	
12 /24		UTC Time		Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							Ship 1587								X54				1
2	☐	chla 45															x 53				2
3	☐	chla 45																		x 36	3
4	☐	chla 45																		x 37	4
5	☐	chla 45																		x 38	5
6	☐	chla 45																		x 39	6
7	☐	chla 45								x [illegible]	x	x 82	x 73		x 93						7
8	☐	5								x [illegible]	x 31	x 80	x 74		x 91						8
9	☐	1								x [illegible]	x 30	x 81	x 75		x 92						9
10	☐	1															x 52				10
11	☐	1		282	281	272		304	288												11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIIA	

12C CTD +50 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 166
Lat: 83 ° 13.19
Echo: 4005
Lon: 25 ° 36.32 E

~~MP~~ not
12 / ⑵④
Date: 8/8/ 24
UTC Time: 22:10
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐							CTD only, over side 24-bH													5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CU	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

CTD 1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

11B

Cast	167	Lat :	83 °03,98		MP		Date	09.08.2024	Pmax :
Echo	3992	Lon :	26 °13,19	E	12/24		UTC Time	01 : 35	Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		283	282	273		305	289												1
2	☐	1000		284	283	274		306	290												2
3	☐	750		285	284	275		307	291												3
4	☐	400		286	285	276		308	292												4
5	☐	250		287	286	277		309	293												5
6	☐	200		288	287	278		310	294												6
7	☐	150		289	288	279		311	295												7
8	☐	100		290	289	280		312	296												8
9	☐	75		291	290	281		313	297												9
10	☐	50		292	291	282		314	298												10
11	☐	25		293	292	283		315	299												11
12	☐	15		294	293	284		316	300												12
13	☐	10		295	294	285		317	301												13
14	☐	5		296	295	286		318	302												14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

750 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 168
Echo: 3976
Lat: 82 ° 55.072 N
Lon: 26 ° 46.148
10C
MP:
12 /24:
Date: 9/8 - 24
UTC Time: 05 : 40
Pmax: 750
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐							Bore CTD													5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Weep

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	169	Lat :	82 °45.656 N
Echo	3922	Lon :	27 °16.5824

9A

MP		Date	9/8 - 24	Pmax :	2000
12 /24		UTC Time	09:14	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	~~Total Suspended Matter~~	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	2000		297	296	287		319	303							Argon					1
2	☐	2000																*53			2
3	☐	1500		298	297	288		320	304												3
4	☐	1000		299	298	289		321	305												4
5	☐	750		300	299	290		322	306												5
6	☐	400																*52			6
7	☐	400		301	300	291		323	307												7
8	☐	250		302	301	292		324	308												8
9	☐	200																*51			9
10	☐	200		303	302	293		325	309												10
11	☐	150		304	303	294		326	310												11
12	☐	100		305	304	295		327	311							*30					12
13	☐	100								x 280 282		x 83	x 81		x 104						13
14	☐	75								x 283 284		x 84	x 82		x 105						14
15	☐	75		306	305	296		328	312												15
16	☐	50		307	306	297		329	313							*29					16
17	☐	50								x 286 285		x 85	x 83		x 106						17
18	☐	25								x		x	x		x						18
19	☐	25		308	307	298		330	314												19
20	☐	15		309	308	299		331	315												20
21	☐	10		310	309	300		332	316							*28					21
22	☐	10								x 292 291		x 87	x 84		x 108						22
23	☐	5		311	310	301		333	317												23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPEK	SIFA	

Shallow #7

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	170	Lat :	82 ° 45647N
Echo	3920	Lon :	27 ° 16.680E

09A

MP		Date	9/8-24	Pmax :	28
12 /24		UTC Time	09:24	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	chla		312	311				ship												1
2	☐	chla													Bec	no					2
3	☐	chla													water						3
4	☐	chla																			4
5	☐	chla									x								x		5
6	☐	chla	28m																x		6
7	☐	chla																	x		7
8	☐	chla																	x		8
9	☐	chla																			9
10	☐	chla																*50			10
11	☐	1																*49			11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Shallow #2

9A

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	171	Lat :	°	MP		Date	9/8-24	Pmax:	50
Echo		Lon :	°	12 /24		UTC Time		Alt :	

correct,

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	50							ship								*57				1
2	☐	chla 28															*56				2
3	☐	chla																		*11	3
4	☐	chla																		*11	4
5	☐	chla																		*11	5
6	☐	chla																		*11	6
7	☐	chla								*289 .291	*	* 85	* 85		* 107						7
8	☐	5								* 292 .294	*	* 88	* 86		* 109						8
9	☐	1								* 298 .300	*	* 89	* 87		* 110						9
10	☐	1															*55				10
11	☐	1		313	312	302		334	318												11
12	☐	1																			12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

Cast 172
Lat : °
Echo
Lon : °

8C

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

MP
12/24
Date 9/18/24
UTC Time 16:08
P_{max} :
Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	$\delta^{18}O$	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	A:	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHI	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

1500m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: ~~171~~ 17

Echo: 3750

Lat: 82° 26.55

Lon: 28 22.05 E

7B

~~MB~~

12/24

Date: 9/8/24

UTC Time: 18:48

Pmax:

Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CD~~O~~M	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		314	313			335	319												1
2	☐	1000		315	314			336	320												2
3	☐	750		316	315			337	321												3
4	☐	400		317	316			338	322												4
5	☐	250		318	317			339	323												5
6	☐	200		319	318			340	324												6
7	☐	150		320	319			341	325												7
8	☐	100		321	320			342	326												8
9	☐	75		322	321			343	327												9
10	☐	50		323	322			344	328												10
11	☐	25		324	323			345	329												11
12	☐	15		325	324			346	330												12
13	☐	10		326	325			347	331												13
14	☐	5		327	326			348	332												14
15	☐																				15
16	☐																				16
17	☐		~~title~~	~~[illegible]~~																	17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

174

T50 m

Arctic Ocean 2024

CTD & Water Sampling Log Sheet

6C

Cast	~~172~~	Lat :	82 ° 17.08		~~NP~~	Date	9/8/24	P
Echo	3648	Lon :	28° 48.17 E		12 [✓ /24]	UTC Time	21:46	Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐	Curve fit																			2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐																				6
7	☐								CTD only												7
8	☐																				8
9	☐							Heavy use of thrusters on the way out.													9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

2000m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

5A

Cast	~~103~~ 175	Lat :	82° 7.82
Echo	3499	Lon :	29 ° 18.70 E

~~NP~~		Date	10/8/24	Pmax :	
12/24		UTC Time	00:31	Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	~~CDOM~~	~~DOC~~	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	~~HPLC~~ Bees SIL	POC & PON	~~Total Suspended Matter~~ Janine	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes Doreen	Niskin
1	☐	2600		328	327			349	333												1
2	☐	1500		329	328			350	334												2
3	☐	1000		330	329			351	335												3
4	☐	750		331	330			352	336												4
5	☐	400		332	331			353	337												5
6	☐	250		333	332			354	338												6
7	☐	200		334	333			355	339												7
8	☐	150		335	334			356	340												8
9	☐	100		336	335			357	341												9
10	☐	75		337	336			358	342												10
11	☐	50		338	337			359	343												11
12	☐	26											1 large	× 14							12
13	☐	26											jug	× 14							13
14	☐	26														× 1 canister					14
15	☐	26														× 1 canister					15
16	☐	26																		× 12	16
17	☐	25		339	338			360	344										1 jug		17
18	☐	15		340	339			361	345												18
19	☐	10		341	340			362	346												19
20	☐	5		342	341			363	347												20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CO	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

5 bottles @ chla max

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast 176
Echo 3479
Lat : 81 °5862 N
Lon : 29 °45.073E
4C

MP
12/24
Date 10/8-24
UTC Time 03:06
Pmax : 750
Alt :

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ¹⁸O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐							Bare CTD													6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

1500 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast	177	Lat :	81 °49.381 N	MP		Date	10/8-24
Echo	3128	Lon :	30 °9.990 E	12 /24		UTC Time	05:14
			3B			Pmax :	1500
						Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	1500		343	342			364	348												1
2	☐	1000		344	343			365	349												2
3	☐	750		345	344			366	350												3
4	☐	400		346	345			367	351												4
5	☐	250		347	346			368	352												5
6	☐	200		348	347			369	353												6
7	☐	150		349	348			370	354												7
8	☐	100		350	349			371	355												8
9	☐	75		351	350			372	356												9
10	☐	50		352	351			373	357												10
11	☐	25		353	352			374	358												11
12	☐	15		354	353			375	359												12
13	☐	10		355	354			376	360												13
14	☐	5		356	355			377	361												14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
			WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

750 m

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast: 178
Echo: 2491
Lat: 81 ° 39.73
Lon: 30 °36,7067 E
2C
~~MR~~
12 / 24
Date: 10/8/24
UTC Time: 10:15
Pmax:
Alt:

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐																				1
2	☐																				2
3	☐																				3
4	☐																				4
5	☐																				5
6	☐								CTD		only										6
7	☐																				7
8	☐																				8
9	☐																				9
10	☐																				10
11	☐																				11
12	☐																				12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHY	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

bottom

1A

Arctic Ocean 2024
CTD & Water Sampling Log Sheet

Cast		Lat :	°	MP		Date		Pmax :	
Echo		Lon :	°	12 /24		UTC Time		Alt :	

Niskin		Pressure	Winkler	Alkalinity & DIC	Nutrients	CDOM	DOC	δ18O	Salinity	Flow Cytometry	FRRF	Phyto-Plankton Taxonomy	CHL-A	HPLC	POC & PON	Total Suspended Matter	Particle Absorption	Meta-barcoding	C & N Uptake rates	C & N Isotopes	Niskin
1	☐	btm		357	356	303		378	362												1
2	☐	400		358	357	304		379	363												2
3	☐	250		359	358	305		380	364												3
4	☐	200		360	359	306		381	365												4
5	☐	150		361	360	307		382	366												5
6	☐	100		362	361	308		383	367												6
7	☐	75		363	362	309		384	368												7
8	☐	50		364	363	10		385	369												8
9	☐	25		365	364	11		386	370												9
10	☐	15		366	365	12		387	371												10
11	☐	10		367	366	13		388	372												11
12	☐	5		368	367	14		389	373												12
13	☐																				13
14	☐																				14
15	☐																				15
16	☐																				16
17	☐																				17
18	☐																				18
19	☐																				19
20	☐																				20
21	☐																				21
22	☐																				22
23	☐																				23
24	☐																				24
		-	WIN	AT	NUT	CD	CD	OXY	SAL	FCM	FRRF	PHT	CHL	HPLC	POC	TSM	ABS	DNA	UPTK	SIFA	

OUT OF TIME

STATION CANCELLED

RAS Recovery Log Sheet

Sampler Deployment Information	
Serial number :	12852-02
Approximate depth :	66m
Mooring :	AMUNDSEN-22
Release Time & Date:	

Notes

↱ Phillip A

	Sample Information						
	Bag	Bag Weight	δ¹⁸O sample #	Nutrient sample #	100ml comm	eDNA sample #	Notes
	1	0.536	89	901	PHT-100	eDNA #1	
1	2	0.5375	—	—	✓ 100ml		
	3	0.540	—	—			
	4	0.5370	90	902	PHT-101	eDNA #2	
2	5	0.5370	—	—	✓ 100ml		
	6	0.5370	—	—			
	7	0.5355	91	903	PHT-102	eDNA #3	
3	8	0.5360	—	—	✓ 100ml		
	9	0.5355	—	—			
	10	0.5355	92	904		eDNA #4	
4	11	0.5350	—	—			
	12	0.5350	—	—			
	13	0.5350	93	905		eDNA #5	
5	14	0.5335	—	—			One air bubble in it
	15	0.5335	—	—			

6	16	0 5330	94	906	X	eDNA #6	
	17	0 5340	—	—			
	18	0 5360	—	—			
7	19	0 5355	95	907	X	eDNA #7	
	20	0 5370	—	–			
	21	0 5380	—	—			
8	22	0.5385	96	908	X	eDNA #8	
	23	0 5380	—	—			
	24	0 5390	—	—			
9	25	0 5405	97	909	X	eDNA #9	
	26	0.5035	—	—			
	27	0,5385	—	—			
10	28	0,5230	98	910	X	eDNA #10	
	29	0,5215	—	—			
	30	0,5380	—	—			
11	31	0.4795	99	911	PHT-103	eDNA #11	
	32	0.5320	—	—	V		
	33	0.5380	—	—			
12	34	0.5400	100	912	PHT-104	eDNA #12	
	35	0.5405	—	—	PHT-105		
	36	0.4965	—	—			
13	37	0.5410	101	913	DHT-105	eDNA #13	
	38	0.5440	—	—			
	39	0.5380	—	—			

14	**40**	0,5410	102	914	PHT-106	eDNA #14	
	41	0.5410	—	—			
	42	0.5420	—	—			
15	**43**	0,5370	103	915	PHT-167	eDNA #15	
	44	0.5410	—	—			
	45	0.5435	—	—			
16.	**46**	0.5420	104	916	PHT-108	eDNA #16	
	47	0.5390	—	—			
	48	0.5390	—	—			

Notes: Bottles for eDNA have been rinsed with 10% bleach and thereafter 3 times with MilliQ water, airdried (all in "clean" lab)

OK

RAS Recovery Log Sheet

Sampler Deployment Information	
Serial number :	ML-12852-01
Approximate depth :	64m
Mooring :	NANSEN-22
Release Time & Date:	| 06-AUG-24

Notes
Eva, Anette, Mats + Zoe Marel M series 2200 balance

Sample Information

	Bag	Bag Weight	δ18O sample #	Nutrient sample #	100 ml comm	eDNA sample #	Notes
17	1 ✓	0.4140	244	917	🟩	eDNA #17	pht 109
	2 ✓	0.4370	—	—			
	3 ✓	0.4135	—	—			
18	4 ✓	0.4555	245	918	🟩	eDNA #18	pht 110
	5 ✓	0.4585	—	—			
	6 ✓	0.4485	—	—			
19	7 ✓	0.4510	246	919	🟩	eDNA #19	pht 111
	8 ✓	0.4565	—	—			
	9 ✓	0.4515	—	—			
20	10	0.4615	247	920	X	eDNA #20	
	11	0.4590	—	—			
	12	0.4450	—	—			
21	13	0.4325	248	921	X	eDNA #21	
	14	0.4315	—	—			
	15	0.4480	—	—			

22	16	0.4565	249	922		eDNA # 22	
	17	0.4730	—	—			
	18	0.4405	—	—			
23	19	0.4500	250	923		eDNA #23	unsure weight is correct
	20	0.4655	—	—			
	21	0.4400	—	—			
24	22	0.4685	251	924		eDNA #24	
	23	0.4620	—	—			
	24	0.4505	—	—			
25	25	0.4440	252	925		eDNA #25	
	26	0.4660	—	—			
	27	0.4770	—	—			ship moving
26	28	0.4585	253	926	🟨	eDNA #26	pht 119, extra phyto plankton comm April
	29	0.4610	—	—	🟨		
	30	0.4650	—	—	🟨		
27	31	0.4655	254	927	🟩	eDNA #27	pht 112
	32	0.4695	—	—	🟩		
	33	0.4515	—	—	🟩		
28	3~~2~~4	0.4795	255	928	🟩	eDNA #28	pht 113
	3~~2~~5	0.4570	—	—	🟩		
	3~~2~~6	0.4085	—	—	🟩		
29	3~~2~~7	0.4675	256	929	🟩	eDNA #29	pht 114
	3~~2~~8	0.4640	—	—	🟩		
	3~~2~~9	0.4585	—	—	🟩		

30	**40**	0.4605	257	930		eDNA #30	pht = 115
	41	0.4485	—	—			
	42	0.4305	—	—			
31	**43**	0.4680	258	931		eDNA #31	pht 116
	44	0.4750	—	—			
	45	~	—	—			no weight
32	**46**	0.4670	259	932		eDNA #32	pht 117
	47	0.4600	—	—			
	48	0.4645	—	—			

Notes:

Buoy Deployment Report

seaiceportal.de

Buoy information

Buoy name: 2024T126
IMEI: 300534063484560
Buoy type: Thermistor Buoy
Buoy owner: Norwegian Polar Institute

Deployment information

Date and Time (UTC): 31.07.2024 07:52
Position (Lat/Lon): 86.58445/-4.85467
Region: Arctic Ocean
Contact:
Mats Granskog (NPI)
Polona Itkin (UiT)
Expedition name: NPI AO2024
Means of deployment: Ship - mummy

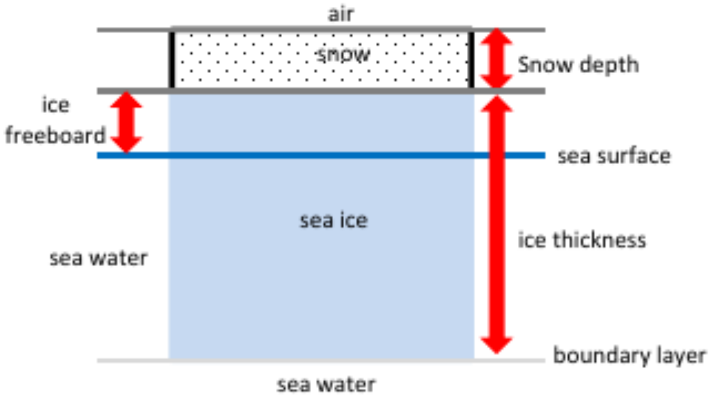
Snow and ice conditions

Snow depth: 0.06 m
Ice thickness: 2.54 m
Ice freeboard: 0.13 m
Ice types:
SYI (Second Year Ice)

Buoy-specific parameters

Chain length: 5 m
Sensor spacing: 0.02 m
Sensor ice water (Sensor ID): 153
Sensor sea surface (Sensor ID): 34
Sensor air snow (Sensor ID): 27

Photo credits:



Additional information *(comments, weather, topography, ice floe size, etc.)*

Second year ice floe of ca. 300x300m surrounded by ridges, some deep melt ponds with melted-through bottoms. Deployed on rafted ice. Ice thickness 1 m away was just 1.92m (core taken). Co-deployed with a MetBuoy by UiT (contact Jack Landy), IMEI300534065857570. Deployed on Norwegian Polar Institute's 2024 Arctic Ocean expedition on R/V Kronprins Haakon. SIMBA provided by H2020 Arctic Passion.

Buoy Deployment Report

seaiceportal.de

Buoy information

Buoy name: 2024T127
IMEI: 300534061787870
Buoy type: Thermistor Buoy
Buoy owner: Norwegian Polar Institute

Deployment information

Date and Time (UTC): 26.07.2024 07:00
Position (Lat/Lon): 87.62649/-15.23082
Region: Arctic Ocean
Contact:
Mats Granskog (NPI)
Polona Itkin (UiT)
Expedition name: NPI AO2024
Means of deployment: Ship - mummy

Snow and ice conditions

Snow depth: 0.07 m
Ice thickness: 1.5 m
Ice freeboard: 0.21 m
Ice types:
SYI (Second Year Ice)

Buoy-specific parameters

Chain length: 5 m
Sensor spacing: 0.02 m
Sensor ice water (Sensor ID): 95
Sensor sea surface (Sensor ID): 30
Sensor snow ice (Sensor ID): 20
Sensor air snow (Sensor ID): 20

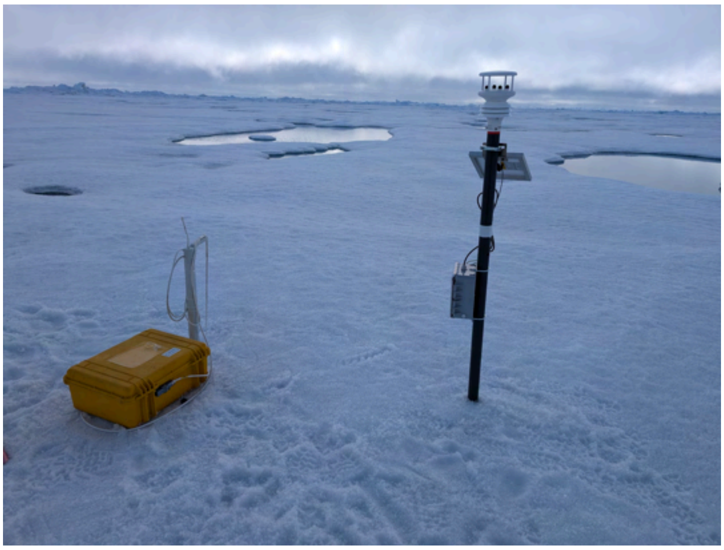
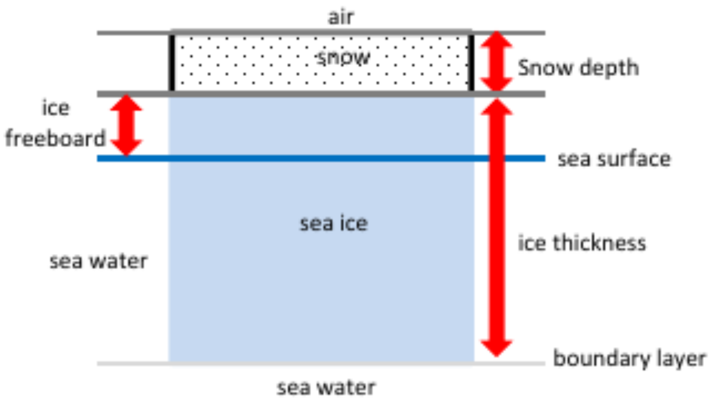


Photo credits:



Additional information *(comments, weather, topography, ice floe size, etc.)*

Deployed on Norwegian Polar Institute’s 2024 Arctic Ocean expedition on R/V Kronprins Haakon. SIMBA provided by H2020 Arctic Passion. Buoy was co-deployed with MetBuoy 300534065853570 by UiT (Jack Landy). Sea ice core for salinity and stable oxygen isotope was collected. The floe was ponded, it had grey sediments, typical for the location. Buoy is only transmitting error messages with position.

Buoy Deployment Report

seaiceportal.de

Photo credits:

Buoy information

Buoy name: 2024T128
IMEI: 300534063255480
Buoy type: Thermistor Buoy
Buoy owner: Norwegian Polar Institute

Deployment information

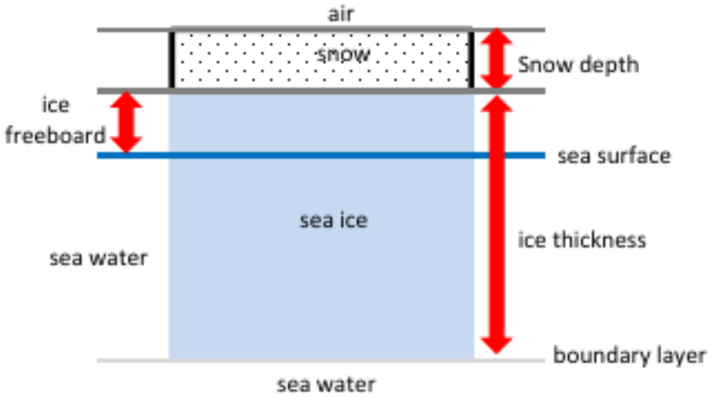
Date and Time (UTC): 27.07.2024 07:00
Position (Lat/Lon): 87.07005/-31.11737
Region: Arctic Ocean
Contact:
Mats Granskog (NPI)
Polona Itkin (UiT)
Expedition name: NPI AO2024
Means of deployment: Ship - mummy

Snow and ice conditions

Snow depth: 0.06 m
Ice thickness: 1.78 m
Ice freeboard: 0.16 m
Ice types:
SYI (Second Year Ice)

Buoy-specific parameters

Chain length: 5 m
Sensor spacing: 0.02 m
Sensor ice water (Sensor ID): 129
Sensor sea surface (Sensor ID): 48
Sensor air snow (Sensor ID): 40



Additional information *(comments, weather, topography, ice floe size, etc.)*

Triangular ice floe of around 200x200m surrounded by ridges. Co-deployed with a MetBuoy by UiT (contact Jack Landy), IMEI300534065858580. Deployed on Norwegian Polar Institute’s 2024 Arctic Ocean expedition on R/V Kronprins Haakon. SIMBA provided by H2020 Arctic Passion.

AMU-24 Deployment Card

Time UTC	SOG	COG	Echo Depth	Dist. to target	TTG estimate	ETA estimate
16:00	~~0·3~~					
16:20						
16:40						
17:00						
17:20						
17:40						
18:00						
18:20						
18:40						
19:00						
19:20	0·4	129	4220	1·34nm	3:28	22:48
19:40	0·4	135	4219	1·31nm	3:00	
20:00	0·4	135	4219	1·14nm	2:47	
20:20	0·4	135	4219	1·02	2:31	
20:40	0·3	135	4219	0·90	VAR	
21:00	0·3	135	4219	0·86	VAR	
21:20	0·2	135	4218	0·83	VAR	
21:40	0 ·2	135	4218		VAR	
22:00	0·1	135	4218	1171m	VAR	
22:20						
22:40						
23:00						
23:20						

Release

Latitude		Longitude		Date	UTC	Echo depth
NN	NNN	NN	NNN	NN-NN-NNNN	NN:NN	NNNN m
86	31·752	005	44·215	01 ~~[illegible]~~-08-2024	23:06	4217

Echo Check: Depth of 50 m float: — NOT VISIBLE.

Echo Check: Depth of 500 m float: 489·69 m. (Signature 55) orig target. 512 m

MAR-24 Deployment Card

Time UTC	SOG	COG	Echo Depth	Dist. to target	TTG estimate	ETA estimate
10:00	0·1	136	4213	—	—	SOUNDER
10:20	0·0	136	4217	—	—	ALTERNATES
10:40	0·1	136	4213	—	—	BETWEEN 4217&4213
11:00	0·1	136	4213	—	—	JUMPING IN
11:20	0·0	N/A	4217	—	—	BETWEEN.
11:40	0·0	N/A	4214	—	—	—
12:00	0·0	N/A	4216	—	—	—
12:20	0·0	N/A	4216	—	—	—
12:40	0·0	N/A	4217	—	—	—
13:00	0·0	N/A	4217	—	—	—
13:20	0·0	N/A	4217	—	—	—
13:40	0·0	N/A	4217	—	—	—
14:00	0·1	136	4217	—	—	—
14:20	0·1	136	4217	—	—	—
14:40	0·1	176	4216	—	—	—
15:00						
15:20						
15:40						
16:00						
16:20						
16:40						
17:00						
17:20						

Release

Latitude		Longitude		Date	UTC	Echo depth
NN	NNN	NN	NNN	NN-NN-NNNN	NN:NN	NNNN m
86	~~[illegible]~~ 31·605	005	~~[illegible]~~ 34·174	02-08-2024	14:45	4216

Release Jammed first time.
THIS IS THE POSITION OF THE SECOND (SUCCESSFUL) RELEASE).

Echo Check: Depth of 50 m float:

Echo Check: Depth of 500 m float:

MMP@ TARGET 603m
OBSERVED 621m. (Possibly).

NAN-24 Deployment Card

Time UTC	SOG	COG	Echo Depth	Dist. to target	TTG estimate	ETA estimate
16:00	0.1	144	4022	779 m.	4:00	
16:20	0.1	144	4022	718 m		
16:40					THRUSTING	
17:00	0.2	144	4022	526 m		
17:20	0.2	144	4022	492 m		
17:40	0.1	144	4022	419 m		
18:00	0.1	144	4022	378 m		
18:20	0.1	144	4022	336 m		
18:40	0.0	144	4022	332 m		
19:00						
19:20						
19:40						
20:00						
20:20						
20:40						
21:00						
21:20						
21:40						
22:00						
22:20						
22:40						
23:00						
23:20						

Release

Latitude		Longitude		Date	UTC	Echo depth
NN	NNN	NN	NNN	NN-NN-NNNN	NN:NN	NNNN m
83°	57.032	22°	15. 427	07-08-2024	18:55	4022

Echo Check: Depth of 50 m float:

Echo Check: Depth of 500 m float: 489.89 m   planned. 493 m