Overturning in the Subpolar North Atlantic Program
Cape Farewell – OSNAP East & OSNAP West

AR84-02 Cruise Report

Photo by James Holte

Cruise Summary

Vessel: R/V *Neil Armstrong*
Cruise ID: AR84-02
Port of call: Reykjavík, Iceland
Dates: July 9 – August 14, 2024
Chief Scientist: Leah McRaven, Woods Hole Oceanographic Institution
Co-Chief Scientist: James Holte, Scripps Institution of Oceanography UC San Diego

Funding for ship time awarded to

NSF-OCE #1948482
PI Fiammetta Straneo, Scripps Institution of Oceanography UC San Diego

NSF-OCE #1948505
PI Amy Bower, Woods Hole Oceanographic Institution
Co-PI Robert Pickart, Woods Hole Oceanographic Institution

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A: Overview & Objectives

Contributing authors: Leah McRaven, James Holte, and Ken Zhao

A1: Overview

The Overturning in the Subpolar North Atlantic Program (OSNAP) is an international program designed to measure the transport of mass, heat, and freshwater in the subpolar North Atlantic and the associated Atlantic Meridional Overturning Circulation (AMOC) (Figure A1). It includes contributions from scientists in the US, UK, Germany, Netherlands, and Canada. One key component of this program are moored arrays maintained along two lines that cross the subpolar North Atlantic flow: OSNAP West, from the Labrador coast to the southern tip of Greenland, and OSNAP East from the southern tip of Greenland, across the Reykjanes Ridge, and extending to Scotland.

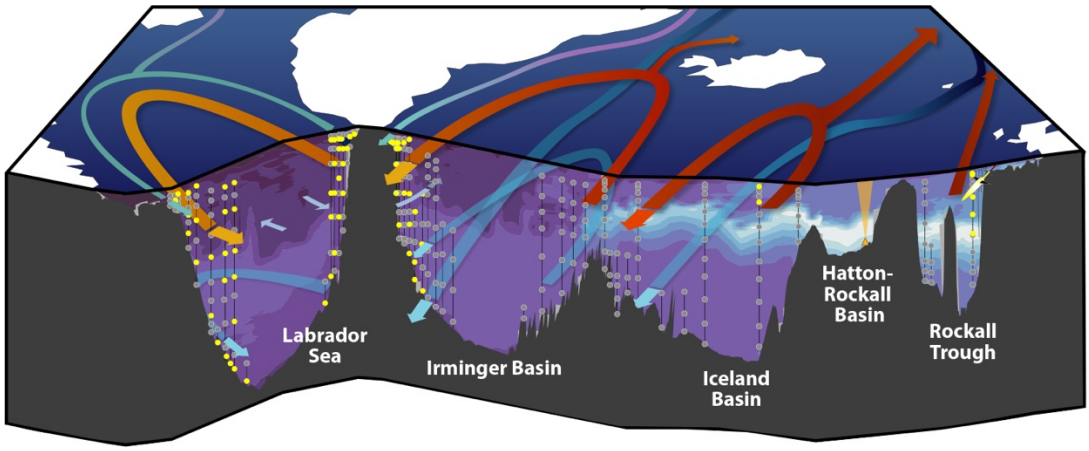


Figure A1: *Schematic of the circulation in the subpolar North Atlantic (colored arrows) and OSNAP moorings (black lines) at 53°N–60°N containing sensors that measure salinity, temperature, and depth at various depths (gray circles). The locations of added GOHSNAP and partner oxygen sensors are in yellow. Atamanchuk et al. (2022).*

OSNAP observations of ocean temperature, salinity, dissolved oxygen, and velocity from moorings and shipboard surveys have been invoked to explain changes in a wide range of physical, chemical, and biological parameters in the North Atlantic, Nordic Seas, and Arctic Ocean. Thus, by quantifying Atlantic meridional overturning variability and understanding its drivers, OSNAP is providing a critical step towards addressing societally-relevant, interdisciplinary questions concerning the melting of Greenland ice and Arctic sea-ice, heat content in the Arctic Ocean, climate of the Nordic Seas, and anthropogenic carbon storage.

In addition to the OSNAP objectives, this cruise supported the collection of data for a complementary biogeochemistry program, GOH-SNAP (Gases in the Overturning and Horizontal circulation of the Subpolar North Atlantic Program, Lead PI Jaime Palter, URI) which has added O2 sensors to the OSNAP array to quantify O2 export from the Labrador and Irminger Seas. The goal of the 2024 cruise for GOHSNAP was to recover, redeploy, and augment moored O2 sensors, collect high-quality conductivity-temperature-depth (CTD) and discrete dissolved oxygen measurements to calibrate the mooring data, and collect DIC/TA samples to aid in the estimation of carbon export. This was one of several GOHSNAP cruises that serviced moorings and collected associated data this summer.

This report summarizes operations carried out aboard the R/V *Neil Armstrong* during AR84-02 in July/August of 2024. This is the sixth US-led cruise primarily dedicated to the servicing two mooring arrays that constitute part of the OSNAP West and East lines, referred to as the LS and CF arrays, respectively, and to the collection of hydrographic and velocity data to provide context for the moored measurements. The cruise participants are listed in Table A1. A cruise event log can be found in Appendix A.

AR84-02 Scientific Objectives

1) Service the OSNAP West and East Cape Farewell mooring arrays.
    - Recover 18 moorings (9 tripod moorings and 9 tall moorings) deployed from 2022-2024.
    - Deploy 12 moorings (6 tripods and 6 tall moorings) with an intended deployment spanning 2024-2026.
2) Collect hydrographic measurements to perform necessary moored instrument calibrations and to support the transport and overturning calculations within the OSNAP program.
3) Collect discrete samples of salinity, dissolved oxygen, dissolved inorganic carbon (DIC), and total alkalinity (TA), as part of the OSNAP and GOHSNAP programs.
4) Carry out hydrographic surveys of opportunity to investigate aspects of the circulation around Greenland.

Table A1. AR84-02 Cruise Participants

Surname	Name	Affiliated Institution	Role
McRaven	Leah	Woods Hole Oceanographic Institution	Chief Scientist
Holte	Jamie	University of California, San Diego / Scripps	Co-Chief Scientist
Kemp	John	Woods Hole Oceanographic Institution	Technician
Davies	Andrew	Woods Hole Oceanographic Institution	Technician
Houk	Adam	Woods Hole Oceanographic Institution	Scientist
Zhao	Ken	University of California, San Diego / Scripps	Postdoc
Gibson	Shelby	University of Rhode Island	Graduate student
Nelson	Monica	University of California, San Diego / Scripps	Graduate student
Kinne	Kylie	University of California, San Diego / Scripps	Graduate student
Nagao	Hiroki	Woods Hole Oceanographic Institution	Graduate student
Sun	Yan	Woods Hole Oceanographic Institution	Graduate student
Cunill I Sàez	Anna	University of Las Palmas de Gran Canaria	Graduate student
Huelbes Muñoz	Sofía	University of Las Palmas de Gran Canaria	Graduate student
McGee	Natalie	Wellesley College	Undergraduate student
Tupper	George	Woods Hole Oceanographic Institution	Scientist
Freiberger	Robert	Oregon State University	Technician

A2: Cruise Narrative

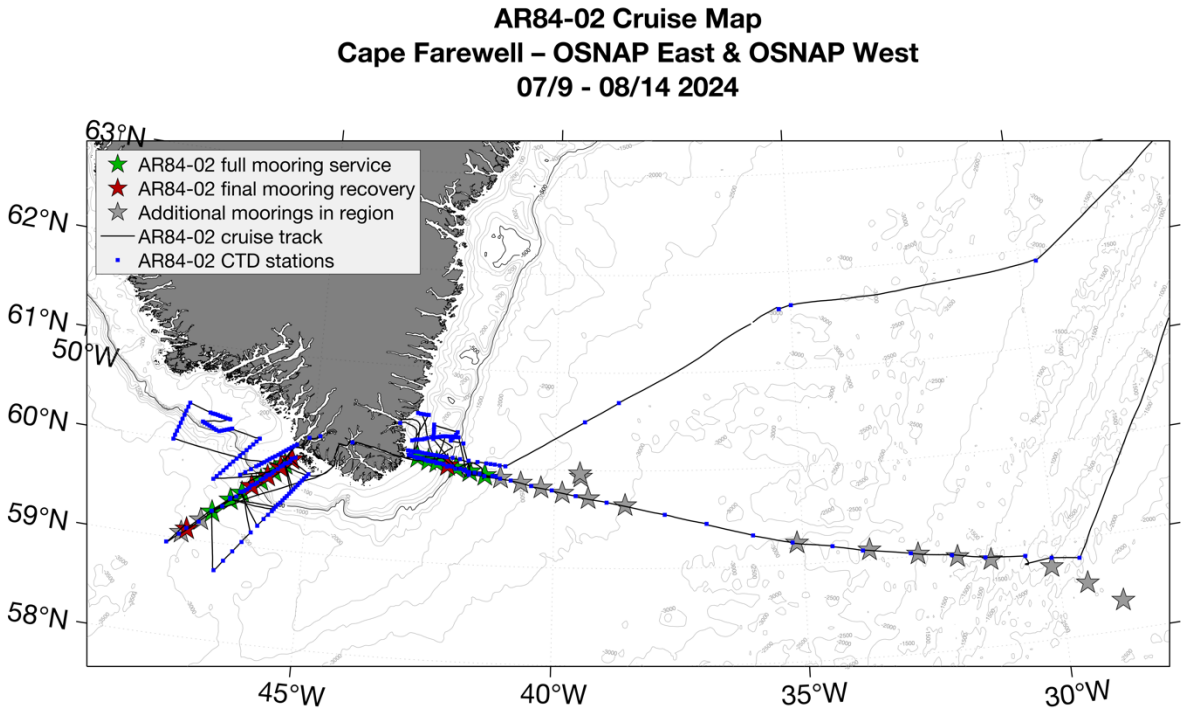


Figure A2: *Map of AR84-02 cruise operations with ship track and CTD stations shown. OSNAP West and East CF moorings serviced during the cruise are indicated in color. Additional OSNAP and OOI moorings in the region are shown in grey.*

Leading up to and during the cruise, sea ice conditions around southern Greenland, specifically near the mooring locations, were closely monitored. July 2024 was marked by higher-than-average sea ice presence in the operational region. The ship and science team used Annotated sea ice charts from the Danish Meteorological Institute (DMI), Satellite imagery products from DMI, and RADARSAT Constellation Mission (RCM) satellite imagery. In addition, we received email updates from sea ice analysts from the DMI Greenland Ice Service for imagery reports on conditions near Prince Christian Sound (PCS) and other near-coastal areas of interest. See Section A3 for more information on sea ice during the cruise.

R/V *Armstrong* left Reykjavik on July 9th. Due to the ice, it was hard to know if we could start with mooring operations or work our way towards Greenland along the Irminger section. After discussion with the captain, there was a consensus that more work would be accomplished if we began operations at the CF array due to poor weather along the Irminger section. The ice was still heavy, but variable, near the CF moorings.

We approached the sea ice edge along the CF line the morning of the 13th hoping to reach CF4 and CF5. We approached an area that DMI marked as being 3/10ths total ice concentration. However, the pieces of ice present were too large and close for the ship to pass through. We retreated to outside of the ice and recovered CF7 and CF6.

On the 15th we again transited toward CF5. This time we found no ice in the vicinity of the mooring; there had been significant ice over the mooring the previous day, but it had completely shifted overnight. CF5 was recovered in the early afternoon and CF4 was recovered after dinner. We took advantage of the now favorable ice conditions and redeployed CF5, CF6, and CF7 over the following days. Overnight hydrographic efforts focused on completing a high-resolution CTD section along the CF line and surveying Kangerlussuatsiaq (Lindenow) trough.

We recovered the three CF tripods before a period of bad weather forecasted to start on the 21st. Rather than sheltering near PCS, which was blocked by thick bands of ice, we transited to Kangerlussuatsiaq trough to shelter near shore. Over two days we refurbished two of the three tripods. This included testing the weight and balance of the tripods with the newly added aural whale recorders. We left the evening of the 22nd to do CTDs overnight, repeating the section north of the CF line.

The remainder of the CF tripods were completed through the 24th. Overnight CTD sections near Kangerlussuatsiaq trough were complicated by bands of sea ice. One section began inshore and proceeded offshore, however, after 5 stations we ran into unexpected ice. We transited south to complete a section just south of the trough.

We transited to the middle of PCS on the 24th where we stayed overnight and then transited to the western exit in the morning. We waited for a storm to pass over the morning and then began work along the LS array. LS8 was recovered early on the 26th and LS7 was recovered on the 27th with CTDs along the LS line overnight. On the 28th we transited to LS7; however, the sea state was too elevated for operations. We utilized daylight by recovering LS4 instead as conditions were slightly calmer farther inshore.

On July 29th, we deployed LS7 and recovered LS3 and LS1. The tripods were refurbished from a sheltered location while a weather system passed. Conditions remained favorable for mooring work through the 5th and the team kept up a steady pace. LS1 and LS3 were deployed, LS5 and LS6 were recovered and redeployed. CTDs over the evenings focused on the LS line and a section to the southeast. LSA was recovered on the 4th before tucking into the same hiding spot for refurbishing. On the 5th LSA was deployed and LSI, LSB, and LS2 were recovered. We completed a CTD survey of Narsaq trough from August 5th through the morning of the 7th.

On the 7th, we transited back through PCS to avoid a large low-pressure system. By the afternoon of the 8th, weather cleared up and we were able to begin work on the Irminger section. Given the fresh surface layer early in the cruise, we added three CTD stations on the shelf to see if it was still present. We also completed CTDs near CF6 and CF7 for newly deployed optodes. We made great time thanks to a consistent tail wind and were able to extend the line a few stations past the IC0-IC4 moorings.

Near the end of the Irminger section we fortuitously met up with RRS *Discovery*, which had just began servicing the NIOZ and UM OSNAP moorings. Shortly after, deteriorating weather conditions associated with three unorganized low-pressure systems prompted us to head back to Reykjavík. We made good speed on the transit back and came into port one day early.

A3: Summary of sea ice during AR84-02 (contribution by Ken Zhao)

Early in the cruise, various satellite products—including those used operationally by DMI for southern Greenland—indicated high sea ice concentrations near the moorings, particularly around CF1-6. During this period, a dense band of sea ice (>40% concentration) was observed near the coastal current.

This ice band, advected by the current at approximately 0.2 to 0.5 m/s, evolved rapidly and changed significantly from day to day. The presence of 20-100 km folds suggested lateral instabilities or excursions in the coastal current (Figure A3).

During our initial attempts to access the coastal CF moorings between July 12th and 15th, we found a strong correlation between the sea ice conditions depicted by the RADARSAT Constellation Mission (RCM) and the Multisensor Analyzed Sea Ice Extent (MASIE) products and the sea ice that obstructed our vessel's passage. Based on our experience, these products provided accurate representations of the ice coverage that hindered our ability to bypass certain areas.

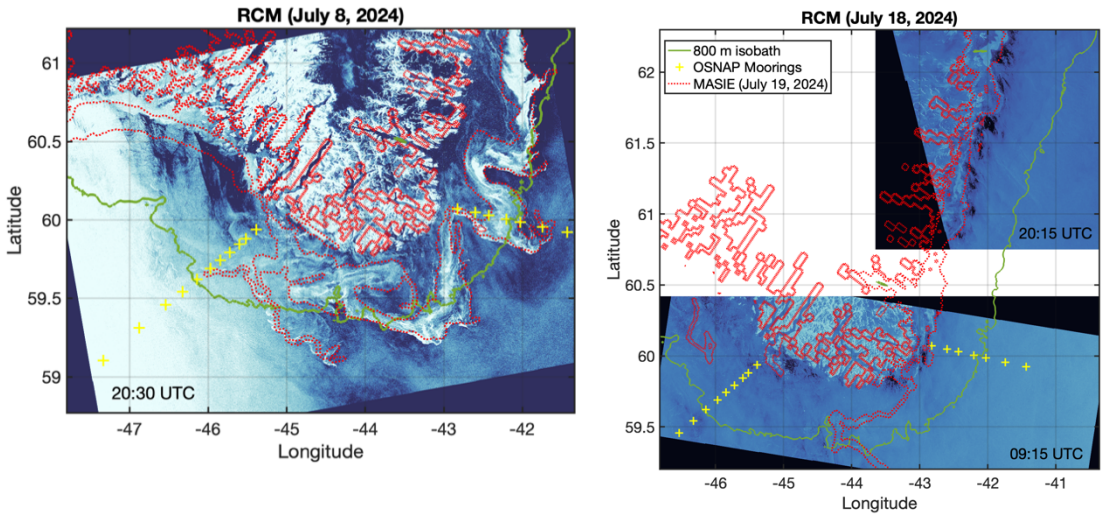


Figure A3: *Composite of RADARSAT Constellation Mission (RCM) satellite images and the Multisensor Analyzed Sea Ice Extent (MASIE) product near CF and LS mooring locations on (left) July 8th, 2024, and (right) July 18th, 2024. The green line denotes the 800 m depth isobath and the yellow '+' markers denote recovered mooring locations.*

By July 18th, the ice band had become more fastened to the coast, allowing for the recovery and redeployment of most coastal moorings. As the cruise progressed, we later observed significant and rapid sea ice loss between Cape Farewell (60° N) and Sermilik Trough (66° N), with much of this sea ice melting within the first 2 weeks of the cruise. Notably, this was the highest sea ice concentration observed near the moorings compared to the five previous OSNAP cruises, which presented both operational challenges and scientific interest.

The presence, advection, and rapid melting of sea ice near the moorings and hydrographic sections inspired our team to conduct preliminary research on the role of solid freshwater and near-surface sea ice meltwater flux across the CF and LS sections. Our ongoing research aims to quantify and investigate the impact of solid freshwater and near-surface liquid freshwater flux that may not be directly observable by moorings but could be assessed through remote sensing and model reanalysis. This work will help contextualize the anomalous sea ice and meltwater observations from this cruise within the broader hydrographic record.

B: Moorings

Contributing authors: James Holte, Leah McRaven, Adam Houk, Shelby Gibson, and Hiroki Nagao

B1: Mooring Operations

Eleven moorings were recovered from the Labrador Sea and Southwest Greenland shelf (LS moorings); six of these moorings were redeployed. Seven moorings were recovered from the Irminger Sea and Southeast Greenland shelf (CF moorings); six of these moorings were redeployed. Of the moorings, nine tripods were recovered on the shelves (six were re-deployed). The remainder of the moorings were subsurface moorings that extend from the seafloor to about 100 m from the surface. Tables B1 and B2 list the recovered and deployed moorings, respectively. The as-deployed mooring diagrams, together with a summary of diagram corrections, are in Appendix B. The mooring locations are shown in Figure B1.

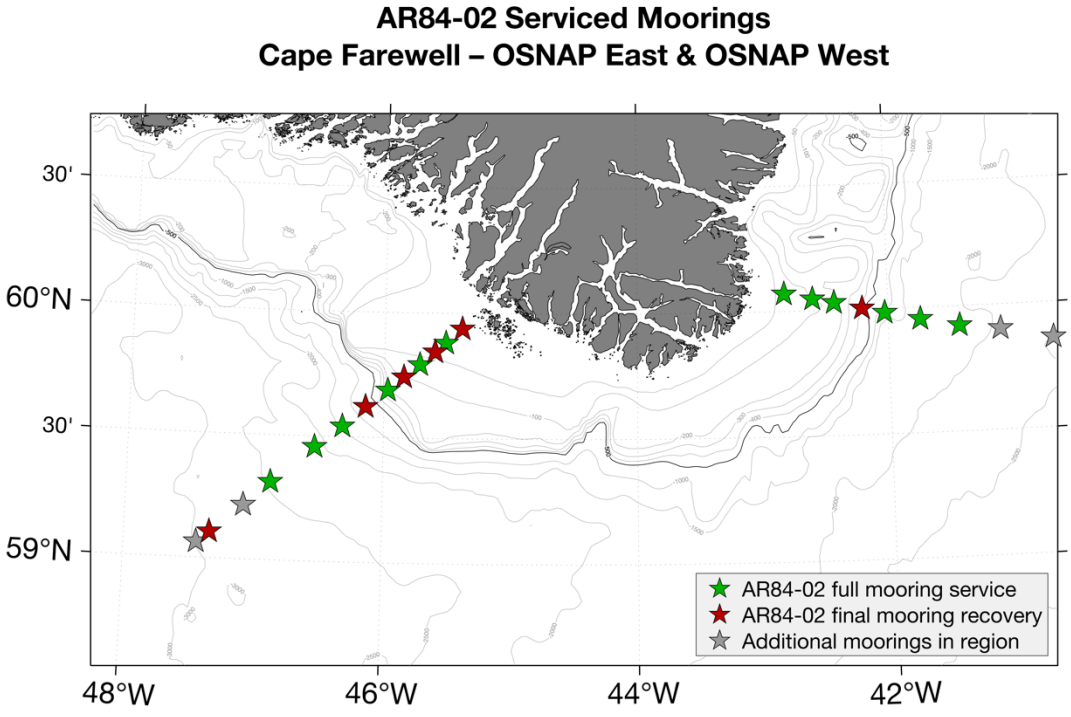


Figure B1: *OSNAP CF and LS moorings serviced during the cruise are indicated in color. Additional OSNAP and OOI moorings in the region are shown in grey.*

Most of the mooring deployments and recoveries used a Lebus double-capstan winch system. Moorings were deployed top flotation first. Instruments were attached progressively as the mooring spooled out, with the ship steaming into the current or the wind to keep the mooring streaming off the transom. Anchor drop locations accounted for mooring fallback. All subsurface moorings were surveyed after deployment; the surveyed locations are reported in Table B2. The tripods were lowered to the seafloor using a lowering release system and the trawl wire; they were released within a few meters of the seafloor. Their deployment locations are reported using the A-frame-referenced ship's position.

Recovery occurred by releasing the moorings with the vessel positioned so that the mooring was expected to surface 300-500m in front of the ship. Moorings were hooked with a grapnel hook connected to the leader line on the Lebus winch fed through a block mounted on the A-frame and recovered progressively through the A-frame. Instruments were sequentially recovered in top to bottom order. All moorings surfaced after release.

B2: Mooring Data

Overall, the mooring data return was excellent. Only four MicroCATs failed or were not recovered. The CF1 and CF2 50m Microcats were both missing. The CF1 50m Microcat was not redeployed as it rarely comes back. CF5 instruments again showed signs of the usual strong current; the 100m Microcat clamped below the sphere was missing and the 100m optode had a groove worn in the pressure casing. Some of the Aquadopps had slid down in their cages and were resting on the anodes as well. The LS8 50m tether Microcat had had its plug shorn off and was flooded. All of the Aquadopps except for one returned full records. The CF6 bottom Aquadopp had some water in it, but a partial record was recovered from the memory card. The two Nortek Signature 100 ADCPs both failed before the end of the deployment. The ADCP on CF2 lasted until March 2023 and the ADCP on LS3 lasted until December 2023. Both appear to have failed because they used all their battery power. CF7's Workhorse ADCP had an incomplete record, and LS2's Long Ranger ADCP only recorded data for a few days. All optodes returned full data records. Figures of moored instrument data return are included in Appendix C.

Approximately 20 CTD casts were conducted to pre, and post calibrate microcats and optodes. Calibration casts involved hose clamping instruments onto ratchet straps mounted vertically on the Rosette. Microcats were programmed to sample at 10 Hz and held at 2-3 depths for 10 min. Further information is available in Appendix A.

Table B1. Recovered mooring positions

OSNAP EAST					
Name	**Latitude**	**Longitude**	**Bottom depth**	**Date**	**Release Time**
CF1	60 04.208	42 49.527	170	20-Jul	6:19
CF2	60 02.853	42 35.975	178	20-Jul	8:01
CF3	60 01.851	42 25.708	184	20-Jul	9:11
CF4	60 00.302	42 12.340	384	15-Jul	18:29
CF5	59 59.087	42 01.563	1260	15-Jul	14:39
CF6	59 57.277	41 44.648	1829	14-Jul	8:45
CF7	59 55.367	41 26.020	1901	15-Jul	7:51
OSNAP WEST					
Name	**Latitude**	**Longitude**	**Bottom depth**	**Date**	**Release Time**
LSI	59 56.281	45 23.240	130	5-Aug	8:02
LSA	59 52.840	45 30.990	121	4-Aug	6:14
LSB	59 50.700	45 36.090	134	5-Aug	9:25
LS1	59 47.598	45 43.222	144	29-Jul	19:26
LS2	59 44.588	45 50.732	157	5-Aug	10:45
LS3	59 41.360	45 58.240	191	29-Jul	17:38
LS4	59 37.318	46 08.631	738	28-Jul	10:40
LS5	59 32.512	46 19.361	1501	1-Aug	14:07
LS6	59 27.437	46 32.210	2033	3-Aug	6:20
LS7	59 18.715	46 52.418	2463	27-Jul	6:32
LS8	59 06.314	47 20.141	2935	26-Jul	8:01

Table B2. Deployed mooring positions

OSNAP EAST						
Name	**Latitude**	**Longitude**	**Bottom depth**	**Date**	**Anchor Drop Time**	**Position Method**
CF1	60 04.208	42 49.523	172	24-Jul	16:47	stern referenced
CF2	60 02.850	42 35.970	180	23-Jul	7:18	stern referenced
CF3	60 01.854	42 25.699	186	24-Jul	8:29	stern referenced
CF5	59 59.177	42 01.663	1267	17-Jul	11:16	surveyed position
CF6	59 57.333	41 44.578	1827	19-Jul	10:46	surveyed position
CF7	59 55.431	41 25.946	1900	19-Jul	16:33	surveyed position
OSNAP WEST						
Name	**Latitude**	**Longitude**	**Bottom depth**	**Date**	**Anchor Drop Time**	**Position Method**
LSA	59 52.839	45 30.985	124	5-Aug	6:30	stern referenced
LS1	59 47.568	45 43.205	143	1-Aug	10:01	stern referenced
LS3	59 41.359	45 58.236	193	1-Aug	12:22	stern referenced
LS5	59 32.486	46 19.564	1514	2-Aug	16:00	surveyed position
LS6	59 27.284	46 32.234	2020	3-Aug	16:23	surveyed position
LS7	59 18.800	46 52.604	2466	29-Jul	11:34	surveyed position

C: Shipboard hydrographic survey

Contributing authors: Leah McRaven and Monica Nelson, Adam Houk, George Tupper, Ben Freiberger, and Hiroki Nagao

C1: CTD survey

A total of 268 CTD casts were done during AR84-02. The CTDs supported moored instrument calibrations (for microcats and optodes), release testing, and the transport and overturning calculations within the OSNAP program. In addition to completing high-resolution hydrographic sections along the CF and LS mooring lines (Figure C1), upstream and downstream sections were occupied near each mooring array for additional quasi-synoptic snapshots of the complex currents near Cape Farewell. Additional CTD surveys were carried out near Kangerlussuatsiaq trough and Narsq trough to shed light on the exchange of waters between the fjord, shelf, and slope regions. At the end of the cruise the Irminger section was occupied, spanning from the end of the CF mooring array to the Reykjanes Ridge. CTD station locations are shown in Figure A2 and an event log with station details is included in Appendix A.

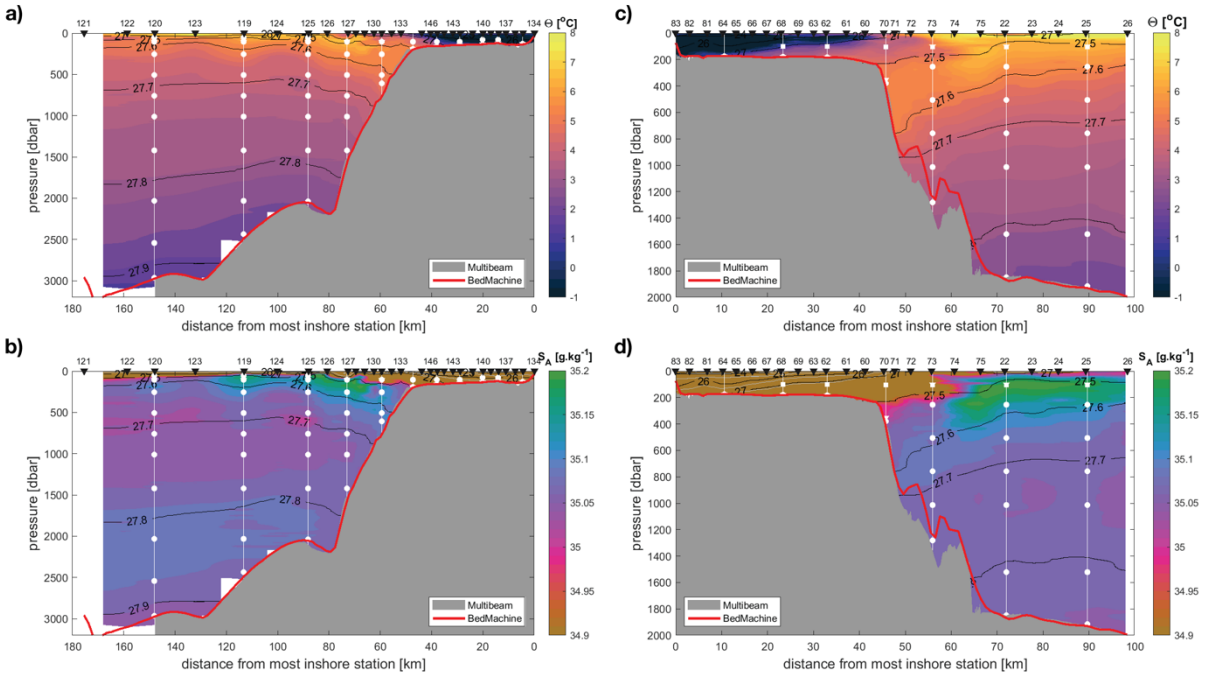


Figure C1: a) *Gridded Conservative Temperature field from CTD casts along the LS mooring array (colored). Potential density contours are shown (black) along with the LS mooring assets (white). Bathymetry is from the shipboard multibeam (grey patch), with BedMachine bathymetry (red) shown for comparison.* ***b)*** *Gridded Absolute Salinity field from CTD casts along the LS mooring array (colored), with the 31, 32, 33, and 34 g/kg-1 isohalines that are off the colormap overlain (grey). Potential density contours, mooring assets, and bathymetry shown as in a).* ***c)*** *and* ***d)*** *Same as* ***a)*** *and* ***b)****, but for the CF mooring array. Plots by Monica Nelson.*

CTDs were performed using a Sea-Bird 911plus CTD and deck unit configured to measure pressure, temperature, conductivity, and dissolved oxygen. Bottom approach was controlled by real time altimeter data together with the ship's multibeam data. Discrete water samples were collected at up to 24 discrete intervals using a CTD rosette frame holding 24 10-L Niskin bottles. Additional information on discrete samples can be found in section C3. Due to the importance of dissolved oxygen measurements for the GOHSNAP objectives, dual SBE43 dissolved oxygen sensors were installed on the system. In addition, a Rinko optode, provided by Scripps ODF, was installed. Calibrations of all CTD sensors were performed by the manufacturer before the cruise.

CTD data were processed using SeaBird data processing software. The raw CTD data were lag corrected, edited for large spikes, smoothed according to sensor, and pressure averaged into 2 db bins for final data quality control and analysis. Salinity and oxygen data were then further quality controlled and calibrated using Niskin water measurements. Overall CTD performance was excellent with the exception of a handful of biofouling events. A detailed outline of important events, problems encountered, and data processing can be found in the AR84-02_CTD_Calibration_Report.pdf document.

C2: SADCP survey

Shipboard ADCP data were collected throughout the cruise using the Armstrong's three hull-mounted current profilers: a Teledyne RDI Workhorse 300 kHz, and two Ocean Surveyor ADCPs operating at 150 and 38 kHz. SADCP data will be used together with CTD observations along the CF, LS, Irminger, and additional quasi-synoptic sections. An example along the CF and LS arrays is shown in Figure C2.

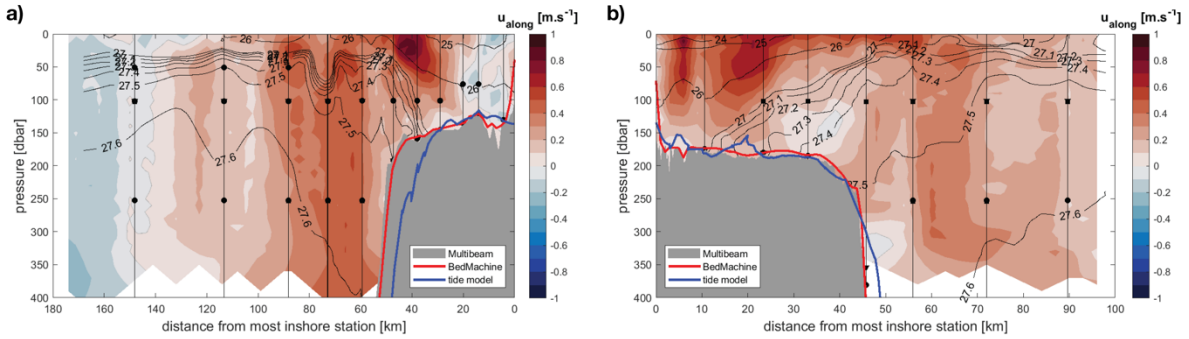


Figure C2: a) *Detitded, gridded along-stream velocity from the OS150 along the LS mooring array (colored), with the 0 m.s-1 contour overlain (grey). The coordinate system is rotated 318.1 degrees clockwise from north (Pacini et al. 2020) to convert to along-and cross-stream coordinates. Potential density contours are shown (black) along with the LS mooring assets (black). Bathymetry is from the shipboard multibeam (grey patch), with BedMachine bathymetry (red) and bathymetry from tide-model (blue) shown for comparison.* ***b)*** *Same as panel a), but along the CF mooring array. The coordinate system is rotated 203.3 degrees clockwise from north (Le Bras et al. 2018) to convert to along-and cross-stream coordinates. Plots by Monica Nelson.*

Data were collected using UHDAS (University of Hawaii Data Acquisition System). Shipboard ADCP data acquisition began shortly after leaving the Iceland EEZ and completed prior to reentering the Iceland EEZ. The 38 kHz Ocean Surveyor (OS38) was configured for narrowband mode, with a vertical bin size of 16 meters, and an ensemble average interval of 300 seconds. The 150 kHz Ocean Surveyor (OS150) was configured for narrowband mode, with a vertical bin size of 4 meters, and an ensemble average interval of 300 seconds. Bottom tracking on the OS38/150 was disabled for the duration of the cruise. The Workhorse 300 kHz ADCP was configured for a vertical bin size of 2 meters, and a 120-second ensemble interval.

Data from all three ADCPs were processed throughout the cruise. The typical UHDAS post-processing steps were performed, which include editing out bad data, applying small phase/amplitude corrections using the water track calibration routine, and finally exporting the averaged ensemble data to MATLAB format for de-tiding and further analysis. Tidal corrections to the current data were made using the OSU tidal prediction software (OTPS) with the TPXO9-v5-atlas tidal model. The data quality of all three sonars was excellent throughout the cruise. Additional configuration details, detailed processing information, and additional information is available upon request.

C3: Discrete water sampling

Discrete water samples were collected for salinity in support of OSNAP objectives, and for dissolved oxygen and DIC/TA were collected in support of GOHSNAP objectives. A higher concentration of these samples was collected from the CF, LS, and Irminger sections, with an emphasis on stations near moorings, pre-mooring recovery casts, moored instrument calibration casts, and deeper/stable water masses. Salinity and dissolved oxygen samples were analyzed at sea. Discrete samples of DIC/TA were collected along the CF, LS, and Irminger sections, and were shipped back to land for analysis. A summary table of discrete sample stations and depths is provided in Appendix A. Additional information on discrete samples can be found in section C3.

Salinity samples were continuously analyzed during the cruise using a WHOI-provided salinometer. A total of 1020 salinity samples were collected in 200 ml glass bottles. The bottles were rinsed three times, and then filled to the neck. After the samples reached the lab temperature of approximately 20°C, they were analyzed for salinity using a Guildline Salinometer model 8400 B. Accuracies of salinity measurements were ±0.002 psu when a good standardization was achieved. Bottle salinity values were then merged with CTD bottle files to be used in further calibrating the CTD's conductivity sensors.

Dissolved oxygen samples were analyzed during the cruise with an SIO/ODF-designed automated oxygen titrator. A total of 589 oxygen samples were collected (including duplicates). Flasks were rinsed 3 times with minimal agitation using a silicone draw tube, then filled and allowed to overflow, ensuring no bubbles remained. Pickling

reagents MnCl2 and NaI/NaOH (1 mL of each) were added via bottle-top dispensers to fix samples before stoppering. Flasks were shaken to assure thorough dispersion of the precipitate - once immediately after drawing and then again after 20-60 minutes. Sample draw temperatures were used to calculate umol/kg concentrations. Niskin samples were analyzed within 2-24 hours of collection.

57 DIC/TA samples were drawn, poisoned with Mercuric Chloride, and stored for onshore analysis. DIC/TA samples were taken at all oxygen sample sites. DIC/TA supplies were provided by H. Palevsky, who is responsible for analyzing the samples (Boston College; palevsky@bc.edu; GOHSNAP co-PI). A detailed summary of all discrete samples is included in Appendix A.

Appendix A

AX1: AR84-02 Event Log

OSNAP 2024 Event Log									
CTD Number	Station Name	Time (UTC)	Latitude (decimal N)	Longitude (decimal W)	Latitude (deg N)	(min N)	Latitude (deg W)	(min W)	Additional notes
Transit		7/9/24 10:30							Departed Reykjavik
1	test	7/10/24 13:20	61.8728	29.6197	61	52.37	29	37.18	CTD and winch testing. O2 and salinity sample training
Transit									Transit towards CF array, dogleg west to avoid rough weather
2	cal dip 1	7/11/24 10:23	61.6538	34.9925	61	39.23	34	59.55	water sampling, pre cal dip
3	cal dip 2	7/11/24 14:28	61.6205	35.2543	61	37.23	35	15.26	water sampling, pre cal dip
4	cal dip 3	7/11/24 18:03	61.6193	35.259	61	37.16	35	15.54	water sampling, pre cal dip
Transit									Transit towards CF array
5	cal dip 4	7/12/24 9:05	60.6953	38.6968	60	41.72	38	41.81	water sampling, shallow pre cal dip
6	cal dip 5	7/12/24 12:31	60.4953	39.4002	60	29.72	39	24.01	water sampling, pre cal dip
Transit									Transit towards section 1
section 1									coming into ice edge
7	S1-1	7/12/24 21:06	60.0242	41.0205	60	1.45	41	1.23	water sampling
8	S1-2	7/12/24 23:26	60.0302	41.1383	60	1.81	41	8.3	
9	S1-3	7/13/24 1:41	60.0373	41.237	60	2.24	41	14.22	water sampling
10	S1-4	7/13/24 3:56	60.041	41.3257	60	2.46	41	19.54	
11	S1-5	7/13/24 5:49	60.0455	41.4148	60	2.73	41	24.89	water sampling
12	S1-7	7/13/24 8:09	60.0557	41.5952	60	3.34	41	35.71	water sampling, skipped S1-6
Transit									Transit in ice towards CF5, unsucessful
section 2									coming out of ice edge
13	S2-19	7/13/24 11:44	59.9517	41.7988	59	57.1	41	47.93	
14	S2-20	7/13/24 13:43	59.943	41.7565	59	56.58	41	45.39	water sampling, pre-recovery CF6 calibration cast
15	S2-21	7/13/24 16:22	59.9463	41.6455	59	56.78	41	38.73	water sampling
16	S2-22	7/13/24 18:14	59.9353	41.5422	59	56.12	41	32.53	water sampling
17	S2-23	7/13/24 20:36	59.9142	41.4408	59	54.85	41	26.45	water sampling, pre-recovery CF7 calibration cast
18	S2-24	7/13/24 23:27	59.9195	41.2722	59	55.17	41	16.33	water sampling
19	S2-25	7/14/24 1:57	59.9155	41.2067	59	54.93	41	12.4	water sampling
20	S2-26	7/14/24 3:55	59.8957	41.1182	59	53.74	41	7.09	water sampling, near M1
CF6 mooring recovery		7/14/24 8:45							
Transit									Transit in ice towards CF5, unsucessful
section 2									coming out of ice edge
21	S2-19	7/14/24 14:39	59.9627	41.8632	59	57.76	41	51.79	water sampling, CTD in ice
22	S2-20	7/14/24 17:47	59.9452	41.7557	59	56.71	41	45.34	water sampling, post cal dip for instruments recovered on CF6
23	S2-21	7/14/24 21:06	59.946	41.6457	59	56.76	41	38.74	
24	S2-22	7/14/24 22:56	59.9362	41.5433	59	56.17	41	32.6	water sampling
25	S2-23	7/15/24 0:46	59.915	41.4425	59	54.9	41	26.55	
26	S2-24	7/15/24 2:44	59.92	41.2752	59	55.2	41	16.51	water sampling
Transit									
CF7 mooring recovery		7/15/24 7:51							
Transit									
27	S2-17	7/15/24 13:22	59.976	42.0357	59	58.56	42	2.14	water sampling, pre-recovery CF5 calibration cast
CF5 mooring recovery		7/15/24 14:39							
28	S2-14	7/15/24 17:35	59.9973	42.2042	59	59.84	42	12.25	water sampling, pre-recovery CF4 calibration cast
CF4 mooring recovery		7/15/24 18:29							
section 2									going into ice edge
29	S2-13	7/15/24 20:16	60.0145	42.2863	60	0.87	42	17.18	
30	S2-12	7/15/24 21:04	60.023	42.36	60	1.38	42	21.6	
Transit									transit back to where we left the line
31	S2-15	7/15/24 22:13	60.0025	42.1692	60	0.15	42	10.15	
32	S2-16	7/15/24 23:17	59.9977	42.1082	59	59.86	42	6.49	
33	S2-17	7/16/24 0:37	59.9767	42.0357	59	58.6	42	2.14	
34	S2-18	7/16/24 2:01	59.9777	41.941	59	58.66	41	56.46	
35	S2-19	7/16/24 3:28	59.9698	41.8437	59	58.19	41	50.62	
mooring refurb									

36	S2-20	7/16/24 10:29	59.9463	41.7508	59	56.78	41	45.05	water sampling, post cal dip cast for instruments recovered on CF7/CF5/CF4
37	S2-20	7/16/24 14:14	59.921	41.761	59	55.26	41	45.66	water sampling, post cal dip cast for instruments recovered on CF7/CF5/CF4
Transit									
section 3: ice survey									going into ice edge along southern edge of Kangerlussuatsiaq trough
38	ICE-1	7/16/24 18:40	60.2987	42.0098	60	17.92	42	0.59	
39	ICE-2	7/16/24 19:19	60.298	42.0662	60	17.88	42	3.97	
40	ICE-3	7/16/24 19:58	60.3035	42.12	60	18.21	42	7.2	
41	ICE-4	7/16/24 19:58	60.302	42.1743	60	18.12	42	10.46	
42	ICE-5	7/16/24 21:13	60.3022	42.2278	60	18.13	42	13.67	
43	ICE-6	7/16/24 21:52	60.3028	42.2827	60	18.17	42	16.96	
44	ICE-7	7/16/24 22:28	60.3	42.34	60	18	42	20.4	
45	ICE-8	7/16/24 23:08	60.294	42.3982	60	17.64	42	23.89	
46	ICE-9	7/16/24 23:49	60.2865	42.4622	60	17.19	42	27.73	
47	ICE-10	7/17/24 0:26	60.2838	42.5272	60	17.03	42	31.63	Ice edge
Transit									
	ICE zig zag								offshore
	ICE zig zag								inshore ice edge
	ICE zig zag								arrive CF5
CF5 mooring deployment		7/17/24 11:16							
Transit									
Kangerlussuatsiaq trough survey (two cross-trough sections)									starting along ice edge
48	TR-1	7/17/24 16:16	60.2665	42.5275	60	15.99	42	31.65	
49	TR-2	7/17/24 16:59	60.2998	42.5288	60	17.99	42	31.73	
50	TR-3	7/17/24 17:49	60.334	42.5232	60	20.04	42	31.39	
51	TR-4	7/17/24 18:42	60.3657	42.5272	60	21.94	42	31.63	water sampling
52	TR-5	7/17/24 19:44	60.3888	42.5268	60	23.33	42	31.61	
53	TR-6	7/17/24 20:38	60.4145	42.529	60	24.87	42	31.74	
54	TR-8	7/17/24 22:38	60.3503	42.0347	60	21.02	42	2.08	skipped TR-7
55	TR-9	7/17/24 23:26	60.3245	42.064	60	19.47	42	3.84	
56	TR-10	7/18/24 0:09	60.3052	42.101	60	18.31	42	6.06	water sampling
57	TR-11	7/18/24 1:08	60.2827	42.133	60	16.96	42	7.98	
58	TR-12	7/18/24 1:56	60.261	42.1668	60	15.66	42	10.01	
59	TR-14	7/18/24 3:21	60.2385	41.9033	60	14.31	41	54.2	water sampling, skipped TR-13
Transit									transit to CF6 for deployment, but too rough so switched to CTDs along CF line
section 2									coming out of ice edge
60	S2-13	7/18/24 10:34	60.0137	42.2852	60	0.82	42	17.11	
61	S2-12	7/18/24 11:20	60.0222	42.3562	60	1.33	42	21.37	
62	S2-11	7/18/24 12:01	60.0215	42.4378	60	1.29	42	26.27	water sampling, pre-recovery CF3 calibration cast
63	S2-10	7/18/24 12:56	60.0367	42.4815	60	2.2	42	28.89	
Transit									transit inshore to ice edge
64	S2-4	7/18/24 14:37	60.062	42.8357	60	3.72	42	50.14	water sampling, pre-recovery CF1 calibration cast
65	S2-5	7/18/24 15:49	60.0657	42.7812	60	3.94	42	46.87	
66	S2-6	7/18/24 16:29	60.0593	42.7173	60	3.56	42	43.04	water sampling
67	S2-7	7/18/24 17:09	60.0473	42.665	60	2.84	42	39.9	
68	S2-8	7/18/24 17:59	60.0382	42.6117	60	2.29	42	36.7	water sampling, pre-recovery CF2 calibration cast
69	S2-9	7/18/24 18:59	60.036	42.543	60	2.16	42	32.58	
Transit									transit back to where we broke off line
70	S2-14	7/18/24 20:41	59.9925	42.2185	59	59.55	42	13.11	
71	S2-15	7/18/24 21:40	60.0017	42.1707	60	0.1	42	10.24	
72	S2-16	7/18/24 22:42	59.9955	42.1082	59	59.73	42	6.49	
73	S2-17	7/18/24 23:58	59.9758	42.0348	59	58.55	42	2.09	
74	S2-18	7/19/24 1:33	59.9783	41.9408	59	58.7	41	56.45	
75	S2-19	7/19/24 2:59	59.9692	41.8412	59	58.15	41	50.47	
CF6 mooring deployment		7/19/24 10:46							
CF7 mooring deployment		7/19/2024 16:33:00 AM							
Transit									
section 1									coming into ice edge
76	S1-9	7/19/24 21:09	60.0647	41.7803	60	3.88	41	46.82	water sampling
77	S1-11	7/19/24 23:10	60.0762	41.9557	60	4.57	41	57.34	
78	S1-13	7/20/24 0:38	60.0862	42.1097	60	5.17	42	6.58	water sampling
79	S1-15	7/20/24 1:51	60.0895	42.232	60	5.37	42	13.92	
80	S1-17	7/20/24 2:42	60.0968	42.3595	60	5.81	42	21.57	water sampling
CF1 mooring recovery		7/20/24 6:19							

CF2 mooring recovery		7/20/24 8:01							
CF3 mooring recovery		7/20/24 8:01							
Transit									
section 2									coming into ice edge
81	S2-3	7/20/24 11:09	60.0717	42.8945	60	4.3	42	53.67	
82	S2-2	7/20/24 12:04	60.085	42.9592	60	5.1	42	57.55	
83	S2-1	7/20/24 12:54	60.0897	43.0115	60	5.38	43	0.69	*Distance to rocks = 0.442 nm *Distance to land = 1.100 nm
Transit									transit north to Kangerlussuatsiaq to shelter during tripod refurbishing
84	S1-28	7/21/24 14:39	60.4083	43.2352	60	24.5	43	14.11	
section 1									
85	S1-27	7/22/24 17:05	60.134	43.0337	60	8.04	43	2.02	*Distance to rocks = 0.5 nm *Distance to land = 0.59 nm water sampling, post-cal dip for instruments recovered on CF tripods
86	S1-26	7/22/24 18:03	60.1307	42.9792	60	7.84	42	58.75	
87	S1-25	7/22/24 18:47	60.1265	42.9208	60	7.59	42	55.25	
88	S1-24	7/22/24 19:40	60.126	42.8457	60	7.56	42	50.74	water sampling
89	S1-23	7/22/24 20:24	60.1238	42.7978	60	7.43	42	47.87	
90	S1-22	7/22/24 21:08	60.1187	42.7387	60	7.12	42	44.32	
91	S1-21	7/22/24 21:51	60.1142	42.6737	60	6.85	42	40.42	water sampling
92	S1-20	7/22/24 22:35	60.112	42.6118	60	6.72	42	36.71	
93	S1-19	7/22/24 23:27	60.1072	42.5482	60	6.43	42	32.89	
94	S1-18	7/23/24 0:06	60.1037	42.484	60	6.22	42	29.04	water sampling
95	S1-17	7/23/24 0:48	60.1022	42.4213	60	6.13	42	25.28	
96	S1-16	7/23/24 1:33	60.0968	42.359	60	5.81	42	21.54	
97	S1-15	7/23/24 2:14	60.0943	42.2973	60	5.66	42	17.84	water sampling
98	S1-14	7/23/24 2:53	60.0903	42.2315	60	5.42	42	13.89	
Transit									
CF2 mooring deployment		7/23/24 7:18							
99		7/23/24 7:35	60.0455	42.6037	60	2.73	42	36.22	water sampling, CF2 post deployment calibration cast
Transit									
Northern trough section									
100	TN-1	7/23/24 13:54	60.5225	42.8785	60	31.35	42	52.71	
101	TN-2	7/23/24 14:30	60.516	42.8208	60	30.96	42	49.25	water sampling
102	TN-3	7/23/24 15:05	60.5138	42.7605	60	30.83	42	45.63	
103	TN-4	7/23/24 15:39	60.5102	42.6945	60	30.61	42	41.67	
104	TN-5	7/23/24 16:14	60.5097	42.6518	60	30.58	42	39.11	Unexpected heavy ice field offshore blocked access to TN-6
Transit									
section 3 inshore									*note this section changed name
105	ST-1	7/23/24 18:28	60.2385	42.9618	60	14.31	42	57.71	
106	ST-2	7/23/24 19:11	60.248	42.8982	60	14.88	42	53.89	water sampling
107	ST-3	7/23/24 19:55	60.252	42.8355	60	15.12	42	50.13	
108	ST-4	7/23/24 20:44	60.2553	42.7518	60	15.32	42	45.11	
109	ST-5	7/23/24 21:33	60.264	42.705	60	15.84	42	42.3	water sampling
110	ST-6	7/23/24 22:45	60.272	42.6522	60	16.32	42	39.13	
111	ST-7	7/23/24 23:36	60.2812	42.5613	60	16.87	42	33.68	
112	ST-8	7/24/24 0:20	60.285	42.5293	60	17.1	42	31.76	water sampling
113	ST-9	7/24/24 1:07	60.2878	42.46	60	17.27	42	27.6	
114	ST-10	7/24/24 1:48	60.2938	42.396	60	17.63	42	23.76	
115	ST-11	7/24/24 2:28	60.2993	42.3375	60	17.96	42	20.25	water sampling
116	ST-12	7/24/24 3:13	60.3018	42.2838	60	18.11	42	17.03	
CF3 mooring deployment		7/24/24 8:29							
117		7/24/24 8:47	60.029	42.433	60	1.74	42	25.98	water sampling, post deployment CF3 calibration cast
Transit									refurbish CF1
CF1 mooring deployment		7/24/24 16:47							
118	S2-4	7/24/24 17:10	60.0692	42.8305	60	4.15	42	49.83	water sampling, post deployment CF1 calibration cast
Transit									through PCS to LS side
section LS-main									
119	LSM-26	7/25/24 21:38	59.3217	46.887	59	19.3	46	53.22	water sampling, pre recovery LS7 calibration cast
120	LSM-28	7/26/24 1:49	59.1137	47.3435	59	6.82	47	20.61	water sampling, pre recovery LS8 calibration cast
LS8 mooring recovery		7/26/24 8:01							
121	LSM-30	7/26/24 14:47	58.9477	47.7033	58	56.86	47	42.2	post-cal dip for instruments recovered on LS8 *two microcats with 1000m

									pressure rating were included by accident
122	LSM-29	7/26/24 19:10	59.0445	47.4753	59	2.67	47	28.52	
123	LSM-27	7/26/24 22:32	59.1935	47.115	59	11.61	47	6.9	
124	LSM-25	7/27/24 2:12	59.3812	46.6872	59	22.87	46	41.23	
LS7 mooring recovery		7/27/24 6:32							
125	LSM-24	7/27/24 12:52	59.4667	46.5483	59	28	46	32.9	water sampling, pre-recovery cal cast for LS6 and post-cal dip for instruments recovered on LS7
126	LSM-23	7/27/24 16:19	59.4965	46.4278	59	29.79	46	25.67	
127	LSM-22	7/27/24 18:23	59.5508	46.3295	59	33.05	46	19.77	water sampling, pre recovery LS5 calibration cast
128	LSM-21	7/27/24 20:22	59.5635	46.2788	59	33.81	46	16.73	
129	LSM-20	7/27/24 21:42	59.581	46.231	59	34.86	46	13.86	
130	LSM-19	7/27/24 22:58	59.6025	46.1828	59	36.15	46	10.97	
131	LSM-18	7/28/24 0:02	59.6305	46.1553	59	37.83	46	9.32	water sampling, pre recovery LS4 calibration cast
132	LSM-17	7/28/24 1:33	59.6437	46.0887	59	38.62	46	5.32	
133	LSM-16	7/28/24 2:22	59.6628	46.039	59	39.77	46	2.34	
Transit									transit out to LS7 for deployment, too rough for deployment
134	LSM-1	7/28/24 16:35	59.9603	45.3208	59	57.62	45	19.25	*Distance to rocks = 0.6 nm
135	LSM-2	7/28/24 17:19	59.9458	45.395	59	56.75	45	23.7	water sampling, pre recovery LSI calibration cast
136	LSM-3	7/28/24 18:05	59.9172	45.4215	59	55.03	45	25.29	
137	LSM-4	7/28/24 18:45	59.8967	45.4705	59	53.8	45	28.23	
138	LSM-5	7/28/24 19:21	59.8887	45.526	59	53.32	45	31.56	water sampling, pre recovery LSA calibration cast
139	LSM-6	7/28/24 20:06	59.8658	45.5605	59	51.95	45	33.63	
140	LSM-7	7/28/24 20:42	59.8532	45.6083	59	51.19	45	36.5	water sampling, pre recovery LSB calibration cast
141	LSM-8	7/28/24 21:35	59.8243	45.6552	59	49.46	45	39.31	
142	LSM-9	7/28/24 22:16	59.8017	45.729	59	48.1	45	43.74	water sampling, pre recovery LS1 calibration cast
143	LSM-10	7/28/24 23:06	59.7788	45.7587	59	46.73	45	45.52	
144	LSM-11	7/28/24 23:42	59.759	45.8057	59	45.54	45	48.34	
145	LSM-12	7/29/24 0:15	59.7525	45.8545	59	45.15	45	51.27	water sampling, pre recovery LS2 calibration cast
146	LSM-13	7/29/24 1:11	59.7317	45.8817	59	43.9	45	52.9	
147	LSM-14	7/29/24 1:45	59.7105	45.9267	59	42.63	45	55.6	
LS7 mooring deploymet		7/29/24 11:34							
148	LSM-15	7/29/24 16:43	59.6977	45.9787	59	41.86	45	58.72	water sampling, pre recovery LS3 calibration cast
LS3 mooring recovery		7/29/24 17:38							
LS1 mooring recovery		7/29/24 19:26							
section LS-north									
149	LSN-1	7/29/24 21:52	59.7227	46.4037	59	43.36	46	24.22	
150	LSN-3	7/29/24 22:59	59.7562	46.306	59	45.37	46	18.36	
151	LSN-5	7/30/24 0:11	59.7928	46.198	59	47.57	46	11.88	
152	LSN-7	7/30/24 1:02	59.8278	46.0997	59	49.67	46	5.98	
153	LSN-8	7/30/24 1:40	59.8438	46.0483	59	50.63	46	2.9	
154	LSN-9	7/30/24 2:20	59.8618	45.9985	59	51.71	45	59.91	
155	LSN-10	7/30/24 2:59	59.8797	45.9427	59	52.78	45	56.56	
156	LSN-11	7/30/24 3:33	59.8987	45.8927	59	53.92	45	53.56	
157	LSN-12	7/30/24 4:11	59.9178	45.8428	59	55.07	45	50.57	
158	LSN-13	7/30/24 4:45	59.9348	45.7882	59	56.09	45	47.29	
159	LSN-14	7/30/24 5:17	59.9512	45.7363	59	57.07	45	44.18	
160	LSN-15	7/30/24 5:51	59.9698	45.6772	59	58.19	45	40.63	
161	LSN-16	7/30/24 6:25	59.9885	45.6293	59	59.31	45	37.76	
162	LSN-17	7/30/24 6:59	60.0065	45.5782	60	0.39	45	34.69	
163	LSN-18	7/30/24 7:31	60.0242	45.526	60	1.45	45	31.56	
164	LSN-19	7/30/24 8:05	60.0417	45.4743	60	2.5	45	28.46	
165	LSN-20	7/30/24 8:38	60.06	45.4223	60	3.6	45	25.34	
166	LSN-21	7/30/24 9:09	60.0787	45.3718	60	4.72	45	22.31	
167	LSN-22	7/30/24 9:45	60.0942	45.3165	60	5.65	45	18.99	*Distance to rocks = 0.25 nm
Transit									transit into fjord for tripod refurbishing and sheltering from weather
168		7/31/24 11:23	60.2047	44.8562	60	12.28	44	51.37	water sampling, cal dip for shallow instruments recovered on LS4, LS3, and LS1
LS1 mooring deployment		8/1/24 10:01							
LS3 mooring deployment		8/1/24 12:22							
LS5 mooring recovery		8/1/24 16:42							
Transit									
section LS-south									

169	LSM-26	8/1/24 19:19	59.32	46.8813	59	19.2	46	52.88	water sampling, post-deployment cal cast for LS7 and cal dip for instruments recovered on LS4 and LS5
Transit									
170	LSS-26	8/2/24 1:42	58.72	46.7002	58	43.2	46	42.01	water sampling
171	LSS-25	8/2/24 4:22	58.8282	46.537	58	49.69	46	32.22	
172	LSS-24	8/2/24 5:55	58.9348	46.3778	58	56.09	46	22.67	
173	LSS-23	8/2/24 7:25	59.0408	46.217	59	2.45	46	13.02	
174	LSS-22	8/2/24 8:57	59.149	46.0567	59	8.94	46	3.4	
Transit									
LS5 mooring deployment		8/2/24 16:00							
175	LSM-22	8/2/24 17:30	59.5502	46.3578	59	33.01	46	21.47	water sampling, post-deployment cal cast for LS5, cal dip to 1000m for pressure-limited sensors recovered on LS moorings.
Transit									
176	LSS-21	8/2/24 21:43	59.2245	45.9418	59	13.47	45	56.51	
177	LSS-20	8/2/24 23:04	59.3002	45.8312	59	18.01	45	49.87	
178	LSS-19	8/3/24 0:18	59.3485	45.7512	59	20.91	45	45.07	
179	LSS-18	8/3/24 1:21	59.389	45.6828	59	23.34	45	40.97	
180	LSS-17	8/3/24 2:17	59.4143	45.6498	59	24.86	45	38.99	
Transit									
LS6 mooring recovery		8/3/24 6:20							
181	LSM-24	8/3/24 10:39	59.4762	46.5447	59	28.57	46	32.68	cal dip for instruments recovered on LS6
LS6 mooring deployment		8/3/24 16:23							
Transit									
182	LSS-16	8/3/24 21:50	59.4393	45.6147	59	26.36	45	36.88	
183	LSS-15	8/3/24 23:00	59.4637	45.5745	59	27.82	45	34.47	water sampling
184	LSS-14	8/4/24 0:17	59.486	45.5307	59	29.16	45	31.84	
185	LSS-13	8/4/24 1:06	59.5117	45.4938	59	30.7	45	29.63	
186	LSS-12	8/4/24 1:53	59.5375	45.454	59	32.25	45	27.24	
187	LSS-11	8/4/24 2:34	59.5592	45.4155	59	33.55	45	24.93	water sampling
188	LSS-10	8/4/24 3:15	59.5862	45.3757	59	35.17	45	22.54	
189	LSS-9	8/4/24 3:51	59.6093	45.3388	59	36.56	45	20.33	
Transit									
LSA mooring recovery		8/4/24 6:14							
Transit									Tuck into fjord for refurbishing LSA and securing back deck for transit
190		8/4/24 12:20	60.1762	45.0748	60	10.57	45	4.49	release testing in fjord
Transit									
191	LSS-1	8/4/24 19:29	59.8055	45.0247	59	48.33	45	1.48	
192	LSS-2	8/4/24 20:04	59.7802	45.0647	59	46.81	45	3.88	water sampling
193	LSS-3	8/4/24 20:41	59.7565	45.1055	59	45.39	45	6.33	
194	LSS-4	8/4/24 21:17	59.7325	45.1448	59	43.95	45	8.69	
195	LSS-5	8/4/24 21:50	59.708	45.1827	59	42.48	45	10.96	water sampling
196	LSS-6	8/4/24 22:28	59.683	45.2208	59	40.98	45	13.25	
197	LSS-7	8/4/24 23:02	59.6595	45.2625	59	39.57	45	15.75	
198	LSS-8	8/4/24 23:38	59.6342	45.2993	59	38.05	45	17.96	water sampling
Transit									
LSA mooring deployment		8/5/24 6:30							
LSI mooring recovery		8/5/24 8:02							
LSB mooring recovery		8/5/24 9:25							
LS2 mooring recovery		8/5/24 10:45							
Transit									
section Narsaq trough survey parts 1 and 2									
199	P2-15	8/5/24 14:18	59.6478	46.9335	59	38.87	46	56.01	water sampling
200	P2-14	8/5/24 15:20	59.6802	46.8727	59	40.81	46	52.36	
201	P2-13	8/5/24 16:15	59.7137	46.8127	59	42.82	46	48.76	
202	P2-12	8/5/24 17:10	59.747	46.753	59	44.82	46	45.18	
203	P2-11	8/5/24 18:14	59.7797	46.696	59	46.78	46	41.76	water sampling
204	P2-10	8/5/24 19:14	59.8147	46.6368	59	48.88	46	38.21	
205	P2-9	8/5/24 20:11	59.8478	46.5763	59	50.87	46	34.58	
206	P2-8	8/5/24 21:11	59.8815	46.515	59	52.89	46	30.9	
207	P2-7	8/5/24 22:10	59.9148	46.4547	59	54.89	46	27.28	
208	P2-6	8/5/24 23:14	59.947	46.3935	59	56.82	46	23.61	water sampling
209	P2-5	8/5/24 23:56	59.9812	46.3328	59	58.87	46	19.97	
210	P2-4	8/6/24 0:32	60.0137	46.2732	60	0.82	46	16.39	
211	P2-3	8/6/24 1:09	60.0468	46.2112	60	2.81	46	12.67	water sampling
212	P2-2	8/6/24 1:48	60.08	46.1508	60	4.8	46	9.05	
213	P2-1	8/6/24 2:22	60.1137	46.0903	60	6.82	46	5.42	
Transit									
214	P1-1	8/6/24 4:23	60.1822	46.6822	60	10.93	46	40.93	

215	P1-2	8/6/24 4:55	60.1733	46.7347	60	10.4	46	44.08	water sampling
216	P1-3	8/6/24 5:37	60.1648	46.7855	60	9.89	46	47.13	
217	P1-4	8/6/24 6:16	60.1565	46.8368	60	9.39	46	50.21	
218	P1-5	8/6/24 6:55	60.1473	46.8885	60	8.84	46	53.31	
219	P1-6	8/6/24 7:35	60.1387	46.9398	60	8.32	46	56.39	water sampling
220	P1-7	8/6/24 8:21	60.1483	47.0025	60	8.9	47	0.15	
221	P1-8	8/6/24 9:02	60.1598	47.0522	60	9.59	47	3.13	
222	P1-9	8/6/24 9:40	60.1707	47.1022	60	10.24	47	6.13	
223	P1-10	8/6/24 10:21	60.1823	47.152	60	10.94	47	9.12	water sampling
224	P1-11	8/6/24 11:07	60.1938	47.202	60	11.63	47	12.12	
225	P1-12	8/6/24 11:44	60.2048	47.252	60	12.29	47	15.12	
226	P1-13	8/6/24 12:17	60.2155	47.2965	60	12.93	47	17.79	
Transit									
227	P1-23	8/6/24 14:31	60.2733	46.7425	60	16.4	46	44.55	skipped P1-24, water sampling
228	P1-22	8/6/24 15:10	60.2778	46.7923	60	16.67	46	47.54	
229	P1-21	8/6/24 15:54	60.2833	46.8473	60	17	46	50.84	
230	P1-20	8/6/24 16:38	60.289	46.9	60	17.34	46	54	
231	P1-19	8/6/24 17:24	60.2948	46.9552	60	17.69	46	57.31	water sampling
232	P1-18	8/6/24 18:14	60.302	47.0085	60	18.12	47	0.51	
233	P1-17	8/6/24 19:02	60.3075	47.0632	60	18.45	47	3.79	
234	P1-16	8/6/24 19:44	60.3098	47.1125	60	18.59	47	6.75	
235	P1-15	8/6/24 20:22	60.3167	47.166	60	19	47	9.96	skipped P1-14, water sampling
Transit									
236	P1-25	8/6/24 22:09	60.3883	47.6088	60	23.3	47	36.53	
237	P1-24	8/6/24 22:50	60.345	47.6357	60	20.7	47	38.14	
238	P1-23	8/6/24 23:32	60.302	47.6662	60	18.12	47	39.97	
239	P1-22	8/7/24 0:13	60.2582	47.6913	60	15.49	47	41.48	water sampling
240	P1-21	8/7/24 1:02	60.2148	47.7205	60	12.89	47	43.23	
241	P1-20	8/7/24 2:04	60.1718	47.744	60	10.31	47	44.64	
242	P1-19	8/7/24 3:06	60.1295	47.7712	60	7.77	47	46.27	water sampling
243	P1-18	8/7/24 4:10	60.0858	47.7993	60	5.15	47	47.96	
244	P1-17	8/7/24 5:13	60.0425	47.8277	60	2.55	47	49.66	
245	P1-16	8/7/24 6:09	60.0002	47.8503	60	0.01	47	51.02	cal dip for 600-1000m instruments, water sampling
Transit									Transit halfway through PCS
246		8/8/24 9:16	60.1713	44.1865	60	10.28	44	11.19	cal dip for shallow instruments
Transit									Complete transit through PCS
CF shelf stations									Coming out of PCS to see how much fresh water remained
247	S2-2	8/8/24 14:08	60.0823	42.9577	60	4.94	42	57.46	
248	S2-8	8/8/24 15:38	60.0398	42.608	60	2.39	42	36.48	
249	S2-13	8/8/24 17:02	60.0145	42.2867	60	0.87	42	17.2	
Irminger Section									
250	IR-1	8/8/24 19:11	59.9458	41.754	59	56.75	41	45.24	post-deployment cal cast for CF6, water sampling
251	IR-2	8/8/24 22:08	59.915	41.4452	59	54.9	41	26.71	post-deployment cal cast for CF7, water sampling
252	IR-3	8/9/24 1:45	59.8805	40.9003	59	52.83	40	54.02	water sampling
253	IR-4	8/9/24 4:46	59.8308	40.4785	59	49.85	40	28.71	water sampling
254	IR-5	8/9/24 8:00	59.7922	40.0587	59	47.53	40	3.52	water sampling
255	IR-6	8/9/24 8:00	59.7922	40.0587	59	47.53	40	3.52	water sampling
256	IR-7	8/9/24 15:19	59.6753	38.9397	59	40.52	38	56.38	water sampling
257	IR-8	8/9/24 20:46	59.5493	37.7625	59	32.96	37	45.75	water sampling
258	IR-9	8/10/24 1:16	59.4493	36.9212	59	26.96	36	55.27	water sampling
259	IR-10	8/10/24 6:13	59.3162	35.9943	59	18.97	35	59.66	water sampling
260	IR-11	8/10/24 10:34	59.226	35.2087	59	13.56	35	12.52	near IC0, water sampling
261	IR-12	8/10/24 15:04	59.1653	34.4155	59	9.92	34	24.93	water sampling
262	IR-13	8/10/24 18:31	59.1005	33.8167	59	6.03	33	49	near IC1, water sampling
263	IR-14	8/10/24 23:08	59.0342	32.8693	59	2.05	32	52.16	near IC2, water sampling
264	IR-15	8/11/24 3:17	58.976	32.0583	58	58.56	32	3.5	near IC3, water sampling
265	IR-16	8/11/24 6:33	58.9188	31.4018	58	55.13	31	24.11	near IC4, water sampling
266	IR-17	8/11/24 10:17	58.8872	30.6137	58	53.23	30	36.82	water sampling
267	IR-18	8/11/24 14:00	58.835	30.1013	58	50.1	30	6.08	
268	IR-19	8/11/24 16:54	58.7978	29.554	58	47.87	29	33.24	
Transit back to Iceland									

AX2: AR84-02 Dissolved Oxygen and DIC/TA sample summary

Dissolved oxygen and DIC/TA sample summary				
CTD station	**Notes**	**Depths Sampled for DO**	**Number of DIC / TA Bottles**	**Depths Samples for DIC/TA**
001	**Test CTD Cast. DO Sampling Practice**	1300m x3, 1517m x3, 1867m x3, Bottom x3	0	N/A
002	Microcat Calibration Dip. Depth level of 2000m from CLIVAR B replaced with 1950m to accommodate for microcat calibration dip. Microcat cal dip stops at 2497m (including release test), 1950m, and 1200m.	N/A	0	N/A
003	**Microcat Calibration Dip and DO Sampling Practice. Depth level of 1733m from CLIVAR C replaced with 1798m (target depth of 1800m) to accommodate for microcat calibration dip. Microcat cal dip stops at 2494m (including release test), 1798m, and 1250m.**	162m x2, 502m x2, 1433m x2, 2494m x2	0	N/A
004	**Optode and Microcat Calibration Dip. Depth level of 1867m from CLIVAR A replaced with 1947m (target depth of 1950m) to accommodate for microcat calibration dip. Optode cal dip stops at 2495m, 1300m, 974m, and 453m. Microcat cal dip stops at same depths as optode cal dips, plus 1947m.**	97m, 237m, 453m, 619m, 974m x2, 1300m x2, 2495m x2	0	N/A
005	Shallow Microcat Calibration Dip. Depths sampled for salinity: 301m, 277m, 232m, 202m, 172m, 142m, 122m, 102m, 77m, 52m, and 27m. Microcat cal dip stop at 277m.	N/A	0	N/A
006	Deep Microcat Calibration Dip. Microcat cal dip stops at 2495m, 1599m, and 902m.	N/A	0	N/A
007 (CF_N 1)		236m, 467m, 1300m x2, 2132m	0	N/A
008 (CF_N 2)		N/A	0	N/A
009 (CF_N 3)		1350m x2	0	N/A
010 (CF_N 4)		N/A	0	N/A
011 (CF_N 5)		1925m, 1101m x2, 452m, 161m	0	N/A
012 (CF_N 6)		980m x2	0	N/A
013 (CF_N 7)		N/A	0	N/A
014 (CF-20)	**Calibration Cast for CF6 Mooring**	236m, 377m, 717m x2, 1150m x2, 1359m x2, 1801m x2	4	236m, 1150m, 1359m, 1801m
015 (CF-21)		602m, 998m, 1335m x2, 1816m	0	N/A
016 (CF-22)		1350m x2	0	N/A
017 (CF-23)	**Calibration Cast for CF7 Mooring**	112m, 354m, 502m, 586m, 1101m x2, 1250m x2, 1885m x2	4	112m, 1101m, 1250m, 1885m
018 (CF-24)		1517m x2	0	N/A
019 (CF-25)	Salts at 112m, 204m, 502m, 999m, 1522m, and 1995m.	999m x2	0	N/A
020 (CF-26)		1497m x2	0	N/A
021 (CF-19)	Salts at 254m, 973m, 1560m, and 1789m.	N/A	0	N/A
022 (CF-20)	**Optode and Microcat Calibration Dip. Optode cal dip stops at 1802m, 1450m, 1101m, and 653m. Microcat cal dip stops at 1802m, 1101m, and 1001m.**	154m, 527m, 653m x2, 1101m x2, 1450m x2, 1802m x2	0	N/A
023 (CF-21)	Repeat of CTD Station 015	N/A	0	N/A
024 (CF-22)	Repeat of CTD Station 016. Salts at 303m, 1102m, 1399m, and 1845m.	1399m x2	0	N/A
025 (CF-23)	Repeat of CTD Station 017	N/A	0	N/A
026 (CF-24)	Repeat of CTD Station 018. Salts at 91m, 1001m, 1450m, and 1957m.	1450m x2	0	N/A
027 (CF-17)	**Calibration Cast for CF5 Mooring**	54m, 203m, 553m x2, 637m x2, 1000m x2, 1303m x2	4	54m, 203m, 553m, 1303m
028 (CF-14)	**Calibration Cast for CF4 Mooring**	43m, 93m x2, 153m, 203m, 253m, 378m x2	2	93m, 378m
029 (CF-13)		N/A	0	N/A
030 (CF-12)		N/A	0	N/A
031 (CF-15)		N/A	0	N/A
032 (CF-16)		N/A	0	N/A
033 (CF-17)		N/A	0	N/A
034 (CF-18)		N/A	0	N/A
035 (CF-19)		N/A	0	N/A
036	**Optode and Microcat Calibration Dip. Release test at bottom. Optode cal dip stops at 1772m, 971m, and 627m. Microcat cal dip stops at 1772m, 1339m, and 971m.**	50m, 183m, 500m x2, 625m x2, 970m x2, 1775m x2	0	N/A
037	Microcat Calibration Dip. Microcat cal dip stops at 1795m, 1398m, and 1099m.	N/A	0	N/A
038 (ICE-1)		N/A	0	N/A
039 (ICE-2)		N/A	0	N/A
040 (ICE-3)		N/A	0	N/A
041 (ICE-4)		N/A	0	N/A
042 (ICE-5)		N/A	0	N/A
043 (ICE-6)		N/A	0	N/A
044 (ICE-7)		N/A	0	N/A
045 (ICE-8)		N/A	0	N/A
046 (ICE-9)		N/A	0	N/A
047 (ICE-10)		N/A	0	N/A
048 (inner-1)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
049 (inner-2)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
050 (inner-3)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A

051 (inner-4)	Trough surveys. Sampling planned by Monica Nelson.	104m, 203m, 303m, and 481m	0	N/A
052 (inner-5)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
053 (inner-6)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
054 (outer-2)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
055 (outer-3)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
056 (outer-4)	Trough surveys. Sampling planned by Monica Nelson.	63m, 153m, 302m, and 380m	0	N/A
057 (outer-5)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
058 (outer-6)	Trough surveys. Sampling planned by Monica Nelson.	N/A	0	N/A
059 (offshore)	Trough surveys. Sampling planned by Monica Nelson.	35m, 65m, 254m, and 1066m	0	N/A
060 (CF-13)	CF line extra cast	N/A	0	N/A
061 (CF-12)	CF line extra cast	N/A	0	N/A
062 (CF-11)	**Calibration Cast for CF3 Mooring**	24m, 54m x2, 123m x2, 180m x2	2	54m, 123m
063 (CF-10)		N/A	0	N/A
064 (CF-4)	**Calibration Cast for CF1 Mooring**	20m x2, 104m x2, 167m	2	20m, 104m
065 (CF-5)		N/A	0	N/A
066 (CF-6)		16m, 53m, 172m	0	N/A
067 (CF-7)		N/A	0	N/A
068 (CF-8)	**Calibration Cast for CF2 Mooring**	53m x2, 89m x2, 176m	2	53m, 89m
069 (CF-9)		N/A	0	N/A
070 (CF-14)	Close to CF4 Mooring	38m, 103m, 203m, and 340m	0	N/A
071 (CF-15)		N/A	0	N/A
072 (CF-16)		N/A	0	N/A
073 (CF-17)	Close to CF5 Mooring	79m, 433m, 602m, and 1305m	0	N/A
074 (CF-18)		N/A	0	N/A
075 (CF-19)		N/A	0	N/A
076 (CF_N 9)		573m, 1151m, and 1429m x2	0	N/A
077 (CF_N 11)		N/A	0	N/A
078 (CF_N 13)		30m, 130m, 254m, and 404m	0	N/A
079 (CF_N 15)		N/A	0	N/A
080 (CF_N 17)		29m, 90m, 168m, and 207m	0	N/A
081 (CF_N 19)		N/A	0	N/A
082		43m, 103m x2, 159m x2	0	N/A
083		N/A	0	N/A
084	**Optode and Microcat Calibration Dip. Release test at bottom. Optode cal dip stops at 273m, 183m, 123m, and 73m. Microcat cal dip stops at 302m, 273m, and 183m.**	73m x2, 123m x2, 183m x2, and 273m x2	0	N/A
085 (CF_N 28)		N/A	0	N/A
086 (CF_N 27)		63m, 113m, 142m, and 153m	0	N/A
087 (CF_N 26)		N/A	0	N/A
088 (CF_N 25)		N/A	0	N/A
089 (CF_N 24)		78m, 93m, 127m, and 164m	0	N/A
090 (CF_N 23)		N/A	0	N/A
091 (CF_N 22)		N/A	0	N/A
092 (CF_N 21)		62m, 93m, 172m, and 203m	0	N/A
093 (CF_N 20)		N/A	0	N/A
094 (CF_ N 19)		N/A	0	N/A
095 (CF_ N 18)		23m, 53m, 103m, and 218m	0	N/A
096 (CF_ N 17)		N/A	0	N/A
097 (CF_ N 16)		N/A	0	N/A
098 (CF_ N 15)		20m, 43m, 78m, and 224m	0	N/A
099 (CF_N 14)	**Post-Deployment Calibration Cast for CF2 Mooring**	28m, 48m, 127m x2, and 170m x2	0	N/A
100		N/A	0	N/A
101		39m, 55m, 78m, and 133m	0	N/A
102		N/A	0	N/A
103		N/A	0	N/A
104	No samples taken due to concerns over sea-ice cover	N/A	0	N/A
105		N/A	0	N/A

106	Niskin Bottle No. 1 failed to close upon firing.	19m, 93m, and 121m	0	N/A
107		N/A	0	N/A
108		N/A	0	N/A
109		20m, 136m, 191m, and 292m	0	N/A
110		N/A	0	N/A
111		N/A	0	N/A
112		18m, 67m, 202m, and 258m	0	N/A
113		N/A	0	N/A
114		N/A	0	N/A
115		38m, 83m, 118m, and 237m	0	N/A
116		N/A	0	N/A
117	**Post-Deployment Calibration Cast for CF3 Mooring**	43m x2, 78m x2, 142m x2, and 176m x2	0	N/A
118	**Post-Deployment Calibration Cast for CF1 Mooring**	73m x2, 103m x2, 123m x2, and 156m x2	0	N/A
119 (LS-26)	**Calibration Cast for LS7 Mooring**	104m, 652m x2, 1200m x2, 1597m x2, and 2455m x2	3	1200m, 1597m, and 2455m
120 (LS-28)	**Calibration Cast for LS8 Mooring**	100m, 222m x2, 1223m x2, 1801m x2, and 2915m x2	5	100m, 222m, 1223m, 1801m, and 2915m
121 (LS-30)	**Optode and Microcat Calibration Dip of LS8 mooring. Release test at bottom. Optode cal dip stops at 2872m, 2099m, 1400m, and 902m. Microcat cal dip stops at 2872m, 1866m, 1151m.**	619m, 902m x2, 1400m x2, 2099m x2, and 2872m x2	0	N/A
122 (LS-29)		N/A	0	N/A
123 (LS-27)		N/A	0	N/A
124 (LS-25)		N/A	0	N/A
125 (LS-24)	**Optode and Microcat Calibration Dip of LS7 mooring + Calibration Cast for LS6 Mooring. Release test at bottom. Optode cal dip stops at 2050m, 1452m, 1053m, and 720m. Microcat cal dip stops at 2050m, 1302m, and 978m.**	197m, 569m, 720m x2, 1053m x2, 1452m x2, and 2050m x2	4	197m, 1053m, 1452m, and 2050m
126 (LS-23)		1416m x2	0	N/A
127 (LS-22)	**Calibration Cast for LS5 Mooring**	220m, 428m, 621m x2, 1100m x2, and 1437m x2	4	428m, 621m, 1100m, and 1437m
128 (LS-21)		N/A	0	N/A
129 (LS-20)		N/A	0	N/A
130 (LS-19)		N/A	0	N/A
131 (LS-18)	**Calibration Cast for LS4 Mooring**	20m, 125m x2, 237m x2, and 619m x2	3	125m, 237m, and 619m
132 (LS-17)		N/A	0	N/A
133 (LS-16)		N/A	0	N/A
134 (LS-1)		N/A	0	N/A
135 (LS-2)	**Calibration Cast for LSI Mooring**	43m, 103m x2, and 124m x2	0	N/A
136 (LS-3)		N/A	0	N/A
137 (LS-4)		N/A	0	N/A
138 (LS-5)	**Calibration Cast for LSA Mooring**	34m x2 and 107m x2	0	N/A
139 (LS-6)		N/A	0	N/A
140 (LS-7)	**Calibration Cast for LSB Mooring**	33m, 89m x2, and 121m x2	0	N/A
141 (LS-8)		N/A	0	N/A
142 (LS-9)	**Calibration Cast for LS1 Mooring**	34m, 64m x2, and 129m x2	2	34m and 129m
143 (LS-10)		N/A	0	N/A
144 (LS-11)		N/A	0	N/A
145 (LS-12)	**Calibration Cast for LS2 Mooring**	40m x2, 103m x2, and 142m	0	N/A
146 (LS-13)		N/A	0	N/A
147 (LS-14)		N/A	0	N/A
148 (LS-15)	**Calibration Cast for LS3 Mooring**	73m x2, 103m x2, and 179m	2	73m and 103m
149	Hydrographic section north of LS line	N/A	0	N/A
150	Hydrographic section north of LS line	N/A	0	N/A
151	Hydrographic section north of LS line	N/A	0	N/A
152	Hydrographic section north of LS line	N/A	0	N/A
153	Hydrographic section north of LS line	N/A	0	N/A
154	Hydrographic section north of LS line	N/A	0	N/A
155	Hydrographic section north of LS line	N/A	0	N/A
156	Hydrographic section north of LS line	N/A	0	N/A
157	Hydrographic section north of LS line	N/A	0	N/A
158	Hydrographic section north of LS line	N/A	0	N/A
159	Hydrographic section north of LS line	N/A	0	N/A
160	Hydrographic section north of LS line	N/A	0	N/A
161	Hydrographic section north of LS line	N/A	0	N/A
162	Hydrographic section north of LS line	N/A	0	N/A
163	Hydrographic section north of LS line	N/A	0	N/A
164	Hydrographic section north of LS line	N/A	0	N/A
165	Hydrographic section north of LS line	N/A	0	N/A
166	Hydrographic section north of LS line	N/A	0	N/A
167	Hydrographic section north of LS line	N/A	0	N/A
168	**Optode and Microcat Calibration Dip of LS1 and LS3 moorings. Optode cal dip stops at 167m, 92m, and 30m. Release test at bottom.**	30m x2, 92m x2, and 167m x2	0	N/A

169	**Optode and Microcat Calibration Dip + LS7 Post-Deployment Calibration Cast. Optode cal dip stops at 2455m, 1865m, 1251m, and 752m. Microcat cal dip stops at 2455m, 1517m, and 752m. Release test at bottom.**	146m, 752m x2, 1251m x2, 1865m x2, and 2455m x2	0	N/A
170	Hydrographic section south of LS line	304m, 1088m x2, 1751m x2, and 2600m	0	N/A
171	Hydrographic section south of LS line	N/A	0	N/A
172	Hydrographic section south of LS line	N/A	0	N/A
173	Hydrographic section south of LS line	N/A	0	N/A
174	Hydrographic section south of LS line	N/A	0	N/A
175	**Microcat Calibration Dip + LS5 Post-Deployment Calibration Cast. Microcat cal dip stops at 328m and 999m.**	129m x2, 328m x2, and 999m x2	0	N/A
176	Hydrographic section south of LS line	N/A	0	N/A
177	Hydrographic section south of LS line	N/A	0	N/A
178	Hydrographic section south of LS line	N/A	0	N/A
179	Hydrographic section south of LS line	N/A	0	N/A
180	Hydrographic section south of LS line	N/A	0	N/A
181	**Optode and Microcat Calibration Dip of LS6 moorings. Optode cal dip stops at 802m, 1298m, and 1592m. Microcat cal dip stops at 802m, 1298m, and 2092m.**	234m, 802m x2, 1298m x2, 1592m x2, and 2092m	0	N/A
182		N/A	0	N/A
183		203m, 402m, 601m, and 910m	0	N/A
184		N/A	0	N/A
185		N/A	0	N/A
186		N/A	0	N/A
187		28m, 43m, 103m, and 199m	0	N/A
188		N/A	0	N/A
189		N/A	0	N/A
190	Acoustic release test.	N/A	0	N/A
191	Hydrographic section south of LS line	N/A	0	N/A
192	Hydrographic section south of LS line	33m, 62m, 92m, and 128m	0	N/A
193	Hydrographic section south of LS line	N/A	0	N/A
194	Hydrographic section south of LS line	N/A	0	N/A
195	Hydrographic section south of LS line	38m, 48m, 68m, and 120m	0	N/A
196	Hydrographic section south of LS line	N/A	0	N/A
197	Hydrographic section south of LS line	N/A	0	N/A
198	Hydrographic section south of LS line	34m, 94m, 123m, and 155m	0	N/A
199	Narsaq Trough Survey	154m, 354m, 503m, and 701m	0	N/A
200	Narsaq Trough Survey	N/A	0	N/A
201	Narsaq Trough Survey	N/A	0	N/A
202	Narsaq Trough Survey	N/A	0	N/A
203	Narsaq Trough Survey	204m, 403m, 601m, and 701m	0	N/A
204	Narsaq Trough Survey	N/A	0	N/A
205	Narsaq Trough Survey	N/A	0	N/A
206	Narsaq Trough Survey	N/A	0	N/A
207	Narsaq Trough Survey	203m, 400m, 596m, and 698m	0	N/A
208	Narsaq Trough Survey	N/A	0	N/A
209	Narsaq Trough Survey	N/A	0	N/A
210	Narsaq Trough Survey	N/A	0	N/A
211	Narsaq Trough Survey	54m, 74m, 94m, and 125m	0	N/A
212	Narsaq Trough Survey	N/A	0	N/A
213	Narsaq Trough Survey	N/A	0	N/A
214	Narsaq Trough Survey	N/A	0	N/A
215	Narsaq Trough Survey	59m, 104m, 173m, and 216m	0	N/A
216	Narsaq Trough Survey	N/A	0	N/A
217	Narsaq Trough Survey	N/A	0	N/A
218	Narsaq Trough Survey	N/A	0	N/A
219	Narsaq Trough Survey	83m, 143m, 228m, and 331m	0	N/A
220	Narsaq Trough Survey	N/A	0	N/A
221	Narsaq Trough Survey	N/A	0	N/A
222	Narsaq Trough Survey	N/A	0	N/A
223	Narsaq Trough Survey	88m, 152m, 242m, and 302m	0	N/A
224	Narsaq Trough Survey	N/A	0	N/A
225	Narsaq Trough Survey	N/A	0	N/A
226	Narsaq Trough Survey	N/A	0	N/A
227	Narsaq Trough Survey	54m, 103m, 128m, and 195m	0	N/A
228	Narsaq Trough Survey	N/A	0	N/A
229	Narsaq Trough Survey	N/A	0	N/A
230	Narsaq Trough Survey	N/A	0	N/A
231	Narsaq Trough Survey	53m, 302m, 401m, and 463m	0	N/A
232	Narsaq Trough Survey	N/A	0	N/A
233	Narsaq Trough Survey	N/A	0	N/A
234	Narsaq Trough Survey	N/A	0	N/A

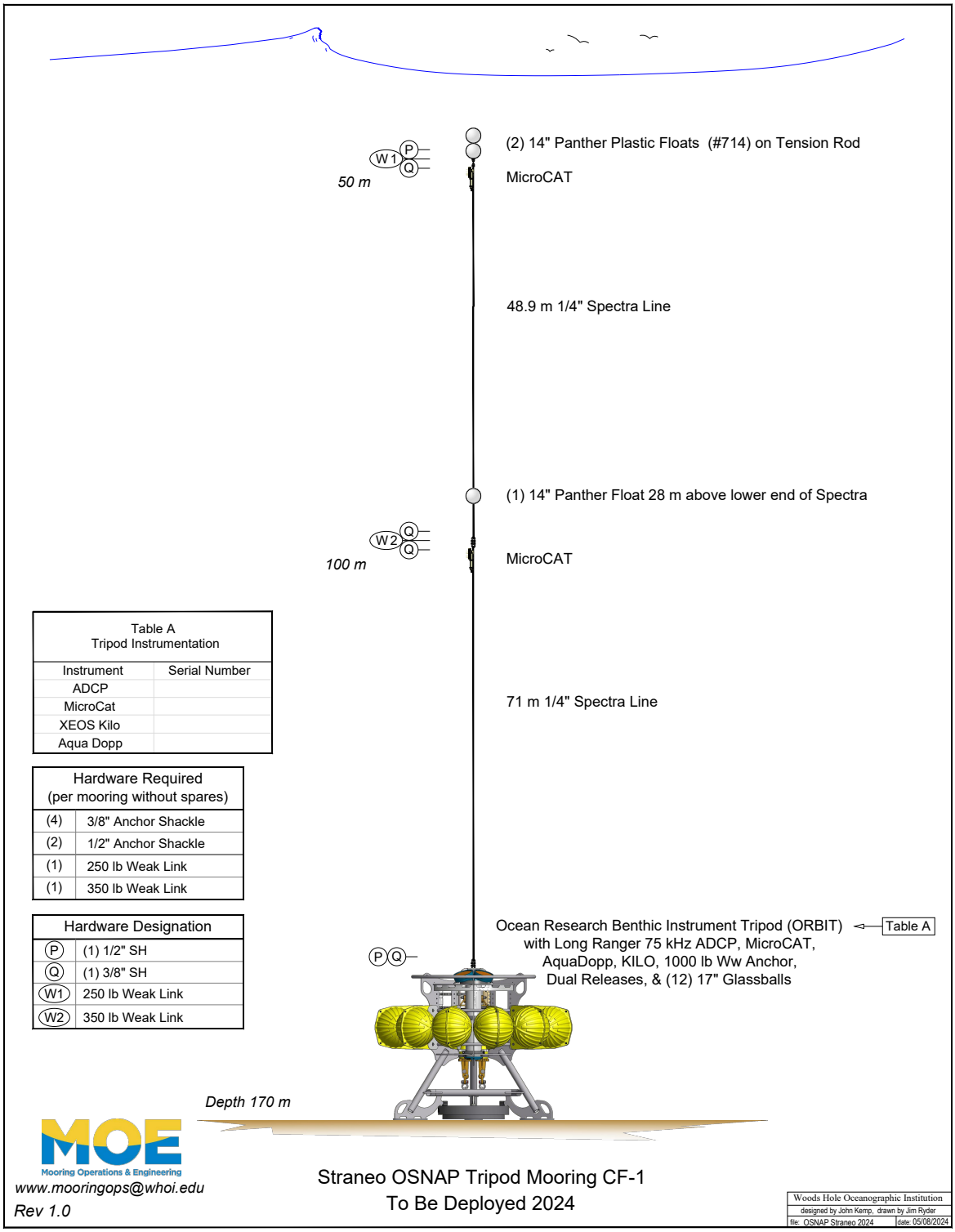
235	Narsaq Trough Survey	23m, 63m, 103m, and 129m	0	N/A
236	Narsaq Trough Survey	N/A	0	N/A
237	Narsaq Trough Survey	N/A	0	N/A
238	Narsaq Trough Survey	N/A	0	N/A
239	Narsaq Trough Survey	31m, 50m, 123m, and 180m	0	N/A
240	Narsaq Trough Survey	N/A	0	N/A
241	Narsaq Trough Survey	N/A	0	N/A
242	Narsaq Trough Survey	33m, 203m, 402m, and 697m	0	N/A
243	Narsaq Trough Survey	N/A	0	N/A
244	Narsaq Trough Survey	N/A	0	N/A
245	Narsaq Trough Survey + Microcat Calibration Dip. Microcat cal dip stops at 600m and 375m.	168m, 233m, 427m, and 600m	0	N/A
246	Microcat Calibration Dip. Microcat cal dip stop at 300m.	N/A	0	N/A
247		N/A	0	N/A
248		N/A	0	N/A
249		N/A	0	N/A
250 (IR-1)	**Post-Deployment Calibration Cast for CF6 Mooring**	46m, 379m x2, 976m x2, 1126m, and 1802m x2	0	N/A
251 (IR-2)	**Post-Deployment Calibration Cast for CF7 Mooring**	204m, 602m x2, 1051m x2, 1600m x2, and 1882m x2	0	N/A
252 (IR-3)		380m, 753m, 1600m, and 2270m	0	N/A
253 (IR-4)		108m, 251m, 429m, 1200m, 1750m x2, and 2463m	0	N/A
254 (IR-5)		652m, 1300m, 1748m, and 2622m	0	N/A
255 (IR-6)		629m, 1102m, 1867m x2, and 2750m	0	N/A
256 (IR-7)		80m, 330m, 554m, 1054m, 2000m x2, and 2895m	5	80m, 554m, 1054m, 2000m, and 2895m
257 (IR-8)		753m, 1052m, 2298m, and 3093m	0	N/A
258 (IR-9)		401m, 600m, 1335m, 2299m x2, and 3094m	0	N/A
259 (IR-10)		422m, 1128m, 2297m, and 3079m	0	N/A
260 (IR-11)	Near Mooring IC0	89m, 374m, 1003m, 2198m x2, and 3015m	5	89m, 374m, 1003m, 2198m, and 3015m
261 (IR-12)		504m, 1002m, 1900m, and 2388m	0	N/A
262 (IR-13)	Near Mooring IC1	254m, 753m, 1102m, and 2249m	0	N/A
263 (IR-14)	Near Mooring IC2	100m, 401m, 1251m, and 2206m x2	4	100m, 401m, 1251m, and 2206m
264 (IR-15)	Near Mooring IC3	277m, 503m, 1400m, and 1755m	0	N/A
265 (IR-16)	Near Mooring IC4	105m, 381m, 601m, 800m, 1433m x2, and 1586m	0	N/A
266 (IR-17)		305m, 604m, 1003m, and 1408m	0	N/A
267 (IR-18)		N/A	0	N/A
268 (IR-19)		N/A	0	N/A

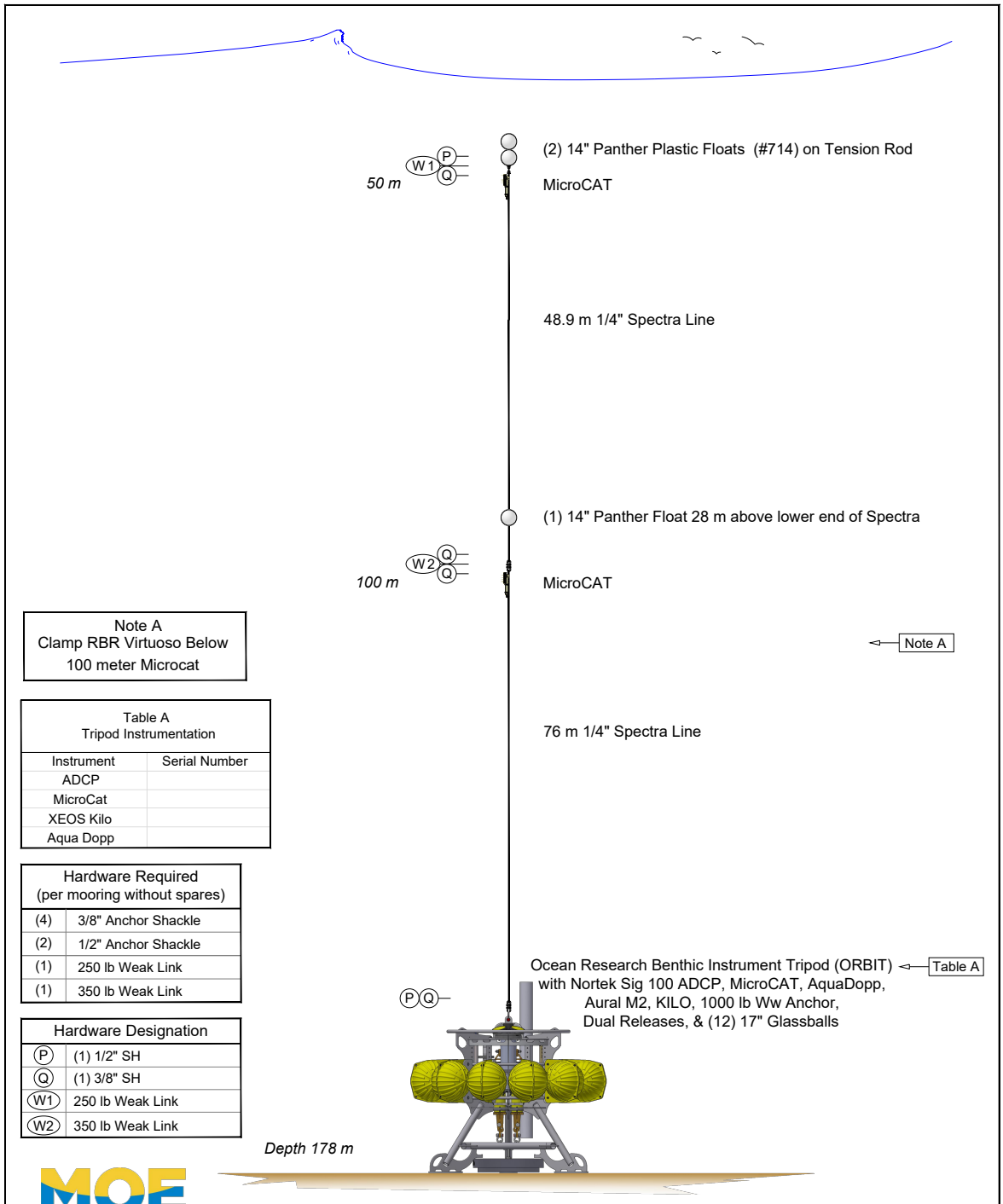
Appendix B

BX1: Mooring diagram modification summary

Mooring	Component or instrument	Change to be made on TBD diagram
OSNAP EAST		
CF1	top teather (50m-100m)	remove
	bottom teather (100m-168m)	lengthen (top floats sit near 120m)
	50m microcat	remove
	100m microcat	move to 120m
	100m optode	add
CF2	100m optode (Note A)	remove
CF3	N/A	N/A
CF5	750m optode	add (Note B)
CF6	50m optode -duet	add under microcat
	105m optode -duet	remove (Note A)
	1500m optode	move to 1000m (Note A)
CF7	1500m optode -duet	remove (Note C) (leave other optode)
OSNAP WEST		
LSA	50m optode -duet	add under microcat
	on tripod optode -duet	add (Table A)
LS1	75m optode -duet	remove (leave other optode)
LS3	N/A	N/A
LS5	105m optode	add (Note A)
	750m optode	add (Note B)
	1400m optode	add (Note B)
LS6	500m optode	add (Note B)
	1000m optode	add (Note B)
LS7	50m optode -duet	add
	105m optode	add (Note A)
	750m optode -duet	add (Note B)
	1400m optode -duet	add (Note B)
	2400m microcat	add
	2400m optode	add (Note B)

BX2: Mooring diagrams




(2) 14" Panther Plastic Floats (#714) on Tension Rod
W1
P
Q
50 m
MicroCAT
48.9 m 1/4" Spectra Line
(1) 14" Panther Float 28 m above lower end of Spectra
W2
Q
Q
100 m
MicroCAT
Note A
Clamp RBR Virtuoso Below
100 meter Microcat
Note A
76 m 1/4" Spectra Line
Table A
Tripod Instrumentation
Instrument
Serial Number
ADCP
MicroCat
XEOS Kilo
Aqua Dopp
Ocean Research Benthic Instrument Tripod (ORBIT)
Table A
with Nortek Sig 100 ADCP, MicroCAT, AquaDopp,
Aural M2, KILO, 1000 lb Ww Anchor,
Dual Releases, & (12) 17" Glassballs
P
Q
Hardware Required
(per mooring without spares)
(4) 3/8" Anchor Shackle
(2) 1/2" Anchor Shackle
(1) 250 lb Weak Link
(1) 350 lb Weak Link
Hardware Designation
P (1) 1/2" SH
Q (1) 3/8" SH
W1 250 lb Weak Link
W2 350 lb Weak Link
Depth 178 m
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Straneo OSNAP Tripod Mooring CF-2
To Be Deployed 2024
Woods Hole Oceanographic Institution
designed by John Kemp, drawn by Jim Ryder
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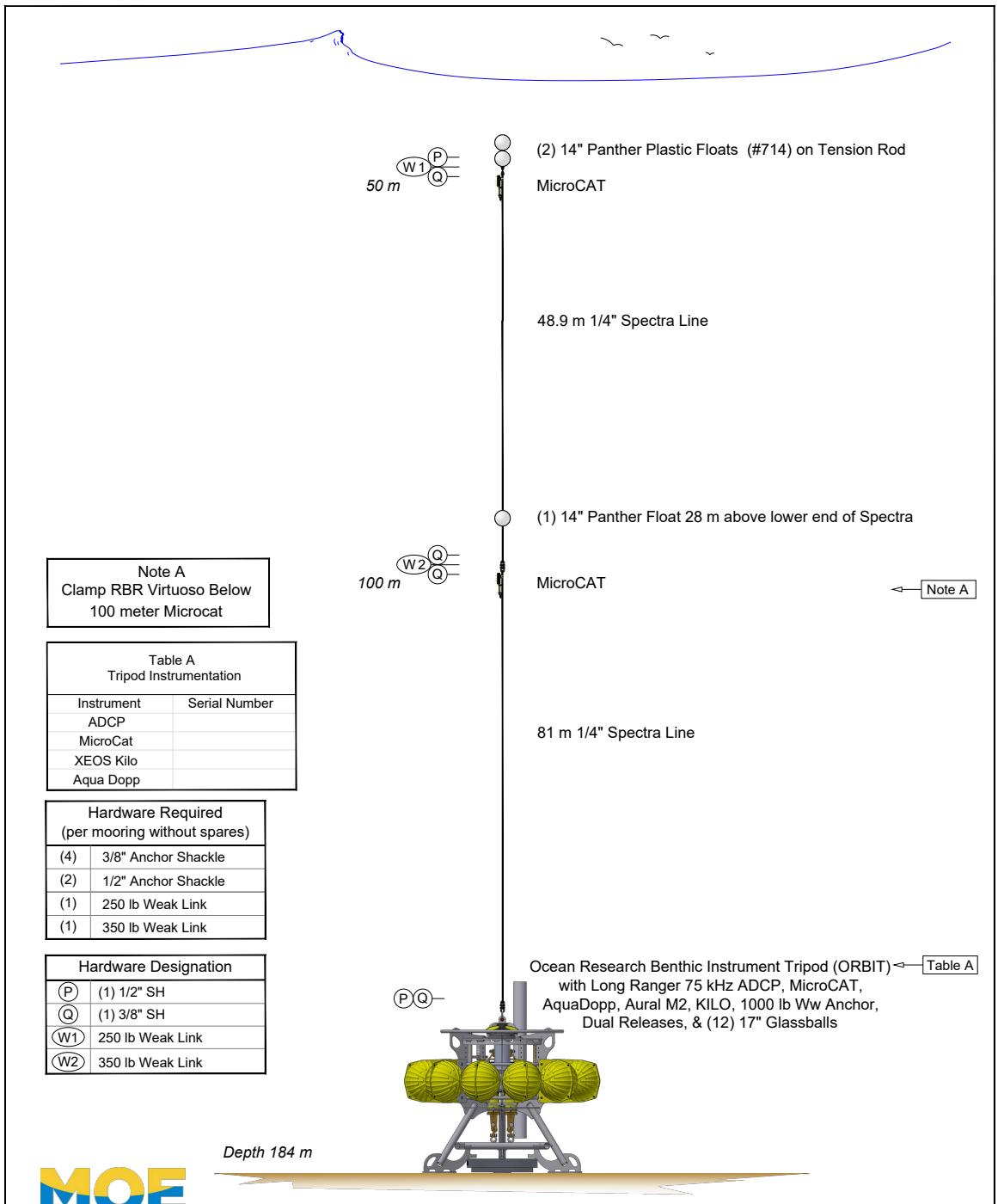

Note A
Clamp RBR Virtuoso Below 100 meter Microcat

Table A
Tripod Instrumentation

Instrument	Serial Number
ADCP	
MicroCat	
XEOS Kilo	
Aqua Dopp	

Hardware Required (per mooring without spares)	
(4)	3/8" Anchor Shackle
(2)	1/2" Anchor Shackle
(1)	250 lb Weak Link
(1)	350 lb Weak Link

Hardware Designation	
P	(1) 1/2" SH
Q	(1) 3/8" SH
W1	250 lb Weak Link
W2	350 lb Weak Link

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Straneo OSNAP Tripod Mooring CF-3
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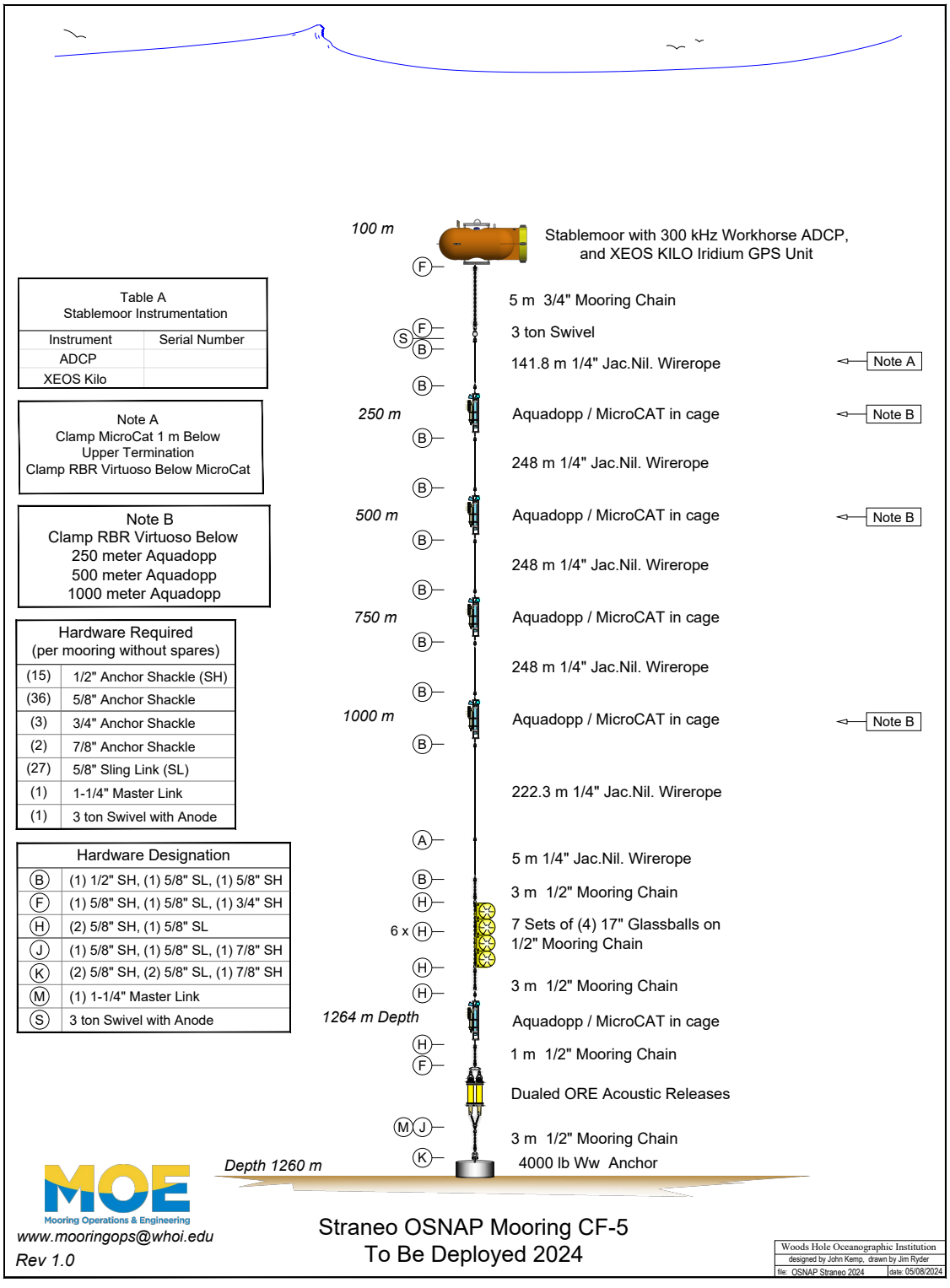

Table A Stablemoor Instrumentation	
Instrument	Serial Number
ADCP	
XEOS Kilo	

Note A
Clamp MicroCat 1 m Below Upper Termination
Clamp RBR Virtuoso Below MicroCat

Note B
Clamp RBR Virtuoso Below
250 meter Aquadopp
500 meter Aquadopp
1000 meter Aquadopp

Hardware Required (per mooring without spares)	
(15)	1/2" Anchor Shackle (SH)
(36)	5/8" Anchor Shackle
(3)	3/4" Anchor Shackle
(2)	7/8" Anchor Shackle
(27)	5/8" Sling Link (SL)
(1)	1-1/4" Master Link
(1)	3 ton Swivel with Anode

Hardware Designation	
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
J	(1) 5/8" SH, (1) 5/8" SL, (1) 7/8" SH
K	(2) 5/8" SH, (2) 5/8" SL, (1) 7/8" SH
M	(1) 1-1/4" Master Link
S	3 ton Swivel with Anode

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Straneo OSNAP Mooring CF-5
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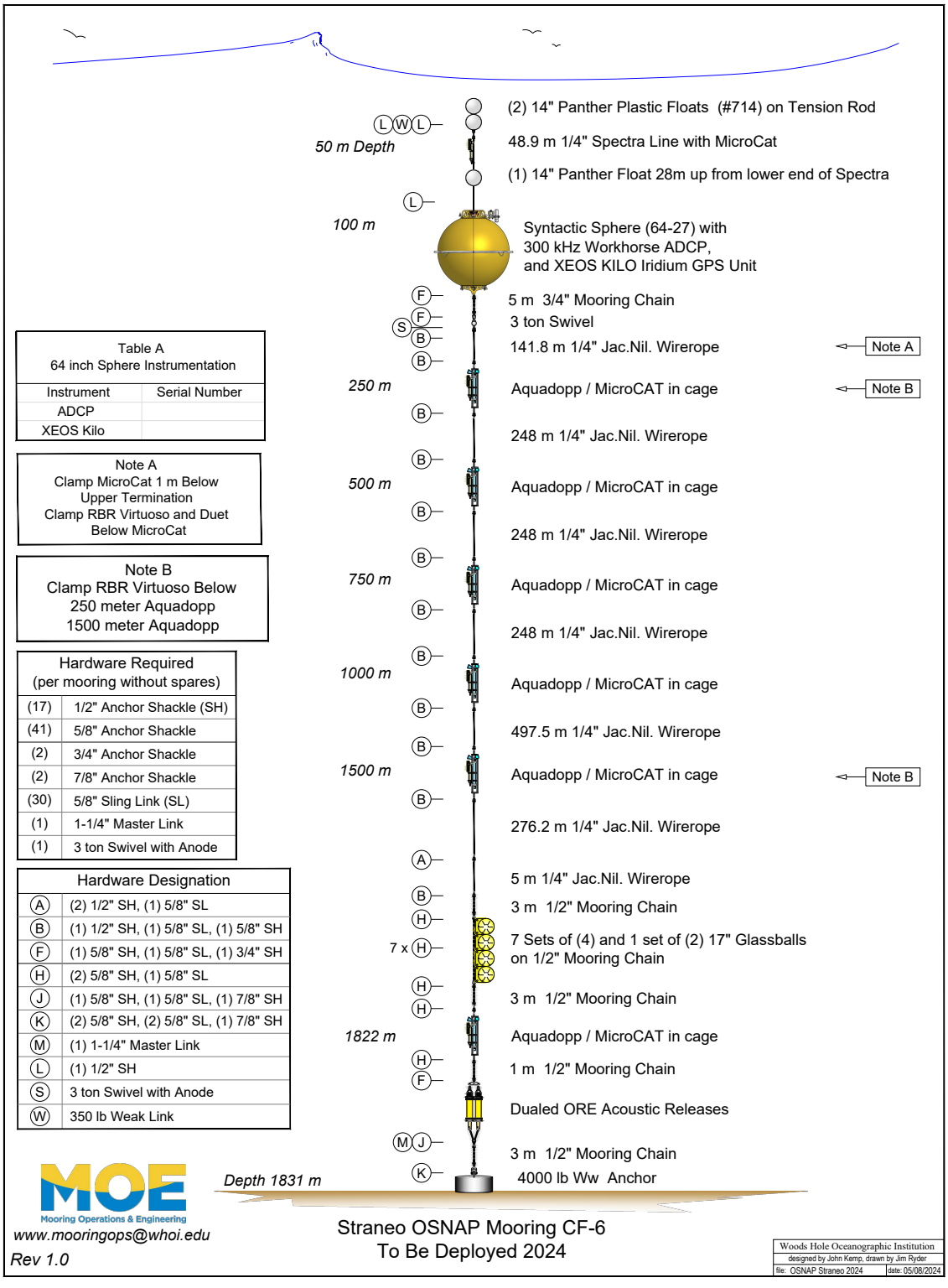

Table A 64 inch Sphere Instrumentation	
Instrument	Serial Number
ADCP	
XEOS Kilo	

Note A
Clamp MicroCat 1 m Below
Upper Termination
Clamp RBR Virtuoso and Duet
Below MicroCat

Note B
Clamp RBR Virtuoso Below
250 meter Aquadopp
1500 meter Aquadopp

Hardware Required (per mooring without spares)	
(17)	1/2" Anchor Shackle (SH)
(41)	5/8" Anchor Shackle
(2)	3/4" Anchor Shackle
(2)	7/8" Anchor Shackle
(30)	5/8" Sling Link (SL)
(1)	1-1/4" Master Link
(1)	3 ton Swivel with Anode

Hardware Designation	
A	(2) 1/2" SH, (1) 5/8" SL
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
J	(1) 5/8" SH, (1) 5/8" SL, (1) 7/8" SH
K	(2) 5/8" SH, (2) 5/8" SL, (1) 7/8" SH
M	(1) 1-1/4" Master Link
L	(1) 1/2" SH
S	3 ton Swivel with Anode
W	350 lb Weak Link

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Straneo OSNAP Mooring CF-6
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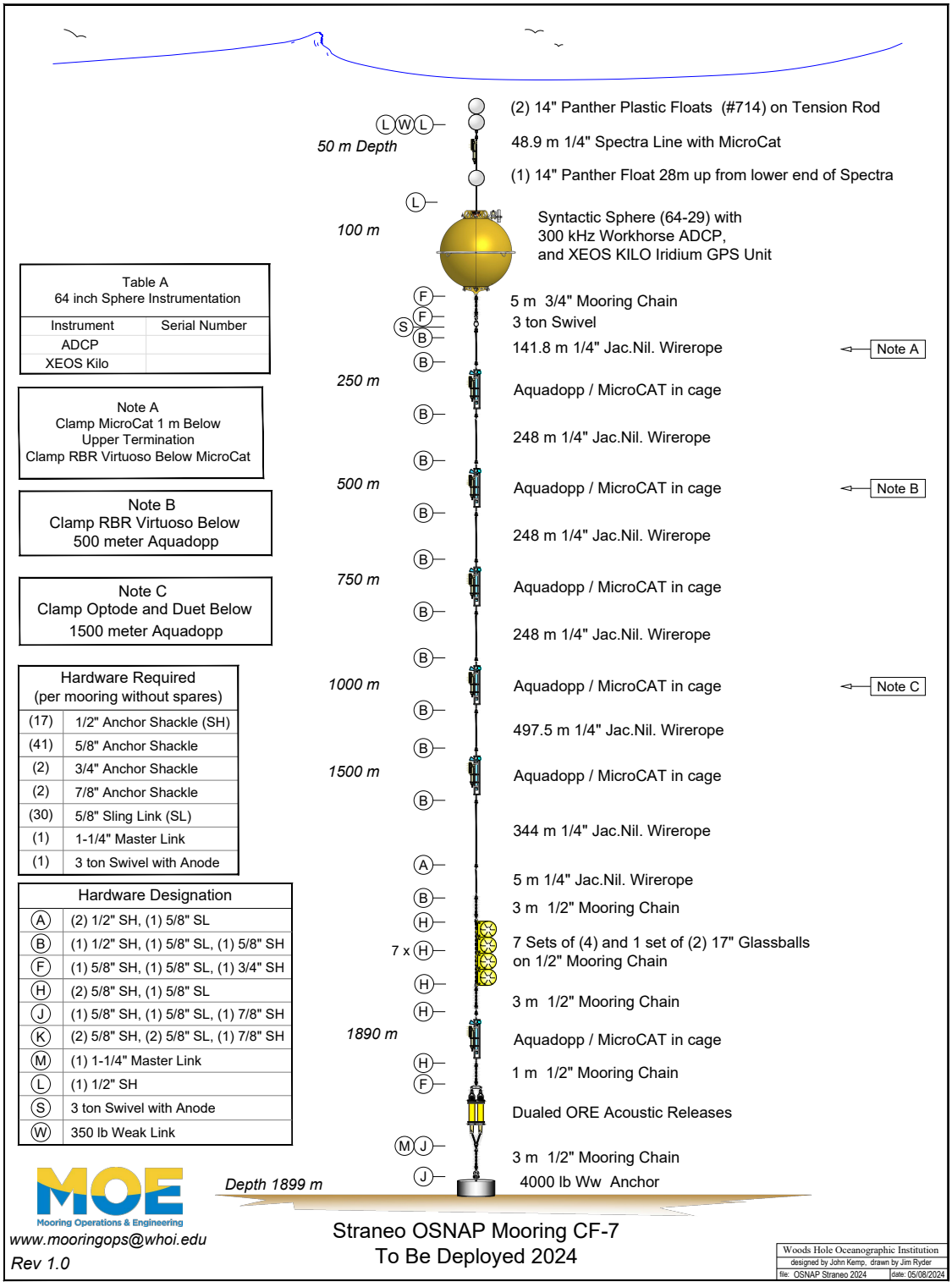

Table A 64 inch Sphere Instrumentation	
Instrument	Serial Number
ADCP	
XEOS Kilo	

Note A
Clamp MicroCat 1 m Below
Upper Termination
Clamp RBR Virtuoso Below MicroCat

Note B
Clamp RBR Virtuoso Below
500 meter Aquadopp

Note C
Clamp Optode and Duet Below
1500 meter Aquadopp

Hardware Required (per mooring without spares)	
(17)	1/2" Anchor Shackle (SH)
(41)	5/8" Anchor Shackle
(2)	3/4" Anchor Shackle
(2)	7/8" Anchor Shackle
(30)	5/8" Sling Link (SL)
(1)	1-1/4" Master Link
(1)	3 ton Swivel with Anode

Hardware Designation	
A	(2) 1/2" SH, (1) 5/8" SL
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
J	(1) 5/8" SH, (1) 5/8" SL, (1) 7/8" SH
K	(2) 5/8" SH, (2) 5/8" SL, (1) 7/8" SH
M	(1) 1-1/4" Master Link
L	(1) 1/2" SH
S	3 ton Swivel with Anode
W	350 lb Weak Link

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Straneo OSNAP Mooring CF-7
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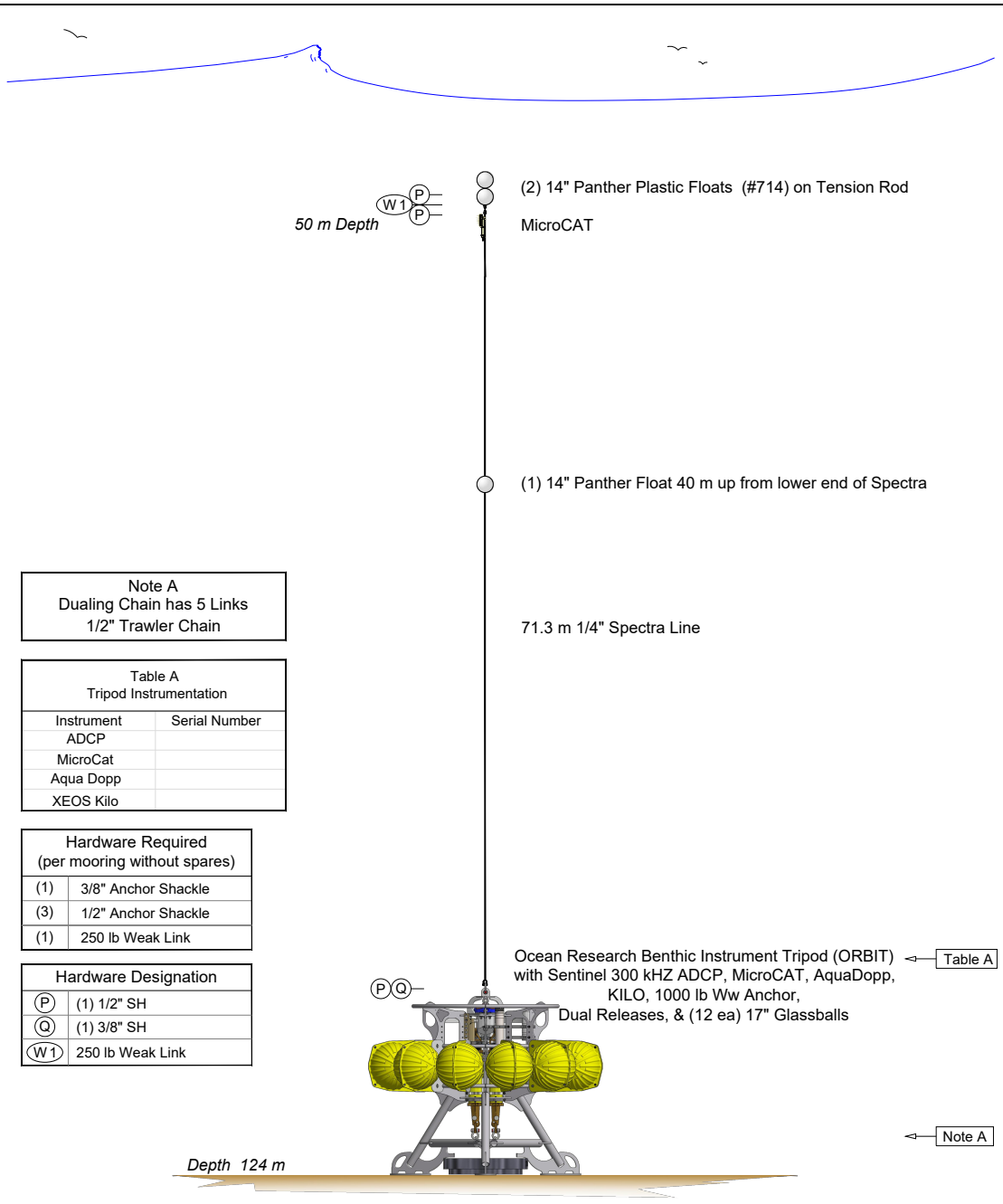

Note A
Dualing Chain has 5 Links 1/2" Trawler Chain

Table A Tripod Instrumentation	
Instrument	Serial Number
ADCP	
MicroCat	
Aqua Dopp	
XEOS Kilo	

Hardware Required (per mooring without spares)	
(1)	3/8" Anchor Shackle
(3)	1/2" Anchor Shackle
(1)	250 lb Weak Link

Hardware Designation	
P	(1) 1/2" SH
Q	(1) 3/8" SH
W 1	250 lb Weak Link

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Pickart OSNAP Mooring LS-A
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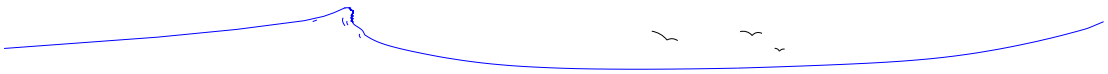


75 m Depth

P
W1
P

(2) 14" Panther Plastic Floats (#714) on Tension Rod

MicroCAT
Oxygen Optode
Optode Duet

(1) 14" Panther Float 38 m from lower end of Spectra

66.3 m 1/4" Spectra Line

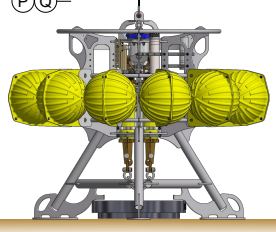
Note A
Dualing Chain has 5 Links
1/2" Trawler Chain

Table A Tripod Instrumentation	
Instrument	Serial Number
ADCP	
MicroCat	
Aqua Dopp	
XEOS Kilo	

Hardware Required (per mooring without spares)	
(1)	3/8" Anchor Shackle
(3)	1/2" Anchor Shackle
(1)	250 lb Weak Link

Hardware Designation	
P	(1) 1/2" SH
Q	(1) 3/8" SH
W1	250 lb Weak Link

P Q



Ocean Research Benthic Instrument Tripod (ORBIT) with Sentinel 300 kHZ ADCP, MicroCAT, AquaDopp, Xeos Kilo, 1000 lb Ww Anchor, Dual Releases, and (12 ea) 17" Glassballs

Table A

Note A

Depth 144 m

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Pickart OSNAP Mooring LS-1
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75 m Depth

W1 P P

(2) 14" Panther Plastic Floats (#714) on Tension Rod

MicroCAT (s/n 11503)
Oxygen Optode (s/n 204684)

(1) 14" Panther Float 61 m from lower end of Spectra

113.3 m 1/4" Spectra Line

P Q

Ocean Research Benthic Instrument Tripod (ORBIT) with Nortek Signature 100, MicroCAT, AquaDopp, Xeos Kilo, 1000 lb Ww Anchor, Dual Releases, and (12 ea) 17" Glassballs

Table A

Note B

Depth 191 m

Note A
Dualing Chain has 5 Links
1/2" Trawler Chain

Table A
Tripod Instrumentation

Instrument	Serial Number
ADCP	
MicroCat	
Aqua Dopp	
XEOS Kilo	

Hardware Required
(per mooring without spares)

(1)	3/8" Anchor Shackle
(3)	1/2" Anchor Shackle
(1)	250 lb Weak Link

Hardware Designation

P	(1) 1/2" SH
Q	(1) 3/8" SH
W1	250 lb Weak Link

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Pickart OSNAP Mooring LS-3
To Be Deployed 2024

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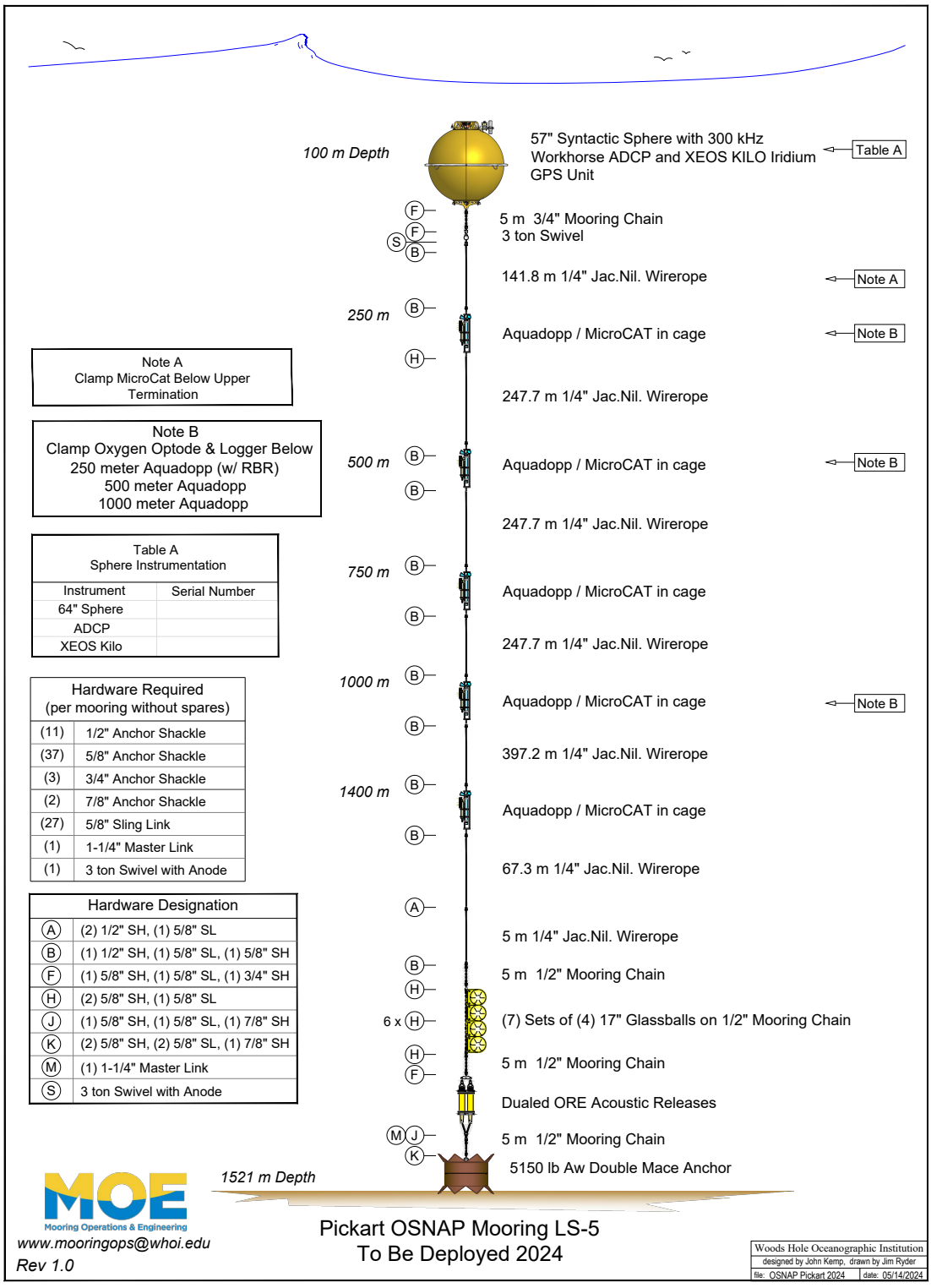
100 m Depth
57" Syntactic Sphere with 300 kHz Workhorse ADCP and XEOS KILO Iridium GPS Unit
Table A
F
F
S
B
5 m 3/4" Mooring Chain
3 ton Swivel
141.8 m 1/4" Jac.Nil. Wirerope
Note A
250 m
B
Aquadopp / MicroCAT in cage
Note B
H
247.7 m 1/4" Jac.Nil. Wirerope
500 m
B
Aquadopp / MicroCAT in cage
Note B
B
247.7 m 1/4" Jac.Nil. Wirerope
750 m
B
Aquadopp / MicroCAT in cage
B
247.7 m 1/4" Jac.Nil. Wirerope
1000 m
B
Aquadopp / MicroCAT in cage
Note B
B
397.2 m 1/4" Jac.Nil. Wirerope
1400 m
B
Aquadopp / MicroCAT in cage
B
67.3 m 1/4" Jac.Nil. Wirerope
A
5 m 1/4" Jac.Nil. Wirerope
B
5 m 1/2" Mooring Chain
H
6 x H
(7) Sets of (4) 17" Glassballs on 1/2" Mooring Chain
H
5 m 1/2" Mooring Chain
F
Dualed ORE Acoustic Releases
M J
5 m 1/2" Mooring Chain
K
5150 lb Aw Double Mace Anchor
1521 m Depth
Note A
Clamp MicroCat Below Upper Termination
Note B
Clamp Oxygen Optode & Logger Below
250 meter Aquadopp (w/ RBR)
500 meter Aquadopp
1000 meter Aquadopp
Table A
Sphere Instrumentation
Instrument
Serial Number
64" Sphere
ADCP
XEOS Kilo
Hardware Required
(per mooring without spares)
(11) 1/2" Anchor Shackle
(37) 5/8" Anchor Shackle
(3) 3/4" Anchor Shackle
(2) 7/8" Anchor Shackle
(27) 5/8" Sling Link
(1) 1-1/4" Master Link
(1) 3 ton Swivel with Anode
Hardware Designation
A (2) 1/2" SH, (1) 5/8" SL
B (1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
F (1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H (2) 5/8" SH, (1) 5/8" SL
J (1) 5/8" SH, (1) 5/8" SL, (1) 7/8" SH
K (2) 5/8" SH, (2) 5/8" SL, (1) 7/8" SH
M (1) 1-1/4" Master Link
S 3 ton Swivel with Anode
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Pickart OSNAP Mooring LS-5
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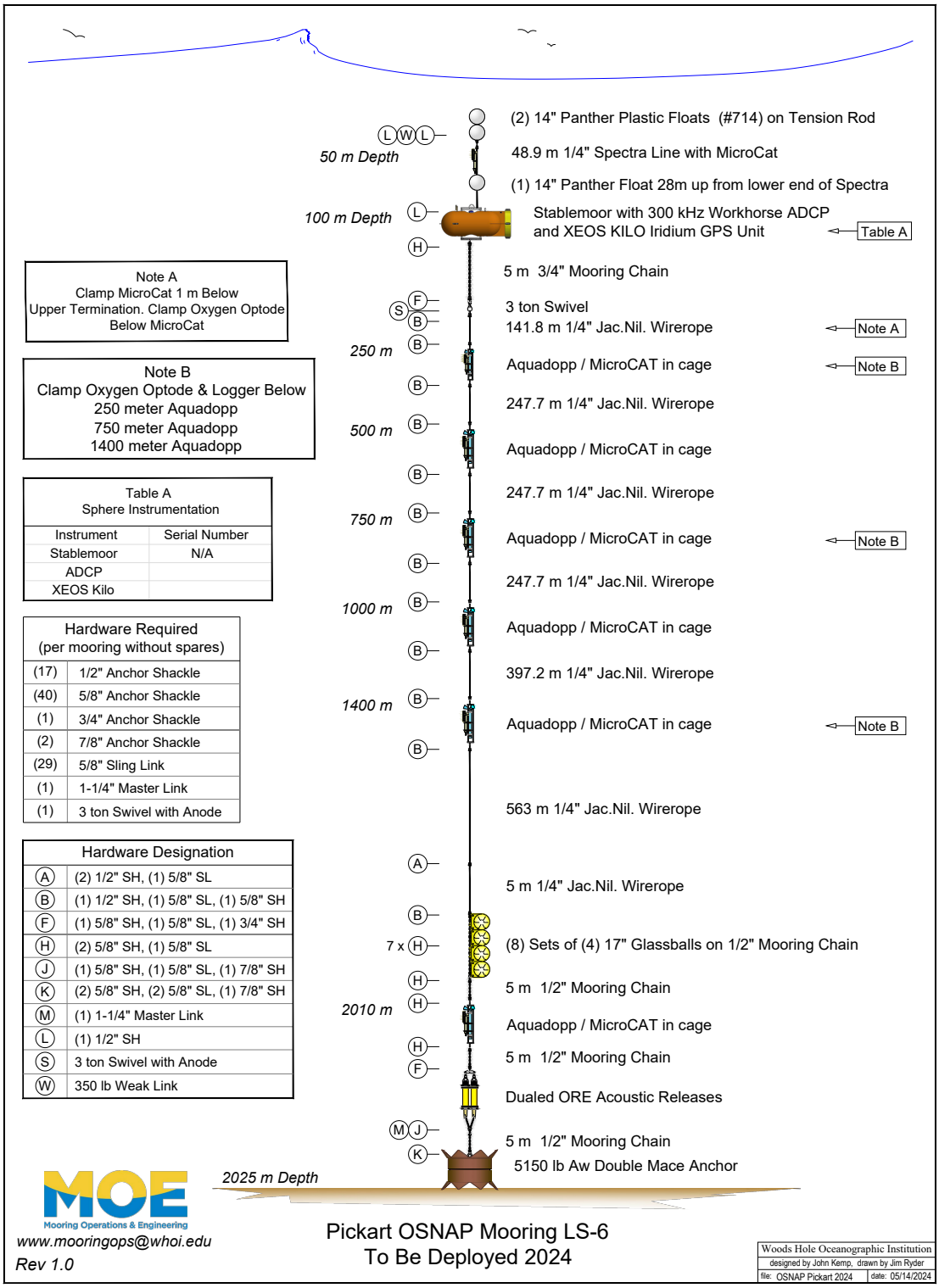

Note A
Clamp MicroCat 1 m Below Upper Termination. Clamp Oxygen Optode Below MicroCat

Note B
Clamp Oxygen Optode & Logger Below
250 meter Aquadopp
750 meter Aquadopp
1400 meter Aquadopp

Table A
Sphere Instrumentation

Instrument	Serial Number
Stablemoor	N/A
ADCP	
XEOS Kilo	

Hardware Required
(per mooring without spares)

(17)	1/2" Anchor Shackle
(40)	5/8" Anchor Shackle
(1)	3/4" Anchor Shackle
(2)	7/8" Anchor Shackle
(29)	5/8" Sling Link
(1)	1-1/4" Master Link
(1)	3 ton Swivel with Anode

Hardware Designation

A	(2) 1/2" SH, (1) 5/8" SL
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
J	(1) 5/8" SH, (1) 5/8" SL, (1) 7/8" SH
K	(2) 5/8" SH, (2) 5/8" SL, (1) 7/8" SH
M	(1) 1-1/4" Master Link
L	(1) 1/2" SH
S	3 ton Swivel with Anode
W	350 lb Weak Link

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Pickart OSNAP Mooring LS-6
To Be Deployed 2024

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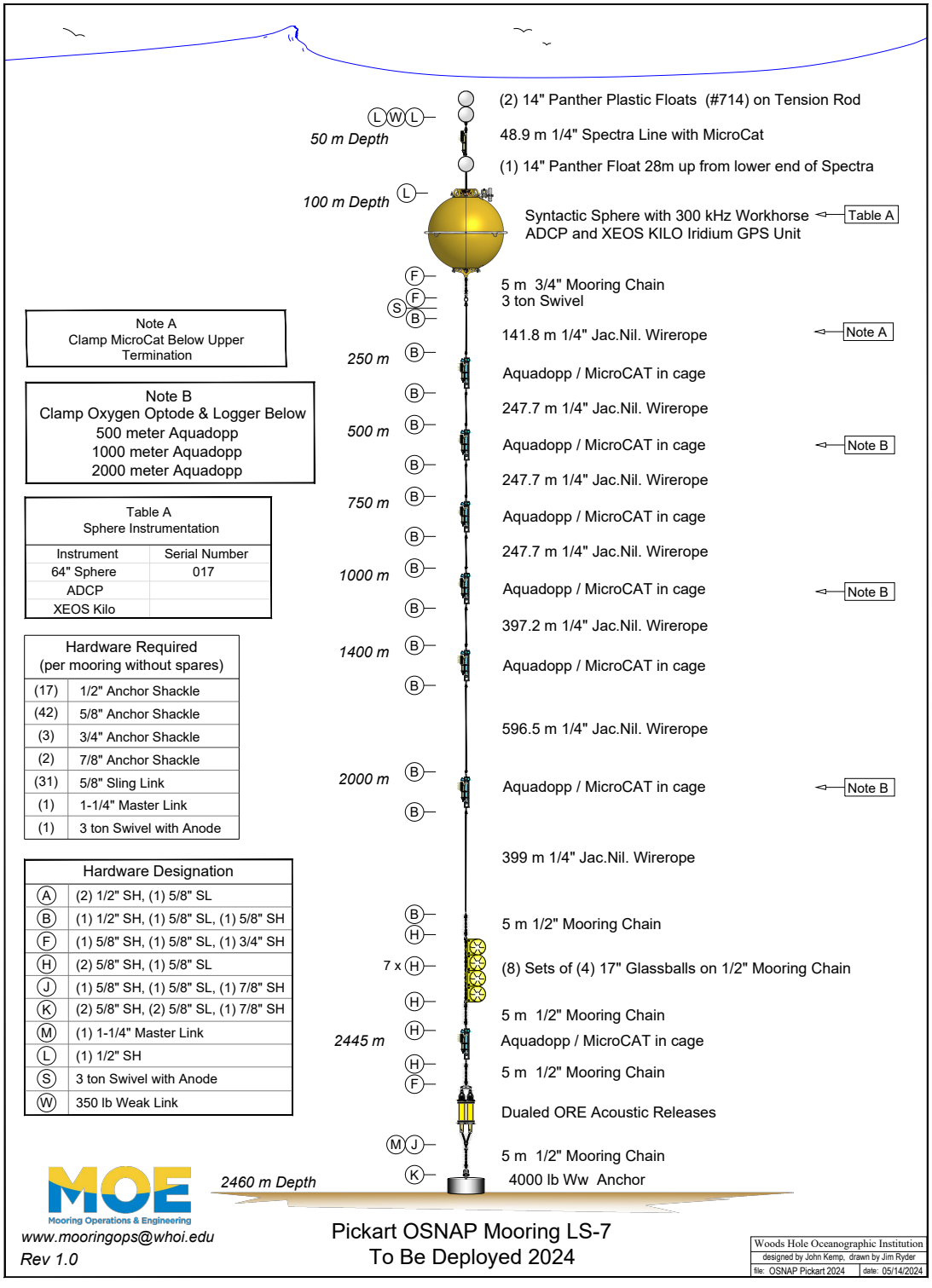

Note A
Clamp MicroCat Below Upper Termination

Note B
Clamp Oxygen Optode & Logger Below
500 meter Aquadopp
1000 meter Aquadopp
2000 meter Aquadopp

Table A
Sphere Instrumentation

Instrument	Serial Number
64" Sphere	017
ADCP	
XEOS Kilo	

Hardware Required
(per mooring without spares)

(17)	1/2" Anchor Shackle
(42)	5/8" Anchor Shackle
(3)	3/4" Anchor Shackle
(2)	7/8" Anchor Shackle
(31)	5/8" Sling Link
(1)	1-1/4" Master Link
(1)	3 ton Swivel with Anode

Hardware Designation

A	(2) 1/2" SH, (1) 5/8" SL
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
J	(1) 5/8" SH, (1) 5/8" SL, (1) 7/8" SH
K	(2) 5/8" SH, (2) 5/8" SL, (1) 7/8" SH
M	(1) 1-1/4" Master Link
L	(1) 1/2" SH
S	3 ton Swivel with Anode
W	350 lb Weak Link

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Pickart OSNAP Mooring LS-7
To Be Deployed 2024

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Appendix C

CX1: Moored optode data return summary

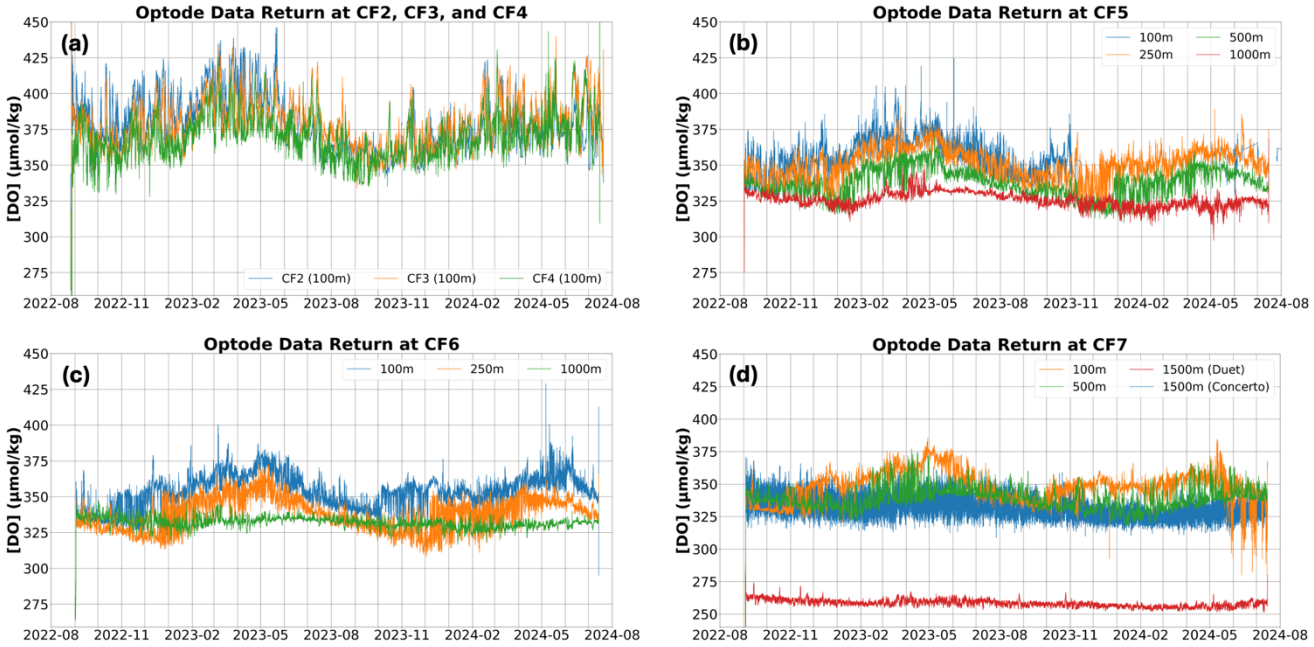

Figure CX1: *Moored optode data return as a function of time for all optode instruments deployed from 2022 – 2024 on* ***a)*** *CF2, CF3, and CF4,* ***b)*** *CF5,* ***c)*** *CF6, and* ***d)*** *CF7.*

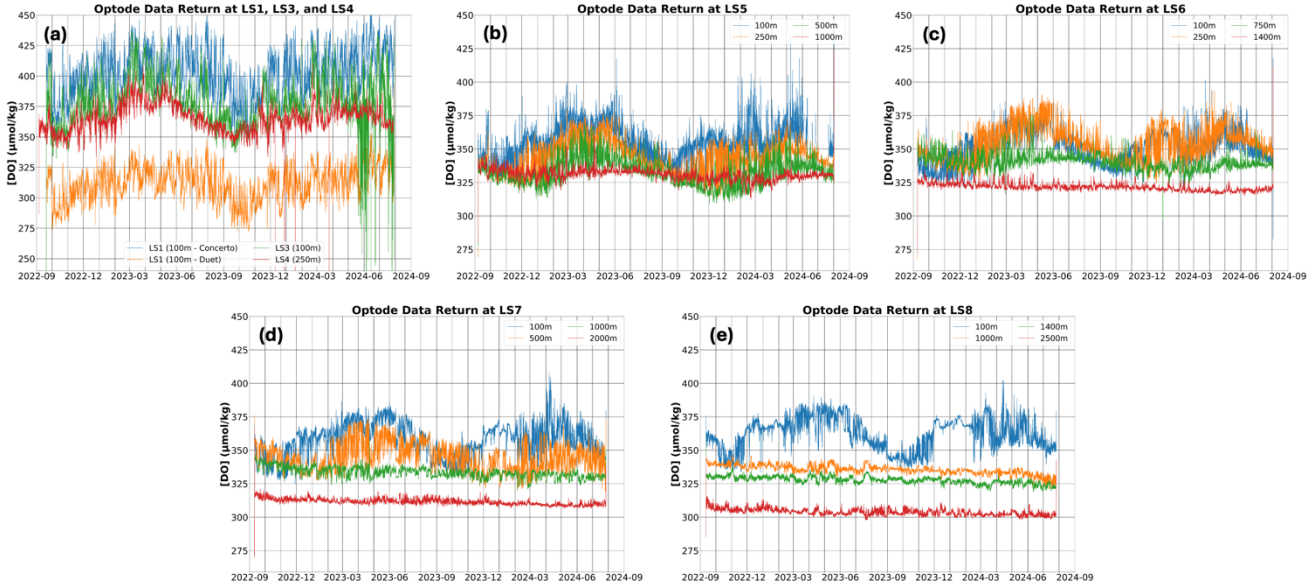

Figure CX2: *Moored optode data return as a function of time for all optode instruments deployed from 2022 – 2024 on* ***a)*** *LS1, LS3, and LS4,* ***b)*** *LS5,* ***c)*** *LS6,* ***d)*** *LS7, and* ***e)*** *LS8.*