Fram Strait Cruise Report

23rd August – 12th September 2015

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4. Kjersti Kalhagen, UiB (CTD)
5. Mhamud Ghani, UiB (CTD)
6. Adam Cooper, Univ. Bristol (CTD)
7. Jenny Ullgren, NERSC (CTD)
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9. Piotr Kowalczuk, IOP, (optics)
10. Anna Raczkowska, IOP (optics)
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13. Malin Johanson (Sea ice)

Technical

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15. Are Bjørdal, NPI (moorings, sea ice, miljødata)
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Scientific participants: a. Laura de Steur, b. Are Bjørdal, c. Adam Cooper, d. Ruben Dens, e. Paul A. Dodd, f. Kristen Fossan, g. Mhamud Ghani, h. Kjersti Kalhagen, i. Piotr Kowalczuk, j. Malin Johansson, k. Alexy Pavlov, l. Alessia Aloise, m. Anja Rösel, n. Jenny Ullgren, o. Anna Raczkowska, p. Monika Zablocka.

Cruise Outline

NPI has maintained an array of oceanographic moorings in the East Greenland Current in Fram Strait since the early 1990s. This array has provided a long time series of observations with which to monitor the outflow from the Arctic Ocean. The main purpose of the 2015 Fram Strait cruise (FS2015) was to recover and redeploy the mooring array in western Fram Strait. All NPI moorings were recovered and redeployed as planned. In addition, two moorings from AWI were recovered: one in the Norske Trough, and the central Fram Strait mooring F10-12. The AWI mooring in the Norske Trough also contained an AADI DL7 string (measuring temperature/salinity/pressure) from NPI, which was unfortunately damaged and had not collected data. This had likely happened already during the deployment in 2014.

NPI has carried out annual sections of CTD and conservative tracer measurements along 78°50'N since 1997. The zonal extent of sections varies from year to year, depending on ice conditions, but the section between the 0 and 10°W (covering the main outflow from the Arctic Ocean) has been sampled every year. During the 2015 Fram Strait cruise the main CTD section was completed between 10° 30'W and 9°E. LADCP data were collected on all stations. Water samples were collected for analysis of $\delta^{18}O$, nutrient, coloured dissolved organic matter (CDOM), dissolved organic carbon-13 ($DO^{13}C$), dissolved inorganic carbon (DIC), total alkalinity (A_T), Iodide, Iodate and ^{129}I samples at most stations along the section. As a pilot project on small-scale mixing, echo sounder data was collected by NERSC (J. Ullgren).

In addition, two CTD/LADCP/tracer sections were completed across the Norske Trough and three across the Westwind Trough on the East Greenland Shelf. These sections were completed to investigate the circulation of warm Altantic water within the Belgica - Norske - Westwind trough system. The trough system is a conduit for warm Atlantic Water to the Greenland coast, where it reaches the 79N and Zachariæ glacier tongues and cause basal melting. The Isle de France section across the Norske Trough has been repeated now since 2013. Unfortunately, there were too many large ice floes blocking the way to the 79N glacier or Diumphna Sound and hence no data was collected there this year.

Sea ice conditions were extremely good along the 78°50'N section and many of the other sections, ie. there was very little sea ice. Therefore the mooring recoveries and deployments in the EGC were very easy and fast. Despited the general low sea ice concentration in the western Fram Strait and the Greenland shelf there were still sufficient floes (however, relatively small floes) to carry out a significant amount of sea ice work. Sea ice work was also carried out on the land-fast ice where also an Ice Mass Balance (IMB) buoy was deployed at 78°43.35'N, 13°29.73'N. This IMB was initially purchased for the N-ICE campaign 2015 but now installed here. It unfortunately only transmitted data for two weeks after deployment in Fram Strait. Sampling of new (very thin) ice was carried out this year as a small pilot project by UiT (M. Johanson).

The cruise track, moorings locations, CTD/LADCP/tracer stations, and the buoy location are shown in Figure 1.

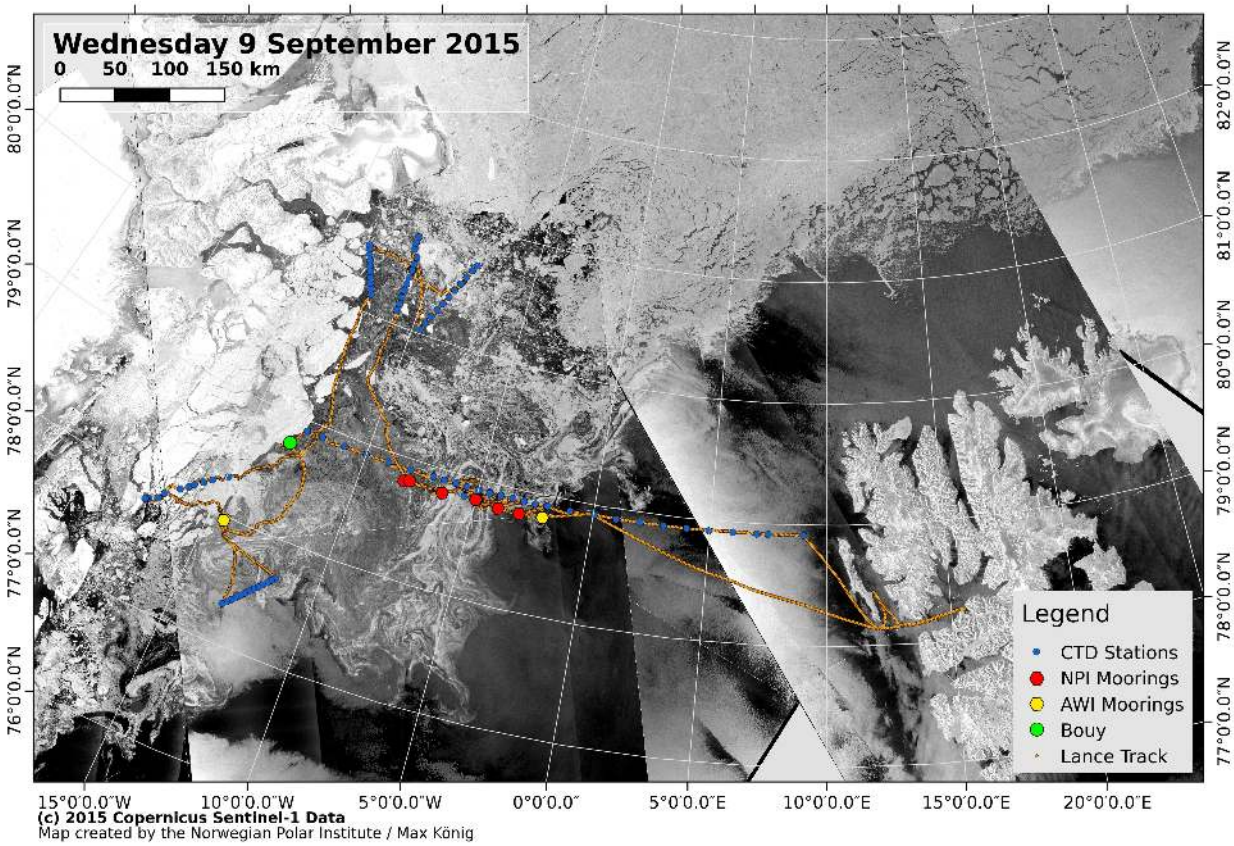


Figure 1: *Cruise track of RV Lance during FS2015 in orange. The mooring positions (red and yellow), CTD stations (blue) and IMB buoy location (green) are shown according to the legend.*

Sailing Log

Date	**Activity** (all times UTC)
Sunday, 23 August 2015	*Loading and departure* **20:00** Departure from Longyearbyen. Late departure because of a connection problem with the CTD cable which needed to be fixed by Kristen.
Monday, 24 August 2015	*Steam to first CTD station* **14:20** First CTD 0W, 78°55'N. Continue CTD section here to the west overnight up to 2.5°W.
Tuesday, 25 August 2015	*Start mooring recoveries, carry out CTDs in between at 78°55'N* **05:00** Arrival at mooring site F11 at 7 am. **06:51** Recovery of F11 after breakfast, followed by a CTD at F11 Steam to F12 **11:59** recovery of F12 after lunch, followed by a CTD at F12. Little sea ice in this region. **16:00** Short sea-ice station after dinner (Anja, Paul, Malin, Are and Ruben) using the MOB. **21:00** Continue CTD stations between 3°W and 4.5°W

Wednesday, 26 August 2015	*Continuing CTDs and mooring work* **am** CTDs **10:02** Recovery F13 after lunch. Still very little ice in the region (even in the EGC core!). Sea ice work with MOB. **16:45** Recovery F13b after dinner (IceCAT was lost). Continue CTD stations up and including 6°W overnight
Thursday, 27 August 2015	*Continuing CTDs and mooring work* **07:32** Recovery F14, CTD at 6.5°W **16:14** Recovery F17 after dinner. Return to the CTD line and continue the section westward
Friday, 28 August 2015	**11:00** Westernmost CTD station on the main section at 12°52'W Head some nm southward along ice edge to localize a good and flat place to enter the ice for sea ice work for the rest of the day. **13:30** Sea ice work while ship moored to the land-fast ice until ±22:00. Three groups departed for IMB buoy deployment, thickness measurements and optical work before dinner. After dinner continued thickness measurements and coring.
Saturday 29 August 2015	**05:00** Arrival at AWIs Belgica2-1 mooring which is recovered at 06:36, followed by a CTD on the Belgica 2-1 mooring site. *Steam to Belgica CTD section* **14:30** Start of Belgica CTD section. Continue CTDs overnight, finish the Belgica section at 04:00 Sunday.
Sunday, 30 August 2015	*Steaming to Belgica2-2 mooring site for deployment, and head to IdF section* **08:24** Deployment of AWIs Belgica 2-2 Start steaming north towards Isle de France section but stop after lunch at **10:30 -14:30** 3 to 4 hours of sea-ice work with 3 groups on the ice (thickness, coring and optics). Need to stop the sea ice work due to approach of polar bear. Continue steaming northward to Isle de France section. **21:00** Start Isle de France CTDs section in the middle of the section, from there steam west first. **22:00** short thin ice sampling project from Malin with the MOB Continue IdF CTDs
Monday 31 August 2015	*Continue Isle de France CTD section* **04:00** Arrival at westernmost IdF station, very strong currents and iceberg drifts. Return to the NE to pick up the line at IdF station 8. Lost of super large broken off land-fast ice floes that make the way back tricky. In between we do some sampling of thin ice for Malin with MOB and short sea-ice station for thickness (EM31) and tracer cores in the afternoon. **20:00** Finalize the IdF section (we cutted off the last two shallow stations on the NE end, which are 100 m deep and are past the shallowest point (79 m) and do not contain AW). Head to the northeast to steam to the Westwind section. One more short MOB thin-ice sampling event around 22:00.
Tuesday, 1 September 2015	*Steaming toward the north to the Westwind section.* **11:00-14:00** Sea-ice station with 3 groups (thickness, coring and

	optics) on land-fast ice at 79.5°N, 12.5°W. Continue steaming north to the Westwind CTD section **18:30** Start on the first, westernmost, Westwind CTD section (Antarctic Bugt Section).
Wednesday, 2 September 2015	**±07:00** Finalize western Westwind section (one station earlier than planned because of too much sea ice, and too large heavy floes pushing eastward). The 'hoped for' Greenland excursion could not take place either. **08:30-10:00** A short sea ice station. Steam eastward to head to do the Westwind 'mouth' section between 79.8N, 8W and 80,5N 10 W. **15:00** Westwind mouth CTD overnight
Thursday, 3 September 2015	**07:00** Finalize Westwind mouth section, steam to the west again to -hopefully- finish the Westwind west section later today, however, first we encounter a lot of sea ice before we can head west. **14:00** A three-hour long sea-ice station for thickness, cores and optical work
Friday, 4 September 2015	**04:00** Start with the 3rd (middle) Westwind section (Nordostrundingen) at 80.5°N, 11°W. 12 stations, first northward, then heading southward. Finalizing CTDs on this 3rd Westwind section and steam southward to mooring site F17 overnight.
Saturday 5 September 2015	*Start mooring deployments, and additional sea ice stations* **05:00** Arrival at mooring site F17. Start preparing. **07:05** Deployment F17 after breakfast. Continue prep F18. **08:25** Deployment of F18 **10:30** Look for ice floe after lunch for a 2-hour sea ice station (thickness and coring only). Prep for F14 deployment. **14:03** Deployment F14 Wait and drift until next day at roughly 6°W.
Sunday, 6 September 2015	**06:00** Repeat CTD (incl. tracers) at 6°W and 5.5°W. Prep for F13B (with IceCAT). **10:59** Deployment of F13B. **12.30** Moor the ship to the ice for a 2.5 hour sea ice station incl. thickness, cores and optics. We stay moored on the floe until dinner. Then steam to and take repeat CTD at 5°W in the evening to repeat tracers and optics. Drift overnight on location.
Monday, 7 September 2015	**04:00** Start search for good floe for ice work before breakfast, moor ship to floe at 6 am. **06:30-08:30** Sea ice station (thickness, coring and optics). Steam to north of F13 mooring site to start deployment after lunch. **10:26** Deployment of F13. Little sea ice but strong drift. Lifting gear and anchors from hold after which we steam to do repeat CTD at 4.5°W, followed by a repeat CTD cast and optical station at 4°W. We repeat the whole (deep) CTD cast here too since we found AW of 7°C on the previous (4.5°W) station. Drift overnight on location.
Tuesday, 8 September 2015	**04:00** Start steaming west to come into Polar Water again for a shallow CTD cast to collect water in 100 m for Alexey's bleaching

	experiment. **06:45-08:45** Tie to a small floe for one last sea ice station (optics, one core and melt pont measurements). **09:00** A short MOB thin ice sampling effort, after which we steam to mooring site F12. **12:17** Deploy F12. Dead calm sea and no sea ice so very easy deployment, ship can stay on position. During late afternoon and evening we take repeat CTD and optics at 3°W and at 2°W. Drift overnight on location.
Wednesday, 9 September 2015	**04:30** Start steaming to mooring site F11. **08:32** Deployment of F11. Very little sea ice, westward drift, ship can manouver and stay on position. **10:22** After lunch we recover F10-12 from AWI which has been in the water for 3 years now. No to little ice. Very easy recovery. We head back to the CTD line at 78°55'N and pick up CTDs at 0° to continue overnight until we get to the BPR site at ±5.5°E Thursday morning.
Thursday, 10 September 2015	*CTDs between 2°E and 5°E were continued early am.* **09:15** BPR site (from C. Peralta Feriz (APL, UW)). We attempted to retrieve data from it but gave up after one hour. The same problem occurred as last year, we could see it, and range it but data transfer failed despite turning of the engine, echo sounder and VMADCP. **10:40** CTDs from 6°W to 9°W continued up until almost midnight. **15:30** "End-of-cruise" dinner (with a short flute concert from Anna)
Friday, 11 September 2015	Steaming back to LYR with a short stop at Poolepynkte to do a little walrus sightseeing. Weather and visibility is too bad to go out in zodiacs. One walrus spotted. Continue steaming to LYR. **14:50** Arrival in Longyearbyen (town dock) **16:00** Packing
Saturday, 12 September 2015	**09:00** Packing and unloading

Moorings Recovered

Mooring	Position	Depth (m)	Date and time (UTC)	Instrument	Serial #	Instrument depth (m)
F11-16	N 78° 49.179', W 003° 02.685'	2447	Deployed: 09 September 2014 14:23 Recovered: 25 Aug 2015, 06:51	IPS SBE37 ADCP SBE37 RCM9 SBE37 RCM11 SBE37 RCM8 AR861	51062 3490 17461 4702 1324 3552 494 8821 10071 287	51 53 57 274 280 1530 1533 2433 2436 2438
F12-16	N 78°49.158' W 004° 01.423'	1832	Deployed: 08 September 2014 14:02 Recovered: 25 Aug 2015, 11:59	IPS SBE37 ADCP SBE37 RCM9 SBE37 RCM11 SBE37 RCM11 AR861	51167 3489 17462 4837 884 3554 235 8822 228 182	55 57 61 274 277 1477 1480 1820 1823 1825
F13-16	N 78° 50.133', W 005° 00.241'	1015	Deployed: 07 September 2014 15:37 Recovered: 26 Aug 2015, 10:02	IPS SBE37 ADCP RCM9 AURAL SBE37 SBE37 RCM9 SBE37 RCM11 AR861	1047 7056 16831 1175 N/A 12232 3993 1327 3551 561 053	51 53 58 60 77 147 247 250 1000 1003 1005
F13B-1	N 78° 50.167', W 005° 31.040'	517	Deployed: 06 September 2014 19:28 Recovered: 26 Aug 2015, 16:45	SBE37-IM ICEBOX SBE37 SBE37 ADCP SBE37 AR661	11435 N/A 12234 12233 707 10295 291	27 54 55 104 106 206 510
F14-16	N 78° 48.859', W 006° 30.058'	271	Deployed: 06 Sept 2014 12:59 Recovered: 27 Aug 2015, 07:32	IPS SBE37 ADCP SBE37 RCM9 AR861	51127 3492 16876 3992 1046 409	58 62 66 257 260 264
F17-11	N 78° 50.381', W 008° 07.530'	225	Deployed: 05 September 2014 21:35 Recovered: 27 Aug 2015, 16:14	SBE37-IM SBE16 ICEBOX SBE37 ADCP SBE16 SBE37 AR661	11434 6693 N/A 2962 7636 6694 7062 110	25 53 54 80 105 109 213 218
Belgica2-1 **AWI/NPI**	N 77° 59.85', W 14° 18.61'	250	Deployed: 14 June 2014 07:20	SBE37 (AWI) DL7 (NPI) LR ADCP (AWI) SBE37 (AWI)	10941 1649 3813 10939	50 150-200 240 246

			Recovered: 29 Aug 2015, 06:36	IXSEA (AWI) IXSEA (AWI)	219 365	246 246
F10-12 **AWI**	N 78° 49.87', W 02° 03.46'	2716	Deployed: 30 June 2012 18:01 Recovered: 09 Sep 2015, 10:22	ARGOS SBE37 ADCP RCM8 SBE37 Holgiphone RCM8 RCM8 RCM11 IXSEA IXSEA	169 9490 14970 10004 9491 H21 9201 9786 296 743 238	50 57 248 252 254 550 755 1512 2708 2711 2711

Table 1: *Moorings recovered during FS2015.*

<u>Notes on the 2014-2015 mooring deployment:</u> (malfunctions marked in red in table above)

- The dsu unit from the DL7 string (SN 1649) on Belgica2-1 was not readable. It will be send to Aanderaa for check/data recovery. One of the C sensors on the string was popped from the connection, leakage/corrosion..?
- The IPS SN 1047 at F13 failed to start. No data. The other three have worked well.
- RCM8 SN 10071 on bottom of F11 appeared to have failed (direction) looking at it in 5059 dsu reading program. However, exporting it as .Asc and processing in Matlab it looks fine. Exported data looks OK while dsu did not.
- The Aural instrument (whale sound recorder) had apparently not worked, never started or failed to store data (Heidi 18/9/15). Need to obtain details from Kristen

Moorings deployed

Mooring	Position	Depth (m)	Date and time (UTC)	Instrument	Serial #	Instrument depth (m)
F11-17	N 78° 48.992' W 03°01.508'	2450	Deployed: 9 Sept 2015 08:32	**IPS** **SBE37** ADCP **SBE37** RCM9 **SBE37** RCM11 **SBE37** RCM Seaguard AR861	**51062** **7054** 17461 **3996** 1049 **7061** 538 **8226** 834 499	**54** **56** 60 **299** 303 **1553** 1556 **2456** 2459 2463

F12-17	N 78° 49.148' W 04° 00.900'	1831	Deployed: 8 Sept 2015 12:17	**IPS** **SBE37** ADCP **SBE37** RCM9 **SBE37** RCM11 **SBE37** RCM11 AR861	**51127** **7055** 17462 **3994** 836 **10295** 556 **8227** 117 500	**55** 57 61 **274** 277 **1477** 1480 **1820** 1823 1825
F13-17	N 78° 50.164' W 05° 00.086'	1015	Deployed: 7 Sept 2015 10:26	**IPS** **SBE16** ADCP AURAL **SBE37** **SBE37** RCM9 **SBE37** RCM11 AR861	**51064** 7353 16831 - **3995** **7060** 1326 **13504** 345 743	**55** 58 61 76 **152** **249** 252 **1002** 1007 1009
F13B-2	N 78° 50.182'N W 05° 30'.886'	520	Deployed: 6 Sept 2015 10:59	**SBE37-IM** ADCP ICEBOX **SBE37-IM** **SBE37** RCM seaguard **SBE37** AR661	**13506** 707 N/A **13507** **7059** 883 **13505** 410	**26** 54 55 **56** **102** 104 **205** 513
F14-17	N 78° 48.866' W 006° 30.033'	271	Deployed: 5 Sept 2015 14:03	**IPS** **SBE37** ADCP **SBE37** RCM9 AR861	**51127** **7058** 16876 **7057** 1359 568	**58** **62** 66 **257** 261 265
F17-12	N 78° 50.167' W 08° 05.010'	225	Deployed: 5 Sept 2015, 07:05	**SBE16** ADCP **SBE16** AR661	**7212** 7636 **7339** ?	**55** 106 **108** 218
F18-10	N 78° 49.290', W 08° 04.722'	218	Deployed: 5 Sept 2015, 08:25	DL7 (new string) AR861	1593 291	57-107 211
Belgica2-2 AWI	N 77° 59.844', W 14° 18.552'	250	Deployed: 30 August 2015, 08:24	SBE37 (AWI) SBE37 (AWI) SBE37 (AWI) ADCP (AWI) SBE37 (AWI) IXSEA (AWI) IXSEA (AWI)	2384 2087 233 17971 235 531 566	71 130 191 241 247 247 247

Table 2: *Moorings deployed during FS2015. Colors indicate different instrument types.*

CTD Measurements

The CTD used as an SBE911+ unit. 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.

A paper log sheet was completed at each CTD station. Log sheets list the depths at which bottles were fired and the samples taken from each bottle. Times and positions manually recorded on log sheets are indented as a backup in the case of a problem with the data acquisition, not a replacement for logged time and position data.

CTD Package Configuration

- Primary temperature sensor serial number **2400** was used for the entire cruise
- Secondary temperature sensor serial number **4052** was used for the entire cruise

- Primary conductivity sensor serial number **2056** was used for the entire cruise
- Secondary conductivity sensor serial number **3742** was used for the entire cruise

- Digiquartz pressure sensor serial number **0972** was used for the entire cruise

CTD sections

Open drift ice on the East Greenland Shelf allowed Lance to move rapidly along most of the planned sections. However, the Norske-Øyer fast ice barrier remained rather intact for the duration of the cruise blocking access to the planned sections in front of the 79N glacier and along Dijmphna sound. The following 6 sections were completed:

1. **Main Fram Strait Section:** An east-west section along the Fram Strait mooring array line at 78º 50 N, which is repeated annually. During Fram Strait 2015, stations were completed between 005 E and 012 W. Station spacing was 20 km for most of the transect and 10 km in the cores of the inflow and outflow. Figure 2 shows the data collected along the Main Fram Strait Section.

2. **Belgica (Belgica Trough) Section:** A high-resolution (4.5 km spacing) section across the Belgica Trough on the East Greenland continental shelf. This section begins at the tip of Isle de France and crosses crossing the complete trough. Figure 3 shows the data collected along the Norske Trough section.

3. **Isle de France (Belgica Trough) Section:** A high-resolution (6.5 km spacing) section across the Belgica-Norske Trough on the East Greenland continental shelf close to Isle de France. This section begins at the tip of Isle de France and crosses the complete trough. The section was completed in August 2013, August 2014 and August 2015. Figure 4 shows the data collected along the Norske Trough section.

4. **Antarctic Bugt (Westwind Trough) Section:** A high-resolution (5 km spacing) section across the Westwind Trough on the East Greenland continental shelf close to Dijmphna Sound. This section did not extend across the complete trough as large peices of broken up fast ice blocked access to the northernmost part of the section. Figure 5 shows the data collected along the Westwind Section.

5. **Nordostrundingen (Westwind Trough) Section:** A high-resolution (6.5 km spacing) north-south section across the Westwind Trough on the East Greenland continental shelf at 11 degrees west. Figure 6 shows the data collected along Westwind Trough Section 2.

6. **Westwind Mouth (Shelf Break) Section:** A high-resolution (8 km spacing) section across the mouth of the Westwind Trough close to where it meets the East Greenland shelf break. Figure 7 shows the data collected along Westwind Trough Section 2.

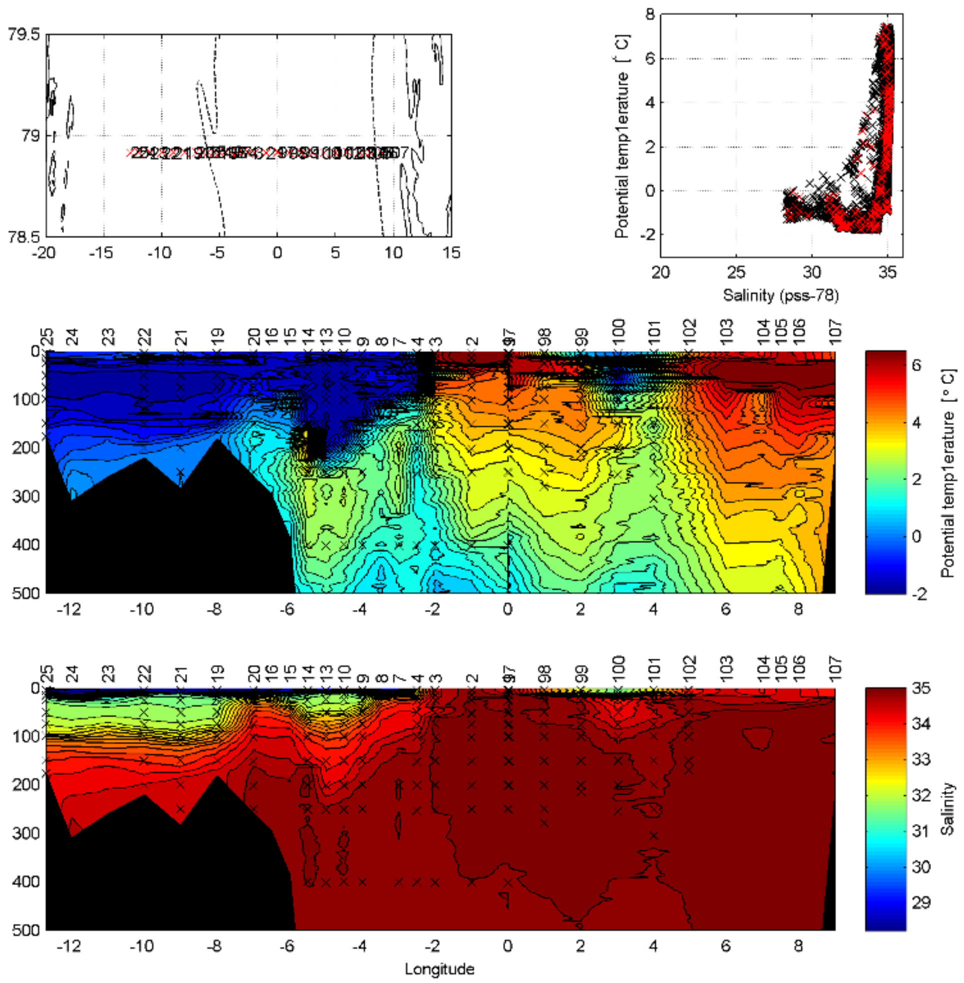


Figure 2: *Map showing the location of CTD stations along the* ***Main Fram Strait Section*** *(top left panel); Measurements from the primary temperature and salinity sensors in θ-S space (top right panel); and sections of potential temperature and salinity (lower 2 panels). Station numbers are indicated above sections.*

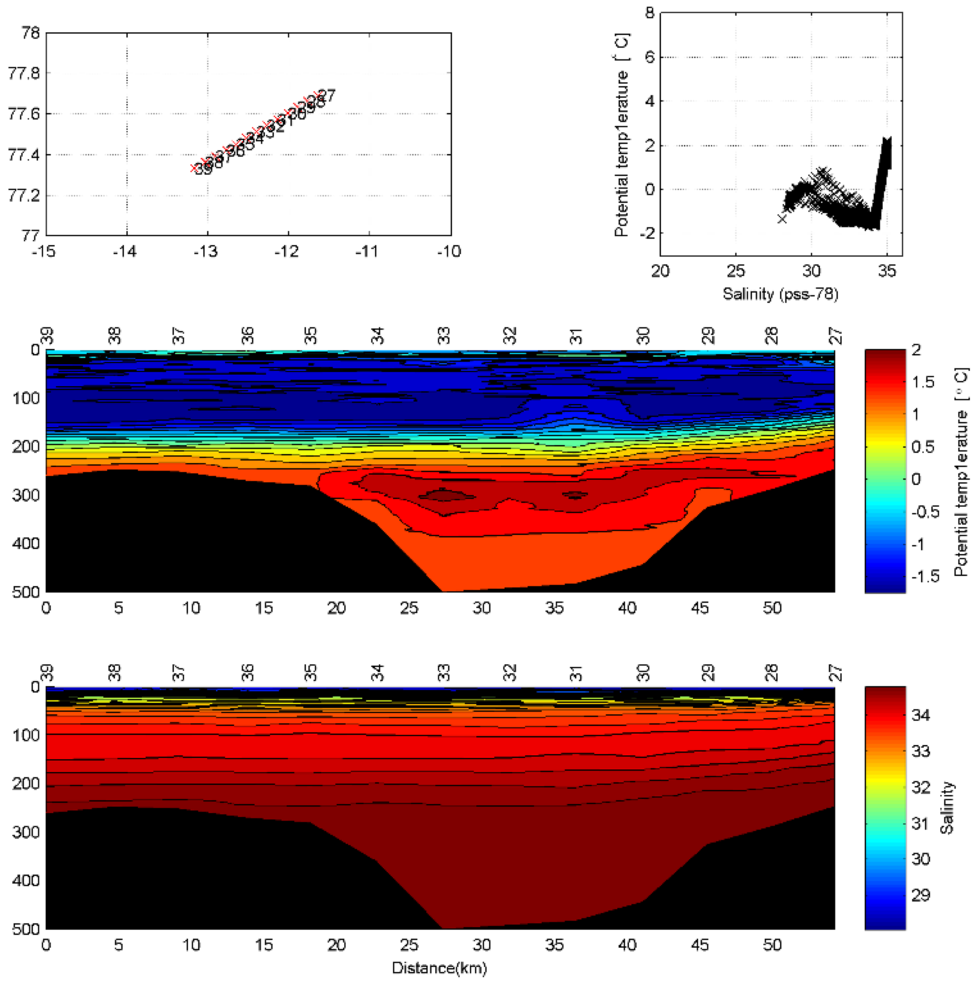


Figure 3: *Map showing the location of CTD stations along the* ***Belgica Section*** *(top left panel); (top left panel); Measurements from the primary temperature and salinity sensors in θ-S space (top right panel); and sections of potential temperature and salinity (lower 2 panels). Station numbers are indicated above sections.*

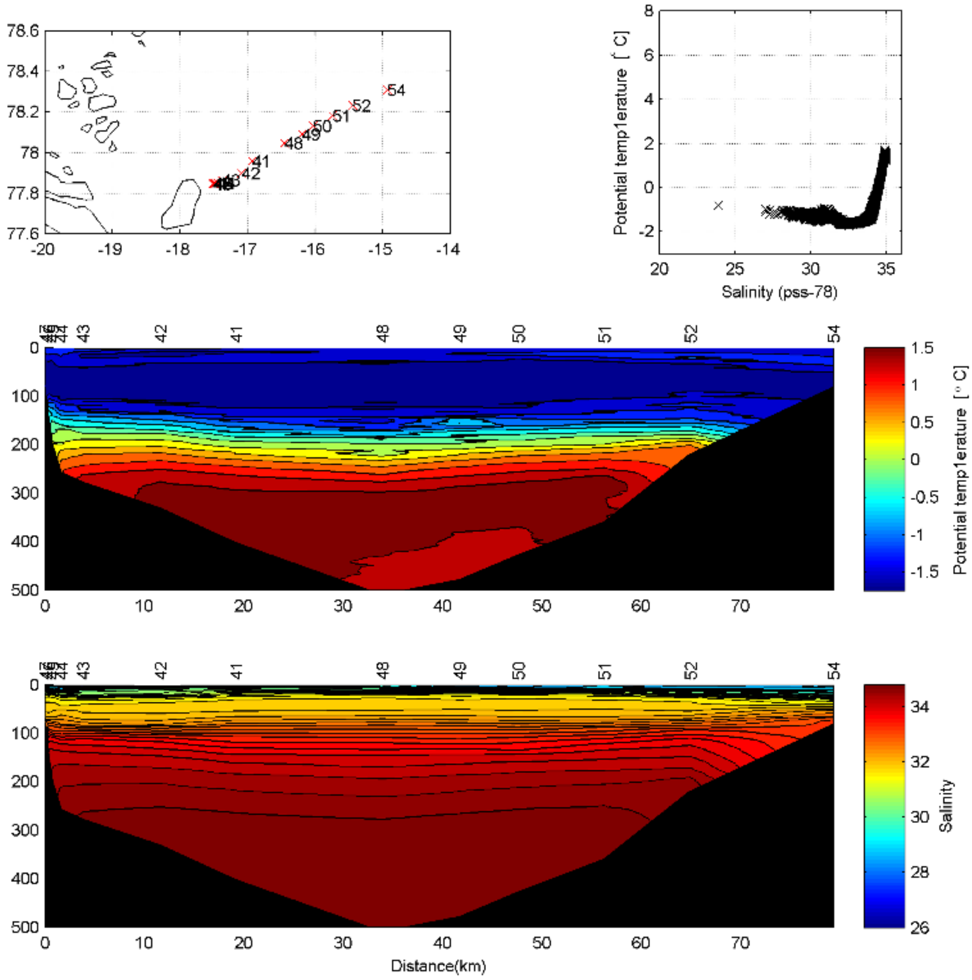


Figure 4: *Map showing the location of CTD stations along the* ***Isle de France Section*** *(top left panel); Measurements from the primary temperature and salinity sensors in θ-S space (top right panel); and sections of potential temperature and salinity (lower 2 panels). Station numbers are indicated above sections.*

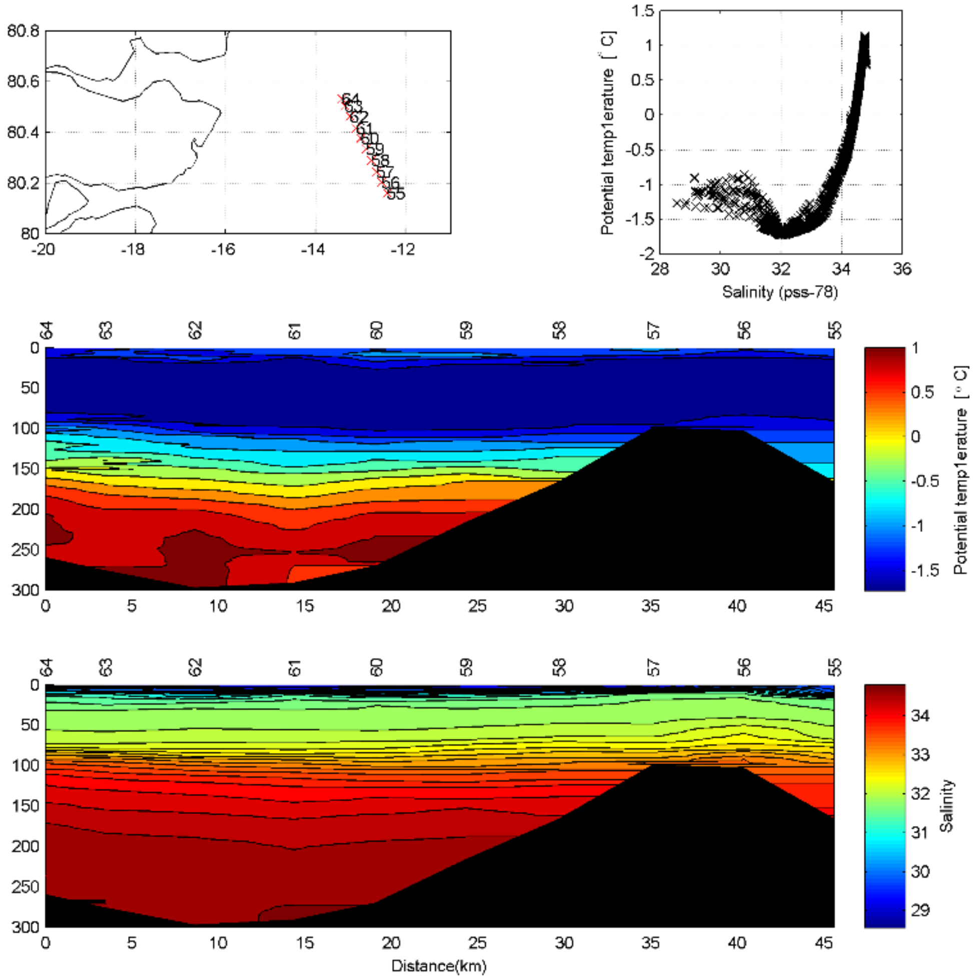


***Figure 5:** Map showing the location of CTD stations along the **Antarctic Bugt Section** (top left panel); Measurements from the primary temperature and salinity sensors in θ-S space (top right panel); and sections of potential temperature and salinity (lower 2 panels). Station numbers are indicated above sections.*

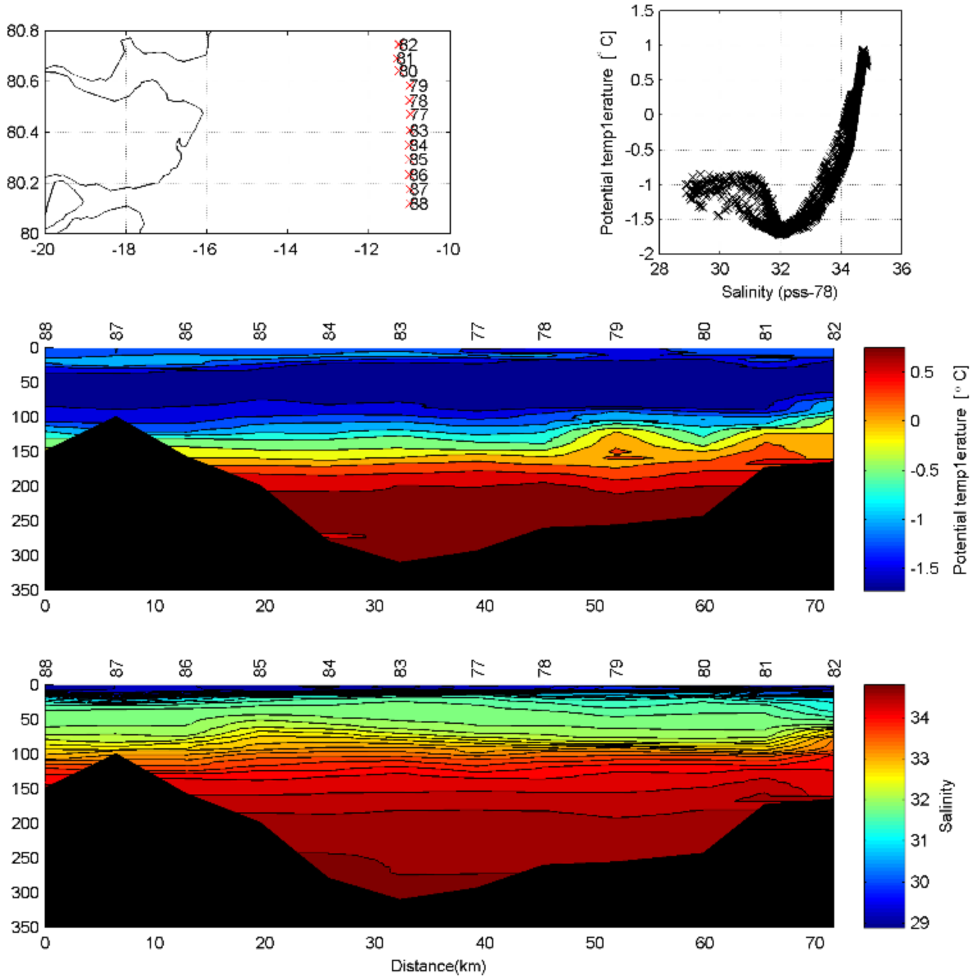


Figure 6: *Map showing the location of CTD stations along the* ***Nordostrundingen Section*** *(top left panel); Measurements from the primary temperature and salinity sensors in θ-S space (top right panel); and sections of potential temperature and salinity (lower 2 panels). Station numbers are indicated above sections.*

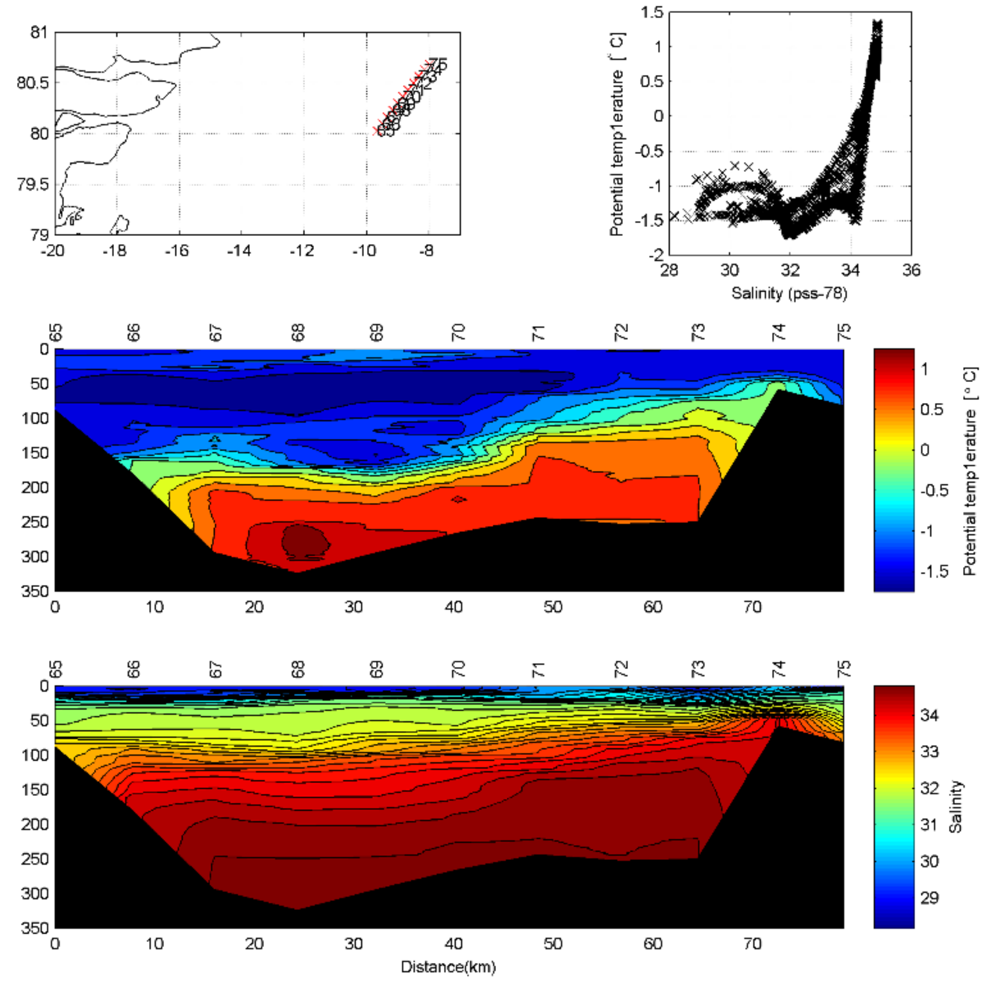


***Figure 7:** Map showing the location of CTD stations along the **Westwind Mouth Section** (top left panel); Measurements from the primary temperature and salinity sensors in θ-S space (top right panel); and sections of potential temperature and salinity (lower 2 panels). Station numbers are indicated above sections.*

CTD Sensor Calibration

Water samples for laboratory salinity measurement were collected at most CTD stations. At stations where tracer samples were collected, salinity samples were collected at standard depths of 5, 15, 25, 50, 75, 100, 150, 200 and 300 dbar, plus two samples from the bottom of the water column. At stations where tracer samples were not collected, samples for salinity measurement were collected from deep parts of the water column where the salinity gradient was shallow. Deep regions provide the best data for conductivity sensor calibration as the water trapped in the Niskin bottles is most similar to that sampled by the CTD.

Salinity samples were analysed on broad Lance using a Guildline Portasal portable salinometer which was standardised after every 24 measurements using IAPSO P-series standard seawater.

Comparison of laboratory salinity measurements and CTD-salinity measurements revealed offsets of < 0.001 psu for both the primary and < 0.002 for the secondary sensor groups (Figure 8). The standard deviation of measurements was < 0.005 psu for both sensor groups. These values are within the expected range for a pumped CTD system.

Figure 8 suggests a minor drift in the calibration of both primary and secondary sensor groups with time during the cruise. However, the magnitude of the drift (ca. 0.001 psu) is smaller than the expected precision of the laboratory salinity measurement so this drift cannot be corrected using bottle data. A minor depth dependant offset of ca 0.002 is apparent in both sensor packages, the magnitude of the depth-dependant offset is also smaller than the expected precision of laboratory salinity measurements so this cannot be corrected.

Both sensor groups on the CTD performed very well during the cruise. As a result no laboratory-based calibration offset will be applied to the CTD data.

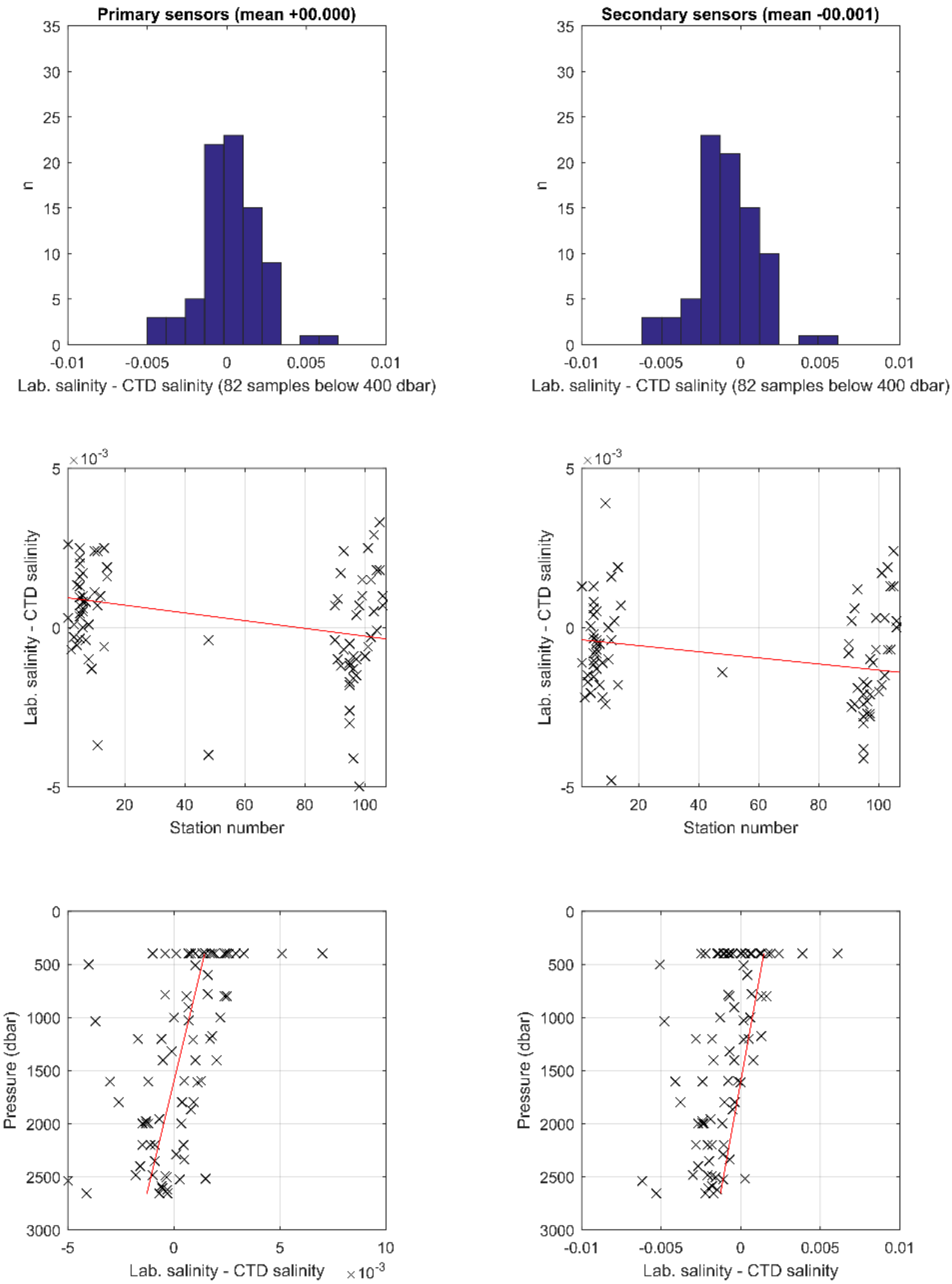


Figure 8: *Plots showing the difference between laboratory salinity measurements and the primary (left hand panels) and secondary (right hand panels) sensor groups on the CTD. Only points deeper than 400 m are considered.*

Tracer Sampling

Water samples were collected at standard pressures of 5, 15, 25, 50, 75, 100, 150, 200, 250, 400 dbar and at the bottom of each cast along the main Fram Strait section (Figure 2).

Samples were collected in the following order:

1. DIC & Total alkalinity
2. CDOM (Filtered)
3. Nutrients
4. $\delta^{18}O$
5. Salinity
6. Particulate light absorption

Laboratory salinity analysis: Samples for laboratory salinity analysis were collected from all Niskin bottles. When the surface of the water column is strongly stratified, the salinity of water trapped in Niskin bottles can be significantly different from that measured by the conductivity sensor at the bottom of the CTD package, which is approximately 1 meter deeper then the top of the Niskin bottles. Independent laboratory salinity measurements give salinity measurements which correspond exactly to the other tracer measurements made from Niskin bottles. Laboratory measurements were made with a Guildline Portasal 8400b salinometer, which was standardized every 24 samples using P-series seawater supplied by OSIL.

Oxygen isotope ratio analysis and dissolved nutrient analysis: Samples for $\delta^{18}O$ isotope ratio analysis and dissolved nutrient analysis were collected at the locations listed in Appendices 1 and 2. Note that samples for $\delta^{18}O$ and dissolved nutrients were always collected concurrently.

Coloured dissolved organic matter (CDOM): Samples for CDOM analysis were collected at the locations listed in appendix 3. Samples for $\delta^{18}O$ isotope ratio analysis and dissolved nutrient analysis were always collected when CDOM samples were collected.

Total alkalinity and dissolved inorganic carbon (A_T & DIC): Samples total alkalinity and dissolved inorganic carbon analysis were collected at the locations listed in Appendix 4. Samples for $\delta^{18}O$ isotope ratio analysis and dissolved nutrient analysis were always collected when Total Alkalinity and Dissolved Inorganic Carbon samples were collected.

Niskin bottle operations: The rubber bands which hold the Niskin bottles closed were in fair condition at the beginning on the cruise and only one bottle required attention during the cruise after it's rubber band became slack.. The rubber o-rings retaining the taps of several Niskin bottles required replacement at the beginning of the cruise. After replacing the rubber o-rings all the Niskin bottles remained in good working order throughout the cruise.

Tracer samples of sea ice: Ice cores for tracer analysis were collected at most sea ice stations as well as from several patches of thin ice (0.5-10 cm thick) accessed using a small boat. Cores were collected in triplicate so as to allow some assessment of the variability of properties at each site sampled. Loose surface snow was removed before coring. Cores were stored in air-tight buckets and melted within 48 hours of collection, after which the melt water was sub-sampled. Cores were handled with latex or nitrile gloves and an all-plastic syringe was used to extract water from buckets for CDOM sampling. Figure 9 shows the location of sites where ice cores for tracer analysis were collected.

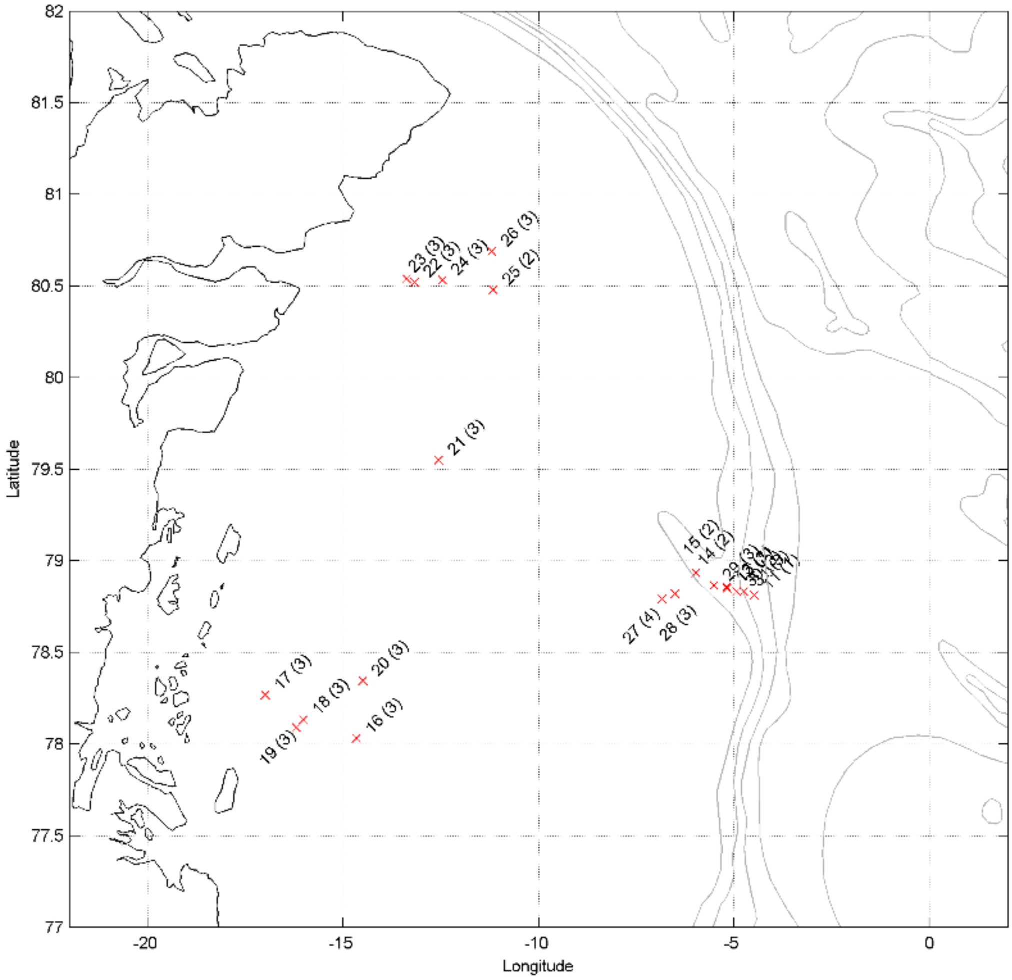
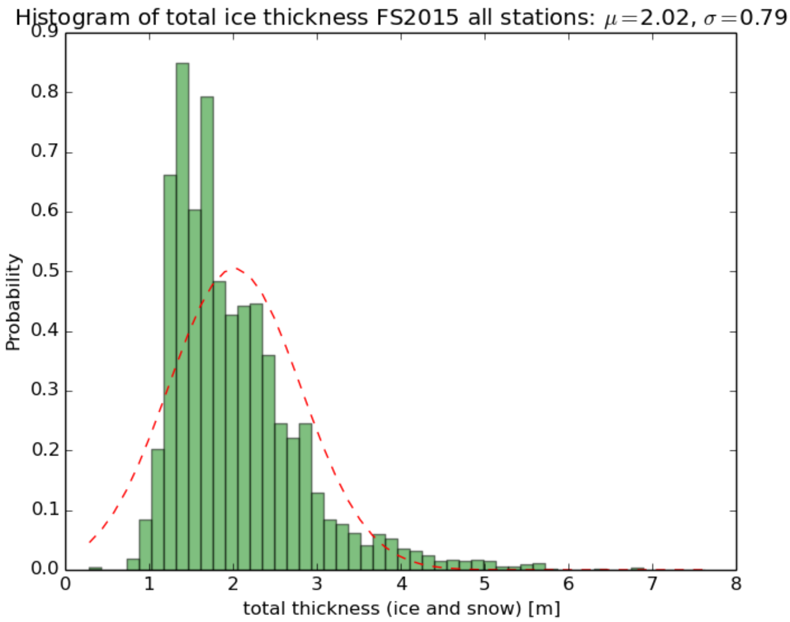


Figure 9: *Locations of sea ice floes (or regions of thin ice) where cores were collected for tracer analysis. The number of cores collected from at each site is shown in brackets.*

Sea ice measurements

The sea ice work on Fram Strait 2015 cruise was coordinated by Anja Rösel (NPI), team members were Ruben Dens (NPI), Are Bjørndal (NPI), Malin Johanson (UiT), and many volunteers from the CTD shifts. Due to the high number of people we always could go with at least 2 teams on the ice.

Altogether we made 23 sea ice stations, 8 of them were mainly for collecting and analyzing thin ice; this includes salinity, tracer, and CDOM measurements. The thin ice samples were collected from the "Man overboard-boat ". On the 15 main sea ice stations we collected ice cores for salinity and temperature analysis and for archive storage and later analysis of the microstructure. On every full sea ice station, 1 to 3 tracer cores were collected by Paul Dodd (NPI). Additionally we did ice thickness measurements with the em31-instrument, accompanied by thickness drillings, mainly for calibration purposes of the em31. The former snow layer from last winter and spring has been transformed to superimposed ice, and after a snowfall event on 25.8.2015 we only had this thin fresh snow layer of 2-4 cm on the ice. The results of all thickness measurements with the em31 instrument (10 stations) are shown in Figure 2: The average thickness of the ice cover of the visited stations was around 2 m, the median shows a shift to the thinner ice (1,5m). Please note that these observations can have an offset from the ice situation in reality, since we visited for safety reasons only reasonable thick and stable ice floes.



At the beginning as at the end of the cruise we had technical problems with both of the computers for the em31. We could solve the problems partly, but for this reasons the collection of em31 data especially in the beginning of the cruise was limited.

On 7 stations, optical measurements were made by Alexey Pavlov (NPI), Piotr Kowalczuk, Anna Raczkowska, and Monika Zablocka, (all from IOPAN).

On the last 4 ice stations we had a closer look at the melt ponds since they were dominating the visited ice floes. We found fresh water ponds - they were in all cases discrete ponds with a thin layer of snow on the frozen surface – and saline ponds: they were mostly linked and had in most cases a bare, salty, frozen surface. We took salinity, depth, and temperature measurements of the ponds and their surroundings.

During the entire cruise sea ice observations were made every 3 hours and entered in the ASISST database. Additionally, 2 Radar digitizing systems (from HZG Geesthacht, Germany, and FMI, Finland) were running and recording the ship's radar signal.

An overview of all visited stations and the performed tasks is shown in Table 3.

Date	Day	#	time (UTC)	lat (start) deg min N	lon (start) deg min W	Task	weather/conditions
23.08.2015	Sun					loading departure LYR 10 pm	
24.08.2015	Mon					Transit Instrument maintance	cloudy/foggy
25.08.2015	Tue	station 1	18:45	78 40.37	-4 34.065	em31 calibration, coring	light snow fall
26.08.2015	Wed	station 2	12:59	78 50.849	-4 10.881	EM31 calib, Coring, snow	overcast, foggy in the evening
		station 3	13:30	78 51.044	-5 10.868	EM31 calib, Coring	
27.08.2015	Thur	station 4	09:01	78 48.928	-6 30.615	EM31 calib, Coring, snow	
		station 5	12:08	78 49.287	-6 30.607	EM31 calib, Coring	
28.08.2015	Fri	station6	14:20	78 43.35	-13 29.73	Land-fast ice: Buoy deployment, optics, coring	calm
29.08.2015	Sat					no ice station	
30.08.2015	Sun	station 7	11:20	78 01.561	-14 39.906	snow, coring, em31, optics	compact ice coverage
		station 8	22:11	77 56.163	-16 59.447	thin ice station	
31.08.2015	Mon	station 9	11:48	78 05.47	-16 12.123	thin ice	
		station 10	12:42	78 07.922	-16 01.692	em31, tracer coring, em31 calibration	calm overcast
		station 11	21:49	78 20.671	-14 29.351	thin ice	
01.09.2015	Tue	station 12	11:29	79 32.949	-12 33.366	em31&MP, coring, calibration, optics	overcast, snowfall
02.09.2015	Wed	station 13	07:18	80 32.332	-13 23.22	thin ice	
		station 14	08:50	80 31.296	-13 10.282	em31, calib, coring	
		station 15	13:53	80 31.865	-12 27.564	thin ice	
03.09.2015	Thur	station 16	14:34	80 28.292	-11 09.603	em31, calib, coring, optics	
04.09.2015	Fri	station 17	11:12	80 41.374	-11 11.59	thin ice	
05.09.2015	Sat	station 18	11:20	78 47.75	-6 50.171	melt pond, em31, calibration, coring	sunny

06.09.2015	Sun	station 19	07:25	78 55.893	-5 59.201	thin ice	overcast, light fog
		station 20	12:56	78 52.169	-5 30.37	melt pond, em31, coring, optics	overcast, clearing up during station
07.09.2015	Mon	station 21	07:42	78 49.47	-4 55.454	melt pond, em31, coring, optics, thickness transect through ponds	snowfall, windy (15-20 kts)
08.09.2015	Tue	station 22	07:08	78 50.263	-4 45 683	melt ponds, em31, thickness transect, optics	sunny in the beginning, later cloudy
		station 23	09:03	78 49.097	-4 41.657	thin ice	calm

Table 3: overview of sea ice stations during FS2015

Newly formed sea ice

In addition, a total of eight sea ice stations, targeting newly formed ice, were carried out. The stations included frazil ice, grease ice, nilas and rafted ice. They are numbered together with the thicker sea ice stations. The stations were planned to overlap with high resolution satellite images from Radarsat-2. At each station three sites were chosen for sampling to account for variabilities within the area. The ice thickness ranged from 0.5 to 6 cm. The mean water temperature was around -1.0°C. The new sea ice station info is given in Table 4 below, these correspond with the light blue rows in Table 3.

Station #	Date	Time (UTC)	Latitude deg min	Longitude deg min	Thickness	Salinity	T	CDOM
8	30.08.2015	22:19	N77 56.163	W16 59.447	X	X	X	X
9	31.08.2015	11:48	N78 05.470	W16 12.123	X	X	X	X
11	31.08.2015	21:59	N78 20.616	W14 29.667	X	X	X	X
13	02.09.2015	06:58	N80 32.332	W13 23.220	X	X	X	X
15	02.09.2015	14:00	N80 31.886	W12 27.501	X	X	X	X
17	04.09.2015	11:12	N80 41.374	W11 11.590	X	X	X	X
19	06.09.2015	07:25	N78 55.893	W05 59.201	X	X	X	X
23	08.09.2015	09:03	N78 49.097	W04 41.657	X	X	X	X

Table 4: overview of newly formed sea ice stations during FS2015

A typical new sea ice station

CDOM-Heat Optics work

The objective of the work of CDOM-Heat project during the Fram Strait 2015 R/V Lance cruise was to collect IOP (Inherent Optical Properties) data profiles across the strait. In addition in collaboration with the CTD and tracer sampling program onboard Lance to collect water samples for characterization of optical properties of the seawater, namely dissolved and particulate absorption.

Four CDOM-Heat project participants participated in the cruise, P. Kowalczuk (IOPAS), A. Raczkowska (IOPAS), M. Zabłocka (IOPAS) and A. Pavlov (NPI) were responsible for operating the IOP instruments and collecting water samples for dissolved and particulate absorption. The optical group also performed IOP measurements on the edge of ice floe. In total measurements on 42 full stations (IOP, particle abs, dissolved abs) and 7 ice edge station (IOP) were undertaken (Table 5).

STATION #	DATE	TIME	LAT	LON	IOP	Particle Abs	Dissolved Abs	Ice edge station
1	2015-08-24	16:23	78 55.00 N	00 00.54 W	☑	☑	☑	
3	2015-08-24	23:27	78 55.00 N	02 00.01 W	☑	☑	☑	
7	2015-08-25	23:26	78 55.00 N	03 00.05 W	☑	☑	☑	
9	2015-08-26	05:55	78 55.00 N	04 00.21 W	☑	☑	☑	
13	2015-08-26	19:00	78 55.00 N	05 00.09 W	☑	☑	☑	
15	2015-08-26	23:43	78 55.00 N	06 00.12 W	☑	☑	☑	
19	2015-08-27	17:55	78 55.00 N	08 00.18 W	☑	☑	☑	
20	2015-08-27	20:55	78 55.00 N	07 00.21 W	☑	☑	☑	
21	2015-08-28	00:41	78 55.00 N	09 00.11 W	☑	☑	☑	
22	2015-08-28	02:48	78 55.00 N	10 00.60 W	☑	☑	☑	
23	2015-08-28	04:55	78 55.00 N	11 00.26 W	☑	☑	☑	
24	2015-08-28	08:00	78 55.00 N	12 00.21 W	☑	☑	☑	
25	2015-08-28	10:24	78 55.00 N	12 42.28 W	☑	☑	☑	
ice station 6	2015-08-28	15:36	78 43.33 N	13 29.90 W	☑			☑
ice station 7	2015-08-30	11:50	78 01.54 N	14 40.07 W	☑			☑
41	2015-08-30	21:05	77.57.00 N	17 04.00 W	☑	☑	☑	
44	2015-08-	02:11	77 50.98 N	17 26.63 W	☑	☑	☑	

	31							
46	2015-08-31	03:31	77 50.70 N	17 29.84 W	☑	☑	☑	
48	2015-08-31	09:03	78.02.00 N	16 27.00 W	☑	☑	☑	
49	2015-08-31	11:21	78 05.46 N	16 11.95 W	☑			
54	2015-08-31	19:25	78 18.50 N	14 55.73 W	☑	☑	☑	
ice station 12	2015-09-01	11:18	79 32.95 N	12 33.32 W	☑			☑
58	2015-09-01	20:32	80 17.38 N	12 45.91 W	☑	☑	☑	
60	2015-09-01	22:38	80 22.55 N	12 59.95 W	☑	☑	☑	
62	2015-09-02	00:56	80 27.69 N	13 14.12 W	☑	☑	☑	
64	2015-09-02	06:15	80 32.14 N	13 24.19 W	☑	☑	☑	
67	2015-09-02	21:14	80 09.96 N	09 21.10 W	☑	☑	☑	
69	2015-09-02	23:46	80 17.99 N	09 00.45 W	☑	☑	☑	
71	2015-09-03	02:00	80 26.08 N	08 40.32 W	☑	☑	☑	
73	2015-09-03	04:23	80 34.04 N	08 19.20 W	☑	☑	☑	
ice station 16	2015-09-03	14:01	80 28.29 N	11 09.09 W	☑			☑
79	2015-09-04	06:44	80 35.22 N	10 57.97 W	☑	☑	☑	
82	2015-09-04	10:12	80 44.99 N	11 16.99 W	☑	☑	☑	
83	2015-09-04	13:51	80 24.50 N	10 59.78 W	☑	☑	☑	
86	2015-09-04	16:18	80 14.00 N	10 59.64 W	☑	▪	☑	
ice station 20	2015-09-06	12:07	78 51.84 N	05 30.74 W	☑			☑
91	2015-09-06	17:20	78 55.00 N	05 00.31 W	☑	☑	☑	
ice station 21	2015-09-07	06:38	78 50.26 N	04 57.60 W	☑			☑
93	2015-09-07	17:36	78 55.00 N	04 01.16 W	☑	☑	☑	
ice station 22	2015-09-08	06:56	78 50.35 N	04 45.74 W	☑			☑
95	2015-09-08	16:27	78 55.00 N	03 00.15 W	☑	☑	☑	

96	2015-09-08	20:05	78 55.00 N	02 00.01 W	☑	☑	☑	
97	2015-09-09	16:23	78 55.00 N	00 02.04 W	☑	☑	☑	
99	2015-09-09	22:58	78 55.00 N	02 00.04 E	☑	☑	☑	
101	2015-09-10	04:55	78 55.00 N	04 00.08 E	☑	☑	☑	
103	2015-09-10	12:34	78 55.00 N	05 58.84 E	☑	☑	☑	
104	2015-09-10	16:50	78 55.00 N	07 00.49 E	☑	☑	☑	
106	2015-09-10	20:15	78 55.00 N	08 00.49 E	☑	☑	☑	
107	2015-09-10	22:27	78 55.00 N	09 00.49 E	☑	☑	☑	

Table 5. *List of IOP profiles, particulate absorption, dissolved absorption and ice edge measurements carried out during the FS2015 cruise*

Left: Optical measurements from the ice edge.

Water sampling

Water samples were collected in the upper 100 m for particulate and dissolved absorption. Samples for CDOM were collected using gravity filtration from the Niskin bottles on the ships rosette, and a Millipore Optical XL filter cartridge with a pore size of 0.2 microns. Filter cartridge was rinsed with MilliQ water prior to first use, and extensively flushed with sample water during sampling. Samples were collected into 40 ml amber glass vials (EPA type), which had been combusted at 450 ˚C overnight, and caps and liners acid soaked and rinsed with MilliQ. Samples were stored at +4 ˚C in dark until analysis in the home lab.

Samples for particulate absorption (listed in the table 1) were collected from the same casts. 5L plastic carboys were filled with sample bottles from the Niskins on the rosette of the ship's CTD. Samples were filtered onto Whatman GF/F glass fiber filters using low vacuum. Samples were then stored directly at -80 ˚C, and shipped to the homelab in a dryshipper with liquid nitrogen after the cruise, where analysis will take place.

In-situ measurements

At all stations inherent optical properties were measured *in situ* with several instruments: (1) an instrument package consisting of an ac-9*plus* attenuation and absorption meter (WET Labs Inc., USA), a Wetstar CDOM fluorometer (WET Labs Inc., USA), a MicroFlu-Chl chlorophyll fluorometer (TrioS GmbH, Germany), and a Seabird SBE 49 FastCAT Conductivity-Temperature-Depth probe (Seabird Electronics, USA.). The data stream from all the instruments was merged with DH4 sensor interface module (WET Labs Inc.) and transferred in real-time to the deck unit and PC; (2) yhe laser in situ scattering and attenuation meter LISST 100X (Sequoia Instruments, Inc., USA); and (3) a Hyperspectral Spherical-Cavity Absorption Meter (a-Sphere, HOBI Labs).

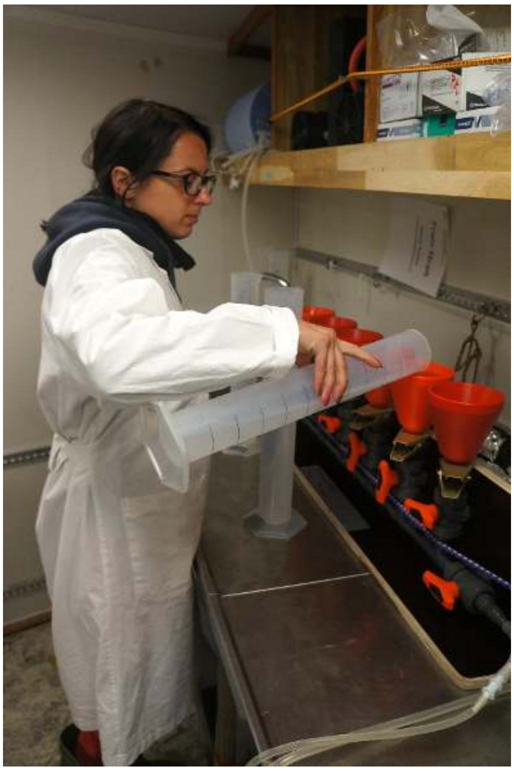
The ac-9*plus* measures the absorption and beam attenuation coefficients at nine wavelengths (412, 440, 488, 510, 532, 555, 650, 676 and 715 nm). Scattering (*b*) was determined by subtraction of absorption from attenuation. CDOM fluorescence was measured with a MicroFlu-CDOM fluorometer (TRIOS GmbH,Germany) and WETStar fluoromerer (WET Labs inc.), which is suitable for in situ measurements without the prior filtration of the water. The maximum of the excitation light spectrum is 370 nm and maximum emission of the light detector is set at 460 nm. The TRIOS MicroFlu-Chla fluorometer has the same functional features the one for CDOM measurements except different excitation (470 nm) and emission (685 nm), wavelengths.

The laser in situ scattering and attenuation meter LISST 100X (Sequoia Instruments, Inc., USA) was deployed along with the Integrated Optical-Hydrological probe for measurements of particle size distribution. The key elements of this self-contained instrument are a solid-state laser diode operating at 670 nm wavelength and a specially designed 32-ring photodiode detector. Ring detector records scattering at 32 angles. The rings cover an angular range from 0.0017 to 0.34 radians, which corresponds to size ranges from 1.2 to 250 microns respectively. The cleaning, maintenance and field calibration schedule was the same as for the Integrated Optical Hydrological probe. The Hyperspectral Spherical-Cavity Absorption Meter (a-Sphere, HOBI Labs) performs spectral absorption measurements in the range 355-750 nm with 1 nm resolution.

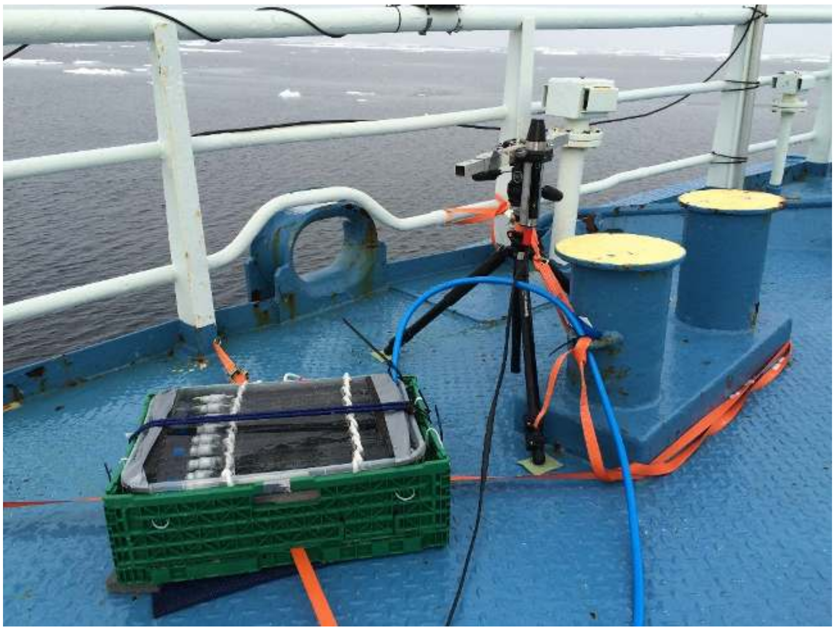
Optical instruments for in situ measurements

Experimental work

Two 4-days CDOM (Colored dissolved organic matter) photobleaching experiments have been carried out on deck. Quartz tubes submerged in a water bath with running seawter were filled with polar water from subsurface and surface layers. Polar water was prefiltered with a Millipore Optical XL filter cartridge with a pore size of 0.2 microns. Samples were collected after 24, 48, 72, and 96 hours after the start of the experiment. Dark controls (tubes wrapped into non-transparent tin foil) were sampled after 48 and 96 hours. During both experiments an incoming spectral solar radiation was recorded with a hyperspectral radiometer TriOS RAMSES-ACC-VIS in the spectral range 320-900 nm in order to eventually normalize observed changes in CDOM optical properties to solar light exposure. All samples were stored at +4 ˚C in dark until analysis in the home lab



Left: Filtration in a lab.



Top: CDOM photobleaching experimental setup

VMADCP data

The vessel mounted ADCP was deployed using the S_300B4 configuration script designed by Pierre Jarracrd (4 metre bin size, standard range parameters, bottom tracking mode on). The same configuration was used for the duration of the cruise. The precise configuration can be determined from examination of the deployment script (below). Bottom tracking pings were sent during complete cruise. Sending bottom tracking pings in deep water is ineffective and slightly reduces the amount of good data water column data collected, but this approach avoids the situation where nobody remembers to turn on bottom tracking when the ship enters shallow water. During Fram Strait cruises we are principally interested in vessel mounted ADCP data collected in shallow water.

```
BEGIN RDI CONFIGURATION FILE (L300B4.CFG)

COMMUNICATIONS
{
ADCP          ( ON   COM2 38400 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
ENSOUT        ( OFF  COM4 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
NAV           ( ON   COM1 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
REFOUT        ( OFF  COM4 4800 N 8 2 ) [ Port Baud Parity Databits Stopbits ]
EXTERNAL      ( ON   COM3 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
}

ENSEMBLE OUT
{
ENS CHOICE    ( N N N N N N N N )  [ Vel Corr Int %Gd Status Leader BTrack Nav ]
ENS OPTIONS   (BOTTOM   1   8   1   8 )  [ Ref First Last Start End ]
}

ADCP HARDWARE
{
Firmware        ( 5.46 )
Angle           (      30 )
Frequency       (     150 )
System          (    BEAM )
Mode            (       4 )
Orientation     (    DOWN )
Pattern         ( CONCAVE )
}

DIRECT COMMANDS
```

```
{
WS400
WF200
BX4000
WN064
WD111100000
WP00001
BP001
WM4
TP000010
BM4
TE00000050
EZ0000001
EP0
ER0
EH0
WB2
}

RECORDING
{
Deployment ( OAER )
Drive 1    (   C  )
Drive 2    (   C  )
ADCP       ( YES )
Average    ( YES )
Navigation ( YES )
}

CALIBRATION
{
ADCP depth                  (    6.00 m      )
Heading / Magnetic offset   (   0.00      0.00 deg )
Transducer misalignment     (    0.00 deg    )
Intensity scale             (    0.43 dB/cts )
Absorption                  (   0.039 dB/m   )
Salinity                    (    35.0 ppt    )
Speed of sound correction   (   NO   1500.0  )
Pitch & roll compensation   (     YES        )
Tilt Misalignment           (    0.00 deg    )
Pitch_Offset                (    0.000 deg    )
Roll_Offset                 (    0.000 deg    )
Top discharge estimate      (    CONSTANT    )
Bottom discharge estimate   (    CONSTANT    )
Power curve exponent        (      0.1667   )
}

PROCESSING
{
Average every ( 300.00 s )
Depth sounder (  NO )
Refout_info (   1   8  30.00  1.000 0      1) [bins:1st last, limit, weight, format, delaysec]
External_formats  ( N N Y N )  [ HDT HDG RDID RDIE ]
External_decode   ( Y Y Y  N ) [ heading pitch roll temp ]
}

GRAPHICS
{
Units        ( SI )
Velocity Reference (    NONE    )
East_Velocity      ( -100.0  100.0  cm/s )
North_Velocity     ( -100.0  100.0  cm/s )
Vert_Velocity      ( -100.0  100.0  cm/s )
Error_Velocity     ( -100.0  100.0  cm/s )
Depth              (      1     61   bin )
Intensity          (      0    200     dB)
Discharge          (  -1000   1000  m3/s )
East_Track         ( -107681 1191414     m )
North_Track        ( -300000 1357285     m )
Ship track         (  5 bin  100.0  cm/s )
Proj_Velocity      ( -100.0  100.0  cm/s )
Proj_Angle         (    0.0  deg from N )
Bad_Below_Bottom   (   NO  )
Line1              (                                                  )
Line2              (                                                  )
}
```

```
HISTORY
{
SOFTWARE       ( BB-TRANSECT )
Version        ( 2.72 )
}
```

```
END RDI CONFIGURATION FILE
```

LADCP data

LACDP data was collected on nearly each CTD station and was generally of good quality. On the first two stations we found that the 'old LADCP' was installed on the CTD rosette. This LADCP head has not been upgraded with new firmware, it does not function well anymore and should not be used at any time. We changed to the newly upgraded (new firmware) LADCP which collected data all right after adding a counter weight on the CTD rosette (to avoid getting a tilt of < 22°!). As of CTD station nr. 4 LADCP data were collected OK. However, some stations gave bugs during processing, i.e on CTD station nr. 52 (LACDP / CTD times are off), 53 (no good CTD .cnv file), 65 (prepinv error, not sufficient data?), 76 (no LADCP data, station for water samples Alexey).

The LADCP data was processed onboard using the LDEO IX.10 software package and using 1Hz averaged CTD profiles, and excluding VMADCP data. The LACDP data was corrected for the magnetic declination using the geomag70 IGRF11 model. After the cruise the LADCP data was detided with the barotropic tidal model AOTIM. It should be kept in mind that there are large baroclinic tides on the shelf these are not taken out of the LACDP data.

The script file that was used to configure and start the LADCP is given below:

```
---------------------------------------------
CR1
WM15
; !!! PRIOR TO EACH CAST MAKE SURE TO RENAME THE FILE NAME BELOW TO MATCH THE CTD
STATION NR!!!:
RN L001_
LZ030,220
CF11111
EA0
EB0
ED0
ES35
EX00111
EZ1111101
```

```
WB1
WD111100000
WF176
WN14
WP1
WS800
WV300
SM1
SA001
SI0
SW75
TE00:00:01.00
TP00:01.00
CK
CS

--------------------------------------------
;Instrument        = Workhorse Sentinel
;Frequency         = 307200
;Water Profile     = YES
;Bottom Track      = NO
;High Res. Modes   = NO
;High Rate Pinging = NO
;Shallow Bottom Mode= NO
;Wave Gauge        = NO
;Lowered ADCP      = YES
;Ice Track         = NO
;Surface Track     = NO
;Beam angle        = 20
;Temperature       = 5.00
;Deployment hours  = 12.00
;Battery packs     = 1
;Automatic TP      = YES
;Memory size [MB]  = 256
;Saved Screen      = 1
;
;Consequences generated by PlanADCP version 2.06:
;First cell range  = 10.11 m
;Last cell range   = 114.11 m
;Max range         = 116.10 m
;Standard deviation = 1.73 cm/s
;Ensemble size     = 521 bytes
;Storage required  = 21.46 MB (22507200 bytes)
;Power usage       = 43.18 Wh
;Battery usage     < 0.1
;
; WARNINGS AND CAUTIONS:
; WM15 feature has to be installed has to be installed in Workhorse to use selected option.
; Advanced settings have been changed.
--------------------------------------------
```

Echo sounder data

Jenny Ullgren, Nansen Environmental and Remote Sensing Center, Bergen

During the Fram Strait 2015 cruise, data from the scientific echo sounder (Simrad EK60) were recorded for a pilot study of acoustically reflective thermohaline fine structure at water mass boundaries. The simultaneous echo sounder and oceanographic (CTD/L-ADCP) data will be used to (a) assess the feasibility of the method in the Fram Strait and locate areas of particular interest, (b) build experience and improve sampling routines for future fieldwork, and (c) develop the processing of echo sounder data for physical oceanography.

Even a limited data 'harvest' will be helpful in addressing questions like: (1) Do we find the expected type of fine structure in the Fram Strait? Where are the best places for acoustic observation of fine structure? (2) What are the limitations? Is the data quality sufficient, if not – why not (ship noise, interference)? How should echo sounder settings be optimized? What additional measurements are needed to complement the echo sounder and CTD?

The echo sounder was set to record on 24 August 10:46 UTC and wrote raw data to file along the whole cruise track with short pauses for example when backing up data or when the navigational data stream was briefly turned off because of technical problems. The maximum ping range was adapted to fit the changing depths along the cruise track. Various settings in terms of pulse duration and ping rate were tested. The recording was ended on 11 September 05:56 UTC.

We had planned to collect data from (at least) two frequency channels: 18 and 38 kHz. However, only the 18 kHz transceiver turned out to be operational during the cruise. The other two transducers, 38 and 120 kHz, did not appear to be active. They were not simply switched off, since no transducers other than the 18 kHz were available for (re-)installation via the ER60 software. It was not clear whether the problem was related to hardware (e.g. damaged transducers), the control unit(s), or whether they had been uninstalled. The need to keep the 18 kHz working during the cruise prevented us from experimenting with the installations.

During the 18 days of operation, 22 Gb of data from the 18 kHz frequency channel were recorded, covering a range of environments from east (Svalbard region) to west (East Greenland shelf region), and from shallow (ca 100 m) to deep (ca 2500 m) water. The data will be post-processed and analyzed back ashore.

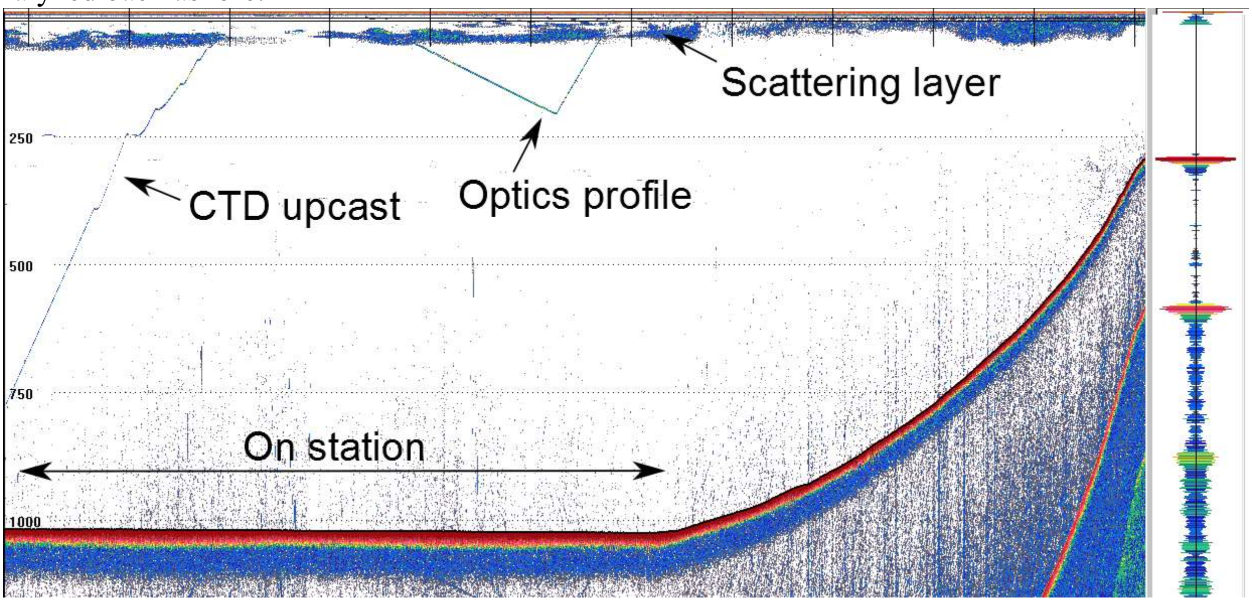


Figure 10: *Screenshot of ER60 echogram from 10 September, 21:28 UTC, going from about 1000 m (left side) to 290 m (right side) water depth over the Svalbard shelf. The image captured one of the last CTD-casts of the cruise followed by an optics cast. The scattering layer likely consists of zooplankton. The wavelength of the 18 kHz signal is too long to target zooplankton individuals, but scattering can occur from thick patches of zooplankton or from larger animals like fish.*

Appendix 1: Summary of CTD stations

Summary of CTD stations, salinity (S), ∂18O, nutrient, CDOM and alkalinity sampling

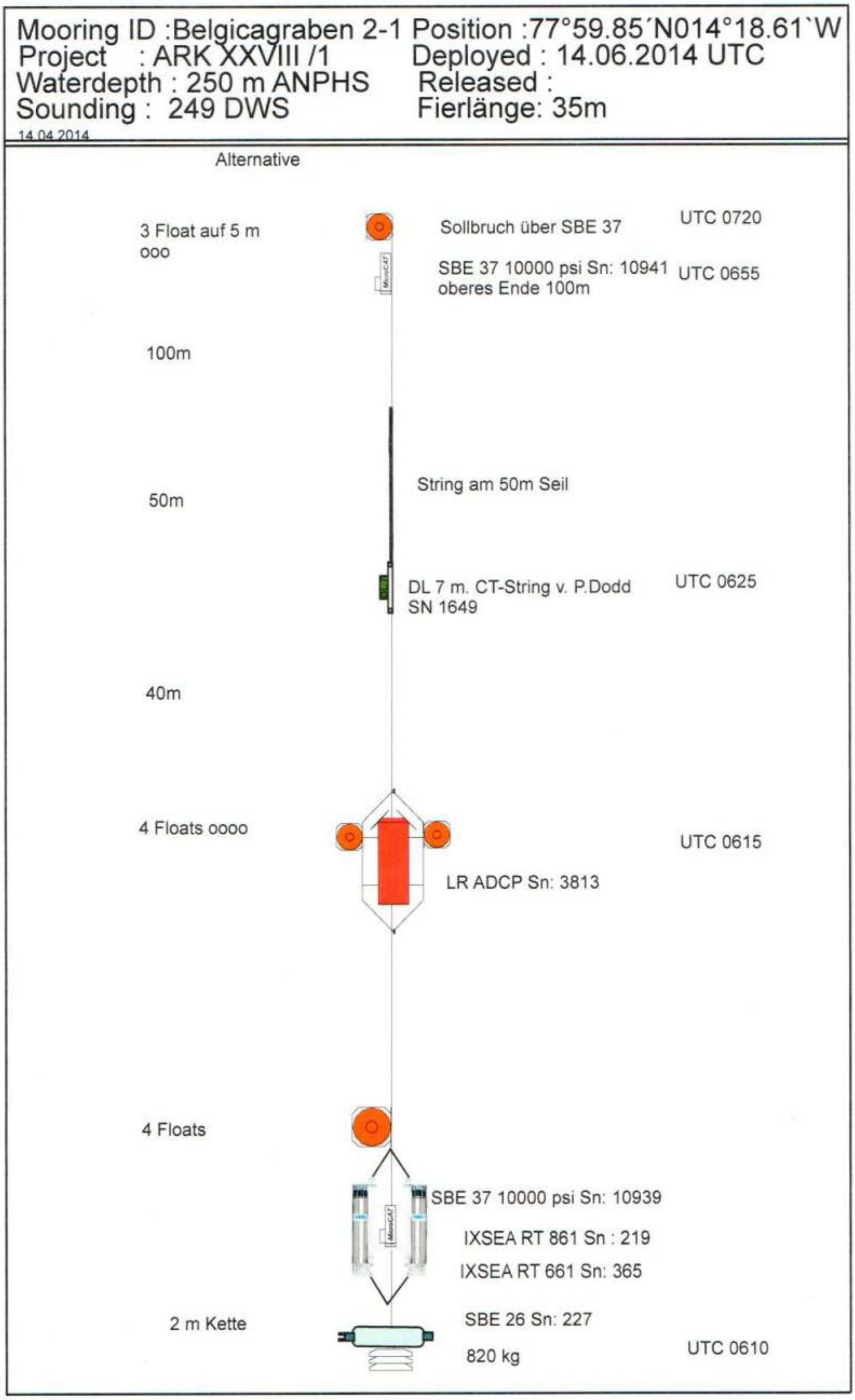
Stn.	Date / Time	Latitude	Longitude	S	d18O	Nutrients	CDOM	Alkalinity
1	24-Aug-2015 14:27:01	78.9185	0.0015	yes	yes	yes	yes	yes
2	24-Aug-2015 18:19:47	78.9153	-0.99767	yes	yes	yes	no	no
3	24-Aug-2015 21:23:32	78.9148	-1.9983	yes	yes	yes	yes	yes
4	25-Aug-2015 00:51:57	78.9148	-2.5018	yes	yes	yes	no	no
5	25-Aug-2015 08:51:14	78.8252	-3.0485	yes	no	no	no	no
6	25-Aug-2015 13:23:40	78.8218	-4.0175	yes	no	no	no	no
7	25-Aug-2015 21:51:32	78.9182	-2.9993	yes	yes	yes	yes	yes
8	26-Aug-2015 01:12:36	78.9185	-3.4797	yes	yes	yes	no	no
9	26-Aug-2015 04:38:23	78.917	-4.0028	yes	yes	yes	yes	yes
10	26-Aug-2015 07:29:29	78.9212	-4.511	yes	yes	yes	no	no
11	26-Aug-2015 10:56:51	78.8347	-4.9853	yes	no	no	no	no
12	26-Aug-2015 17:28:00	78.8353	-5.5175	yes	no	no	no	no
13	26-Aug-2015 19:07:01	78.9168	-5.0027	yes	yes	yes	yes	yes
14	26-Aug-2015 21:27:53	78.9182	-5.5107	yes	yes	yes	no	no
15	26-Aug-2015 23:20:02	78.9197	-6.0045	yes	yes	yes	yes	yes
16	27-Aug-2015 06:14:26	78.9178	-6.505	yes	yes	yes	no	no
17	27-Aug-2015 08:12:24	78.8137	-6.4983	no	no	no	no	no
18	27-Aug-2015 16:49:22	78.8378	-8.1168	no	no	no	no	no
19	27-Aug-2015 17:41:12	78.9163	-8.0032	yes	yes	yes	yes	yes
20	27-Aug-2015 20:36:52	78.9177	-6.997	yes	yes	yes	yes	yes
21	28-Aug-2015 00:18:55	78.9163	-9.0025	yes	yes	yes	yes	yes
22	28-Aug-2015 02:29:38	78.9158	-10.0085	yes	yes	yes	yes	yes
23	28-Aug-2015 04:35:27	78.9153	-11.004	yes	yes	yes	yes	yes
24	28-Aug-2015 07:40:27	78.9187	-12.0037	yes	yes	yes	yes	yes
25	28-Aug-2015 10:08:41	78.9177	-12.7052	yes	yes	yes	yes	yes

26	29-Aug-2015 07:38:52	77.9985	-14.3127	no	no	no	no	no
27	29-Aug-2015 14:42:34	77.692	-11.6437	no	no	no	no	no
28	29-Aug-2015 15:17:51	77.6647	-11.7765	no	no	no	no	no
29	29-Aug-2015 16:08:34	77.6347	-11.8953	no	no	no	no	no
30	29-Aug-2015 16:51:24	77.604	-12.0153	no	no	no	no	no
31	29-Aug-2015 17:44:05	77.5732	-12.145	no	no	no	no	no
32	29-Aug-2015 18:37:03	77.543	-12.2757	no	no	no	no	no
33	29-Aug-2015 19:23:35	77.5132	-12.404	no	no	no	no	no
34	29-Aug-2015 21:39:15	77.4825	-12.5287	no	no	no	no	no
35	29-Aug-2015 22:21:02	77.451	-12.6518	no	no	no	no	no
36	29-Aug-2015 22:56:13	77.4215	-12.7707	no	no	no	no	no
37	29-Aug-2015 23:31:52	77.391	-12.907	no	no	no	no	no
38	30-Aug-2015 00:06:04	77.3623	-13.0327	no	no	no	no	no
39	30-Aug-2015 00:44:42	77.3325	-13.168	no	no	no	no	no
40	30-Aug-2015 07:29:52	77.9973	-14.3087	no	no	no	no	no
41	30-Aug-2015 20:40:12	77.9582	-16.9293	yes	yes	yes	yes	yes
42	30-Aug-2015 23:43:16	77.8985	-17.0877	no	no	no	no	no
43	31-Aug-2015 01:00:35	77.863	-17.375	no	no	no	no	no
44	31-Aug-2015 01:29:23	77.8498	-17.4448	yes	yes	yes	yes	yes
45	31-Aug-2015 02:53:23	77.8468	-17.4802	no	no	no	no	no
46	31-Aug-2015 03:16:51	77.8457	-17.4953	yes	yes	yes	yes	yes
47	31-Aug-2015 04:04:46	77.8458	-17.5108	no	no	no	no	no
48	31-Aug-2015 08:50:25	78.0465	-16.4542	yes	yes	yes	yes	yes
49	31-Aug-2015 10:59:43	78.0913	-16.1948	no	no	no	no	no
50	31-Aug-2015 12:51:47	78.1323	-16.0272	no	no	no	no	no
51	31-Aug-2015 15:20:41	78.182	-15.7383	no	no	no	no	no
52	31-Aug-2015 16:33:00	78.2322	-15.445	no	no	no	no	no
53	31-Aug-2015	78.2663	-15.2218	no	no	no	no	no

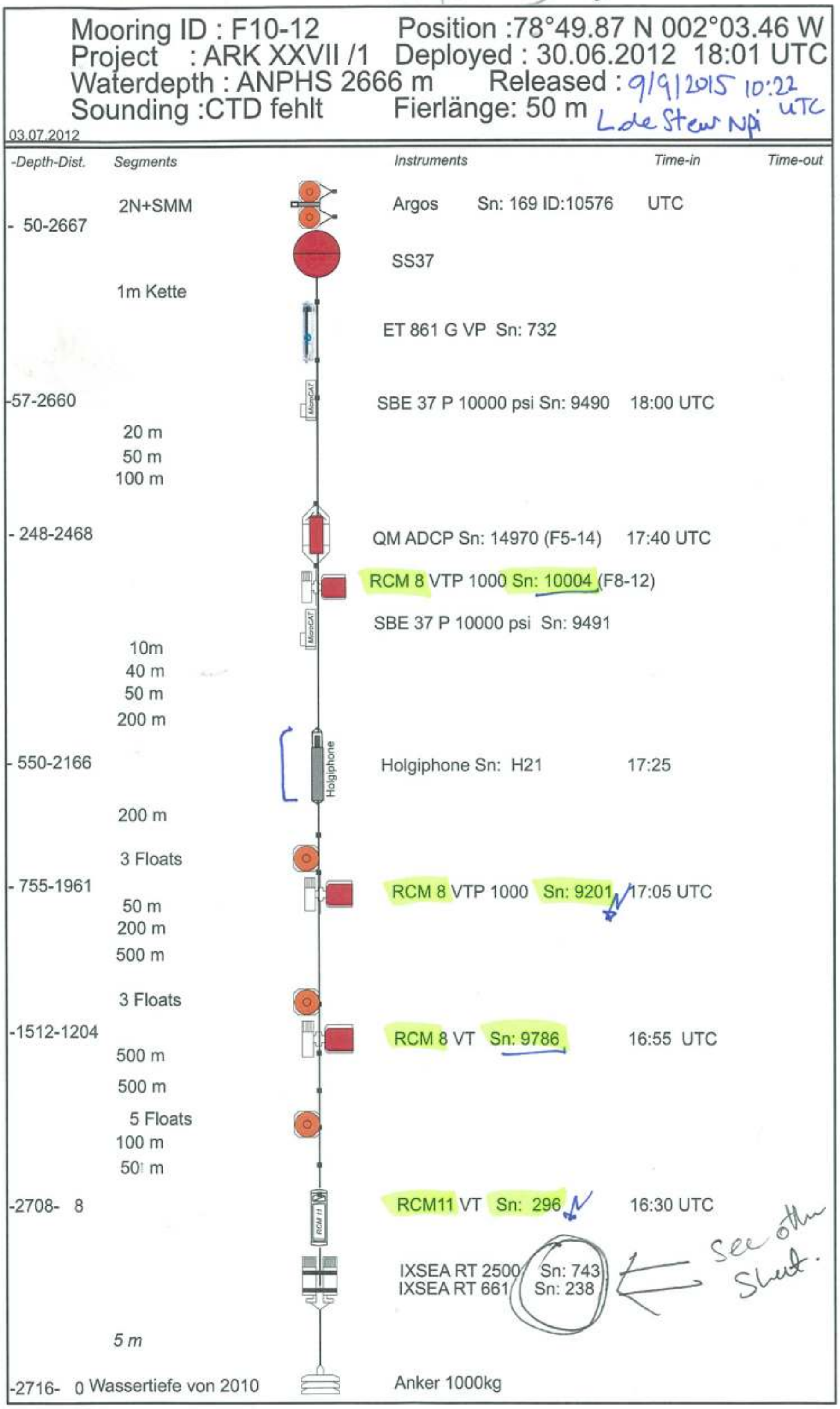
	17:50:00							
54	31-Aug-2015 19:07:51	78.3085	-14.9287	yes	yes	yes	yes	yes
55	01-Sep-2015 18:22:14	80.1592	-12.413	no	no	no	no	no
56	01-Sep-2015 19:04:32	80.2018	-12.529	no	no	no	no	no
57	01-Sep-2015 19:42:19	80.2445	-12.647	no	no	no	no	no
58	01-Sep-2015 20:19:34	80.2893	-12.7638	no	no	no	no	no
59	01-Sep-2015 21:30:27	80.3337	-12.8797	yes	yes	no	yes	no
60	01-Sep-2015 22:19:03	80.376	-12.9992	no	no	no	no	no
61	01-Sep-2015 23:33:40	80.4152	-13.0972	no	no	no	no	no
62	02-Sep-2015 00:37:34	80.4617	-13.2355	no	no	no	no	no
63	02-Sep-2015 02:12:04	80.5038	-13.3527	no	no	no	no	no
64	02-Sep-2015 05:39:38	80.5332	-13.4157	no	no	no	no	no
65	02-Sep-2015 18:53:03	80.0327	-9.66	no	no	no	no	no
66	02-Sep-2015 19:58:44	80.0973	-9.4933	no	no	no	no	no
67	02-Sep-2015 20:52:51	80.1665	-9.3468	yes	yes	no	yes	no
68	02-Sep-2015 22:30:41	80.2343	-9.1667	no	no	no	no	no
69	02-Sep-2015 23:23:10	80.3	-9.0077	yes	yes	no	yes	no
70	03-Sep-2015 00:55:16	80.3677	-8.8332	no	no	no	no	no
71	03-Sep-2015 01:45:15	80.435	-8.6717	yes	yes	no	yes	no
72	03-Sep-2015 03:04:17	80.5028	-8.4838	no	no	no	no	no
73	03-Sep-2015 04:04:04	80.5673	-8.3257	yes	yes	no	yes	no
74	03-Sep-2015 05:29:45	80.634	-8.1503	no	no	no	no	no
75	03-Sep-2015 06:38:22	80.6867	-7.9893	no	no	no	no	no
76	03-Sep-2015 18:45:03	80.4952	-11.0533	yes	yes	no	yes	no
77	04-Sep-2015 04:44:01	80.4713	-10.9817	no	no	no	no	no
78	04-Sep-2015 05:25:14	80.526	-11.001	no	no	no	no	no
79	04-Sep-2015 06:10:50	80.5848	-10.9995	no	no	no	no	no
80	04-Sep-2015 08:21:56	80.6425	-11.2593	no	no	no	no	no

81	04-Sep-2015 09:00:00	80.692	-11.3128	no	no	no	no	no
82	04-Sep-2015 09:59:22	80.7475	-11.2618	no	no	no	no	no
83	04-Sep-2015 13:30:37	80.4083	-10.9987	no	no	no	yes	no
84	04-Sep-2015 14:48:16	80.3498	-11.0053	no	no	no	no	no
85	04-Sep-2015 15:30:07	80.2933	-11.0008	no	no	no	no	no
86	04-Sep-2015 16:14:26	80.2328	-10.9992	no	no	no	no	no
87	04-Sep-2015 17:27:36	80.1762	-10.9953	no	no	no	no	no
88	04-Sep-2015 18:14:02	80.118	-10.9943	no	no	no	no	no
89	06-Sep-2015 06:42:53	78.9217	-5.9998	yes	yes	yes	yes	yes
90	06-Sep-2015 08:45:02	78.9148	-5.4935	yes	yes	yes	no	no
91	06-Sep-2015 17:17:45	78.9145	-4.9885	yes	yes	yes	yes	yes
92	07-Sep-2015 13:22:52	78.9113	-4.4965	yes	yes	yes	no	no
93	07-Sep-2015 16:37:30	78.918	-4.0202	yes	yes	yes	yes	yes
94	08-Sep-2015 06:16:59	78.8455	-4.7502	yes	yes	no	yes	no
95	08-Sep-2015 14:46:00	78.9143	-3.0047	yes	yes	no	yes	no
96	08-Sep-2015 18:54:19	78.9192	-1.9725	yes	yes	no	yes	no
97	09-Sep-2015 14:33:44	78.9192	0.030667	yes	yes	no	yes	no
98	09-Sep-2015 18:12:32	78.9163	0.998	yes	yes	yes	no	no
99	09-Sep-2015 21:14:59	78.9175	2.0078	yes	yes	yes	yes	yes
100	10-Sep-2015 00:26:55	78.9165	3.0272	yes	yes	yes	no	no
101	10-Sep-2015 03:03:33	78.9167	4.0147	yes	yes	yes	yes	yes
102	10-Sep-2015 06:28:11	78.9153	4.9715	yes	yes	yes	no	no
103	10-Sep-2015 10:56:55	78.918	5.9983	yes	yes	yes	yes	yes
104	10-Sep-2015 14:15:37	78.9162	7.0115	yes	yes	yes	yes	yes
105	10-Sep-2015 17:58:22	78.9163	7.4973	yes	yes	yes	no	no
106	10-Sep-2015 19:29:49	78.917	7.9983	yes	yes	yes	yes	yes
107	10-Sep-2015 22:06:56	78.917	8.9978	yes	yes	yes	yes	yes

Appendix 2: Moorings recovered during FS2015



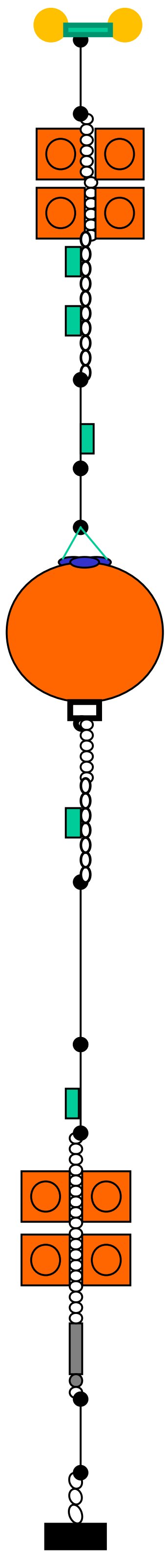
If time allows; recover during FS 2015
F10-12 (AWI)



NOTE: 2nd mooring F10-13 er på 78° 49.72'N 1° 59.06'W

Rigg F17-11 78 50.610 N

Satt ut SEP 2014 , kl 21:28 008 08.493W

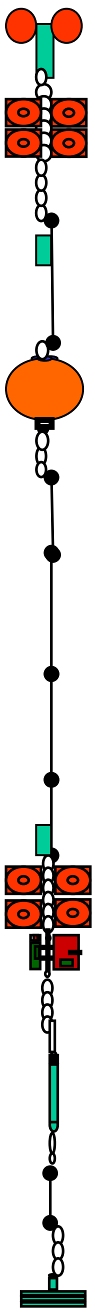


		Dyp:	Fra bunn:	Ut:
ICECat	SNR. 11434	27	198	21:26
25 m Wire				
Weak link				
3 m Kjetting galv.				
4 Glasskuler				
ICECAT Modem				
SBE16	SNR.6693	55	170	21:26
40 m Kevlar				
SBE37	SNR.2962	95	130	21:19
10 m Kevlar				
ADCP	SNR.7636	106	119	21:19
2 m Kjetting galv.				
SBE16	SNR.6694	108	117	21:19
100 m Kevlar				
5 m Kevlar				
SBE37	SNR.7062	213	12	21:19
2 m Kjetting galv.				
4 GLASSKULER		210	10	21:10
AR661	SNR. 110			
5 m Kevlar.				
2 m Kjetting galv.				
ANKER	770/(620)kg	225	0	

Rigg F14-16

Satt ut 6 SEP 2014 , kl 11:56

78 48,85N
006 30,09W

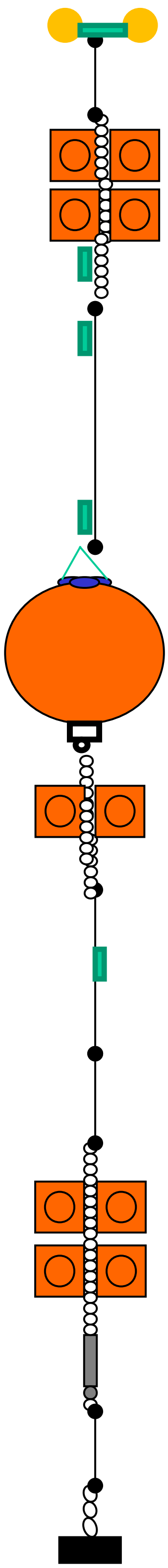


		Dyp:	Fra bunn:	Ned i vann:
IPS	SNR. 51127	58	213	11:40
4 Glasskuler 2 m Kjetting galv.				
SBE37	SNR: 3492	62	209	11:40
5 m Kevlar				
ADCP 300	SNR: 16876	66	205	11:40
1 m Kjetting Galv. 0,5 m Kjetting Galv.				
40 m Kevlar				
100 m Kevlar				
50 m Kevlar				
SBE37	SNR.3992	258	13	11:30
4 Glasskuler 2 m Kjetting Galv.				
RCM9	SNR. 1046	261	10	11:30
Svivel				
AR861	SNR. 409			
3,5 m Kevlar				
2,5 m Kjetting				
ANKER 925/(740) kg		271	0	

Rigg F13B-1

Satt ut 6 SEP 2014 , kl 17:30

78 50.17 N
006 31.06W



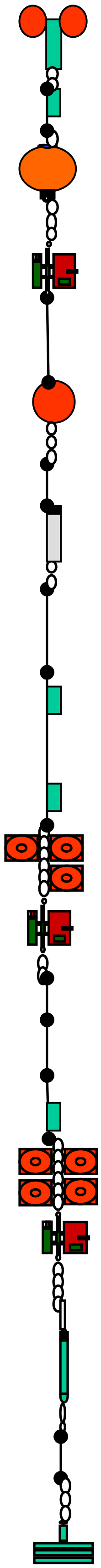
		Dyp:	Fra bunn:	Ut:
ICECat	SNR. 11435	26	490	17:25
25 m Wire				
Weak link				
3 m Kjetting galv.				
4 Glasskuler				
ICECat modem				
SBE37	SNR. 12234	54	462	17:16
50 m Kevlar				
SBE37	SNR. 12233	102	414	17:06
ADCP	SNR.707	103	413	17:06
1 m Kjetting galv.				
2 Glasskuler				
200 m Kevlar				
SBE37	SNR. 10295	205	311	16:54
200 m Kevlar				
2 m Kjetting galv.				
4 GLASSKULER		506		16:45
AR661	SNR. 291			
5 m Kevlar.				
2 m Kjetting galv.				
ANKER	770/(620)kg	516	0	

Rigg F13-16

78 50.133N

Settes ut 7 SEP 2014, kl 13:50 005 00.241W

Tatt opp AUG 201 kl :00



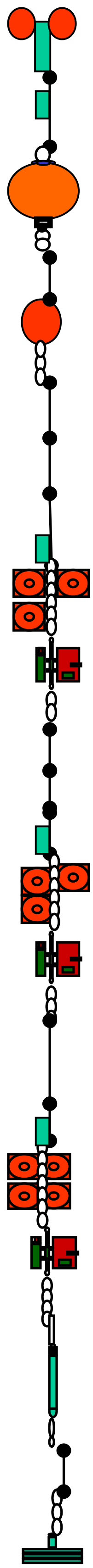
		Dyp:	Fra bunn:	Ned i vann:
IPS4	SNR. 1047	54	961	13:18
SBE37	SNR: 7056	56	959	13:18
5 m Kevlar				
ADCP300	SNR: 16831	60	955	13:18
1,5 m Kjetting galv				
RCM9	SNR. 1175	62	953	13:09
10 m Kevlar				
Stålkule 37		72	943	
1,5 m Kjetting galv.				
5 m Kevlar				
Hvallydopptaker		79	936	
0,5 m Kjetting galv.				
50 + 20 m Kevlar				
SBE37	SNR. 12232	151	864	13:00
100 m Kevlar				
SBE37	SNR.3993	249	766	12:57
3 Glasskuler				
2 m Kjetting galv.				
RCM9	SNR.1327	252	763	12:57
0,5 m Kjetting galv				
500 m Kevlar K				
200 m Kevlar				
50 m Kevlar				
SBE37	SNR.3551	1002	13	12:38
4 Glasskuler				
2 m Kjetting galv.				
RCM11	SNR. 561	1005	10	12:38
0,5 m Kjetting rustfri				
Svivel				
AR861	SNR. 053			
3,5 m Kevlar				
3 m Kjetting galvanisert				
ANKER	1100/(880) kg	1015	0	

Rigg F12-16

78 49,154N

Settes ut 8 SEP 2014 kl 12:00 004 01,435W

Tatt opp AUG 20 kl



		Dyp:	Fra bunn:	Ut:
IPS	SNR. 51167	53	1780	11:55
SBE37	SNR.3489	55	1778	11:55
5 m Kevlar				
ADCP300	SNR: 17462	59	1774	11:55
0,5m Kjetting galvanisert				
10 m Kevlar				
Stålkule 37	SNR. 596	69	1764	
1,5 m Kjetting galvanisert				
200 m Kevlar				
SBE37	SNR.4837	270	1563	11:42
3 Glasskuler				
2 m Kjetting galvanisert				
RCM9	SNR. 884	273	1560	11:42
0,5 m Kjetting galv				
500 m Kevlar				
500 m Kevlar				
200 m Kevlar				
SBE37	SNR.3554	1473	360	11:21
3 Glasskuler				
2 m Kjetting galvanisert				
RCM11	SNR.235	1480	353	11:21
0,5 m Kjetting galv				
200 m Kevlar				
100 m Kevlar				
40 m Kevlar				
SBE37	SNR. 8822	1820	13	11:10
4 Glasskuler				
2 m Kjetting galvanisert				
RCM11	SNR.228	1823	10	11:10
0,5 m Kjetting rustfri				
Svivel				
AR861	SNR. 182			
3,5 m Kevlar				
3 m Kjetting galvanisert				
ANKER	1190/(960) kg	1833	0	

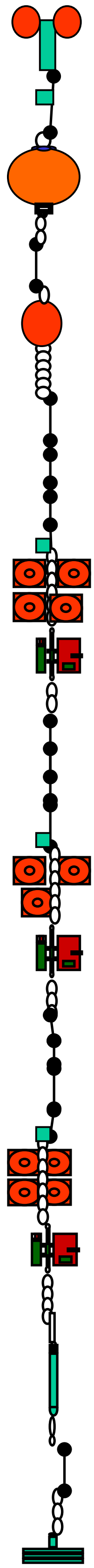
Rigg F11-16

Satt ut 9 SEP 2014 kl 12:30

78 48,2N

003 04,7W

Tatt opp AUG kl



		Dyp:	Fra bunn:	Ut:
IPS	SNR. 51062	53	2395	12:00
SBE37	SNR. 3490	55	2393	12:00
5 m Kevlar				
ADCP300	SNR: 17461	59	2389	12:20
1 m Kjetting galvanisert				
10 m Kevlar				
Stålkule 37 McLane		71	2377	
1,5 m Kjetting galvanisert				
100 m Kevlar				
50 m Kevlar				
50 m Kevlar				
5 m Kevlar				
SBE37	SNR. 4702	278	2170	12:07
4 Glasskuler (gule)				
2 m Kjetting galvanisert				
RCM9	SNR.1324	282	2166	12:07
0,5 m Kjetting galv				
200 m Kevlar K				
500 m Kevlar K				
500 m Kevlar				
50 m Kevlar				
SBE37	SNR. 3552	1532	916	11:38
3 Glasskuler (2 oransje + 1 gul)				
2 m Kjetting galvanisert				
RCM11	SNR.494	1535	913	11:38
0,5 m Kjetting galv				
500 m Kevlar K				
200 m Kevlar				
200 m Kevlar				
SBE37	SNR. 8821	2435	13	11:20
4 Glasskuler (gule)				
2 m Kjetting galvanisert				
RCM8	SNR.10071	2438	10	11:20
0,5 m Kjetting rustfri				
Svivel				
AR861	SNR. 287			
3,5 m Kevlar				
3 m Kjetting galvanisert				
ANKER 1230/(980) kg		2448	0	

Appendix 3: Moorings deployed during FS2015

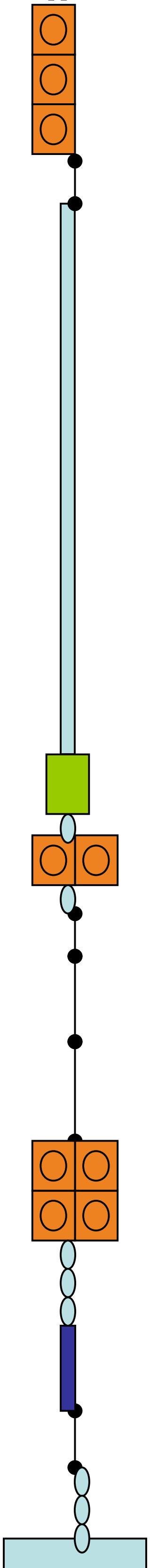
Rigg F18-10

Satt ut 5 SEP 2015, kl 08:27

Tatt opp AUG kl

78 50.290N

008 04.722W

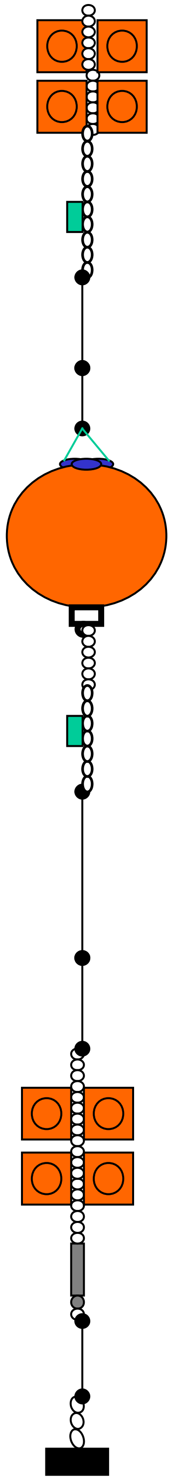


Komponent		Dyp:	Fra bunn:	Ut:
		60	158	08:26
3 Glasskuler 5 m Kevlar				
		65	153	
Seaguard String	Snr. 1593		115	103
2 Glasskuler 1 m Kjetting galv.				
40 m Kevlar				
50 m Kevlar				
4 Glasskuler				
3 m Kjetting galv.				
AR861	Snr. 553			
5 m Kevlar				
2 m Kjetting				
Anker	670/(540) Kg	218	0	

Rigg F17-12

Satt ut 5 SEP 2015 , kl 07:05

78 50.107 N
008 05.010W

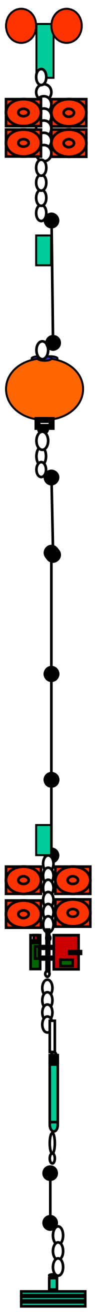


		Dyp:	Fra bunn:	Ut:
3 m Kjetting galv.				
4 Glasskuler				
SBE16	SNR. 7212	55	170	07:00
50 m Kevlar				
ADCP	SNR.7636	106	119	06:54
2 m Kjetting galv.				
SBE16	SNR. 7339	108	117	06:54
100 m Kevlar				
10 m Kevlar				
3 m Kjetting galv.				
4 GLASSKULER		210	10	06:44
AR861CS	SNR. 501			
5 m Kevlar.				
2 m Kjetting galv.				
ANKER	780/(630)kg	225	0	

Rigg F14-17

Satt ut 5 SEP 2015 , kl 14:05

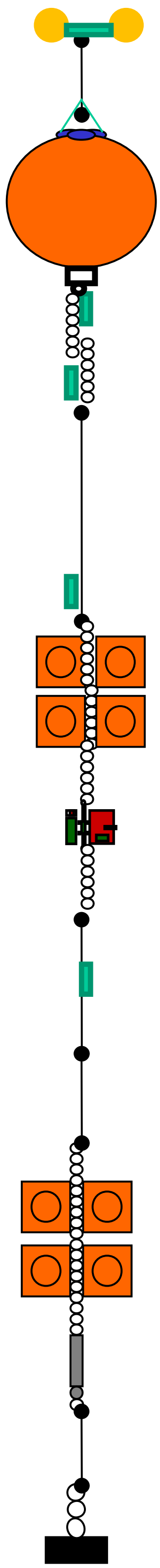
78 48,866N
006 30,033W



		Dyp:	Fra bunn:	Ned i vann:
IPS	SNR. 51127	58	213	11:04
4 Glasskuler				
2 m Kjetting galv.				
SBE37	SNR: 7058	62	209	14:04
5 m Kevlar				
ADCP 300	SNR: 16876	67	204	14:03
1 m Kjetting Galv.				
0,5 m Kjetting Galv.				
100 m Kevlar				
50 m Kevlar				
40 m Kevlar				
SBE37	SNR.7057	258	13	11:53
4 Glasskuler				
2 m Kjetting Galv.				
RCM9	SNR. 1325	261	10	13:50
Svivel				
AR861	SNR. 568			
3,5 m Kevlar				
2,5 m Kjetting				
ANKER 925/(740) kg		271	0	

Rigg F13B-2
Satt ut 6 SEP 2015 , kl 10 :59

78 50.182 N
005 30.886W



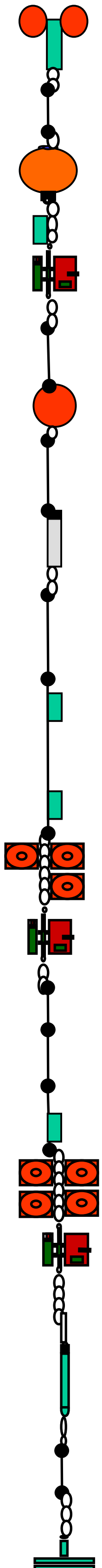
		Dyp:	Fra bunn:	Ut:
ICECat	SNR. 13506	30	486	10:57
30 m Wire weak link				
ADCP	SNR.727	60	456	10:57
IceCat Modem				
SBE37IM	SNR. 13507	62	454	10:57
40 m Kevlar				
SBE37SM	SNR. 7059	102	414	10:52
3 m Kjetting galv. 4 Glasskuler				
Seaguard	SNR. 883	204	312	10:52
SBE37SM	SNR. 13505	205	311	10:45
200 m Kevlar				
200(204) m Kevlar				
2 m Kjetting galv.				
4 GLASSKULER		506	10	10:36
AR661CS	SNR. 410			
5 m Kevlar.				
2 m Kjetting galv.				
ANKER	770/(620)kg	516	0	

Rigg F13-17

78 50.164N

Settes ut 7 SEP 2015, kl 11:15 005 00.086W

Tatt opp AUG 201 kl :00



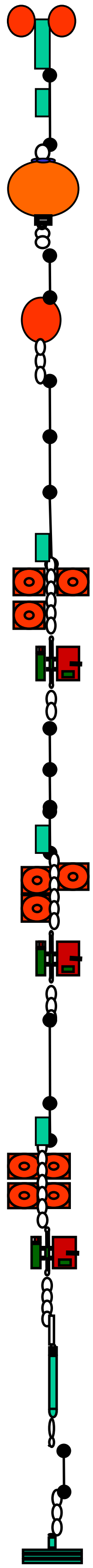
		Dyp:	Fra bunn:	Ned i vann:
IPS5	SNR. 51064	49	961	11:10
5 m Kevlar				
ADCP300	SNR: 16831	55	955	11:10
1,5 m Kjetting galv				
SBE16	SNR: 7253	56	954	11:10
RCM9	SNR. 1175	57	953	11:10
0,5 m Kjetting galv.				
10 m Kevlar				
Stålkule 37		69	941	
5 m Kevlar				
Hvallydopptaker		74	936	11:01
0,5 m Kjetting galv.				
20 m Kevlar				
50 m Kevlar				
SBE37	SNR. 3995	146	864	10:54
100 m Kevlar				
SBE37	SNR.7060	244	766	10:50
3 Glasskuler				
2 m Kjetting galv.				
RCM9	SNR.1326	247	763	10:50
0,5 m Kjetting galv				
500 m Kevlar K				
100 m Kevlar				
100 m Kevlar				
50 m Kevlar				
SBE37	SNR. 13504	997	13	10:32
4 Glasskuler				
2 m Kjetting galv.				
RCM11	SNR. 345	1000	10	10:30
0,5 m Kjetting rustfri				
Svivel				
AR861	SNR. 743			
3,5 m Kevlar				
3 m Kjetting galvanisert				
ANKER 1100/(880) kg		1010	0	

Rigg F12-17

78 49,148N

Settes ut 8 SEP 2015 kl 12:19 004 00,900W

Tatt opp AUG 20 kl



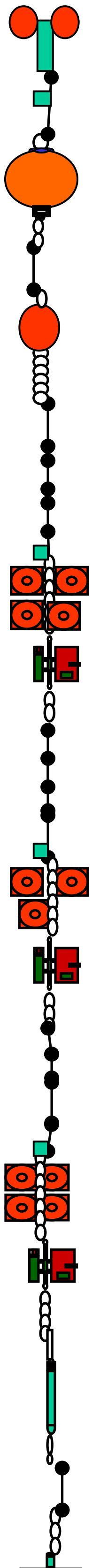
		Dyp:	Fra bunn:	Ut:
IPS	SNR. 51167	47	1770	11:55
SBE37	SNR.7055	49	1772	11:55
5 m Kevlar				
ADCP300	SNR: 17462	53	1777	11:54
1,0 m Kjetting galvanisert				
10 m Kevlar				
Stålkule 37	SNR.	65	1765	
1,0 m Kjetting galvanisert				
200 m Kevlar				
SBE37	SNR.3994	272	1564	11:43
3 Glasskuler				
2 m Kjetting galvanisert				
RCM9	SNR. 836	269	1561	11:43
0,5 m Kjetting galv				
500(498) m Kevlar				
500(497) m Kevlar				
200(203) m Kevlar				
SBE37	SNR.10294	1468	362	11:15
3 Glasskuler				
2 m Kjetting galvanisert				
RCM11	SNR.556	1471	359	11:15
0,5 m Kjetting galv				
200(205) m Kevlar				
100(101) m Kevlar				
40 m Kevlar				
SBE37	SNR. 8227	1817	13	11:01
4 Glasskuler				
2 m Kjetting galvanisert				
RCM11	SNR.117	1820	10	11:01
0,5 m Kjetting rustfri				
Svivel				
AR861	SNR. 500			
3,5 m Kevlar				
3 m Kjetting galvanisert				
ANKER	1190/(960) kg	1830	0	

Rigg F11-17

Satt ut 9 SEP 2015 kl 08:35   003 01,508W

Tatt opp AUG kl

78 48,992N



		Dyp:	Fra bunn:	Ut:
IPS	SNR. 51062	49	2401	08:30
SBE37	SNR. 7054	51	2399	08:30
5 m Kevlar				
ADCP300	SNR: 17461	55	2395	08:30
1 m Kjetting galvanisert				
10 m Kevlar				
Stålkule 37 McLane		67	2383	
1,0 m Kjetting galvanisert				
100 m Kevlar				
50 m Kevlar				
50 m Kevlar				
SBE37	SNR. 3996	268	2182	08:16
4 Glasskuler (gule)				
2 m Kjetting galvanisert				
RCM9	SNR.1049	269	2179	08:16
0,5 m Kjetting galv				
200(199) m Kevlar K				
500(507) m Kevlar K				
500(505) m Kevlar				
40 m Kevlar				
SBE37	SNR. 7061	1532	928	07:46
3 Glasskuler (2 oransje + 1 gul)				
2 m Kjetting galvanisert				
RCM11	SNR.538	1535	925	07:46
0,5 m Kjetting galv				
500(512) m Kevlar K				
200 m Kevlar				
200 m Kevlar				
SBE37	SNR. 8226	2437	13	07:21
4 Glasskuler (gule)				
2 m Kjetting galvanisert				
Seaguard	SNR.834	2440	10	07:21
0,5 m Kjetting rustfri				
Svivel				
AR861	SNR. 499			
3,5 m Kevlar				
3 m Kjetting galvanisert				
ANKER 1230/(980) kg		2450	0	