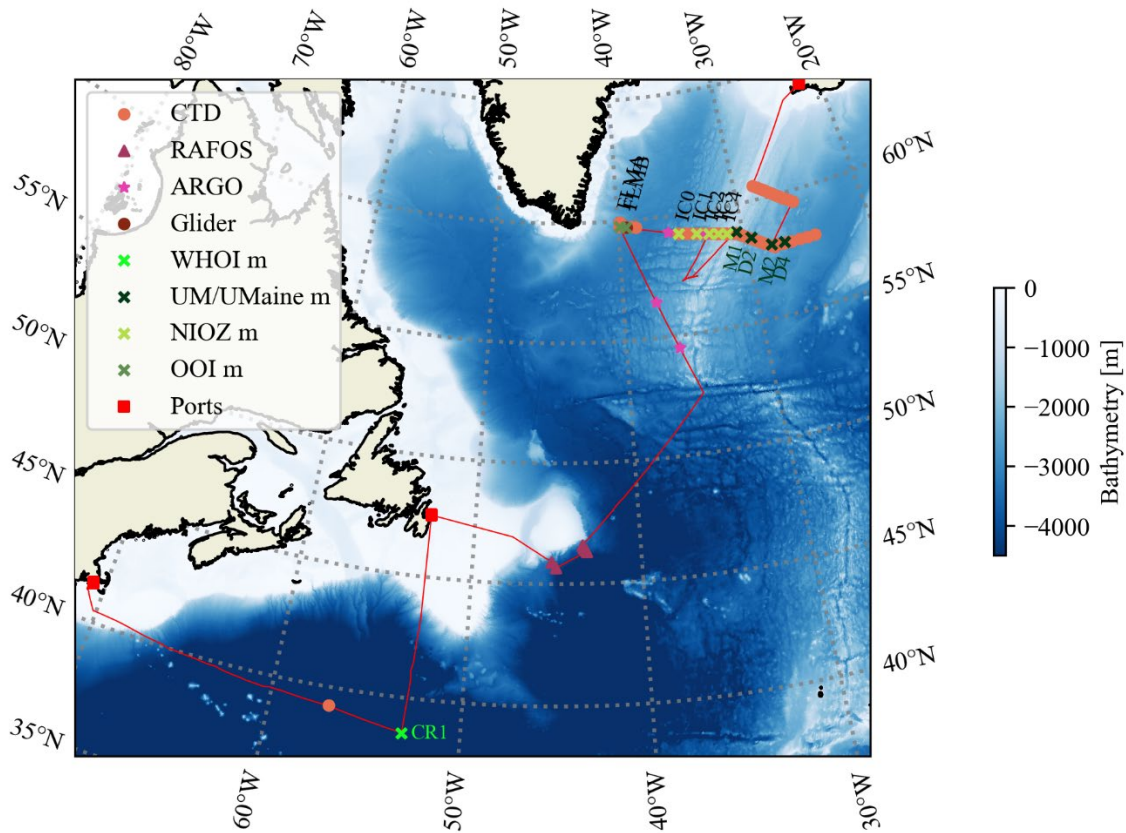


Crossroads Cruise Report

AR102-01 R/V Armstrong

June 7-July 16, 2026



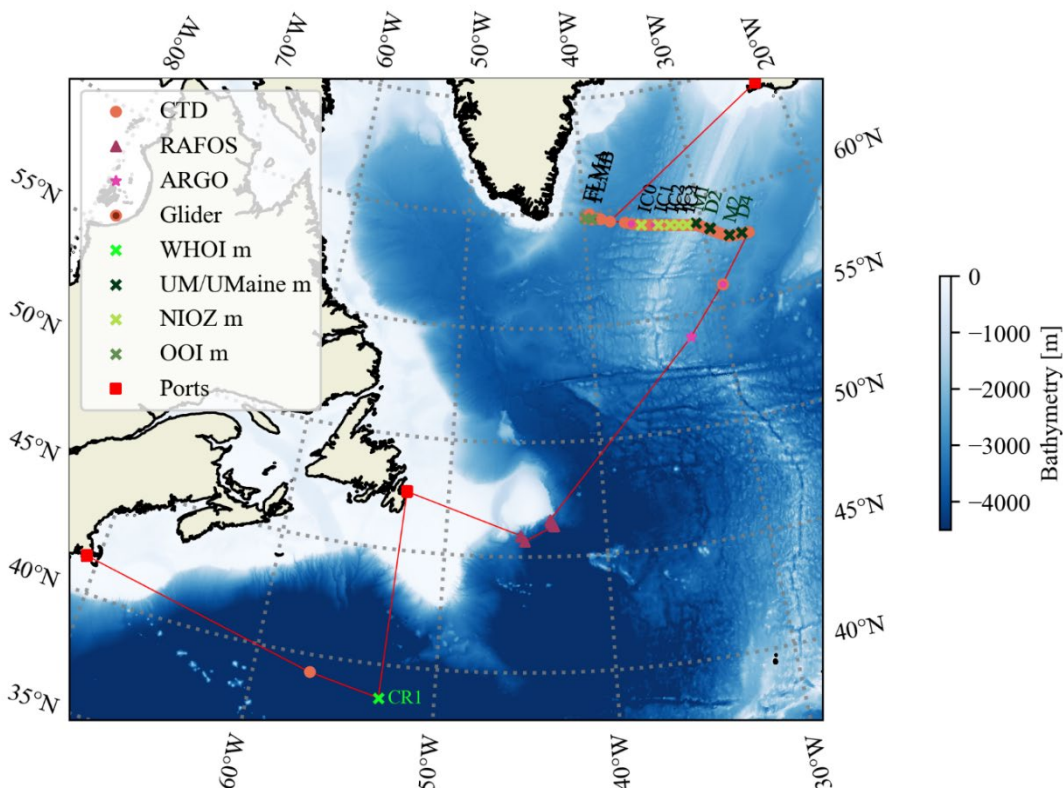
Heather Furey

Woods Hole Oceanographic Institution

1. Overview

The goals of the Crossroads fieldwork completed on R/V Armstrong cruise AR102-01, 07 June- 16 July 2026, were to deploy the last sound source mooring, CR#1, and deploy the remaining 14 spherical RAFOS floats. This work, along with OOI-Irminger FLMA and FLMB servicing, were ancillary activities on the UMaine/UMiami/NIOZ OSNAP East cruise led by Chief Scientist Tiago Bilo.

The first leg of this cruise, Woods Hole to St. John's was 9 days at sea. Work completed included one acoustic release test cast and the CR1 mooring deployment and acoustic survey. Due to weather on the first leg, we did not have time to deploy the RAFOS floats prior to St. Johns. We then steamed into St. Johns to pick up the Dutch science party who are part of OSNAP and the OOI science party who are working to turn the OOI flanking moorings. After departing St. Johns, we deployed the remaining floats south of the Flemish Cap. Figure 1 shows the cruise track and station locations. Note that the configuration of the fieldwork and cruise track changed after leaving the Flemish Cap and going northward due to weather (Figure 1).



	Science Party	Role, University	Work responsibilities
1	Tiago Bilo	Scientist, UMaine	Chief Scientist
2	Ana Clara Baptista Mariani	Student, UMaine	LADCP, salinometer, CTD watch, communication
3	Andrew Treat	Student, UMaine	LADCP, salinometer, CTD watch
4	Collin Beirne	Student, UMaine	mooring deployments, CTD watch
5	Eduardo Jardim	Technician, UMiami	Deck Lead
6	Cedric Guigand	Technician, UMiami	Deck/ OSNAP UMaine Instrumentation
7	Joe Bretl	Technician, UMiami	Deck/Instrumentation
8	Elodie Duyck	Scientist, NIOZ	OSNAP West RR
9	Jan Dirk de Visser	Technician, NIOZ	Deck, moorings, instrumentation

10	Jelle Soon	Student, NIOZ	watchstander
11	Matlide Esposite	Student, NIOZ	watchstander
12	Reinet Hagen	Sutdent, NIOZ	watchstander
13	Heather Furey	Scientist/Technician, WHOI	Manage Crossroads work, Argo work, OOI sampling and documentation, CTD watch leader
14	Andrew Barna	Technician, ODF	Oxygen sampling and titrations
	Ship Crew	Role	
	Kent Sheasley	Captain	
	Diego Geaudan	Chief Mate, Medical Officer	
	Moriah Kopec-Belliveau	2 nd Mate	
	Chrissy Hogan	3 rd Mate	
	Katie Davis	Bosun	
	Derrek Rogers	AB	
	Monica Barber	AB	
	Rosel Garcia	AB	
	Kate Adams	OS	
	Isaac Cardoso	Chief Engineer	
	Matt McGlynn	1 st Assistant Engineer	
	Braedon Peluso	2 nd Assistant Engineer	
	Mac Glennon	3 rd Assistant Engineer	
	Xavier Cain	Oiler	
	Adam Swarm	Oiler	
	Harry Burnett	Chief Steward	
	Samantha Bush	Cook	
	Derric Greenidge	Cook	
	Emily Foley	SSSG	
	Howie Johnson	SSSG	
	Cristinia Rorres	SSSG, MATE Intern	Sampling, CTD watch

3. Chronology

Cruise chronology runs through the Crossroads work only. The cruise continued and OOI moorings, NIOZ moorings and UMaine/UMiami moorings were turned, with accompanying CTDs.

Day#	Day/date	events	commentary
Port1	TH 04 June	Load UMiami, load NIOZ, load WHOI floats.	Argo floats started up and stowed, SRFS loaded and stowed, trained on DIC/TA, helped load stores. Stowed soso and RFS totes and personal totes.
Port2	FR 05 June	Loaded WHOI Crossroads gear.	Discussed mooring operations and mooring component placement with Jim Ryder/Eduardo Jardim.
Port3	SA 06 June	Spoiled CR1 mooring wire, moved soso onto pallet w/ cradles.	Worked w/ Andrew Barna to get rest of gear (LADCP boxes, LADCP lithium batteries, DeepSOLO) stowed and made space ship-shape. Moved onboard w/ Steve H helping, bringing my luggage, gave Steve & Elise a tour of the ship.
1	SU 07 June	Departed, put together soso bridles.	Got connected to ship drive.
2	MO 08 June	Work on schedule of startup of soso.	Work on other project work: EMC mostly. Making RFB files.
3	TU 09 June	steam	Rough night of sleep for everyone, big waves, lots of movement. Folks a bit seasick. Steam. Discussed mooring w/ Moriah, got her a diagram. Found good videos and pics for Eduardo for different deployment methods. Got releases on the frame. Found a spare deckbox.
4	WE 10 June	Put together sound source; set soso to run before 0930 local (1330UTC) (could do after CTD); CTD@7am, check soso pong@2130 (pong 1)	Trained a little on CTD deploy and data acquisition. Skies spat some unexpected rain when first started source started up. Unsure if related, but when turned source on, both the clock and the source mission needed to be reset. Sent logfile to Adam/JimV. Eduardo and Cedric helped to get source into spot where I could work out of rain

			and spray. Worked w/ JimV (mostly) and Adam to get float re-programmed. All praise WhatsApp. Source up and running. Sent logfile to Adam and JimV to double check. Adam gives it the pass. Moved source back to deploy spot. <i>Waiting on JimV's OK.</i> Jim wanted more testing – Eduardo moved source back to hanger, I disabled the source, did more transmitter tests (successful) and set it back to run. Waiting on JimV's OK to deploy. Left the source in the hanger this time. JimV's blessing arrived. Started cruise report. Time change to St. John's (GMT-2.5 hours).
5	TH 11 June	Deck setup CR1 at 0800; Deploy CR1 at 1200, Survey acoustic release	Beautiful day to deploy mooring. Deployed the mooring. Successful deployment. Joe Bretyl from U Miami did the survey, successful survey.
6	FR 12 June	transit	Worked on other projects, cruise report. BowerLab meeting.
7	SA 13 June	transit	Worked on other projects. Confirmed RFS order, timing of deployments, and coordinates w/ Tiago. On night shift 2000-0400.
8	SU 14 June	transit	
9	MO 15 June	Arrive St. Johns	
10	TU 16 June	St. Johns	
11	WE 17 June	Depart St. Johns	SOLO a no-go, moved to science hold. Moved soso box to science hold.
12	TH 18 June	RFS deploy – 2x3000dbar deployed SNs 036 & 038	Rough seas made for slow going, and slow to get to stations.
13	FR 19 June	RFS deploy – 2 x 3800 dbar 2 x 3800 1 x 3800 (1 got hit) 2 x 3800 3 x (2@3400, 1@3000)	Two floats about 2:15 am, and remainder mid-day. Remainder floats in sunny calm seas, everything went smoothly, but for one float, which tapped the side of the ship on its way into the water – dropweight lanyard sheared. Float will ride the ship back to Woods Hole.

14	SA 20 June	transit	On to the subsequent OOI work and WHOI Argo work and UMaine/UMiami OSNAP work (Figure 2).
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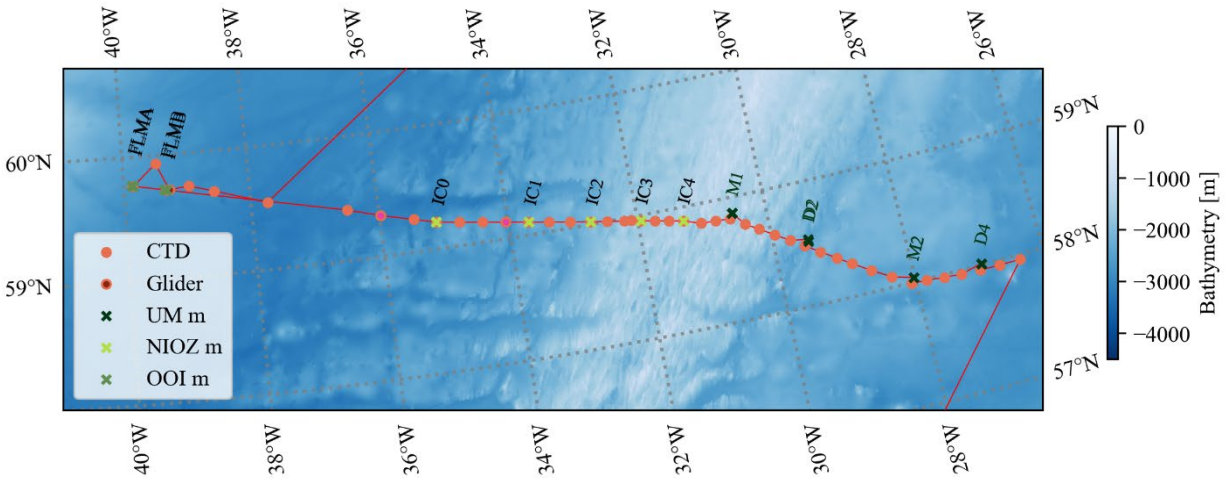


Figure 2: Cruise track, zoomed in on the OSNAP/OOI line. Figure by Ana Clara Baptista Mariani, U Maine. The order of work changed after leaving the Flemish Cap due to weather and was completed from west to east. We continued to be plagued by storms this cruise, with many weather days – we needed every weather day we had.

4. Sound Source Initialization

A single WHOI-built sound source was initialized and prepared for deployment. The source model was the ‘new-build’ variety – a joint build by James Valdes and Keenan Ball from AOPE. The source resonator tube diameter was 12”. Source was started up on deck, but pong schedule was not initialized, and clock was not set so I could not set the source to !Run. Sent logfile to Jim Valdes and Adam Houk. Jim and I WhatsApp-ed for about an hour to work through resetting the clock and setting the schedule. After a couple of different transmitter tests, the source appeared ready. Four logfiles for this source are printed in Appendix A. I measured the 80-second voltage flow for the source pong at 2026-06-11 01:30UTC using voltage meter, which was successful. The deployment sheet is reproduced at the end of Appendix A. Jim does not know why the source mission and time were wiped between when the source was last checked in the Clark Highbay and then on



the ship. Jim asked if the source had been sitting on deck exposed to hot temperatures. The source was lashed to the deck in port, and temps were up to about 75F? We do not know. Having a handheld voltage meter ('voltage meter pen') on board was critical to the success of reprogramming and testing the sound source.

5. Sound Source Deployment

We had some extra time and some good weather. We set up the deck after breakfast and deployed after lunch. Air temperature was ~19-20°C, wind speeds 12 knots, and swell about 1-2 meters, under clear skies. We are smack in the Gulf Stream, 3 knot current (~1.6 m/s). See Armstrong SADCP screen and earth.nullschool.net website grab shown in Figures 3 and 4.

Two releases were loaded on the ship, one for the mooring and one spare. Releases were tested along with two UMiami/OSNAP releases to 3000 m depth. Because there were four releases on the rosette, no bottles were fired as the extra water weight would have overburdened the package and wire. During testing, one WHOI release did not fire. We used the successfully tested release #48273.

Estimated water depth was 5346m, from an ETOPO2 database. Uncorrected water depth at the site was 5395 meters and corrected water depth was 5367 m. Corrected sound speed used was 1529.3 m/s. Mooring was deployed as designed, no shot adjustments were made.

Tiago Bilo estimated fallback for the mooring. I knew that placement of this mooring did not need to be exact as it is a sound source meant to ensonify a large region, and not an instrumented mooring measuring currents at specific location. Interestingly, this location was in the Gulf Stream (which varies in location) when it was deployed.

Anchor release fallback worked out by Tiago, derived from Bill Johns methods, was estimated as follows: With 3 knot west to east current, and travelling 1.5 knots to the west, our effective speed over ground was 1.5 knots, the speed at which we want to tow the mooring. We set up with a three-hour window for deployment. Tiago calculated the fallback to be 3000m (note chief mate Diego was dubious) as follows:

Bill Johns estimates that still water mooring fallback is 1/6 the mooring height (CR1 is 3000 m tall) based on a relatively buoyant mooring, so 500m, plus amount of time to settle times the vertical mean current speed. [Side note: Bill J. estimates 1/5 the height still-water fallback if a low-buoyant mooring.] We estimated (since we were smack in the GS), that the vertical mean current speed is 0.7-0.9 m/s. We know from Crossroads mooring CR2 (same height) that it took 50 minutes for the anchor to settle. Fifty minutes times 0.7 m/s

water column velocity is 2100 m. Using 0.9 m/s is 2700 m. Adding to that 500 m still-water fallback, is an estimate of 2600m to 3200 m fallback. As a result, we steamed 4.5 miles + 3 km from the mooring target position and dropped the anchor 3000 m out. This is an exceptionally large distance anchor drop to compensate for the rocking Gulf Stream.

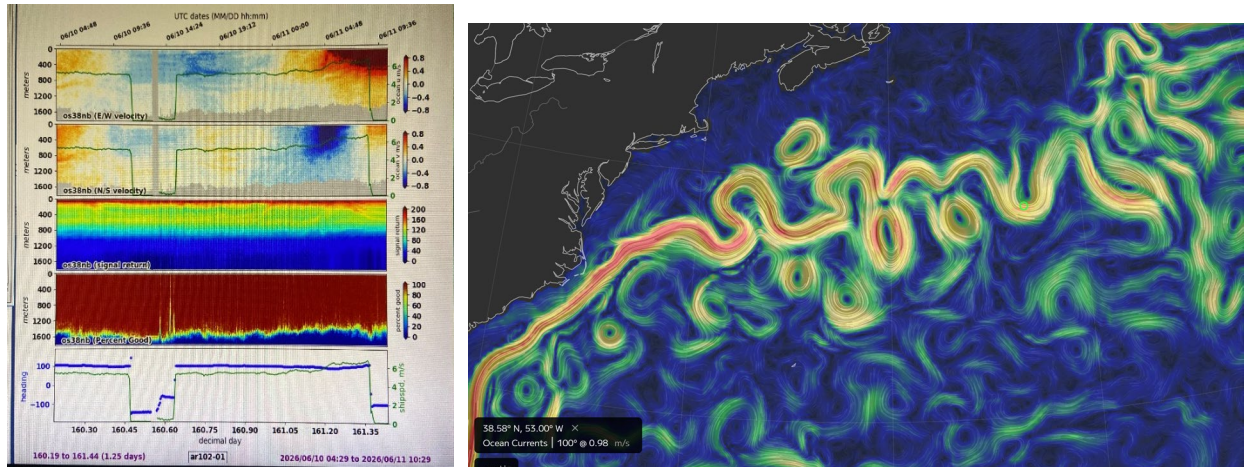


Figure 3: underway screen showing shipboard ADCP velocity, and the Gulf Stream. GS model screengrab from earth.nullschool.net. Mooring location is marked as a small green circle.

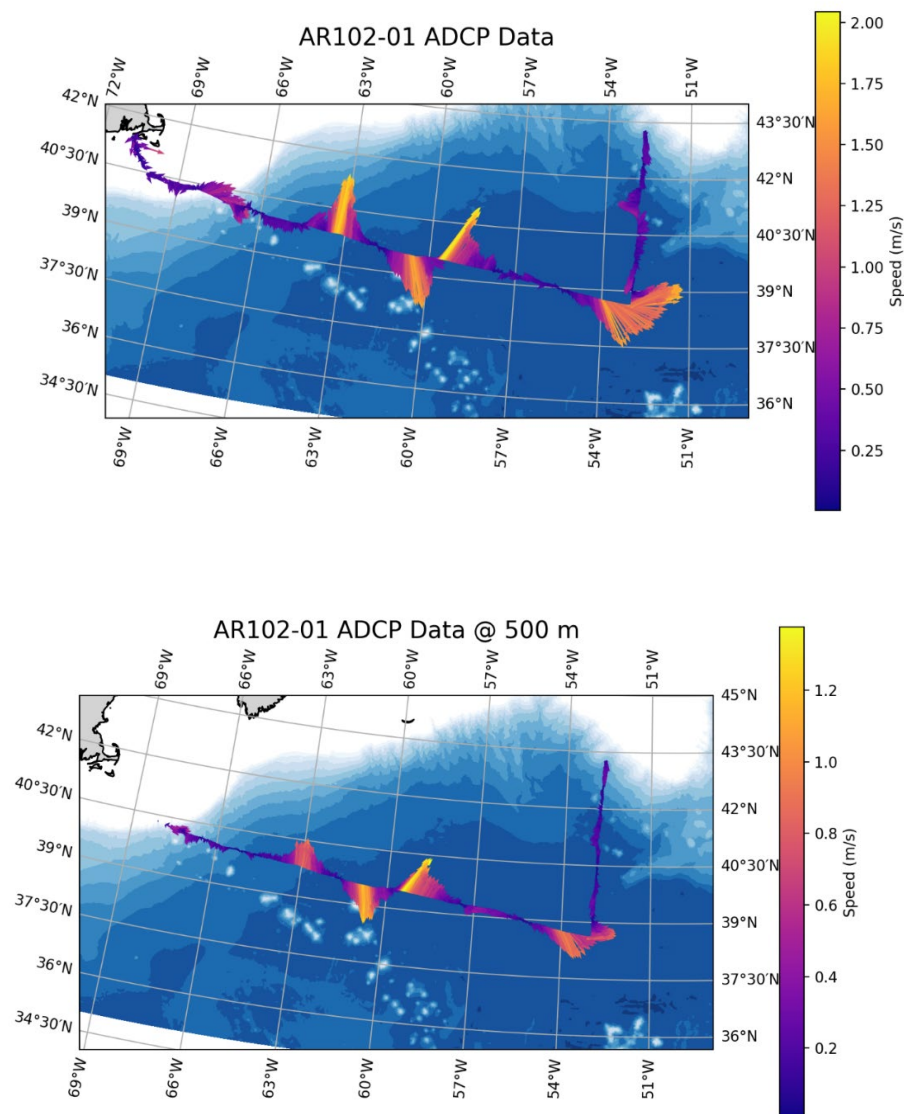


Figure 4. Surface and 500-m shipboard ADCP data. Note strong currents at CR1 mooring site. Figures by Andrew Treat, UMaine.

Deployment went smoothly. Deployment started at 12:13 local time and the anchor was dropped at 15:15, with overall deployment taking 3 hours and 2 minutes. The source was deployed using the rigging developed by Nico Llanos during AE6026. Ali Exley had videoed one of the sound source mooring deployments on AE6026, and this video was a valuable resource for the deck lead Eduardo Jardim. Eduardo created a line replicating the deployment bridle originally rigged by Nico, but with the ends spliced to improve on the rigging that had hung up in the shackle during the Exley/Llanos deployment. During the filmed AE6026 deployment, no tag lines were used. We did not apply taglines in this

deployment, but the source swung quite a bit on deployment. To fix this there could be one or two bales attached to the sound source bridle. Or something similar.

During this deployment there was a lot of swing of the sound source as it went over the lip of the aft deck. Eduardo states that some of the swing was because the A-frame operator was not keeping the line from the frame to the source perpendicular, which introduced forward momentum. In addition, the ship had some swing to it with the swells. Despite this, the source was placed in the water in a manner much better than on previous cruises without the bridle system, as the top end of the source (where the power cord attaches the electronics case to the transducer) is not vulnerable to hitting the deck.



Figure 5: Photo of rigging system on source. Eduardo Jardim spliced a deployment line specific to this source. Photo by H. Furey.

The deployment took about 1 hour longer than a similar deployment on AE6026 (see CR#2 deployment narrative; Exley, 2025), in similar weather conditions, and with similar mooring height and configuration. I think that the following contributed to this. (1) The communication during different phases of the deployment took a while to get established,

as this was the first mooring deployment and new groups were working together. (2) The top flotation was not assembled prior to deployment, so had to be put together piece by piece as the top of the mooring went overboard. (4) UMiami were dealing with a different method of mooring assembly, meaning they did not design the mooring or choose the hardware, WHOI Mooring and Rigging did, and methods were a bit dissimilar.

Improvement to the sound source would be to put two bales on the source as pickup and tagline points – at either end and opposite to the source electronics pod.

I got to learn a new skill this deployment, reading the hardware components off the mooring diagram and making sure the right shackles were used in the right order in the right places. For example, I made sure the swivel was inserted below the sound source on the mooring. While we did not get a video of the source deployment, we did get a swivel in the assembled mooring.

Anchor drop location was surveyed by Joe Bretl using Adam Houk software re-coded by Bretl in Python (Table 1, Appendix B) and was found to be 700 m short of the mark. In the world of float tracking, this does not affect the science. Also, the bathymetry was flat in this region so accuracy constraints were large (a few kilometers).

Tiago and I discussed this after the deployment, and he concluded that he assumed the Gulf Stream would be more barotropic than it was – such that the mooring did not experience 0.7 m/s currents over the full water column. Estimating the current speed as 0.6 m/s through out the water column would have resulted in the correct fallback. It is remarkable to have a 2.3 km fallback.

Table 1. Surveyed mooring details.

Mooring	Date and Time (UTC)	Coordinates (surveyed positions)	Sound Source SN	Expected Water depth	Measured water depth (corrected)	Additional Shot	Depth of source (m)
CR1	June 11, 2026 18:41	38 34.663N 53 00.897W	95	5346	5367	none	1221

6. RAFOS Deployments

RAFOS deployments occurred over the course of 24 hours. The first two deployments occurred overnight, in rough seas, gray, raining and 47F. It was sometimes difficult to get depth readings. Deployments went smoothly over the starboard aft, ship steaming at ~2 knots. We deployed in the same manner as was done on Exley's AE2606 cruise (where

Nico had deployed them before). We had 3 people at deployment: Nico Llanos to direct the deployment and run the line, Collin Beirne to help Nico get the float dropweight to head over the rail first, and myself to hold the tail wire and make sure it went over untangled and did not get caught on anything. It helped to have someone in the main lab to record deployments, especially due to the weather and seas on deck.

The next day's deployments were under smoother seas, blue skies and sun. Four sites were occupied and again the deployments went smoothly, except for one. When deploying float SRFS081, the float knocked against the side of the ship and the dropweight came off. During this single deployment, Nico let Dan take the lead on the line, and this could have contributed. The monofilament could have been compromised before deployment. The float was recovered using a boathook and stowed in the science hold to return to WHOI. The remaining deployments went smoothly.

All floats were programmed for 730-day missions, and record PR/TE and acoustic signals every 12 hours. The clocks were reset at WHOI by Peter Jones on April 26th, 2026, and set to run and checked for Iridium throughput by Ali Exley and Anna Pinckney the week of May 26th, prior to loading. Floats went into active mission when they reached the pressure of 10 dbar.

Table 2. Float deployment details.

Float SN	Date GMT (YYYY-MM-DD HH:MM)	Coordinates (lat, lon)	Water depth (m)	Target PR (dbar)
036	2026-06-19 02:25	45 55.18'N 45 19.91'W	3444	3000
038	2026-06-19 02:28	45 55.24'N 45 19.79'W	3444	3000
071	2026-06-19 05:00	45 40.21'N 45 04.90'W	3996	3800
076	2026-06-19 05:01	45 40.20'N 45 04.88'W	3996	3800
070	2026-06-19 14:22	46 19.95'N 43 15.30'W	4171	3800
073	2026-06-19 14:23	46 19.97'N 43 15.26'W	4171	3800
078	2026-06-19 15:06	46 24.97'N 43 20.08'W	4059	3800
068	2026-06-19 16:01	46 24.97'N 43 25.15'W	3959	3800
077	2026-06-19 16:02	46 24.97'N 43 25.15'W	3959	3800
035	2026-06-19 16:45	46 35.05'N 43 30.00'W	3610	3000
050	2026-06-19 16:46	46 35.05'N 43 30.00'W	3610	3400
062	2026-06-19 16:48	46 35.05'N 43 30.00'W	3610	3400
081	Lost dropweight as entered water, recovered immediately.			3800

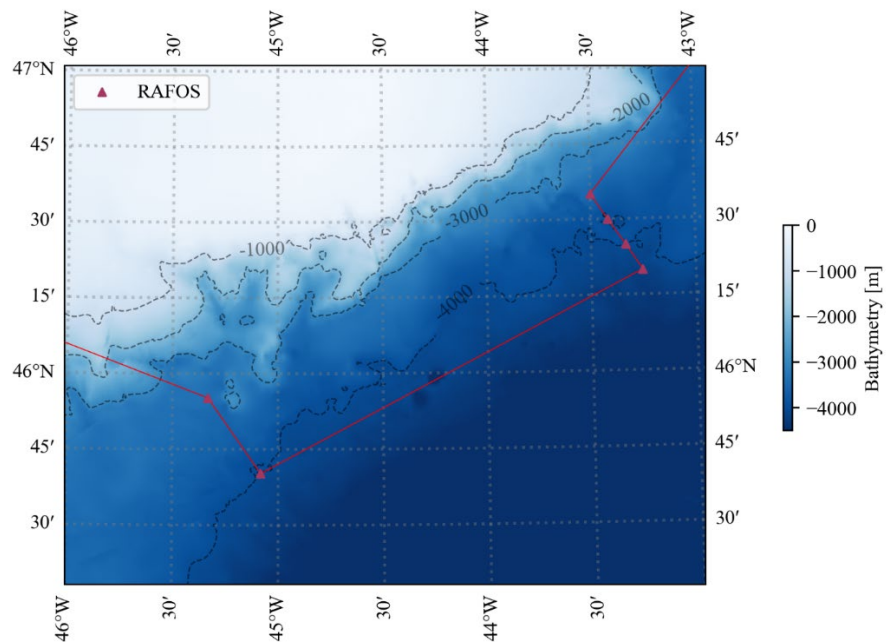


Figure 5. Map showing locations of SRFS deployments. Figure by Ana Clara Baptista Mariani, U Maine.

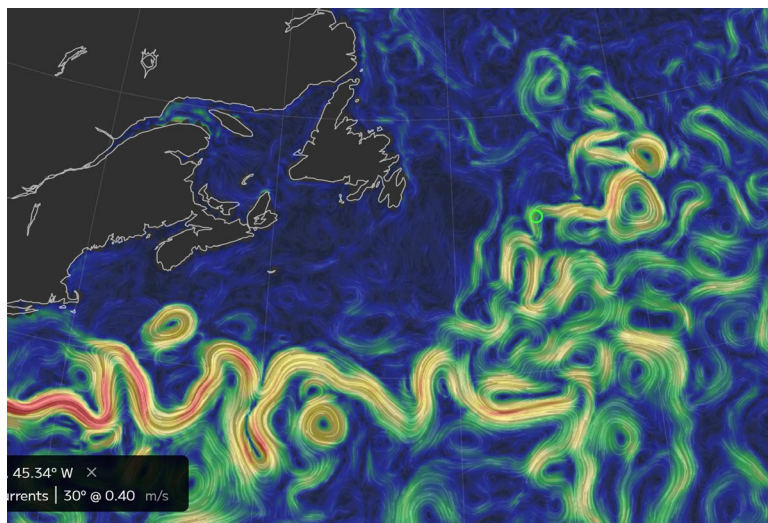


Figure 6: Ocean modelled conditions at time of first RAFOS deployment 6/18/2026 at ~23:30 – ships location is at green circle.

Mood

First days out of port were rough going, rough seas, strong winds, unfortunate heading. Duct-taped my things in my room like the loose vanity door. Slammed around in the bunk for one night. Folks not feeling well. But weather changed midday on June 9th. Long first weeks w/ not much work for folks, but we settled in. Port stop in St. John's was a welcome break, we hiked ran, did yoga, and most folks sipped pints while watching the world cup in bars. The weather was sunny and lovely.

After leaving port, it was a 10-knot crawl to the mooring line, with night shift folks (myself, Andrew B, Collin, Andrew T) gradually shifting our schedules. The remainder of the cruise was long, plagued with bad weather spells. Successful, but hard on personnel. It was, IMHO, difficult for different groups to have copious downtime. And it is difficult for us to have work areas so far apart. On the plus side, we had enough time to really get to know each other. Thank all goodness for the World Cup being broadcast at this time, the world cup brackets. And cribbage tournaments.

7. Lessons/ Notes for next time

- The GEBCO 30 arcsecond bathymetry database is considered better than the ETOPO database to determine water depth.
- I cleaned out my packing tote prior to departure, and wouldn't you know it, I've been asked for plastic bags and double-sided Velcro (not there anymore). Happy to report my power strip and 3-hole punch, extra page protectors, and rite-in-rain paper have come in handy so far, as in other folks have needed these things.
- When I asked Andrew B. to video the deployment of the sound source and he agreed, I should have double checked he was going to do that on the day of. It's unfortunate we do not have a video of deployment.
- Ask Keenan Ball's lab if bales could be attached to the sound source tube. If so, make part of the design.
- Having the hand-held current meter was key. Make sure always have this.
- Learned a lot about salt sampling this cruise, in work unrelated to Crossroads. Tiago had his students remove the cone-shaped plastic inserts at the start of the cruise. The salt samples taken (12 per cast) were left to sit a long time while autosal/portosal issues worked out, and while we ran from storms. As a result, evaporation of the samples occurred. Once we had a working salinometer, we also put the caps back into the sample bottles. Folks did a better job sampling, and samples were run in a timelier manner. And everything started to improve. One thing learned through direct comparison on this cruise: the plastic inserts shaped like bowler hats do a much better job than the plastic cone inserts to eliminate

evaporation. Salts run that had been collected and stored w/ the plastic inserts had less scatter than those w/ cone inserts.

Acknowledgement

This fieldwork was funded by NSF Ocean Science Grant OCE-2318947.

Reference

Exley, A., 2026. Crossroads Cruise Report 6026 R/V Atlantic Explorer, July 24-August 8 2025.

Appendix A

Checkout logs for sound source SN95.

May 29, 2026: while still in warehouse, pre-cruise check.
'soso95log_29May2026_checkout.txt'

Sound Source Rev 1.2 Jan 2020

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-05-29 20:03:00

Alarm = xx-xx-30 00:00:00

Vac=071 cBars VAux=102 dV VCpu=102 dV

*Initialized Idle

->?!|

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 Set up transmitter on waveform 2

Offset 00 13:30:00 Trigger transmitter

Offset 00 23:00:00 End of Window

*Initialized Max Xmit level C

Update Mission Length and Parameters (Y/N)?n

->?!|

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 Set up transmitter on waveform 2

Offset 00 13:30:00 Trigger transmitter

Offset 00 23:00:00 End of Window

*Initialized Max Xmit level C

Update Mission Length and Parameters (Y/N)?N

->?T

D&T = 26-05-29 20:04:56...

Alarm = xx-xx-30 00:00:00

Clock Module Info

CKM_Time = 00-01-01 20:05:02...

->?T

D&T = 26-05-29 20:05:19...

Alarm = xx-xx-30 00:00:00

Clock Module Info

CKM_Time = 00-01-01 20:05:25...

->!Q

->

June 10, 2026, initialization 1: Tried to check the source and set to run. Note it was raining a bit and computer keyboard was not working properly. Vacuum and battery good, but RTClock not set, and schedule not set, so not able to continue.

'soso95log_10june2026_init.txt'

Sound Source Rev 1.2 Jan 2020

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 12:28:02

Alarm = xx-xx-00 00:00:00

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Not Initialized

*RTC not set

->?!|

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 Set up transmitter on waveform 2

Offset 00 13:30:00 Trigger transmitter

Offset 00 23:00:00 End of Window

*Not Initialized

Update Mission Length and Parameters (Y/N)?n

->?T

RTC not set

D&T = 26-06-10 12:31:08...

Alarm = xx-xx-01 00:00:00

Clock Module Info

CKM_Time = 00-01-01 12:31:12...

->?T

RTC not set

D&T = 26-06-10 12:31:48...

Alarm = xx-xx-01 00:00:00

Clock Module Info

CKM_Time = 00-01-01 12:31:52...

->?T

RTC not set

D&T = 26-06-10 12:32:15...

Alarm = xx-xx-01 00:00:00

Clock Module Info

CKM_Time = 00-01-01 12:32:19...

->?T

RTC not set

D&T = 26-06-10 12:32:45...

Alarm = xx-xx-01 00:00:00

Clock Module Info

CKM_Time = 00-01-01 12:32:49...

->!R

Float is not Initialized

->?i

..?

->?i

..?

->?i

..?

->?il

..?

->?l

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter
Offset 00 13:29:00 Set up transmitter on waveform 2
Offset 00 13:30:00 Trigger transmitter
Offset 00 23:00:00 End of Window

*Not Initialized

Update Mission Length and Parameters (Y/N)?N

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 12:36:27

Alarm = xx-xx-01 00:00:00

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Not Initialized

*RTC not set

->!R

Float is not Initialized

->!q

..?

->!Q

->!

June 10, 2026, initialization 2: Worked through most issues w/ Jim Valdes (using WhatsApp, needed a phone call) but after !Run done, there was a transmitter fault message. 'soso95log_10june2026_init2.txt'

Sound Source Rev 1.2 Jan 2020

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 13:43:25

Alarm = xx-xx-01 00:00:00

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Not Initialized

*RTC not set

->!T

Set Clock YY-MM-DD hh:mn:ss sync on @

D&T=260610134700@

->?T

..?

->?T

D&T = 26-06-10 13:47:52...

Alarm = xx-xx-10 19:47:00

Clock Module Info

CKM_Time = 00-01-01 13:48:01...

->!T

Set Clock YY-MM-DD hh:mn:ss sync on @

D&T=290610101010@

->?T

..?

->?T

D&T = 29-06-10 10:10:52...

Alarm = xx-xx-10 16:10:10

Clock Module Info

CKM_Time = 00-01-01 10:11:01...

->!T

Set Clock YY-MM-DD hh:mn:ss sync on @

D&T=260610095200@

->?T

..?

->?T

D&T = 26-06-10 09:53:32...

Alarm = xx-xx-10 15:52:00

Clock Module Info

CKM_Time = 00-01-01 09:53:40...

->?T

D&T = 26-06-10 09:53:59...

Alarm = xx-xx-10 15:52:00

Clock Module Info

CKM_Time = 00-01-01 09:54:07...

->!T

Set Clock YY-MM-DD hh:mn:ss sync on @

D&T=260610095430@

->?T

..?

->?T

D&T = 26-06-10 09:55:04...

Alarm = xx-xx-10 15:54:30

Clock Module Info

CKM_Time = 00-01-01 09:55:12...

->?s

..?

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 09:55:29

Alarm = xx-xx-10 15:54:30

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Not Initialized

->!T

Set Clock YY-MM-DD hh:mn:ss sync on @

D&T=260610135630@

->?T

..?

->?T

D&T = 26-06-10 13:57:05...

Alarm = xx-xx-10 19:56:30

Clock Module Info

CKM_Time = 00-01-01 13:57:13...

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 13:57:23

Alarm = xx-xx-10 19:56:30

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Not Initialized

->!I

Task table initialization, 25 actions maximum

Number of windows to execute NNNN= 9999

Open window at HH:MN 0000

Cycle structure A=Arm, X=Xmit, E=End

Action 0 (A,X,E)? A Offset DD:HH:MN = 012900

Action 1 (A,X,E)? X Offset DD:HH:MN = 013000

Action 2 (A,X,E)? E Offset DD:HH:MN = 132900

Wave from (0 to f) = 2

Max Xmit level from (0 to f) = 8

Task has been updated and saved to EEprom

->?I

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 02 05:00:00 Set up transmitter on waveform 2

Offset 02 06:00:00 Trigger transmitter

Offset 14 05:00:00 End of Window

*Initialized Max Xmit level 8

Update Mission Length and Parameters (Y/N)?N

->!!

Task table initialization, 25 actions maximum

Number of windows to execute NNNN= 9999

Open window at HH:MN 0000

Cycle structure A=Arm, X=Xmit, E=End

Action 0 (A,X,E)? A Offset DD:HH:MN = 000129

Action 1 (A,X,E)? 0

..?

Action 1 (A,X,E)? 0

..?

Action 1 (A,X,E)? X Offset DD:HH:MN = 000130

Action 2 (A,X,E)? E Offset DD:HH:MN = 001329

Wave from (0 to f) = 2

Max Xmit level from (0 to f) = C

Task has been updated and saved to EEprom

->?!|

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 End of Window

*Initialized Max Xmit level C

Update Mission Length and Parameters (Y/N)?N

->?!|

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 End of Window

*Initialized Max Xmit level C

Update Mission Length and Parameters (Y/N)?N

->!!

Task table initialization, 25 actions maximum

Number of windows to execute NNNN= 9999

Open window at HH:MN 0000
Cycle structure A=Arm, X=Xmit, E=End
Action 0 (A,X,E)? A Offset DD:HH:MN = 000129
Action 1 (A,X,E)? X Offset DD:HH:MN = 000130
Action 2 (A,X,E)? A Offset DD:HH:MN = 001329
Action 3 (A,X,E)? X Offset DD:HH:MN = 001330
Action 4 (A,X,E)? E Offset DD:HH:MN = 002300
Wave from (0 to f) = 2
Max Xmit level from (0 to f) = C
Task has been updated and saved to EEprom
->?I

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999
Open window at = 00 00:00:00
Offset 00 01:29:00 Set up transmitter on waveform 2
Offset 00 01:30:00 Trigger transmitter
Offset 00 13:29:00 Set up transmitter on waveform 2
Offset 00 13:30:00 Trigger transmitter
Offset 00 23:00:00 End of Window

*Initialized Max Xmit level C
Update Mission Length and Parameters (Y/N)?N
->?S
Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 14:08:58
Alarm = xx-xx-10 19:56:30
Vac=071 cBars VAux=102 dV VCpu=102 dV
*Initialized Idle
->?S
Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 14:12:18
Alarm = xx-xx-10 19:56:30
Vac=071 cBars VAux=102 dV VCpu=102 dV
*Initialized Idle
->?I

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999
Open window at = 00 00:00:00
Offset 00 01:29:00 Set up transmitter on waveform 2
Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 Set up transmitter on waveform 2
Offset 00 13:30:00 Trigger transmitter
Offset 00 23:00:00 End of Window

*Initialized Max Xmit level C
Update Mission Length and Parameters (Y/N)?N
->?T
D&T = 26-06-10 14:13:50...
Alarm = xx-xx-10 19:56:30

Clock Module Info
CKM_Time = 00-01-01 14:13:58...
->?T
D&T = 26-06-10 14:14:51...
Alarm = xx-xx-10 19:56:30

Clock Module Info
CKM_Time = 00-01-01 14:14:59...
->!R
Run or Idle (R,I)?Run... Arming Xmtr
Transmit Level= 10
Xmtr Trigger OK
Hit any key to abort pong...
Xmtr State error

Running Mission, disconnect RS232 link now
-> Mission Phase: ACTIVE_MISSION
at 26-06-10 19:56:30...
No task
Current time
at 26-06-10 14:15:58...
***Next:
Mission Phase: ACTIVE_MISSION
Task type: NO_TASK
at 26-06-10 15:15:58...

Running

June 10, 2026, initialization 3: Jim had me set source back to Idle and test transmitter 3 times. Voltage meter came in very handy. 'soso95log_10june2026_init3.txt'

Sound Source Rev 1.2 Jan 2020

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 17:03:41

Alarm = xx-xx-10 17:15:58

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Initialized Running Mission Phase 1

->!R

Run or Idle (R,I)?Idle

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 17:04:10

Alarm = xx-xx-10 17:15:58

Vac=071 cBars VAux=102 dV VCpu=101 dV

*Initialized Idle

->?I

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 Set up transmitter on waveform 2

Offset 00 13:30:00 Trigger transmitter

Offset 00 23:00:00 End of Window

*Initialized Max Xmit level C

Update Mission Length and Parameters (Y/N)?N

->?T

D&T = 26-06-10 17:05:12...

Alarm = xx-xx-10 17:15:58

Clock Module Info

CKM_Time = 00-01-01 17:05:20...

->!X

Transmitter Test

Input Waveform (0-F)=2

Send <cr> to start...

Hit any key to abort...

End of transmission

->!X

Transmitter Test

Input Waveform (0-F)=2

Send <cr> to start...

Hit any key to abort...

End of transmission

->!X

Transmitter Test

Input Waveform (0-F)=2

Send <cr> to start...

Hit any key to abort...

End of transmission

->?S

Sound Source Rev 1.2 Jan 2020

D&T = 26-06-10 17:12:31

Alarm = xx-xx-10 17:15:58

Vac=071 cBars VAux=102 dV VCpu=102 dV

*Initialized Idle

->?I

SCHEDULER TASK TABLE

Number of windows to acquire (<10000) = 9999

Open window at = 00 00:00:00

Offset 00 01:29:00 Set up transmitter on waveform 2

Offset 00 01:30:00 Trigger transmitter

Offset 00 13:29:00 Set up transmitter on waveform 2

Offset 00 13:30:00 Trigger transmitter

Offset 00 23:00:00 End of Window

*Initialized Max Xmit level C

Update Mission Length and Parameters (Y/N)?N

->?T

D&T = 26-06-10 17:13:06...

Alarm = xx-xx-10 17:15:58

Clock Module Info

CKM_Time = 00-01-01 17:13:14...

->!R

Run or Idle (R,I)?Run... Arming Xmtr

Transmit Level= 10

Xmtr Trigger OK

Hit any key to abort pong...

End of transmission

Running Mission, disconnect RS232 link now

-> Mission Phase: ACTIVE_MISSION

at 26-06-10 17:15:58...

No task

Current time

at 26-06-10 17:15:04...

***Next:

Mission Phase: ACTIVE_MISSION

Task type: NO_TASK

at 26-06-10 18:15:04...

Running



U.S. Crossroads

URI-Valdes Sound Source - AR102-01

WHOI Bower/Furey

Contact: hfurey@whoi.edu / 1.508.221.2021

June-July 2026

R/V Neil Armstrong Woods Hole, MA, USA - Reykjavik, Iceland

Total Deployments: 1 sound source mooring



Sound Source Startup & Log SHEET

Sound Source s/n # 95

1. Connect to sound source ✓
2. Start log ✓
3. Swipe magnet ✓
4. ?S ✓
5. ?I ✓
6. ?T ✓
7. IR ✓

Vacuum = 071

Vaux = 102

VCpu = 102

Sound Source schedule: 01:30 , 13:30

Time Check (YY-MM-DD HH:MM:SS @) 26-06-10 14:13:50, 51 ✓, $\Delta T = 0$

Source IRun Time (YY-MM-DD HH:MM) 26-06-10 14:13:50, 51 $\Delta T = 0$

Cruise # AR102-01 Station/CTD # —

Adjusted (Y/N) Water Depth (m) 5367

Launch Position 38° 34.663' N (lat) 53° 00.897' W (long)

Launch Date (yy/mm/dd) 2024/06/11 Time (hh:mm) UTC 18:41

Comments: a lot of rigamarole getting this source started - had to reprogram

Preparer: Heather Furey

schedule and DTF
tricks. JIMV
talking me thru it
was key.
having a volt meter
board was key

Appendix B: Mooring CR1 deployment results.

A102-01-2026-DEPLOY LOG

Date (YYYY-MM-DD) 2026-06-11

CR1 Target Position:

38° 34.8' N

53° 00.0' W

Depth (estimated): 5346 m

Source Schedule:

01:30, 13:30 UTC

1200 m Depth

S/N: 95

7500m

USING

Note A
(6 ea) .5 meters 3/8" Mooring Chain
for Source Bridles

Hardware Designation

(A)	(2) 1/2" SH, (1) 5/8" SL
(B)	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
(D)	(1) 1/2" SH, (1) 5/8" SL, (1) 7/8" SH
(S)	3 ton Swivel

Hardware Required (Per Mooring Without Spares)

(59)	1/2" Anchor Shackles (SH)
(6)	5/8" Anchor Shackles
(1)	7/8" Anchor Shackles
(26)	5/8" Sling Links (SL)
(2)	3 ton Swivel with Anode

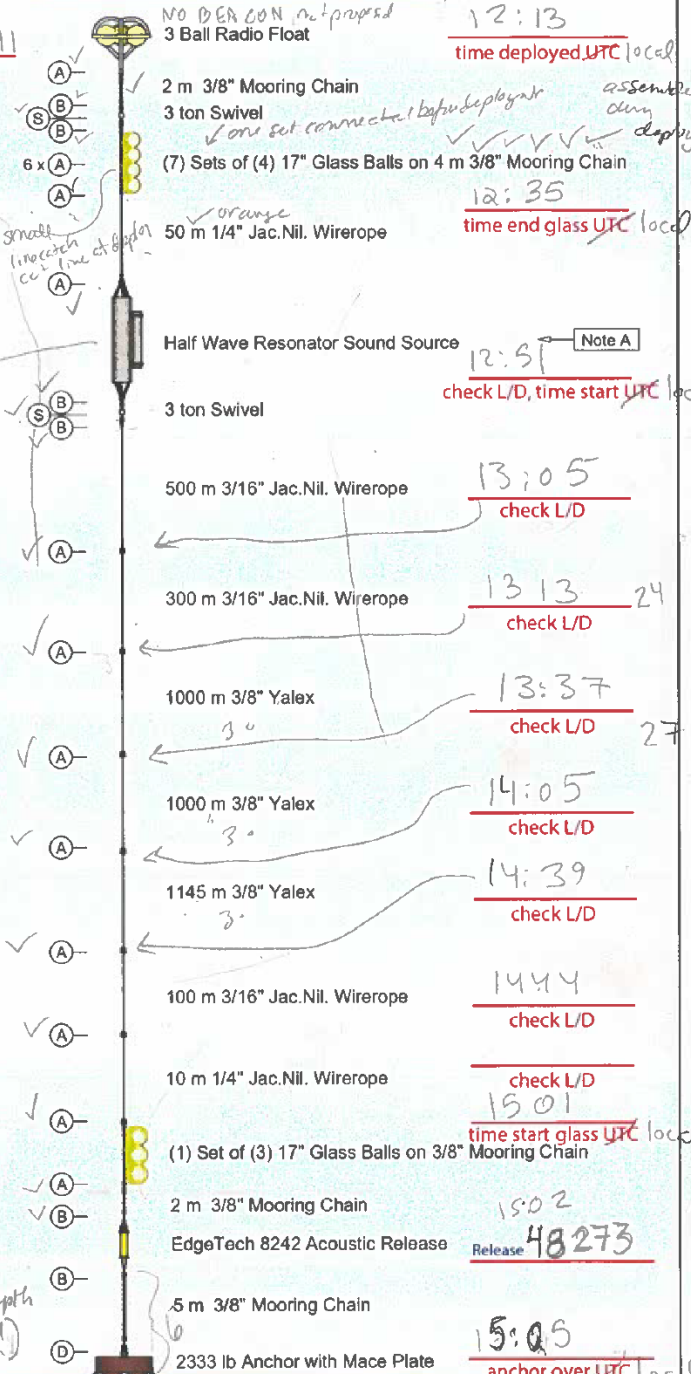
4.5 depth transducer depth

5367 corrected depth
(5395 uncorrected depth)
5346 m Depth

MOE
Mooring Operations & Engineering

www.mooringops@whoi.edu

Rev 1.0



Crossroads
CR1

Woods Hole Oceanographic Institution
designed by Eric Trolldenier, drawn by Jim Ryder

Mooring Deployment Logsheet

Project Cres. 2.10.2015 OTECH Mooring #
Cruise AR 62-01 Mooring Site CRA
Ship R/V Neil UTC Time and Date 14:39 06/11/20
Armstrong

Target Coordinates:

Lat: 38° 39.800' N
Lon: 53° 00.000' W

Target Depth: 5367 m (corrected depth)

Avg. Sound Speed: 1529 m/s

Anchor Launch:

Time: 17:45 UTC
Lat: 38° 34.461' N
Lon: 53° 02.103' W
Depth 5366 m (corrected depth)

Radio off at:

On the bottom at: 18:11 UTC

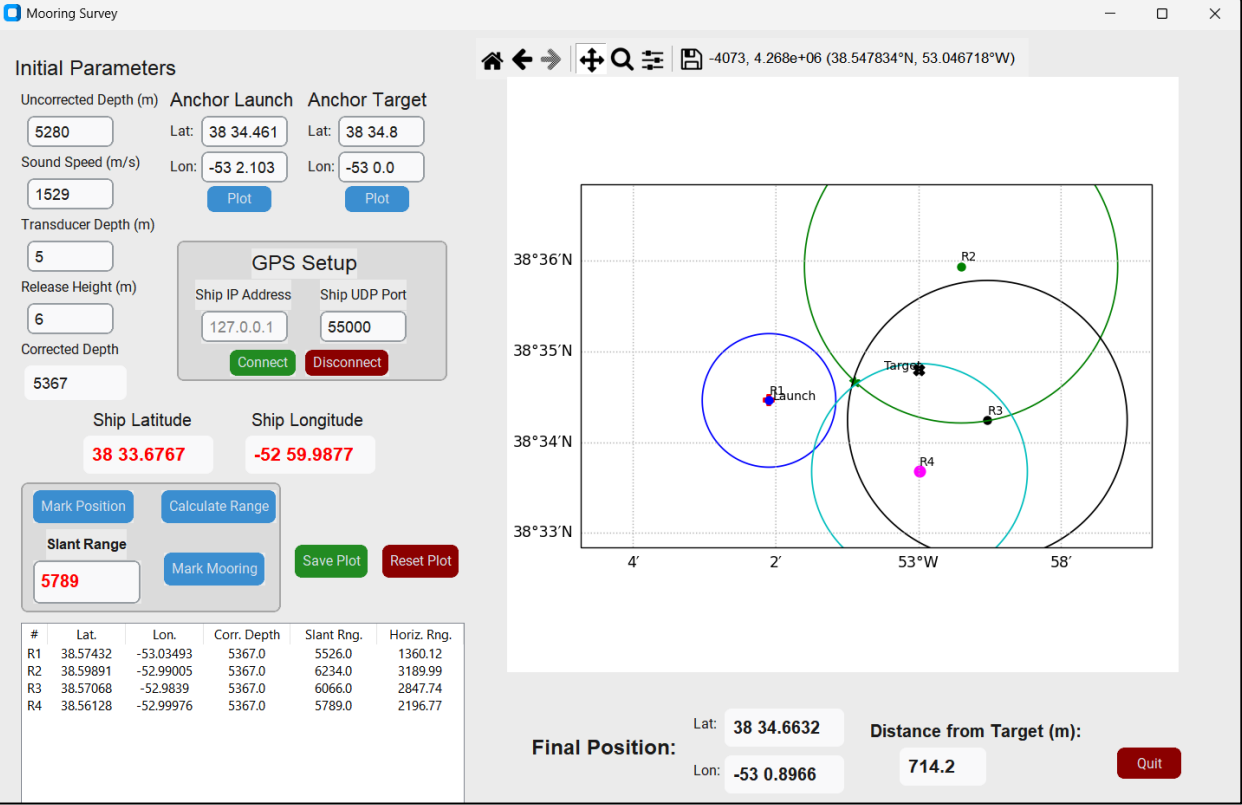
Surveyed Bottom Position:

Lat: 38° 39.6032' N
Lon: 53° 00.8966' W

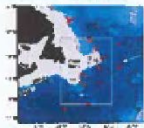
7.4 m off
target (faalbot)
~2.3 km

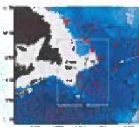
Comments:

Target not mooring in the first attempt



Appendix C: RAFOS deployment sheets.

U.S. Crossroads SRFS Launch Sheet	
WHOI Bower/Furey	
Contact: hfurey@whoi.edu / 1.508.221.2021	
June 2026: Woods Hole, USA → Reykjavik, Iceland	
AR102-01	
Total Deployments: 13 Spherical RAFOS	
	TARGET 45.9167N (55.00') -45.3333W (19.98') expected depth 3419 m
Number of windows (days) <u>730</u>	Forced Start Count (30-minute intervals) <u>4800</u>
Cruise # <u>AR102-01</u>	Overpressure value <u>4000 dbar</u>
Float s/n # <u>036</u>	multibeam too noisy totuise.
Do float and dropweight serial numbers match? <u>YES</u>	
Ballast Pressure (dbar) <u>3000</u>	Station # <u>"RF1"</u>
Adjusted (Y/N) Water Depth (m) <u>3444 (but noisy on lat)</u>	
Launch Position <u>45° 55.18</u> (lat) <u>45° 19.91</u> (long)	
Launch Date/Time GMT (yyyy/mm/dd hh:mm) <u>2026/06/19 02:25</u>	
Float s/n # <u>038</u>	
Do float and dropweight serial numbers match? <u>YES</u>	
Ballast Pressure (dbar) <u>3000</u>	Station # <u>"RF1"</u>
Adjusted (Y/N) Water Depth (m) <u>~ 3444 (but noisy more between 3000m-3000m)</u>	
Launch Position <u>45° 55.24</u> (lat) <u>45° 19.79</u> (long)	
Launch Date/Time GMT (yyyy/mm/dd hh:mm) <u>2026/06/19 02:28</u>	
Comments:	
Preparer: <u>Ama Clara Morani</u>	
RF#1	



U.S. Crossroads SRFS Launch Sheet

WHOI Bower/Furey

Contact: hfurey@whoi.edu / 1.508.221.2021

June 2026: Woods Hole, USA → Reykjavik, Iceland

AR102-01

Total Deployments: 13 Spherical RAFOS

TARGET
45.667 (40.02')
-45.0833 (05.00')

expected DE 4018m

Number of windows (days) 730 Forced Start Count (30-minute intervals) 4800

Cruise # AR102-01 Overpressure value 4000 dbar

Float s/n # 071

Do float and dropweight serial numbers match? Yes

Ballast Pressure (dbar) 3800 Station # "RF2"

Adjusted (Y/N) Water Depth (m) 3996

Launch Position 45 40.21 (lat) 45 04.90 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 04:59:59

Float s/n # 076

Do float and dropweight serial numbers match? Yes

Ballast Pressure (dbar) 3800 Station # "RF2"

Adjusted (Y/N) Water Depth (m) 3996

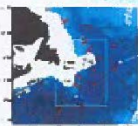
Launch Position 45 40.20 (lat) 45 04.88 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 05:00:45

Comments:

Preparer: BARNIA

RF #2



U.S. Crossroads SRFS Launch Sheet

WHOI Bower/Furey

Contact: hfurey@whoi.edu / 1.508.221.2021

June 2026: Woods Hole, USA → Reykjavik, Iceland

AR102-01

Total Deployments: 13 Spherical RAFOS

TARGET

46.3333N (19.98')
-43.2500W (15.00')

EXPECTED DE
= 4176m

Number of windows (days) 730 Forced Start Count (30-minute intervals) 4800

Cruise # AR102-01 Overpressure value 4000 dbar

Float s/n # 070

Do float and dropweight serial numbers match? ✓

Ballast Pressure (dbar) 3800 Station # "RF3"

Adjusted (Y/N) Water Depth (m) 4171

Launch Position 46° 19.95 N (lat) 43° 15.298 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 14:22

Float s/n # 073

Do float and dropweight serial numbers match? ✓

Ballast Pressure (dbar) 3800 Station # "RF3"

Adjusted (Y/N) Water Depth (m) 4171

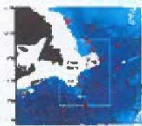
Launch Position 46° 19.97 (lat) 43° 15.26 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 14:23

Comments:

Preparer: Ama Clara B. Mariam

RF#3



U.S. Crossroads SRFS Launch Sheet

WHOI Bower/Furey

Contact: bfurey@whoi.edu / 1.508.221.2021

June 2026: Woods Hole, USA → Reykjavik, Iceland

AR102-01

Total Deployments: 13 Spherical RAFOS

TARGET
46.4167N (25.002')
-43.3333W (19.98')

EXPECTED DE= 3974m

Number of windows (days) 730 Forced Start Count (30-minute intervals) 4800

Cruise # AR102-01 Overpressure value 4000 dbar

Float s/n # 078

Do float and dropweight serial numbers match? ☒

Ballast Pressure (dbar) 3800 Station # RF4

Adjusted (Y/N) Water Depth (m) 4059

Launch Position 46° 24.360 (lat) 43° 20.08 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 15:06

Float s/n # 081

Do float and dropweight serial numbers match? ☒

Ballast Pressure (dbar) 3800 Station # RF4

Adjusted (Y/N) Water Depth (m) 4054

Launch Position 46° 25.000 (lat) 43° 20.110 (long)

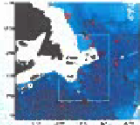
Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 15:08

RECOVERED
15:18

Comments: The float 081 hit side of the ship and lost the drop weight. We had to recover it.

Preparer: ACBM

RF#4



U.S. Crossroads SRFS Launch Sheet
WHOI Bower/Furey
Contact: hfurey@whoi.edu / 1.508.221.2021
June 2026: Woods Hole, USA → Reykjavik, Iceland
AR102-01
Total Deployments: 13 Spherical RAFOS

TARGET

46.5000N (30')
-43.4167W (25.002')

EXPECTED DE =
4005 m

Number of windows (days) 730 Forced Start Count (30-minute intervals) 4800

Cruise # AR102-01 Overpressure value 4000 dbar

Float s/n # 068

Do float and dropweight serial numbers match? yes

Ballast Pressure (dbar) 3800 Station # RF5

Adjusted (Y/N) Water Depth (m) 3959

Launch Position 46° 29.995 (lat) 43° 25.147 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 16:01

Float s/n # 077

Do float and dropweight serial numbers match? yes

Ballast Pressure (dbar) 3800 Station # RF5

Adjusted (Y/N) Water Depth (m) 3959

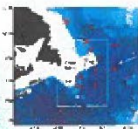
Launch Position 46° 29.985 (lat) 43° 25.147 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 16:02

Comments:

Preparer: AMT Andrew Treat

RF#5



U.S. Crossroads SRFS Launch Sheet

WHOI Bower/Furey

Contact: h.furey@who.edu / 1.508.221.2021

June 2026: Woods Hole, USA → Reykjavik, Iceland

AR102-01

Total Deployments: 13 Spherical RAFOS

TARGET
46.5833N (34.99°)
-43.5000W (30°)

EXPECTED DE =
3600m

Number of windows (days) 730 Forced Start Count (30-minute intervals) 4800

Cruise # AR102-01 Overpressure value 4000 dbar

Float s/n # 035

Do float and dropweight serial numbers match? yes

Ballast Pressure (dbar) 3000 Station # RF6

Adjusted (Y/N) Water Depth (m) 3610

Launch Position 46°35.049 (lat) 43°30.000 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 16:45

Float s/n # 050

Do float and dropweight serial numbers match? yes

Ballast Pressure (dbar) 3400 Station # RF6

Adjusted (Y/N) Water Depth (m) 3610

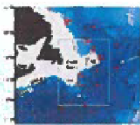
Launch Position 46°35.049 (lat) 43°30.000 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 16:46

Comments:

Preparer: AWF

RF#6



U.S. Crossroads SRFS Launch Sheet

WHOI Bower/Furey

Contact: bfurey@whoi.edu / 1.508.221.2021

June 2026: Woods Hole, USA → Reykjavik, Iceland

AR102-01

Total Deployments: 13 Spherical RAFOS

TARGET
46.5833N (34.998')

-43.5000W (30')

Expected DE
= 3660m

Number of windows (days) 730 Forced Start Count (30-minute intervals) 4800

Cruise # AR102-01 Overpressure value 4000 dbar

Float s/n # 062

Do float and dropweight serial numbers match? Yes

Ballast Pressure (dbar) 3400 Station # RF6

Adjusted (Y/N) Water Depth (m) 3609

Launch Position 46° 35.049 (lat) 43° 30.000 (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) 2026/06/19 16:48

Float s/n # _____

Do float and dropweight serial numbers match? _____

Ballast Pressure (dbar) _____ Station # _____

Adjusted (Y/N) Water Depth (m) _____

Launch Position _____ (lat) _____ (long)

Launch Date/Time GMT (yyyy/mm/dd hh:mm) _____

Comments:

Preparer: Auto

RF#6