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Short Cruise Report

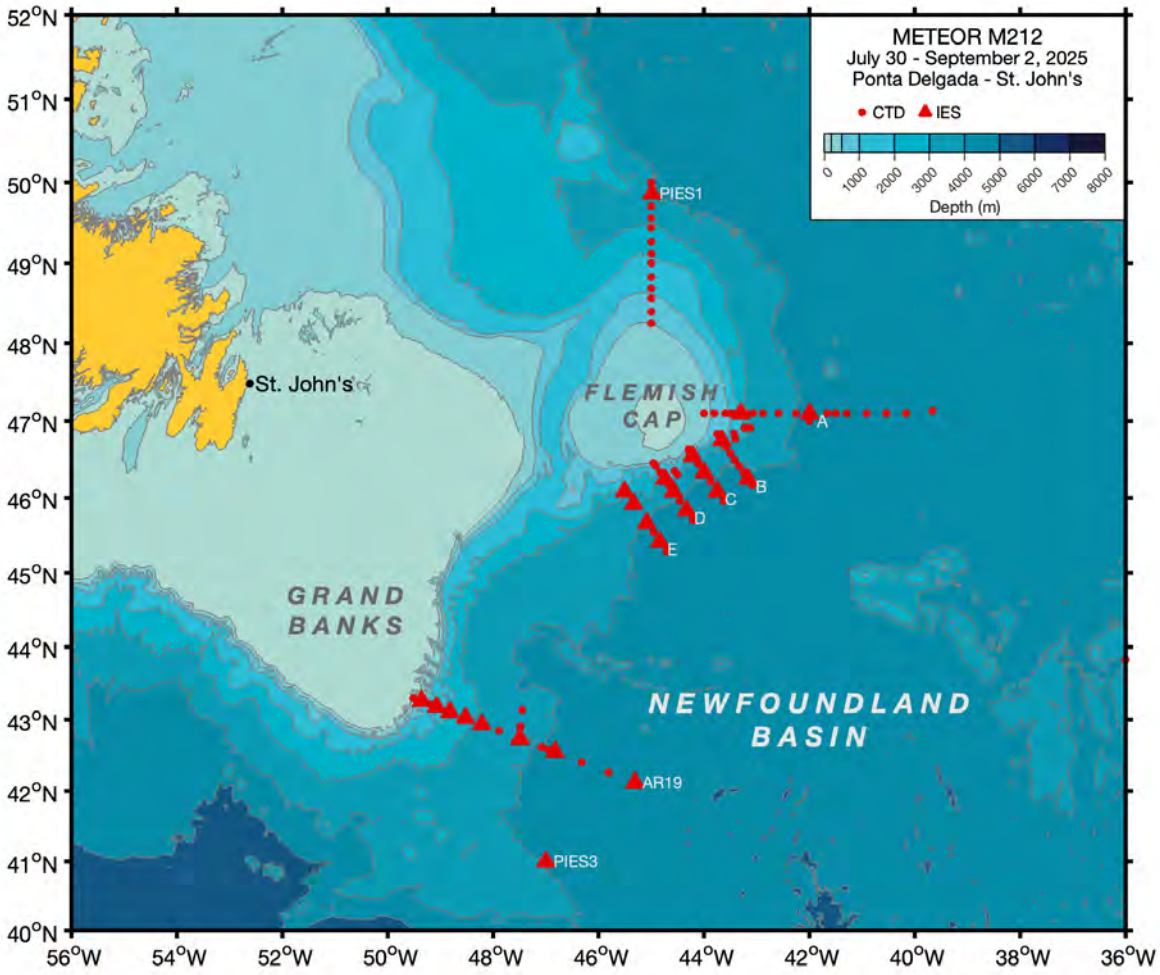
METEOR M212

Ponta Delgada — St. John's

July 30, 2025 — September 2, 2025

Chief Scientist: Christian Mertens

Captain: Detlef Korte



Objectives

The scientific program of R/V METEOR cruise M212 was a contribution to the field experiments of the collaborative Horizon Europe project EPOC 'Explaining and Predicting the Ocean Conveyor' (epoc-eu.org) and of the DFG Collaborative Research Centre (CRC/TRR) 181 'Energy Transfers in Atmosphere and Ocean' (www.trr-energytransfers.de). EPOC aims to identify key processes that determine the meridional connectivity of ocean transports, in particular the mechanisms responsible for the coherence of the Atlantic Meridional Overturning Circulation (AMOC) across key latitudes in the Atlantic and the influence of North Atlantic Current (NAC) variability on the Deep Western Boundary Current (DWBC). The contribution to CRC 181 addresses the relationship between mesoscale structures and the internal wave field with a focus on adaptive sampling by autonomous underwater vehicles. The work area was located at Flemish Cap and the Grand Banks of Newfoundland, a region where recent evidence suggests substantial discontinuity in the overturning circulation, as sharp changes in seafloor topography cause the DWBC to break away from the continental slope.

Cruise M212 marks the end of the 2-year EPOC field experiment which, together with high-resolution coupled simulations, will improve the understanding of the physical processes that determine the transport variability in the so-called Transition Zone (TZ) between subpolar and subtropical Atlantic at Flemish Cap and the Grand Banks. To observe the processes actively setting or breaking coherence in the TZ, a field experiment with an array of moorings and inverted echo sounders was deployed in October 2023 (MARIA S. MERIAN cruise MSM121) to measure the transport of North Atlantic Deep Water (NADW) into and out of the TZ. The array was designed to identify signals propagating along the western boundary of the Atlantic from the subpolar to the subtropical gyre. Here, interaction between the NAC and the DWBC weakens the boundary current and also modulates the northward surface limb of the AMOC. The array of inverted echo sounders will provide time-varying estimates of the surface and deep transports, which will be used to diagnose interactions and assess whether the changes observed in the DWBC from north to south of the Flemish Cap are due to variations in the NAC pathway, intensity, or eddy kinetic energy.

The scientific program consisted of hydrographic surveys (including CTD tow-yo sections and microstructure measurements), glider deployments, and deployments of inverted echo sounders. CTD (Conductivity-Temperature-Depth) and LADCP (lowered Acoustic Doppler Current Profiler) measurements were made at 93 stations along hydrographic sections around Flemish Cap and the Grand Banks. Repeated CTD/LADCP casts were made at different locations on the continental slope with the ship moving slowly across the bathymetry ("tow-yo"). The achieved horizontal resolution of a few hundred meters allowed to identify mechanisms that maintain lateral and vertical mixing and current-topography interactions. A total of 16 inverted echo sounder were recovered, and 8 of them redeployed. Ocean gliders were used to repeatedly transverse the frontal zone between boundary current and the NAC. The two gliders were deployed with mission between 6 and 14 days in the water. This allowed for highly resolved, frontal crossings, enabling to diagnose mixing length scales and the cross-frontal exchange of properties, such as heat, and also to investigate energetic characteristics within the frontal system. Newly developed adaptive sampling algorithms were used to further improve the ability to focus on the property of interest and facilitate repeated observations within the time frame.

Narrative

The R/V METEOR left the port of Ponta Delgada, Azores, in the morning of Wednesday, July 30, at 09:30 LT for the four-day transit to the research area located at the Flemish Cap and the Grand Banks of Newfoundland. Our team consisted of 19 scientists from the Universities of Bremen, Hamburg, and Tallinn. Underway measurements (38 kHz and 75 kHz shipboard ADCPs, multibeam echosounder, and thermosalinograph) were started in the morning of August 1, 10:00 LT, after leaving the EEZ of Portugal, followed by a test of the CTD/Rosette and the free-falling microstructure probe, both of which went well.

On August 3, we arrived in the work area, and began a meridional CTD/LADCP section along 47° N at 09:00 LT, heading toward Flemish Cap in the west. By the morning of August 5, 14 CTD stations had been completed along the section, and five deep RAFOS floats were deployed at the continental slope of Flemish Cap, ballasted for depths between 3000 and 3800 meters. Two Slocum Gliders (IfM09 and IfM16), each equipped with microstructure probes, were deployed at 08:50 LT and 10:40 LT, respectively. The deployment position at 47° 12.0’ N and 41° 42’ W, was located at the frontal zone between the southward boundary current off Flemish Cap and the northward North Atlantic Current centered near 41° W. At the same location, three microstructure cast were made before resuming the CTD section along 47° N toward the easternmost station at 39° 40’ W. At noon on August 6, after completing two stations where 10 surface drifters were deployed at each, we began a transit to the next CTD section at 45° W, north of Flemish Cap. Thereby we also stayed clear from the effects of the former tropical storm Dexter, which crossed our research area at 47° N on Friday, August 8. In total, 20 CTD stations were completed along the section, 11 of which included tracer sampling (CFC/SF6).

We arrived at the first CTD station of the next section, at 50° N and 45° W, on August 8 at 12:00 LT. In the evening, after the second CTD, a bottom mounted inverted echo sounder with pressure sensor (PIES) was released at 20:00 LT and recovered about one hour an 15 minutes later, at 21:15 LT. The CTD section along 45° W was completed on August 10 at 00:40 LT, with tracer samples collected on 6 of the 13 stations. Five deep RAFOS floats were deployed in the northern part of the section. A 108 NM transit began toward the next station at the southeastern tip of Flemish Cap, but was interrupted on August 10 at 09:15 LT to change course in direction of glider IfM09. Data transmitted from the glider indicated an increasing weight, suggesting a probable leak. We arrived at the position at 14:00 LT, sea state was calm and visibility excellent. The glider had surfaced, and communication with the vehicle was stable. However, it was not receiving continuous position updates, so it took some time to search the instrument, before it was recovered at 16:00 LT. During the night we recovered a PIES at 47° 6.0’ N and 42° 0.0’ W.

On the morning of August 11, we began a 12-hour CTD tow-yo in east direction at the southeastern tip of Flemish Cap. The CTD/Rosette was towed at a speed of 0.3 to 0.5 knots while being alternately lowered and raised between a water depth of 1000 m and the seafloor. After the tow-yo, we attempted to recover the nearby PIES A1, but the dense fog made it too risky. Instead, we proceeded to section B, south of Flemish Cap, where we began a CTD cast on August 11 at 23:04 LT and afterwards recovered PIES B1, that was on deck at 02:19 LT on August 12. CTD casts were then continued along section B. On August 13 at 04:37 LT, PIES B2 was successfully recovered on deck. The final CTD cast of section B followed and was completed at 08:24 LT. Upon completion, the R/V METEOR transited 39 NM to section C, where the first CTD cast was deployed at 16:20 LT. Later in the evening, at 19:30 LT, C-PIES C3 was recovered, and CTD operations continued along section C overnight. On August 14 C-PIES C2 was recovered at 11:23 LT. PIES C3 was subsequently recovered at 19:00 LT. The section concluded with the final CTD on deck at 21:42 LT, after which the R/V METEOR proceeded on a 30 NM transit to section D. CTD

work commenced along section D at 01:05 LT on August 15. PIES D1 was recovered at 05:15 LT, after which CTD operations continued throughout the day. At 16:48 LT, C-PIES D2 was recovered, and the section proceeded with additional CTD casts. On August 16, PIES D3 was recovered at 02:15 LT. The last CTD of section D was completed at 06:08 LT. A 33 NM transit to section E followed, and the first CTD cast of the new section was deployed at 10:05 LT. Later that afternoon, at 17:39 LT, PIES E4 was successfully recovered. CTD work then resumed along the section.

During the early hours of August 17, a CTD cast was aborted at 00:30 LT due to technical problems with data transmission. Operations shifted to recovery of inverted echo sounders, with C-PIES E2 brought on deck at 02:36 LT. At 06:00 LT, C-PIES E3 surfaced and was sighted; however, recovery was complicated by entanglement of the cable with the vessel. The top float carrying a current meter sensor detached and drifted away rapidly, while the main PIES unit was successfully recovered with assistance by boat. PIES E1 was subsequently recovered at 09:58 LT. CTD operations then resumed, and four stations were completed along section E. The final CTD of section E was completed at 00:02 LT on August 18. The R/V METEOR then began a 137 NM transit toward the recovery site of glider IfM16 at 46° 54.0’ N 42° 21.0’ W. At 14:15 LT, the ship arrived at the glider recovery position. The glider was transmitting its position continuously, which enabled successful location despite limited visibility. Recovery was accomplished using a net, and the glider was retrieved undamaged. The ship left the site on August 19 at 15:20 LT and proceeded toward PIES A1, which was recovered on deck at 22:38 LT.

A series of CTD tow-yo stations followed. The first deployment began on August 19 at 00:33 LT at 46° 50.7’ N, 43° 25.9’ W, with the vessel heading 165° at a speed of 0.3–0.5 kn. The tow-yo concluded with recovery on deck at 12:14 LT. A second tow-yo commenced at 16:07 LT at 46° 35.2’ N, 44° 11.6’ W, heading 154°, and was completed on August 20 at 02:58 LT. The third tow-yo began at 08:14 LT at 46° 21.3’ N, 44° 33.5’ W, heading 141°, and concluded with recovery on deck at 19:19 LT. The R/V METEOR then set course for Trinity Bay, Newfoundland, to seek shelter from ex-Hurricane Erin.

Underway measurements were stopped on Thursday, August 22 at 17:00 LT, and the ship assumed at waiting position north of Hant’s Harbour, Trinity Bay, at 21:00 LT. After the storm had passed, the ship left this position on August 24 at 08:30 LT for the transit toward the second work area, southeast of the Grand Banks. Underway measurements resumed at 12:00 LT. On August 25 at 14:30 LT, the glider IfM16 was deployed at 44° 6.0’ N, 48° 13.7’ W, in the frontal zone between the Labrador and North Atlantic Currents. The ship then proceeded to the southernmost position of the cruise, 41° N, 47° W, and recovered the Inverted Echo Sounder PIES3 on August 26 at 13:45 LT.

After a transit to the start of the Grand Banks section at 42° 07.3’ N, 45° 18.3’ W, where the ship arrived 22:30 LT, a CTD cast was made and PIES P8 deployed. The section was completed on August 29 at 14:00 LT at 43° 17.6’ N, 49° 30.3’ W, with a total of 15 CTD casts and eight PIES deployments. Microstructure measurements in the upper 200 m were made at the 8 stations in the frontal zone between Labrador Current and North Atlantic Current, directly after the CTD cast. The ship returned then to the center of the section, where the maximum Deep Western Boundary Current had been found, for a CTD time series station, that started at 23:45 LT. Seven CTD casts were made. A second CTD time series station was made upstream of the Deep Western Boundary Current, that endet on August 31 at 13:15 LT. After a 35 NM transit the ship arrived at the glider recovery position 42° 49.0’ N, 48° 16.0’ W, the glider was easily found and on deck at 17:15 LT. This was the end of the station work for this cruise and the transit to St. John’s started. The underway measurements were stopped on September 1, 15:00 LT. The ship arrived in St. John’s on September 2, 09:00 LT.

List of participants

1.	MERTENS, Christian	Chief Scientist	IUP
2.	BACHMAYER, Ralf	Glider	MARUM
3.	OELERICH, Ria	Glider	MARUM
4.	RAMAHERISON, Sariaka	Glider	MARUM
5.	DOGLIONI, Francesca	Inverted echo sounder	MARUM
6.	ASCHENBECK, Lara	Inverted echo sounder	IUP
7.	MIDDENDORF, Lina	Oxygen	IUP
8.	LEIMANN, Ilmar	Floats	MARUM
9.	DUONG, Buu Lik	SADCP, Microstructure	MARUM
10.	FRAJKA-WILLIAMS, Eleanor	CTD/LADCP Tow-yo	IFM
11.	BRACAMONTES RAMÍREZ, Joel	LADCP	IFM
12.	STEINFELDT, Reiner	CTD, Tracer, Salinometer	IUP
13.	BREUNIG, Emelie	CTD, Drifter	IFM
14.	SCHELIGA, Kaja	CTD, Outreach	IFM
15.	SCHMITZ, Isabelle	CTD	IFM
16.	MORITZ, Till	CTD	IFM
17.	SIHT, Enriko	CTD	TALTECH
18.	HEGELER, Hagen	CTD	IUP
19.	RIPKE, Kim	CTD	IUP
20.	OTTE, Frank	Meteorology	DWD

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List of stations

Station	Date / Time UTC	Device	Latitude	Longitude	Depth (m)	Comment
M212_1-1	2025/08/01 10:12	CTD	42° 43.712' N	033° 59.337' W	3969	
M212_2-1	2025/08/01 11:45	MSS	42° 43.588' N	033° 59.428' W	3962	
M212_3-1	2025/08/03 08:55	CTD	47° 05.996' N	042° 00.005' W	4227	
M212_4-1	2025/08/03 12:32	CTD	47° 05.993' N	042° 15.340' W	4032	
M212_5-1	2025/08/03 14:58	Float	47° 06.489' N	042° 15.845' W	4019	RAFOS 3800
M212_6-1	2025/08/03 15:02	Float	47° 06.523' N	042° 15.889' W	4018	RAFOS 3400
M212_7-1	2025/08/03 16:38	CTD	47° 06.076' N	042° 35.060' W	3672	
M212_8-1	2025/08/03 18:48	Float	47° 06.271' N	042° 34.972' W	3670	RAFOS 3400
M212_9-1	2025/08/03 18:52	Float	47° 06.279' N	042° 34.938' W	3671	RAFOS 3000
M212_10-1	2025/08/03 20:33	CTD	47° 05.994' N	042° 52.999' W	3452	
M212_11-1	2025/08/03 23:00	Float	47° 07.487' N	042° 53.695' W	3451	RAFOS 3000
M212_12-1	2025/08/03 23:29	ADCP	47° 06.032' N	042° 53.014' W	3452	Profile start
M212_12-1	2025/08/04 08:33	ADCP	47° 06.000' N	044° 12.210' W	546	Profile end
M212_13-1	2025/08/04 09:58	CTD	47° 05.998' N	044° 00.014' W	391	
M212_14-1	2025/08/04 11:30	CTD	47° 06.100' N	043° 47.977' W	577	
M212_15-1	2025/08/04 13:01	CTD	47° 06.043' N	043° 35.960' W	838	
M212_16-1	2025/08/04 14:19	CTD	47° 06.012' N	043° 30.052' W	1037	
M212_17-1	2025/08/04 15:51	CTD	47° 06.021' N	043° 24.047' W	1365	
M212_18-1	2025/08/04 17:36	CTD	47° 05.980' N	043° 20.021' W	1941	
M212_19-1	2025/08/04 19:23	CTD	47° 05.999' N	043° 17.995' W	2536	
M212_20-1	2025/08/04 22:01	CTD	47° 06.024' N	043° 12.014' W	3116	
M212_21-1	2025/08/05 00:49	CTD	47° 06.054' N	043° 03.970' W	3575	
M212_22-1	2025/08/05 10:49	Glider	47° 11.956' N	041° 41.871' W	4329	Glider IFM09 deployment
M212_23-1	2025/08/05 12:38	Glider	47° 11.939' N	041° 41.799' W	4331	Glider IFM16 deployment
M212_24-1	2025/08/05 14:06	MSS	47° 12.052' N	041° 41.839' W	4329	
M212_25-1	2025/08/05 16:13	CTD	47° 05.967' N	041° 39.502' W	4291	
M212_26-1	2025/08/05 20:00	CTD	47° 05.981' N	041° 29.990' W	4334	
M212_27-1	2025/08/05 23:52	CTD	47° 05.989' N	041° 17.429' W	4422	
M212_28-1	2025/08/06 04:50	CTD	47° 05.998' N	040° 54.960' W	4502	
M212_29-1	2025/08/06 09:42	CTD	47° 06.051' N	040° 32.359' W	4554	
M212_30-1	2025/08/06 14:43	CTD	47° 06.023' N	040° 10.000' W	4508	
M212_31-1	2025/08/06 20:01	CTD	47° 07.999' N	039° 39.989' W	4566	
M212_32-1	2025/08/07 08:02	Drifter	46° 59.980' N	041° 25.785' W	4347	10 SVP drifter deployment
M212_33-1	2025/08/07 13:19	Drifter	46° 50.281' N	042° 05.139' W	4147	10 SVP drifter deployment
M212_34-1	2025/08/08 14:07	CTD	50° 00.003' N	044° 59.938' W	3971	
M212_35-1	2025/08/08 17:36	CTD	49° 53.506' N	045° 00.025' W	3922	
M212_36-1	2025/08/08 20:10	Float	49° 53.850' N	045° 00.965' W	3928	RAFOS 3800
M212_37-1	2025/08/08 20:14	Float	49° 53.858' N	045° 00.994' W	3926	RAFOS 3400
M212_38-1	2025/08/08 22:00	PIES	49° 51.775' N	044° 59.410' W	3940	PIES1/FC4P recovery
M212_39-1	2025/08/09 00:30	CTD	49° 42.515' N	044° 59.972' W	3552	
M212_40-1	2025/08/09 02:49	Float	49° 42.936' N	044° 59.673' W	3596	RAFOS 3400
M212_41-1	2025/08/09 02:52	Float	49° 42.968' N	044° 59.696' W	3600	RAFOS 3000
M212_42-1	2025/08/09 04:08	CTD	49° 33.753' N	045° 00.015' W	3232	
M212_43-1	2025/08/09 06:09	Float	49° 34.340' N	045° 00.452' W	3256	RAFOS 3000
M212_44-1	2025/08/09 07:42	CTD	49° 26.510' N	045° 00.016' W	2907	
M212_45-1	2025/08/09 10:47	CTD	49° 16.288' N	045° 00.020' W	2577	
M212_46-1	2025/08/09 13:33	CTD	49° 07.489' N	044° 59.926' W	2243	
M212_47-1	2025/08/09 16:04	CTD	49° 00.271' N	045° 00.030' W	1644	
M212_48-1	2025/08/09 18:31	CTD	48° 50.032' N	044° 59.987' W	1287	
M212_49-1	2025/08/09 20:43	CTD	48° 41.257' N	044° 59.999' W	1166	
M212_50-1	2025/08/09 22:32	CTD	48° 34.012' N	045° 00.080' W	899	
M212_51-1	2025/08/10 00:30	CTD	48° 23.759' N	045° 00.047' W	672	
M212_52-1	2025/08/10 02:14	CTD	48° 15.036' N	044° 59.999' W	516	

M212_53-1	2025/08/10 17:45	Glider	47° 02.759' N	042° 13.238' W	4056	Glider IFM09 recovery
M212_54-1	2025/08/10 19:26	CTD	46° 59.979' N	042° 00.012' W	4232	
M212_55-1	2025/08/10 23:13	PIES	47° 05.855' N	041° 59.845' W	4232	PIES A2 released
M212_56-1	2025/08/11 07:13	CTD	46° 54.797' N	043° 14.003' W	1895	Tow-Yo begin
M212_56-1	2025/08/11 19:05	CTD	46° 54.773' N	043° 07.300' W	3411	Tow-Yo end
M212_57-1	2025/08/12 01:04	CTD	46° 44.965' N	043° 40.052' W	2590	
M212_58-1	2025/08/12 03:11	PIES	46° 45.135' N	043° 39.603' W	2590	PIES B1 released
M212_59-1	2025/08/12 05:12	CTD	46° 49.997' N	043° 44.998' W	881	
M212_60-1	2025/08/12 07:21	CTD	46° 40.008' N	043° 34.993' W	3260	
M212_61-1	2025/08/12 10:16	CTD	46° 34.991' N	043° 30.013' W	3602	
M212_62-1	2025/08/12 12:50	Float	46° 34.291' N	043° 29.623' W	3643	RAFOS 3400
M212_63-1	2025/08/12 12:56	Float	46° 34.261' N	043° 29.669' W	3642	RAFOS 3000
M212_64-1	2025/08/12 14:09	CTD	46° 30.001' N	043° 24.950' W	3963	
M212_65-1	2025/08/12 16:34	Float	46° 29.972' N	043° 24.946' W	3963	RAFOS 3800
M212_66-1	2025/08/12 16:42	Float	46° 29.851' N	043° 24.975' W	3963	RAFOS 3400
M212_67-1	2025/08/12 18:02	CTD	46° 25.053' N	043° 19.973' W	4057	
M212_68-1	2025/08/12 20:36	Float	46° 25.072' N	043° 19.184' W	4057	RAFOS 3800
M212_69-1	2025/08/12 20:39	Float	46° 25.071' N	043° 19.190' W	4060	RAFOS 3400
M212_70-1	2025/08/12 21:36	CTD	46° 20.009' N	043° 14.975' W	4177	
M212_71-1	2025/08/13 00:18	Float	46° 20.346' N	043° 12.937' W	4199	RAFOS 3800
M212_72-1	2025/08/13 01:07	CTD	46° 15.054' N	043° 09.640' W	4277	
M212_73-1	2025/08/13 04:25	PIES	46° 14.858' N	043° 09.693' W	4239	PIES B2 released
M212_74-1	2025/08/13 07:42	CTD	46° 10.009' N	043° 04.984' W	4417	
M212_75-1	2025/08/13 16:22	CTD	46° 05.035' N	043° 44.997' W	4361	
M212_76-1	2025/08/13 19:51	PIES	46° 04.945' N	043° 44.880' W	4360	C-PIES C3 released
M212_77-1	2025/08/13 22:33	CTD	45° 57.464' N	043° 37.478' W	4581	
M212_78-1	2025/08/14 03:45	CTD	46° 12.485' N	043° 52.482' W	4049	
M212_79-1	2025/08/14 07:15	Float	46° 11.898' N	043° 50.407' W	4090	RAFOS 3800
M212_80-1	2025/08/14 07:17	Float	46° 11.889' N	043° 50.408' W	4093	RAFOS 3400
M212_81-1	2025/08/14 08:56	CTD	46° 19.994' N	044° 00.020' W	3896	
M212_82-1	2025/08/14 11:22	Float	46° 19.254' N	043° 58.308' W	3900	RAFOS 3400
M212_83-1	2025/08/14 11:26	Float	46° 19.226' N	043° 58.340' W	3900	RAFOS 3000
M212_84-1	2025/08/14 11:53	PIES	46° 19.815' N	043° 59.784' W	3900	C-PIES C2 released
M212_85-1	2025/08/14 14:37	CTD	46° 26.482' N	044° 06.424' W	3352	
M212_86-1	2025/08/14 16:43	Float	46° 26.437' N	044° 06.151' W	3358	RAFOS 3000
M212_87-1	2025/08/14 18:02	CTD	46° 32.973' N	044° 13.065' W	2310	
M212_88-1	2025-08-14 19:48	PIES	46° 32.925' N	044° 12.909' W	2310	PIES C1 released
M212_89-1	2025-08-14 21:51	CTD	46° 36.006' N	044° 16.001' W	1136	
M212_90-1	2025-08-14 23:13	CTD	46° 38.019' N	044° 17.514' W	546	
M212_91-1	2025-08-15 03:04	CTD	46° 27.515' N	044° 57.478' W	591	
M212_92-1	2025-08-15 04:11	CTD	46° 25.022' N	044° 55.000' W	1239	
M212_93-1	2025-08-15 05:57	CTD	46° 20.001' N	044° 49.995' W	2474	
M212_94-1	2025-08-15 08:23	CTD	46° 14.999' N	044° 44.982' W	1899	
M212_95-1	2025-08-15 10:04	PIES	46° 14.999' N	044° 44.779' W	1900	PIES D1 released
M212_96-1	2025-08-15 12:10	CTD	46° 10.032' N	044° 39.968' W	3339	
M212_97-1	2025-08-15 15:09	CTD	46° 05.021' N	044° 34.990' W	3591	
M212_98-1	2025-08-15 17:30	PIES	46° 05.057' N	044° 34.773' W	3590	C-PIES D2 released
M212_99-1	2025-08-15 20:20	CTD	45° 57.498' N	044° 27.506' W	4027	
M212_100-1	2025-08-15 23:57	CTD	45° 50.029' N	044° 20.013' W	4322	
M212_101-1	2025-08-16 02:13	PIES	45° 50.076' N	044° 19.863' W	4320	PIES D3 released
M212_102-1	2025-08-16 05:30	CTD	45° 42.497' N	044° 12.513' W	4597	
M212_103-1	2025-08-16 12:04	CTD	45° 17.493' N	044° 42.527' W	4564	
M212_104-1	2025-08-16 16:01	CTD	45° 25.177' N	044° 50.018' W	4509	
M212_105-1	2025-08-16 18:09	PIES	45° 25.175' N	044° 50.015' W	4500	PIES E4 released
M212_106-1	2025-08-16 20:55	CTD	45° 32.504' N	044° 57.497' W	4268	
M212_107-1	2025-08-17 01:56	CTD	45° 40.002' N	045° 04.995' W	4017	
M212_108-1	2025-08-17 02:35	Float	45° 40.029' N	045° 04.984' W	4020	RAFOS 3800

M212_109-1	2025-08-17 02:38	Float	45° 40.060' N	045° 04.953' W	4020	RAFOS 3400
M212_110-1	2025-08-17 02:49	PIES	45° 40.036' N	045° 05.082' W	4020	C-PIES E3 released
M212_111-1	2025-08-17 05:49	Float	45° 47.552' N	045° 12.507' W	3643	RAFOS 3400
M212_112-1	2025-08-17 05:50	Float	45° 47.573' N	045° 12.501' W	3645	RAFOS 3000
M212_113-1	2025-08-17 06:51	Float	45° 54.961' N	045° 20.114' W	3445	RAFOS 3000
M212_114-1	2025-08-17 07:17	PIES	45° 55.196' N	045° 20.312' W	3450	C-PIES E2 released
M212_115-1	2025-08-17 10:48	PIES	46° 05.196' N	045° 30.257' W	2412	PIES E1 released
M212_116-1	2025-08-17 12:08	CTD	46° 05.195' N	045° 30.376' W	2413	
M212_117-1	2025-08-17 15:34	CTD	45° 55.092' N	045° 19.941' W	3443	
M212_118-1	2025-08-17 19:25	CTD	45° 40.002' N	045° 04.997' W	4019	
M212_119-1	2025-08-17 23:53	CTD	45° 55.099' N	045° 20.104' W	3444	
M212_120-1	2025-08-18 16:48	Glider	46° 54.925' N	042° 23.398' W	3856	IFM16 recovery
M212_121-1	2025-08-18 21:24	CTD	47° 06.025' N	043° 17.463' W	2644	
M212_122-1	2025-08-18 23:28	PIES	47° 05.865' N	043° 17.778' W	2650	PIES A1 released
M212_123-1	2025-08-19 02:33	CTD	46° 50.699' N	043° 25.875' W	1448	Tow-Yo begin
M212_123-1	2025-08-19 13:47	CTD	46° 46.167' N	043° 24.110' W	2947	Tow-Yo end
M212_124-1	2025-08-19 18:07	CTD	46° 35.185' N	044° 11.573' W	1398	Tow-Yo begin
M212_124-1	2025-08-20 04:27	CTD	46° 31.779' N	044° 09.168' W	2609	Tow-Yo end
M212_125-1	2025-08-20 08:14	CTD	46° 21.273' N	044° 33.542' W	1698	Tow-Yo begin
M212_125-1	2025-08-20 19:51	CTD	46° 18.244' N	044° 30.186' W	3187	Tow-Yo end
M212_126-1	2025-08-25 16:48	Glider	44° 05.979' N	048° 13.686' W	3514	IFM16 deployment
M212_127-1	2025-08-26 12:31	CTD	40° 59.990' N	046° 59.769' W	4134	
M212_128-1	2025-08-26 14:20	PIES	40° 59.972' N	046° 59.962' W	4126	PIES PIES3 released
M212_129-1	2025-08-27 00:36	PIES	42° 07.340' N	045° 18.304' W	4776	PIES P8 deployment
M212_130-1	2025-08-27 00:46	CTD	42° 07.325' N	045° 18.324' W	4776	
M212_131-1	2025-08-27 06:55	CTD	42° 15.851' N	045° 48.702' W	4695	
M212_132-1	2025-08-27 12:23	CTD	42° 24.378' N	046° 19.084' W	4891	
M212_133-1	2025-08-27 17:52	PIES	42° 32.856' N	046° 49.482' W	4248	PIES P7 deployment
M212_134-1	2025-08-27 17:58	CTD	42° 32.861' N	046° 49.467' W	4248	
M212_135-1	2025-08-27 21:36	CTD	42° 34.980' N	046° 57.253' W	4072	
M212_136-1	2025-08-28 01:00	CTD	42° 37.189' N	047° 04.978' W	3952	
M212_137-1	2025-08-28 03:31	Float	42° 37.269' N	047° 04.957' W	3946	RAFOS 3800
M212_138-1	2025-08-28 05:48	PIES	42° 44.154' N	047° 30.012' W	3783	C-PIES P6 deployment
M212_139-1	2025-08-28 06:00	CTD	42° 44.143' N	047° 30.014' W	3783	
M212_140-1	2025-08-28 08:19	Float	42° 44.397' N	047° 29.911' W	3773	RAFOS 3400
M212_141-1	2025-08-28 08:28	MSS	42° 44.379' N	047° 29.923' W	3792	
M212_142-1	2025-08-28 11:12	CTD	42° 50.730' N	047° 53.459' W	3608	
M212_143-1	2025-08-28 13:33	Float	42° 50.747' N	047° 53.433' W	3613	RAFOS 3400
M212_144-1	2025-08-28 13:37	Float	42° 50.740' N	047° 53.404' W	3613	RAFOS 3000
M212_145-1	2025-08-28 13:41	MSS	42° 50.713' N	047° 53.401' W	3612	
M212_146-1	2025-08-28 16:17	PIES	42° 55.976' N	048° 12.688' W	3245	C-PIES P5 deployment
M212_147-1	2025-08-28 16:25	CTD	42° 55.965' N	048° 12.707' W	3245	
M212_148-1	2025-08-28 18:30	Float	42° 55.896' N	048° 12.798' W	3242	RAFOS 3000
M212_149-1	2025-08-28 18:37	MSS	42° 55.895' N	048° 12.817' W	3241	
M212_150-1	2025-08-28 21:29	PIES	43° 01.379' N	048° 31.580' W	2696	C-PIES P2 deployment
M212_151-1	2025-08-28 21:42	CTD	43° 01.353' N	048° 31.515' W	2696	
M212_152-1	2025-08-28 23:37	MSS	43° 01.311' N	048° 31.612' W	2695	
M212_153-1	2025-08-29 02:04	PIES	43° 06.478' N	048° 49.586' W	2004	C-PIES P3 deployment
M212_154-1	2025-08-29 02:14	CTD	43° 06.491' N	048° 49.597' W	2004	
M212_155-1	2025-08-29 03:36	MSS	43° 06.482' N	048° 49.753' W	1996	
M212_156-1	2025-08-29 05:54	PIES	43° 10.495' N	049° 04.204' W	1343	PIES P2 deployment
M212_157-1	2025-08-29 06:03	CTD	43° 10.495' N	049° 04.203' W	1343	
M212_158-1	2025-08-29 07:09	MSS	43° 10.494' N	049° 04.222' W	1341	
M212_159-1	2025-08-29 08:54	CTD	43° 12.793' N	049° 12.503' W	910	
M212_160-1	2025-08-29 09:48	MSS	43° 12.462' N	049° 12.575' W	960	
M212_161-1	2025-08-29 11:57	PIES	43° 15.346' N	049° 21.634' W	820	PIES P1 deployment
M212_162-1	2025-08-29 12:06	CTD	43° 15.301' N	049° 21.664' W	613	

M212_163-1	2025-08-29 12:48	MSS	43° 14.926' N	049° 21.814' W	652	
M212_164-1	2025-08-29 15:04	CTD	43° 17.910' N	049° 30.686' W	448	
M212_165-1	2025-08-29 15:48	MSS	43° 17.589' N	049° 30.344' W	247	Uprising
M212_166-1	2025-08-30 01:50	CTD	42° 44.473' N	047° 31.007' W	3748	Time series begin
M212_166-1	2025-08-30 15:56	CTD	42° 44.555' N	047° 31.011' W	3745	Time series end
M212_167-1	2025-08-30 20:47	CTD	43° 07.996' N	047° 27.010' W	3567	
M212_168-1	2025-08-31 01:19	CTD	42° 54.546' N	047° 28.876' W	3707	Time series begin
M212_168-1	2025-08-31 08:49	CTD	42° 53.468' N	047° 29.083' W	3734	Time series end
M212_169-1	2025-08-31 18:59	Glider	42° 50.932' N	048° 16.895' W	3221	IfM16 recovery