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Short Cruise Report
- RV Maria S. Merian, Cruise MSM-38 -

Cadiz – St. John's
07 May - 05 June 2014
Chief Scientist: Dr. Dagmar Kieke
Captain: Ralf Schmidt

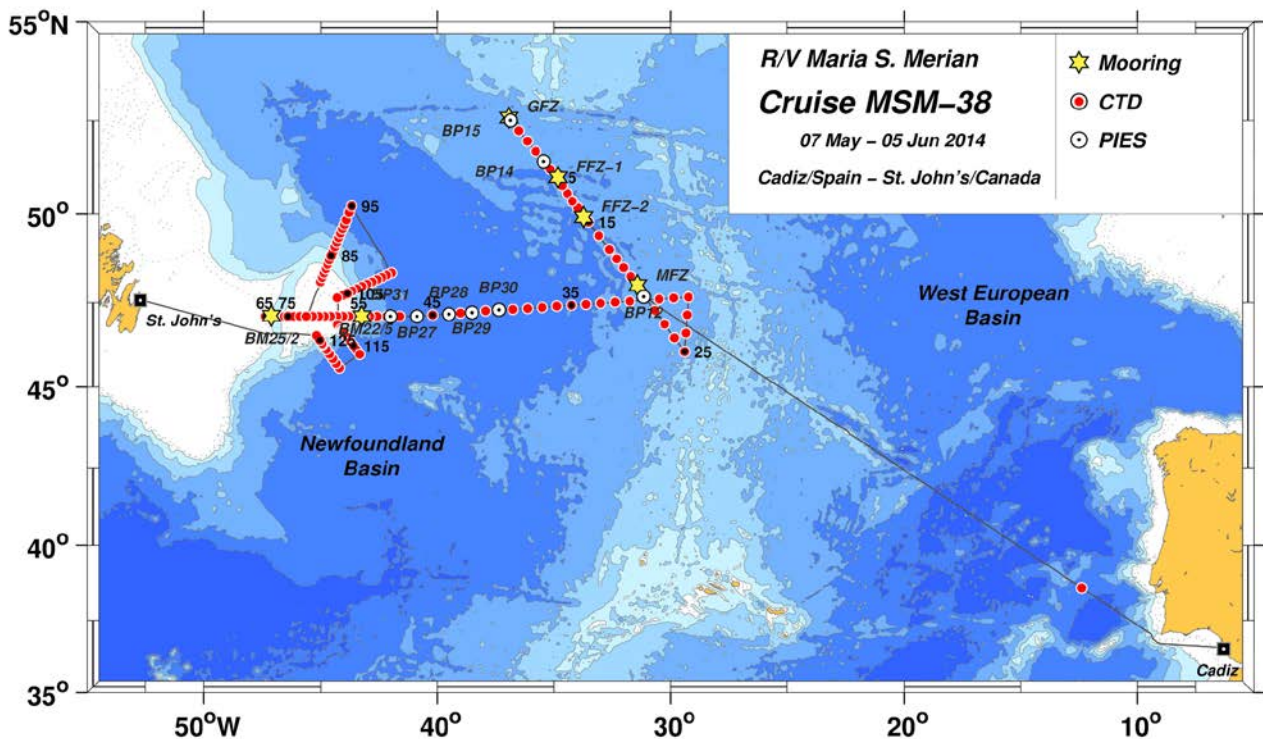


Figure 1: Track of RV Maria S. Merian, cruise MSM-38.

1. Objectives

Physical oceanographic measurements conducted during cruise *MSM-38* were carried out in the framework of the *Cluster of Excellence “Marum”*, sub-project OC1, funded by the *German Science Foundation* (DFG). They further contributed to the cooperative research project “RACE”, sub-project 1.2, funded by the *Federal Ministry of Education and Research* (BMBF), and the *DFG*-funded project “FLEPVAR”. The primary objectives of cruise *MSM-38* were:

- 1) To install and exchange longterm deep-sea observatories consisting of moorings in the Deep Western Boundary Current (DWBC) east of Flemish Cap at 47°N, in Flemish Pass, and along the western flank of the Mid-Atlantic Ridge (MAR). All moorings serve to measure the velocity structure and temperature and salinity of different components of North Atlantic Deep Water (NADW) as well as of the North Atlantic Current (NAC) and the Labrador Current (LC), respectively.
- 2) To service echo-sounders equipped with pressure sensors (PIES) installed at the sea bottom and to retrieve recorded data from the deployment period 2013-2014.
- 3) To analyze the strength and variability in the strength of the exported NADW in relation to the variations in the strength of the NAC in the Newfoundland Basin during 2013-2014.
- 4) To infer the main pathways of the NADW components and the NAC in the open subpolar North Atlantic and the strength of the subpolar gyre as it crosses the MAR.
- 5) To estimate the export of deep water towards the subtropics within the boundary current around Flemish Cap and via Flemish Pass, and to identify the water mass characteristics and respective changes on interannual time scales.
- 6) To assess the importance of the NAC and the deep water pathways for the lateral propagation of heat and freshwater anomalies.

2. Narrative of cruise MSM-38

RV MARIA S. MERIAN left Cadiz/Spain on May 07th, 2014, at 09:50 UTC. Having passed the 12 nm-zone¹, continuous logging of underway data (thermosalinograph and vessel-mounted Acoustic Doppler Current Profilers (ADCP) operated at 38 kHz and 75 kHz) was

¹ nm = nautical mile

switched on at 12:00 UTC. Course was set to northwest towards the western flank of the Mid-Atlantic Ridge (MAR). Having successfully completed a test station on May 08th, station work began on May 12th, 2014, 01:30 UTC, when the first inverted echo-sounder equipped with pressure sensor (PIES), *BP-12/4*, was visited. Recorded data was successfully received via acoustic telemetry. The same day mooring *MFZ* was recovered at the western exit of Maxwell Fracture Zone. High wind and swell conditions impacted the order of scientific activities in the following days.

Between May 13th and May 17th moorings *FFZ-1* and *GFZ* were recovered successfully (see Table 2). Unfortunately, the attempt to recover mooring *FFZ-2* (May 13th) failed. While the acoustic release package could be located, diagnostics of the releases revealed a horizontal position of the release package. The mooring was considered torn off at some time in the past and was therefore lost. A follow-up mooring *FFZ-2* was deployed the same day.

While following a course to the northwest, PIES stations *BP-14/2*, *BP-15/2*, and *BP-15a/1* (see Table 5) were visited, and respective data was successfully retrieved via acoustic telemetry. PIES *BP-14/2* and *BP-15/2* were recovered afterwards. While the first was deployed three days later (May 15th) at the same location, the instrument formerly located at PIES station *BP-15/2* was later on shifted to the Newfoundland Basin. The location of mooring *GFZ*, recovered on May 15th and redeployed on May 16th, marked the northern end of the hydrographic section following the course of the Mid-Atlantic Ridge.

Between May 16th and May 20th, RV MARIA S. MERIAN gradually descended from 52°30'N to 46°06'N, thereby repeating the section while performing hydrographic casts (Conductivity-Temperature-Depth-Oxygen (CTDO) units, lowered Acoustic Doppler Current Profilers (LADCP), water sampling, and sensor calibration) at distances of 15 nm to 30 nm. On May 17th, mooring *FFZ-1* was deployed again followed by the deployment of mooring *MFZ* on May 19th.

Continuous hydrographic station work along the so-called 47°N-section was resumed on May 21st, when RV MARIA S. MERIAN started to head towards west with station distances of about 25 nm, which became considerably smaller when approaching the region of the Deep Western Boundary Current (DWBC) located to the east of Flemish Cap. While gradually approaching Flemish Cap, the PIES stations *BP-27* to *BP-30* (Table 5) were visited, and recorded data was retrieved via acoustic telemetry. The instrument previously recovered at the MAR was furthermore re-installed as PIES station *BP-31*.

On May 26th, mooring BM-22/5 was placed into the core of the DWBC east of Flemish Cap (Table 3). Between May 26th and May 27th, RV MARIA S. MERIAN headed across Flemish Cap, thereby performing shallow hydrographic stations on top of the cap. On the evening of May 28th activities to recover mooring *BM-25/2* installed at the western side of Flemish Pass failed, since the acoustic release responded a horizontal position at the sea bottom (Table 4).

Between May 27th and May 28th, hydrographic sampling was conducted while crossing the Flemish Pass at 47°06'N from its western side towards Flemish Cap. Having arrived on the top of Flemish Cap, RV MARIA S. MERIAN turned towards north-northeast and started a hydrographic section across the northern flank of Flemish Cap (May 28th). A similar section directed up-hill followed but was shifted to the southeast. The scientific program was finished after running two additional sections across the DWBC located to the south of the 47°N section (June 01st to June 03rd).

While passing the Canadian 12 nm-zone continuous logging of underway data was stopped on June 05th, 08:30 UTC. The same day at 10:30 UTC RV MARIA S. MERIAN arrived at the pilot station of St. John's and was towed at pier 17 at 11:30 UTC, which marked the end of cruise MSM-38.

Acknowledgements

Once again, we enjoyed the team spirit, enthusiasm and close cooperation between the different scientific teams and the ship's crew which made our stay aboard *RV Maria S. Merian* very comfortable. For this reason, we would like to thank the master of the vessel, Ralf Schmidt, and his entire crew for the assistance and support granted to us during cruise *MSM-38*. Further thanks goes to the "helping hands" at our home laboratories and the institutions (*Zentrum für Marine Umweltwissenschaften (Marum)*, *Federal Ministry for Education and Research (BMBF)*, *German Science Foundation (DFG)*, *Senatskommission für Ozeanographie*, and *Leitstelle Deutsche Forschungsschiffe*) that provided the necessary ship time, funding, and support to pursue all scientific work.

Table 1. Participants of cruise MSM-38

| | Name | Institute | Field of Activity |
|-----|----------------------------------|-------------|--|
| 1. | Kieke, Dagmar, Dr. | IUPHB/Marum | chief scientist |
| 2. | Breckenfelder, Tilia | IUPHB/Marum | CTDO/IADCP watch, data analysis |
| 3. | Büsing, Merle | Marum | sampling of carbon & oxygen isotopes |
| 4. | Diekmann, Thorben | Marum | CTDO/IADCP watch |
| 5. | Gerken, Jan | Marum | CTDO/IADCP watch |
| 6. | Hauck, Dennis | BSH | recovery and deployment of BSH moorings |
| 7. | Horn, Myriel | Marum | CTDO/IADCP watch |
| 8. | Hüsener genannt Daniel, Matthias | Marum | CFC and oxygen sampling |
| 9. | Leiner, Milena | Marum | sampling of carbon and oxygen isotopes |
| 10. | Papp, Dennis | Marum | CFC and oxygen sampling |
| 11. | Raschke, Michaela | Marum | CTDO/IADCP watch |
| 12. | Roessler, Achim, Dr. | IUPHB | vm-ADCP data processing, PIES analysis, IUPHB mooring deployment |
| 13. | Schneehorst, Anja | BSH | programming and analysis of BSH moorings |
| 14. | Schneider, Linn | IUPHB | lowered ADCP data processing and analysis |
| 15. | Steinfeldt, Reiner, Dr. | IUPHB | salinometry, CTDO data processing and calibration, data analysis |
| 16. | Stendardo, Ilaria, Dr. | IUPHB | oxygen titration and analysis |
| 17. | Thewes, Daniel | Marum | CTDO/IADCP watch |
| 18. | Uhde, Hans | BSH | recovery and deployment of BSH moorings |
| 19. | Winkel, Jeannine | CWS | bird observations |

BSH Bundesamt für Seeschifffahrt und Hydrographie, Hamburg, Germany

CWS Canadian Wildlife Service, Dartmouth, Canada

IUPHB Universität Bremen, Institut für Umweltphysik, AG Ozeanographie Bremen, Germany

Marum Zentrum für Marine Umweltwissenschaften der Universität Bremen, Bremen, Germany

Table 2. Moorings deployed/recovered at the Mid-Atlantic Ridge, cruise MSM-38

| Moorings ID | Latitude | Longitude | Depth [m] | Deployment Date/Time | Recovery Date/Time | CTD Profile |
|-------------|------------|------------|-----------|----------------------------|--|-------------|
| GFZ/2 | 52°35.00'N | 36°56.00'W | 3269 | --- | 15 May 2014 12:20-16:38 | 354/007 |
| GFZ/3 | 52°35.00'N | 36°56.00'W | 3293 | 16 May 2014 08:24-12:02 | --- | 354/007 |
| FFZ-1/5 | 50°58.35'N | 34°51.00'W | 4335 | --- | 14 May 2014 16:07-19:51 | 349/005 |
| FFZ-1/6 | 51°00.00'N | 34°50.00'W | 4352 | 17 May 2014 11:38-14:58 | --- | 349/005 |
| FFZ-2/5 | 49°55.01'N | 33°49.90'W | 4030 | --- | 13 May 2014 07:56-13:12 mooring lost | 345/002 |
| FFZ-2/6 | 49°55.00'N | 33°44.00'W | 4150 | 13 May 2014 15:00-19:08 | --- | 345/002 |
| MFZ/1 | 47°59.99'N | 31°24.99'W | 4020 | --- | 12 May 2014 06:59-11:30 | 344/001 |
| MFZ/2 | 48°00.00'N | 31°25.00'W | 4031 | 19 May 2014 09:30-12:54 | --- | 344/001 |

All times are given as UTC. The top elements of all recovered moorings carried flags. Mooring *GFZ* was additionally equipped with an *Iridium* beacon. All deployed moorings were equipped with flags and radio beacons and, except mooring *MFZ*, with additional *Iridium* beacons.

Table 3. Moorings deployed east of Flemish Cap (DWBC), cruise MSM-38

| Moorings ID | Latitude | Longitude | Depth [m] | Deployment Date/Time | CTD Profile |
|-------------|-------------|-------------|-----------|----------------------------|-------------|
| BM-22/5 | 47°06.186'N | 43°13.303'W | 3054 | 26 May 2014 09:48-12:30 | 404/053 |

All times are given as UTC. The top buoy of the mooring was equipped with two radio beacons, two flashers, an *Iridium* beacon and a flag.

Table 4. Moorings recovered in Flemish Pass, cruise MSM-38

| Moorings ID | Latitude | Longitude | Depth [m] | Recovery Date/Time | CTD Profile |
|-------------|------------|------------|-----------|--|-------------|
| BM-25/2 | 47°07.11'N | 47°06.38'W | 1014 | 27 May 2014 18:57-22:00 mooring lost | --- |

All times are given as UTC. The top buoy of the mooring was equipped with two radio beacons, two flashers, and a flag.

Table 5. PIES activities carried out during cruise MSM-38

| PIES ID | s/n | Latitude | Longitude | Depth [m] | Deployment Date/Time | Telemetry Date/Time | Recovery Date/Time | CTD Profile |
|----------|-----|------------|------------|-----------|----------------------------|----------------------------|----------------------------|-------------|
| BP-12/4 | 201 | 47°40.11'N | 31°08.95'W | 4090 | --- | 12 May 2014 01:55-04:51 | --- | 372/021 |
| BP-14/2 | 271 | 51°25.70'N | 35°26.33'W | 3604 | | 15 May 2014 00:14-03:03 | 15 May 2014 03:07-04:19 | 361/012 |
| BP-14/3 | 271 | 51°25.76'N | 35°26.11'W | 3631 | 17 May 2014 06:15-07:26 | --- | --- | 361/012 |
| BP-15/2 | 075 | 52°30.50'N | 36°51.60'W | 3386 | --- | 15 May 2014 20:53-23:43 | 16 May 2014 00:06-01:23 | 356/008 |
| BP-15a/1 | 235 | 52°30.48'N | 36°51.63'W | 3386 | --- | 16 May 2014 01:51-04:28 | --- | 356/008 |
| BP-27/1 | 272 | 47°05.84'N | 40°52.53'W | 4498 | --- | 25 May 2014 04:06-06:43 | --- | 397/046 |
| BP-28/1 | 240 | 47°09.68'N | 39°30.06'W | 4584 | --- | 24 May 2014 12:43-15:20 | --- | 395/044 |
| BP-29/1 | 302 | 47°12.52'N | 38°31.09'W | 4610 | --- | 24 May 2014 00:37-03:14 | --- | 393/042 |
| BP-30/1 | 303 | 47°17.52'N | 37°21.47'W | 4546 | --- | 23 May 2014 10:37-13:14 | --- | 391/040 |
| BP-31/1 | 075 | 47°05.84'N | 41°59.94'W | 4236 | 24 May 2014 16:01-17:26 | --- | --- | 399/48 |

PIES: Inverted echo-sounder with pressure sensor. All instruments were equipped with flags, radio beacons and flashers. All times are given as UTC.

Table 6. List of CTDO/lowered ADCP/Water Sampling Stations, MSM-38

| Station | Profile | Date | Time | Latitude | Longitude | Water Depth [m] | CFC | Oxygen | Isotopes ¹⁸ O ¹⁴ C | LADCP | Comments |
|---------|---------|------------|-------|------------|------------|-----------------|-----|--------|--|-------|---|
| MSM-343 | 0 | 2014-05-08 | 12:03 | 38°35.50'N | 12°23.07'W | 4868 | x | - | - | x | Test Station Calibration of MicroCATs + NKEs |
| MSM-344 | 1 | 2014-05-12 | 12:03 | 48°0.06'N | 31°25.07'W | 4030 | x | x | x | x | |
| MSM-345 | 2 | 2014-05-13 | 04:02 | 49°55.00'N | 33°43.99'W | 4151 | x | x | x | x | Calibration of MicroCATs + NKEs |
| MSM-347 | 3 | 2014-05-13 | 20:44 | 50°10.33'N | 33°58.24'W | 3737 | x | x | - | x | |
| MSM-348 | 4 | 2014-05-14 | 02:05 | 50°33.72'N | 34°25.14'W | 4178 | x | x | - | x | |
| MSM-349 | 5 | 2014-05-14 | 07:38 | 51°00.00'N | 34°49.98'W | 4352 | x | x | x | x | |
| MSM-350 | 6 | 2014-05-14 | 12:13 | 51°12.84'N | 35°09.57'W | 3635 | - | x | - | x | |
| MSM-354 | 7 | 2014-05-15 | 17:07 | 52°35.00'N | 36°55.99'W | 3292 | x | x | x | x | Calibration of MicroCATs |
| MSM-355 | 8 | 2014-05-16 | 04:48 | 52°30.39'N | 36°50.86'W | 3471 | - | x | - | x | |
| MSM-358 | 9 | 2014-05-16 | 15:16 | 52°14.55'N | 36°30.10'W | 3635 | x | x | - | x | |
| MSM-359 | 10 | 2014-05-16 | 19:26 | 51°57.90'N | 36°08.45'W | 3879 | x | x | x | x | |
| MSM-360 | 11 | 2014-05-16 | 23:52 | 51°41.45'N | 35°47.04'W | 3667 | x | x | - | x | |
| MSM-361 | 12 | 2014-05-17 | 04:03 | 51°25.70'N | 35°26.28'W | 3630 | x | x | x | x | |
| MSM-363 | 13 | 2014-05-17 | 17:37 | 50°46.48'N | 34°39.20'W | 4240 | x | x | - | x | |
| MSM-364 | 14 | 2014-05-17 | 23:47 | 50°20.80'N | 34°13.00'W | 3751 | x | x | - | x | |
| MSM-365 | 15 | 2014-05-18 | 05:56 | 49°47.00'N | 33°31.32'W | 4238 | x | x | - | x | |
| MSM-366 | 16 | 2014-05-18 | 11:09 | 49°23.62'N | 33°04.41'W | 3797 | x | x | - | x | |
| MSM-367 | 17 | 2014-05-18 | 16:08 | 49°00.68'N | 32°36.94'W | 3932 | x | x | x | x | |
| MSM-368 | 18 | 2014-05-18 | 20:23 | 48°45.01'N | 32°18.81'W | 3712 | - | x | - | x | |
| MSM-369 | 19 | 2014-05-19 | 00:37 | 48°30.01'N | 32°01.01'W | 4210 | x | x | x | x | |
| MSM-370 | 20 | 2014-05-19 | 04:55 | 48°14.95'N | 31°42.96'W | 3863 | x | x | - | x | |
| MSM-372 | 21 | 2014-05-19 | 15:15 | 47°40.08'N | 31°08.89'W | 4077 | x | x | x | x | |
| MSM-373 | 22 | 2014-05-19 | 20:18 | 47°16.18'N | 30°40.74'W | 3686 | - | x | - | x | |
| MSM-374 | 23 | 2014-05-20 | 01:18 | 46°52.00'N | 30°15.33'W | 3186 | - | x | x | x | |
| MSM-375 | 24 | 2014-05-20 | 05:55 | 46°27.88'N | 29°49.98'W | 3095 | - | x | - | x | |
| MSM-376 | 25 | 2014-05-20 | 10:30 | 46°03.72'N | 29°24.62'W | 2827 | - | x | x | x | |
| MSM-377 | 26 | 2014-05-20 | 15:31 | 46°36.31'N | 29°20.91'W | 3277 | - | x | x | x | |
| MSM-378 | 27 | 2014-05-20 | 20:44 | 47°08.62'N | 29°17.64'W | 3113 | - | x | - | x | |
| MSM-379 | 28 | 2014-05-21 | 01:32 | 47°39.40'N | 29°14.38'W | 3351 | - | x | x | x | |

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| Station | Profile | Date | Time | Latitude | Longitude | Water Depth [m] | CFC | Oxygen | Isotopes ¹⁸ O ¹⁴ C | LADCP | Comments |
|---------|---------|------------|-------|------------|------------|-----------------|-----|--------|--|-------|----------------------------|
| MSM-380 | 29 | 2014-05-21 | 06:00 | 47°37.64'N | 29°51.95'W | 3380 | - | x | - | x | |
| MSM-381 | 30 | 2014-05-21 | 10:37 | 47°35.88'N | 30°29.39'W | 3367 | - | x | x | x | |
| MSM-382 | 31 | 2014-05-21 | 17:21 | 47°32.30'N | 31°44.76'W | 3714 | - | x | - | x | |
| MSM-383 | 32 | 2014-05-21 | 21:45 | 47°30.49'N | 32°22.35'W | 4107 | - | x | x | x | |
| MSM-384 | 33 | 2014-05-22 | 02:25 | 47°28.73'N | 32°59.95'W | 4072 | - | x | - | x | |
| MSM-385 | 34 | 2014-05-22 | 07:06 | 47°26.96'N | 33°37.52'W | 4198 | - | x | x | x | |
| MSM-386 | 35 | 2014-05-22 | 11:39 | 47°25.20'N | 34°15.19'W | 4082 | - | x | - | x | |
| MSM-387 | 36 | 2014-05-22 | 16:11 | 47°23.82'N | 34°52.66'W | 4147 | - | x | x | x | |
| MSM-388 | 37 | 2014-05-22 | 20:34 | 47°21.66'N | 35°30.37'W | 4402 | - | x | - | x | |
| MSM-389 | 38 | 2014-05-23 | 01:07 | 47°19.81'N | 36°07.83'W | 4229 | - | x | x | x | |
| MSM-390 | 39 | 2014-05-23 | 05:38 | 47°18.08'N | 36°45.47'W | 4423 | - | x | - | x | |
| MSM-391 | 40 | 2014-05-23 | 10:09 | 47°17.52'N | 37°21.50'W | 4544 | x | x | x | - | |
| MSM-392 | 41 | 2014-05-23 | 15:28 | 47°15.35'N | 37°55.10'W | 4585 | x | x | - | x | |
| MSM-393 | 42 | 2014-05-23 | 20:22 | 47°12.63'N | 38°31.08'W | 4610 | x | x | x | x | Releaser Test, s/n 760+761 |
| MSM-394 | 43 | 2014-05-24 | 05:21 | 47°11.47'N | 39°00.01'W | 4582 | x | x | - | x | |
| MSM-395 | 44 | 2014-05-24 | 09:48 | 47°09.68'N | 39°29.97'W | 4574 | x | x | x | x | |
| MSM-396 | 45 | 2014-05-24 | 18:26 | 47°08.12'N | 40°11.98'W | 454 | x | x | - | x | |
| MSM-397 | 46 | 2014-05-25 | 00:35 | 47°05.87'N | 40°52.46'W | 4489 | x | x | x | x | |
| MSM-398 | 47 | 2014-05-25 | 09:33 | 47°06.10'N | 41°36.27'W | 4301 | x | x | - | x | |
| MSM-399 | 48 | 2014-05-25 | 13:28 | 47°05.91'N | 41°59.91'W | 4226 | - | x | - | x | |
| MSM-400 | 49 | 2014-05-25 | 18:41 | 47°05.92'N | 42°10.83'W | 4111 | x | x | x | x | |
| MSM-401 | 50 | 2014-05-25 | 22:33 | 47°06.00'N | 42°35.46'W | 3663 | x | x | - | x | |
| MSM-402 | 51 | 2014-05-26 | 01:56 | 47°06.01'N | 42°53.64'W | 3459 | - | x | x | x | |
| MSM-403 | 52 | 2014-05-26 | 04:53 | 47°06.05'N | 43°07.14'W | 3517 | - | - | - | x | |
| MSM-404 | 53 | 2014-05-26 | 07:29 | 47°06.00'N | 43°13.70'W | 3007 | x | x | x | x | |
| MSM-405 | 54 | 2014-05-26 | 13:00 | 47°06.03'N | 43°17.88'W | 2559 | x | - | - | x | |
| MSM-406 | 55 | 2014-05-26 | 15:00 | 47°05.89'N | 43°20.19'W | 1799 | x | x | x | x | |
| MSM-407 | 56 | 2014-05-26 | 16:48 | 47°05.97'N | 43°25.29'W | 1276 | x | - | - | x | |
| MSM-408 | 57 | 2014-05-26 | 18:41 | 47°05.99'N | 43°38.42'W | 766 | x | x | x | x | |
| MSM-409 | 58 | 2014-05-26 | 20:00 | 47°06.00'N | 43°47.51'W | 582 | x | - | x | x | Releaser Test, s/n 482 |
| MSM-410 | 59 | 2014-05-27 | 03:52 | 47°06.06'N | 44°02.58'W | 355 | - | - | - | x | |

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| Station | Profile | Date | Time | Latitude | Longitude | Water Depth [m] | CFC | Oxygen | Isotopes ¹⁸ O ¹⁴ C | LADCP | Comments |
|---------|---------|------------|-------|------------|------------|-----------------|-----|--------|--|-------|----------|
| MSM-411 | 60 | 2014-05-27 | 05:35 | 47°05.98'N | 44°18.27'W | 242 | - | - | - | X | |
| MSM-412 | 61 | 2014-05-27 | 07:09 | 47°05.99'N | 44°34.03'W | 150 | - | - | - | X | |
| MSM-413 | 62 | 2014-05-27 | 08:45 | 47°05.99'N | 44°49.77'W | 157 | - | - | - | X | |
| MSM-414 | 63 | 2014-05-27 | 10:20 | 47°06.01'N | 45°05.48'W | 159 | - | - | - | X | |
| MSM-415 | 64 | 2014-05-27 | 11:56 | 47°05.99'N | 45°21.24'W | 190 | - | - | - | X | |
| MSM-417 | 65 | 2014-05-27 | 23:10 | 47°06.03'N | 47°22.59'W | 240 | - | - | - | X | |
| MSM-418 | 66 | 2014-05-28 | 00:07 | 47°06.03'N | 47°15.90'W | 472 | - | X | X | X | |
| MSM-419 | 67 | 2014-05-28 | 01:10 | 47°06.07'N | 47°09.36'W | 885 | - | - | X | X | |
| MSM-420 | 68 | 2014-05-28 | 02:15 | 47°06.02'N | 47°05.93'W | 1018 | - | X | X | X | |
| MSM-421 | 69 | 2014-05-28 | 03:35 | 47°06.01'N | 47°00.57'W | 1124 | - | - | - | X | |
| MSM-422 | 70 | 2014-05-28 | 05:08 | 47°05.99'N | 46°51.23'W | 1167 | - | X | X | X | |
| MSM-423 | 71 | 2014-05-28 | 06:36 | 47°06.00'N | 46°42.46'W | 1135 | - | - | - | X | |
| MSM-424 | 72 | 2014-05-28 | 07:46 | 47°05.99'N | 46°39.99'W | 1101 | - | X | X | X | |
| MSM-425 | 73 | 2014-05-28 | 08:54 | 47°05.99'N | 46°36.68'W | 804 | - | - | X | X | |
| MSM-426 | 74 | 2014-05-28 | 10:01 | 47°06.02'N | 46°33.35'W | 494 | - | X | X | X | |
| MSM-427 | 75 | 2014-05-28 | 11:20 | 47°06.04'N | 46°24.24'W | 356 | - | - | - | X | |
| MSM-428 | 76 | 2014-05-28 | 13:05 | 47°06.05'N | 46°08.50'W | 333 | - | - | - | X | |
| MSM-429 | 77 | 2014-05-28 | 14:48 | 47°06.07'N | 45°52.71'W | 308 | - | - | - | X | |
| MSM-430 | 78 | 2014-05-28 | 16:26 | 47°06.03'N | 45°36.94'W | 263 | - | - | - | X | |
| MSM-431 | 79 | 2014-05-28 | 22:33 | 48°05.66'N | 45°00.72'W | 366 | - | - | - | X | |
| MSM-432 | 80 | 2014-05-28 | 23:59 | 48°13.11'N | 44°55.91'W | 494 | - | X | X | X | |
| MSM-433 | 81 | 2014-05-29 | 01:27 | 48°20.61'N | 44°51.18'W | 646 | - | X | - | X | |
| MSM-434 | 82 | 2014-05-29 | 03:00 | 48°28.09'N | 44°46.46'W | 847 | - | X | X | X | |
| MSM-435 | 83 | 2014-05-29 | 04:43 | 48°35.52'N | 44°41.73'W | 1155 | - | X | - | X | |
| MSM-436 | 84 | 2014-05-29 | 06:29 | 48°43.03'N | 44°37.02'W | 1458 | - | X | X | X | |
| MSM-437 | 85 | 2014-05-29 | 08:28 | 48°50.48'N | 44°32.27'W | 1599 | - | X | - | X | |
| MSM-438 | 86 | 2014-05-29 | 10:33 | 48°57.94'N | 44°27.52'W | 1972 | - | X | X | X | |
| MSM-439 | 87 | 2014-05-29 | 12:52 | 49°05.39'N | 44°22.71'W | 2617 | - | X | - | X | |
| MSM-440 | 88 | 2014-05-29 | 15:28 | 49°12.90'N | 44°18.01'W | 3110 | - | X | X | X | |
| MSM-441 | 89 | 2014-05-29 | 18:25 | 49°20.34'N | 44°13.29'W | 3408 | - | X | - | X | |
| MSM-442 | 90 | 2014-05-29 | 21:27 | 49°27.86'N | 44°08.65'W | 3773 | - | X | X | X | |

Short Cruise Report, RV Maria S. Merian, cruise MSM-38, Cadiz – St. John's, May 07th – Jun 05th 2014

| Station | Profile | Date | Time | Latitude | Longitude | Water Depth [m] | CFC | Oxygen | Isotopes ¹⁸ O ¹⁴ C | LADCP | Comments |
|---------|---------|------------|-------|------------|------------|-----------------|-----|--------|--|-------|----------|
| MSM-443 | 91 | 2014-05-30 | 00:52 | 49°35.33'N | 44°03.86'W | 3976 | - | x | - | x | |
| MSM-444 | 92 | 2014-05-30 | 04:16 | 49°42.81'N | 43°59.00'W | 4050 | - | x | x | x | |
| MSM-445 | 93 | 2014-05-30 | 07:36 | 49°50.28'N | 43°54.29'W | 4149 | - | x | - | x | |
| MSM-446 | 94 | 2014-05-30 | 11:28 | 50°02.78'N | 43°46.83'W | 4220 | - | x | x | x | |
| MSM-447 | 95 | 2014-05-30 | 15:33 | 50°13.09'N | 43°40.50'W | 4243 | - | x | - | x | |
| MSM-448 | 96 | 2014-05-31 | 04:45 | 48°20.86'N | 41°57.30'W | 4374 | - | x | - | x | |
| MSM-449 | 97 | 2014-05-31 | 08:09 | 48°17.01'N | 42°10.03'W | 4274 | - | x | x | x | |
| MSM-450 | 98 | 2014-05-31 | 11:31 | 48°13.08'N | 42°22.77'W | 4226 | - | x | - | x | |
| MSM-451 | 99 | 2014-05-31 | 14:52 | 48°09.22'N | 42°35.39'W | 4057 | - | x | x | x | |
| MSM-452 | 100 | 2014-05-31 | 18:48 | 48°05.30'N | 42°48.16'W | 3846 | - | x | - | x | |
| MSM-453 | 101 | 2014-05-31 | 21:56 | 48°01.44'N | 43°00.82'W | 3490 | - | x | x | x | |
| MSM-454 | 102 | 2014-06-01 | 01:07 | 47°57.60'N | 43°13.52'W | 3087 | - | x | - | x | |
| MSM-455 | 103 | 2014-06-01 | 03:57 | 47°53.56'N | 43°26.27'W | 3016 | - | x | x | x | |
| MSM-456 | 104 | 2014-06-01 | 06:45 | 47°49.69'N | 43°38.97'W | 1325 | - | x | - | x | |
| MSM-457 | 105 | 2014-06-01 | 08:39 | 47°45.79'N | 43°51.68'W | 824 | - | x | x | x | |
| MSM-458 | 106 | 2014-06-01 | 10:16 | 47°41.90'N | 44°04.39'W | 524 | - | x | - | x | |
| MSM-458 | 107 | 2014-06-01 | 11:48 | 47°38.00'N | 44°17.10'W | 330 | - | - | x | x | |
| MSM-460 | 108 | 2014-06-01 | 16:15 | 46°51.21'N | 44°16.12'W | 273 | - | - | - | x | |
| MSM-461 | 109 | 2014-06-01 | 17:32 | 46°43.78'N | 44°07.81'W | 484 | - | x | x | x | |
| MSM-462 | 110 | 2014-06-01 | 19:00 | 46°40.63'N | 44°04.38'W | 1002 | - | - | - | x | |
| MSM-463 | 111 | 2014-06-01 | 20:18 | 46°38.85'N | 44°02.40'W | 1782 | - | x | x | x | |
| MSM-464 | 112 | 2014-06-01 | 21:56 | 46°36.34'N | 43°59.70'W | 2595 | - | - | - | x | |
| MSM-465 | 113 | 2014-06-02 | 00:26 | 46°28.85'N | 43°51.61'W | 3487 | - | x | x | x | |
| MSM-466 | 114 | 2014-06-02 | 03:21 | 46°21.45'N | 43°43.53'W | 3903 | - | x | - | x | |
| MSM-467 | 115 | 2014-06-02 | 06:39 | 46°14.02'N | 43°35.37'W | 4206 | - | x | x | x | |
| MSM-468 | 116 | 2014-06-02 | 10:13 | 46°06.57'N | 43°27.21'W | 4472 | - | x | - | x | |
| MSM-469 | 117 | 2014-06-02 | 14:05 | 45°59.09'N | 43°19.07'W | 4630 | - | x | x | x | |
| MSM-470 | 118 | 2014-06-02 | 21:18 | 45°34.30'N | 44°11.51'W | 4614 | - | - | x | x | |
| MSM-471 | 119 | 2014-06-03 | 00:58 | 45°42.59'N | 44°20.07'W | 4515 | - | - | x | x | |
| MSM-472 | 120 | 2014-06-03 | 04:30 | 45°50.93'N | 44°28.46'W | 4174 | - | - | - | x | |
| MSM-473 | 121 | 2014-06-03 | 07:55 | 45°59.26'N | 44°37.05'W | 3863 | - | - | x | x | |

Short Cruise Report, RV Maria S. Merian, cruise MSM-38, Cadiz – St. John's, May 07th – Jun 05th 2014

| Station | Profile | Date | Time | Latitude | Longitude | Water Depth [m] | CFC | Oxygen | Isotopes ¹⁸ O ¹⁴ C | LADCP | Comments |
|---------|---------|------------|-------|------------|------------|-----------------|-----|--------|--|-------|----------|
| MSM-474 | 122 | 2014-06-03 | 11:01 | 46°07.53'N | 44°45.54'W | 3292 | - | - | - | X | |
| MSM-478 | 123 | 2014-06-03 | 14:15 | 46°15.82'N | 44°54.02'W | 2508 | - | - | X | X | |
| MSM-476 | 124 | 2014-06-03 | 16:10 | 46°17.42'N | 44°55.70'W | 1775 | - | - | X | X | |
| MSM-477 | 125 | 2014-06-03 | 18:27 | 46°24.27'N | 45°02.67'W | 1189 | - | - | X | X | |
| MSM-478 | 126 | 2014-06-03 | 19:37 | 46°25.75'N | 45°04.38'W | 689 | - | - | X | X | |
| MSM-479 | 127 | 2014-06-03 | 20:37 | 46°27.47'N | 45°06.22'W | 456 | - | - | X | X | |
| MSM-480 | 128 | 2014-06-03 | 21:48 | 46°32.40'N | 45°11.12'W | 267 | - | - | - | X | |