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Short Cruise Report Maria S. Merian 58

Reykjavik, Island – Ponta Delgada, Azoren

10.09.2016 – 07.10.2016

Chief Scientist: Dr. Janne Repschläger

Captain: Ralf Schmidt

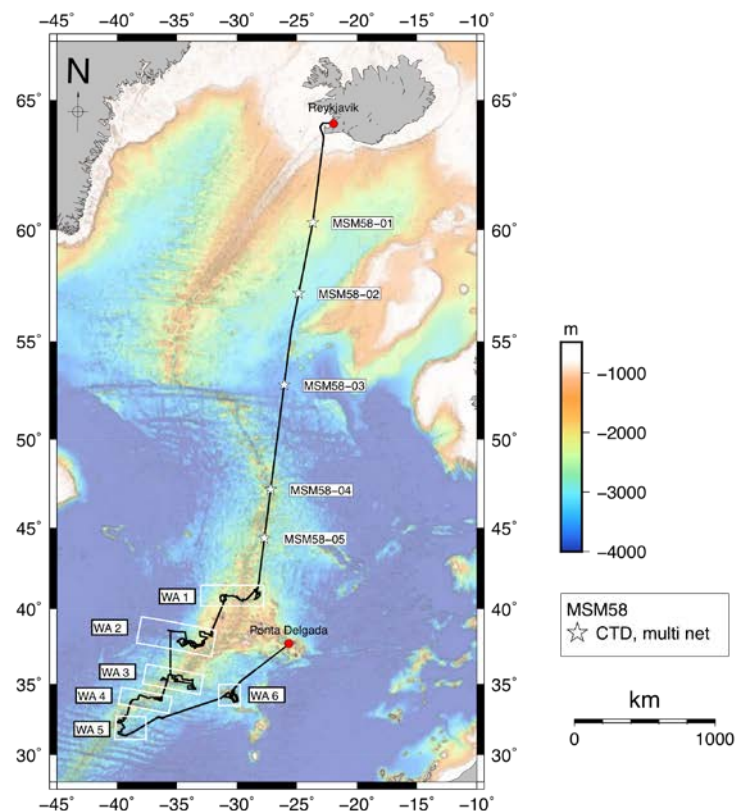


Fig. 1 Cruise track of MSM58 with CTD and multinet stations on transit and working areas 1-6 where coring operations were carried out

Objectives

The Subtropical Gyre (STG) in the North Atlantic Ocean is a climatically important region. It can either act as a storage area for heat during reduced Atlantic Meridional Overturning Circulation (AMOC) and at the same time can be displaced southward due to meltwater fluxes from the subpolar ocean, leading to a warm water storage at subsurface depth. The release of the stored heat from the subtropics to the North is assumed to play a major role in the resumption of AMOC, and yet is not fully understood.

At depth, the region beneath the STG is a main throughflow area of North Atlantic Deepwater (NADW) and mixing region of NADW with underlying Antarctic Bottom Water (AABW), with the glacial extension of the latter still under debate. Furthermore, the oligotrophic STG is one of the key regions to investigate changes in the global nutrient inventory, with nitrogen fixation in particular.

The overarching goal of MSM58 is to gain knowledge about the natural variability of the STG and Azores Front system as well as on changes in the deepwater composition and geometry in the eastern and western North Atlantic Basins. There is a particular emphasis on times of significant warming and ice sheet melting during the last 25,000 years. This new knowledge should assist to gain a better understanding of the complex interactions between freshwater fluxes from glaciated continents, surface and subsurface heat storage patterns as well as paleoproductivity and nutrient inventory changes within the subtropical to subpolar Central North Atlantic, including associated deep-water circulation changes. The comparison of these reconstructions with predictions from climate models can help to identify the interactions between the subtropical North Atlantic and AMOC and enhance our understanding of mechanisms underlying Deglacial and Holocene AMOC instabilities.

MSM58 was designed to survey and sample the highest quality pelagic sediments to meet these objectives and to sample the water column along the Mid Atlantic Ridge (MAR) from 32° to 41°N and four E-W depth transects on the MAR flanks. Water column sampling is needed to get new material for proxy calibration and basic understanding of foraminifera physiology. The sediment sampling program was carried out to reconstruct the N-S displacement of the STG over time, to reconstruct deepwater distribution changes between glacial and interglacial periods with special focus on the LGM and Last Deglaciation, and finally to investigate the changing nutrient inventory of the subtropical gyre.

Narrative

Leg MSM58 from Reykjavik to Ponta Delgada left Reykjavik at September 10th (fig 4.1).

The first week of the cruise, needed for the transit from Iceland to the first geologic working area, was used to sample a north-south transect of water and plankton of the upper 700 m water column and for geophysical data acquisition. Both operations started with crossing the EEZ of Iceland at noon of September 11th. For water column sampling a station with CTD and two plankton multinet hauls to 100 m and 700 m water depth was carried out roughly every morning at 6 am. CTD data and plankton abundances showed the transect from subpolar to subtropical waters, including changes in the thermocline depth and structure and abundance changes from subpolar to subtropical species. Low abundances of foraminifera in general with few living subsurface dwelling species, indicated that the plankton bloom already was over in the subpolar North Atlantic.

After 6 days of transit we arrived working area 1 at 41° 30'N in the evening of Thursday 15th September. Geophysical survey and coring operations in basin structures east and west of the Mid Atlantic Ridge and in the Mid Atlantic Ridge Crest at water depth between

2200 and 2800 m were carried out within 3 days. Two coring sites at the eastern Mid Atlantic basin and 3 sites at the western basin were cored with a multi- and corer gravity corer. Additionally, water and plankton sampling was conducted with one CTD haul to the bottom and two Multinet hauls (100 m and 700 m) in each basin. Preliminary data analyses indicated the sediments include the Holocene and at least two glacial cycles.

In the evening of September 18th we started the transit to working area 2, aiming to core a depth transect into the western North Atlantic basin at Pico Fracture Zone. The 5 working days in this area started with a 24 hrs hydroacoustic survey, followed by coring operations during daytime and additional surveys during nights. The first day of survey showed that at the latitude of Pico Fracture Zone, wide parts of the western MAR flank were covered with mass wasting debris, including channel structures. To avoid coring in these deposits, we limited survey in the following 3 days to basins south and North of Pico fracture zone with less steep bathymetry than the basin itself. We cored a depth transect from 2400 to 2800 m water depth in basin structures south of Pico fracture zone. On the northward transit across Pico fracture zone, an additional site at 2100 m depth was cored at the southern flank of Pico fracture zone. Two additional coring sites at 3000 and 4000 m water depth were situated at northern flank of Pico fracture zone. . Additional survey on shallow sites on the western Flank of the MAR between 1300 to 2400 m identified 4 coring sites. For all coring operations a gravity corer was used, surface sediments were obtained with multicorer or box corer depending on the stiffness of the surface sediment layer (see station list). A deep CTD and a multinet casts accompanied coring at the deepest and the shallowest site.

Work in working area 3 at Oceanographers Fracture Zone at about 35°N started in the morning of Saturday 24th of September with a 24 hrs survey, across the MAR, additional survey was carried out in the following two nights, in water depth between 1700 and 3500 m. The sediment cover at 35 °N was reduced compared to the previous two working areas. The reduced sedimentation rates resulted in condensation of the sediments that were harder to penetrate with Multi- and gravity corer and resulted in shorter cores. These observations were in agreement with our results from plankton tows, no live planktonic foraminifera were samples from surface waters and denitrifying Trichodesmium cyanobacteria were present, indicating that we arrived oligotrophic waters with low primary productivity. Coring operations in working area 3 resulted in four cores, two from each site of the MAR. Cores from the western North Atlantic basin match well with the stratigraphy of the cores from Working area 1 and Working area 2, probably containing Holocene sediments and reaching back to at least MIS 5.5. Both cores from the eastern North Atlantic basin seem to be more condensed.

Water sampling in Working area 3 was carried out at the deepest station on each side of the MAR. Both CTD profiles showed similar water mass distributions with subtropical mode water that overlays a core of Mediterranean outflow water (MOW), underlain by Labrador Sea Water (LSW) and by North Atlantic Deepwater (NADW).

We started the transit to working area 4 North of Hay's fracture Zone (24°N) at noon of Tuesday September 27. Again, survey was carried out during three nights, followed by coring and water sampling activities at daytime. The sediment deposits within this area were far thinner and more difficult to find than in the northern more basins. Many basins were occupied by mass wasted debris. Three out of the four coring sites were chosen from small sediment terraces not more than 0.5 nm miles wide. The exact positioning system of Maria S. Merian allowed coring these sites. One of these terraces was situated within Hay's fracture zone.

Both CTD and multinet casts accompanied the deepest coring sites in the western and eastern basin. Both CTD profiles showed similar water mass distribution as the previous

water profiles. Surprisingly, a bloom of denitrifying *Trichodesmium* cyanobacteria occurred at 34°N, on September 28, probably related to local eddy activity.

The last week of our cruise concentrated on the eastern North Atlantic basin in working area 5 and 6, between 31° 30' and 32° 30'N and 34 to 35°N respectively. Working area 5, situated at the eastern flank of the MAR south of Hay's fracture zone was surveyed during two nights. The first survey was concentrated on depth between 2000 and 2800 m. The small sediment cover within these depths was mainly heavily disturbed by turbidites. Only one small terrace with suitable sediments for coring were found after 10 hrs of survey. Also the second survey mainly revealed disturbed sediment packages and basement barren of young sediments, probably due to current activity wiping out the fine particles of mainly biogenic origin. The second coring site thus was situated within a basin, which sediment cover was interrupted by several debris flows. In a last station on the transit toward working area 6 undisturbed sediments finally could be obtained and were cored in the evening of Saturday 1st of October. Again, CTD and multinetts were driven at the deeper of the stations.

Working area 6 at Atlantic seamount was reached at October 3rd. Here, again, two night surveys were carried out and three cores at water depth between 3200 and 2400m were taken. All sediments in working area 5 and 6 were characterized by nannofossil ooze with hard surfaces, resulting in strong reflectors in the Parasound. Therefore maximal core length within this area was 6 m. These changes in sediment indicate that the eastern North Atlantic basin between 34 and 31°N is more oligotrophic than its western counterpart.

Our last coring operation ended at noon of October 5, together with foraminifera culturing experiments. The night from 5th to 6th of October was used for a last hydroacoustic survey at Atlantis seamount. Hydroacoustic data acquisition ended at 12 pm of October 6th. The last day at sea was used then for packing the equipment, cleaning the labs, data archiving and report writing.

All survey and sampling work proceeded without incidents. This was made possible by the technical support and great flexibility of the ship's crew during the search for optimal core sites, supported by the shipboard hydroacoustic equipment, and during the deployment of continuously changing gears on station.

Acknowledgements

We like to thank captain and crew of leg MSM58 for their friendly, very helpful and flexible support. The positioning system of Maria S. Merian and nautical skills of the officers enabled us to core small sediment structures, and played a major role for the success of our cruise. Financial support for the cruise was given by the DFG through the Senatory Commission for Ocean Research.

Participants

Name / Name	Task	Institut/Institute
1. Repschläger, Janne	Fahrtleiter / Chief-scientist	CAU Kiel
2. Schneider, Ralph	Paleoceanography, Sedimentology	CAU Kiel
3. Auderset, Alexandra	Paleonutrients	MPIC
4. Blanz, Thomas	Organic Geochemistry	CAU Kiel
5. Böttner, Christoph	Hydroacoustics	CAU Kiel
6. Bremer, Karen	Water Chemistry	CAU Kiel
7. Eich, Charlotte	Water Properties	CAU Kiel
8. Kausch, Thore	Hydroacoustics	CAU Kiel
9. Keigwin, Lloyd	Paleoceanography, Isotope Geochemistry	WHOI
10. Keul, Nina	Micropaleontology, Water & Microfossil Chemistry	CAU Kiel
11. Kiefer, Jil	Sedimentology	CAU Kiel
12. Krupp, Alena	Sedimentology	CAU Kiel
13. Lindhorst, Katja	Hydroacoustics	CAU Kiel
14. Macholdt, Dorothea	Sedimentology	MPIC
15. Petersen, Jassin	Sedimentology	MPIC
16. Schiebel, Ralf	Micropaleontology, Paleoceanography	MPIC
17. Schulze, Inken	Hydroacoustics	CAU Kiel
18. Steen, Eric	Sampling gear handling	CAU Kiel
19. Schwarz, Jan-Philipp	Sampling gear handling	CAU Kiel
20. Weis, Ulrike	Sedimentology	CAU Kiel

CAU Kiel, Institut für Geowissenschaften, Kiel / Germany

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WHOI, Woods Hole Oceanographic Institution, Woods Hole, MA, USA

Stationlist

Station No	ship Station	Date	Time	Position Lat	Position Lon	Gear	Comment
MSM58-01-1	MSM58/657-1	12.09.16	11:36	60° 17,42' N	23° 40,70' W	CTD/ RO	
MSM58-01-2	MSM58/657-2	12.09.16	13:28	60° 17,41' N	23° 40,71' W	MN	
MSM58-01-3	MSM58/657-3	12.09.16	13:41	60° 17,42' N	23° 40,70' W	MN CTD/ RO	
MSM58-02-1	MSM58/658-1	13.09.16	06:08	57° 13,43' N	24° 51,35' W	MN	
MSM58-02-2	MSM58/658-2	13.09.16	06:53	57° 13,44' N	24° 51,35' W	MN	
MSM58-02-3	MSM58/658-3	13.09.16	07:11	57° 13,42' N	24° 51,41' W	MN	
MSM58-03-1	MSM58/659-1	14.09.16	06:12	52° 49,96' N	26° 4,12' W	CTD/ RO	techn. Problems at 300m
MSM58-03-2	MSM58/659-2	14.09.16	06:54	52° 49,77' N	26° 4,07' W	MN	
MSM58-03-3	MSM58/659-3	14.09.16	07:10	52° 49,66' N	26° 4,00' W	MN CTD/ RO	
MSM58-03-4	MSM58/659-4	14.09.16	08:06	52° 49,28' N	26° 3,57' W	CTD/ RO	
MSM58-04-1	MSM58/660-1	15.09.16	14:00	47° 12,27' N	27° 11,48' W	MN	
MSM58-04-2	MSM58/660-2	15.09.16	14:44	47° 12,27' N	27° 11,50' W	MN	
MSM58-04-3	MSM58/660-3	15.09.16	14:58	47° 12,27' N	27° 11,50' W	MN CTD/ RO	
MSM58-04-4	MSM58/660-4	15.09.16	15:55	47° 12,27' N	27° 11,50' W	CTD/ RO	
MSM58-05-1	MSM58/661-1	16.09.16	06:03	44° 21,91' N	27° 42,90' W	MN	
MSM58-05-2	MSM58/661-2	16.09.16	07:36	44° 21,91' N	27° 42,90' W	MN	
MSM58-05-3	MSM58/661-3	16.09.16	07:51	44° 21,91' N	27° 42,90' W	MUC	
MSM58-07-1	MSM58/663-1	17.09.16	12:48	40° 40,02' N	28° 25,32' W	GC	
MSM58-07-2	MSM58/663-2	17.09.16	14:33	40° 40,02' N	28° 25,32' W	MUC	
MSM58-08-1	MSM58/664-1	17.09.16	19:24	41° 22,11' N	28° 13,91' W	GC	
MSM58-08-2	MSM58/664-2	17.09.16	21:11	41° 22,09' N	28° 13,93' W	CTD -R	
MSM58-08-3	MSM58/664-3	17.09.16	22:46	41° 21,83' N	28° 14,04' W	MN	
MSM58-08-4	MSM58/664-4	18.09.16	00:49	41° 21,83' N	28° 14,04' W	MN	
MSM58-08-5	MSM58/664-5	18.09.16	01:05	41° 21,82' N	28° 13,95' W	MN CTD/ RO	
MSM58-10-1	MSM58/666-1	18.09.16	15:09	40° 43,01' N	29° 55,94' W	MUC	
MSM58-10-2	MSM58/666-2	18.09.16	15:29	40° 43,01' N	29° 55,94' W	GC	
MSM58-10-3	MSM58/666-3	18.09.16	17:18	40° 43,02' N	29° 55,94' W	CTD/ RO	
MSM58-10-4	MSM58/666-4	18.09.16	18:52	40° 43,28' N	29° 55,82' W	MUC	
MSM58-12-1	MSM58/668-1	19.09.16	10:46	40° 53,01' N	30° 53,08' W	GC	
MSM58-12-2	MSM58/668-2	19.09.16	12:20	40° 53,00' N	30° 53,09' W	MUC	
MSM58-13-1	MSM58/669-1	19.09.16	16:21	40° 24,04' N	31° 4,77' W	GC	
MSM58-13-2	MSM58/669-2	19.09.16	17:47	40° 24,04' N	31° 4,78' W	MB+ PS	
MSM58-14-1	MSM58/670-1	20.09.16	05:03	38° 29,58' N	32° 7,73' W	MUC	
MSM58-15-1	MSM58/671-1	21.09.16	08:06	37° 32,72' N	33° 11,43' W	GC	
MSM58-15-2	MSM58/671-2	21.09.16	09:05	37° 32,72' N	33° 11,43' W	CTD/ RO	
MSM58-16-1	MSM58/672-1	21.09.16	10:41	37° 33,83' N	33° 7,84' W	MN	
MSM58-16-2	MSM58/672-2	21.09.16	11:48	37° 33,83' N	33° 7,84' W	MN	
MSM58-16-3	MSM58/672-3	21.09.16	12:06	37° 33,83' N	33° 7,84' W	MN	
MSM58-16-4	MSM58/672-4	21.09.16	13:12	37° 33,82' N	33° 7,84' W	GKG	

Station No	ship Station	Date	Time	Position Lat	Position Lon	Gear	Comment
MSM58-16-5	MSM58/672-5	21.09.16	14:12	37° 33,83' N	33° 7,84' W	GC	
MSM58-17-1	MSM58/673-1	21.09.16	16:17	37° 37,21' N	32° 52,37' W	GKG	
MSM58-17-2	MSM58/673-2	21.09.16	17:25	37° 37,21' N	32° 52,37' W	GC	
MSM58-18-1	MSM58/674-1	21.09.16	20:43	37° 57,12' N	32° 44,70' W	MUC	
MSM58-18-2	MSM58/674-2	21.09.16	21:58	37° 57,12' N	32° 44,70' W	GC	
MSM58-19-1	MSM58/675-1	22.09.16	04:44	37° 36,22' N	33° 48,53' W	MB+ PS	
MSM58-20-1	MSM58/676-1	22.09.16	13:18	37° 44,41' N	33° 56,21' W	MUC	
MSM58-20-2	MSM58/676-2	22.09.16	15:15	37° 44,41' N	33° 56,21' W	GC	
MSM58-21-1	MSM58/676-2	22.09.16	16:26	37° 44,41' N	33° 56,21' W	GC	
MSM58-21-2	MSM58/677-2	22.09.16	19:35	37° 46,15' N	33° 39,87' W	GC	
MSM58-22-1	MSM58/678-1	22.09.16	23:15	37° 53,66' N	34° 14,01' W	MB+ PS	
MSM58-23-1	MSM58/679-1	23.09.16	07:06	37° 36,84' N	34° 23,01' W	MUC	
MSM58-23-2	MSM58/679-2	23.09.16	08:55	37° 36,85' N	34° 23,02' W	GC	
MSM58-24-1	MSM58/680-1	23.09.16	12:21	37° 51,54' N	34° 10,79' W	MUC	
MSM58-24-2	MSM58/680-2	23.09.16	13:51	37° 51,54' N	34° 10,79' W	GC	
MSM58-25-1	MSM58/681-1	23.09.16	17:59	38° 29,43' N	34° 18,47' W	MB+ PS	
MSM58-26-1	MSM58/682-1	23.09.16	19:45	38° 29,55' N	34° 28,76' W	MUC	
MSM58-26-2	MSM58/682-2	23.09.16	21:46	38° 29,55' N	34° 28,76' W	GC	
MSM58-27-1	MSM58/683-1	24.09.16	02:31	38° 32,70' N	35° 19,94' W	MB+ PS	
MSM58-28-1	MSM58/684-1	24.09.16	05:37	38° 35,02' N	35° 32,15' W	CTD/ RO	
MSM58-28-2	MSM58/684-2	24.09.16	08:22	38° 35,02' N	35° 32,15' W	MN	
MSM58-28-3	MSM58/684-3	24.09.16	08:43	38° 35,02' N	35° 32,15' W	MUC	
MSM58-28-4	MSM58/684-4	24.09.16	11:17	38° 35,02' N	35° 32,15' W	GC	
MSM58-29-1	MSM58/685-1	25.09.16	04:07	35° 40,35' N	35° 33,17' W	MB+ PS	
MSM58-30-1	MSM58/686-1	26.09.16	05:04	34° 45,85' N	33° 33,82' W	CTD/ RO	
MSM58-30-2	MSM58/686-2	26.09.16	07:28	34° 45,85' N	33° 33,82' W	MN	
MSM58-30-3	MSM58/686-3	26.09.16	07:43	34° 45,83' N	33° 33,85' W	MN	
MSM58-30-4	MSM58/686-5	26.09.16	08:37	34° 45,77' N	33° 33,98' W	MUC	
MSM58-30-5	MSM58/686-6	26.09.16	10:58	34° 45,85' N	33° 33,80' W	GC	
MSM58-31-1	MSM58/687-1	26.09.16	14:28	35° 0,79' N	33° 40,95' W	MUC	
MSM58-31-2	MSM58/687-2	26.09.16	16:11	35° 0,79' N	33° 40,95' W	GC	
MSM58-32-1	MSM58/688-1	26.09.16	23:21	35° 12,82' N	35° 4,28' W	MB+ PS	
MSM58-33-1	MSM58/689-1	27.09.16	09:05	35° 39,57' N	35° 32,09' W	MUC	
MSM58-34-1	MSM58/690-1	27.09.16	11:20	35° 39,02' N	35° 30,12' W	MUC	
MSM58-34-2	MSM58/690-2	27.09.16	13:16	35° 39,02' N	35° 30,15' W	GC	
MSM58-35-1	MSM58/691-1	27.09.16	14:44	35° 38,74' N	35° 30,34' W	MB+ PS	
MSM58-36-1	MSM58/692-1	27.09.16	17:38	35° 30,77' N	35° 44,38' W	MUC	
MSM58-37-1	MSM58/693-1	27.09.16	19:20	35° 30,39' N	35° 44,10' W	MB+ PS	
MSM58-38-1	MSM58/694-1	28.09.16	04:56	35° 17,12' N	35° 47,40' W	CTD/ RO	
MSM58-38-2	MSM58/694-2	28.09.16	06:36	35° 17,12' N	35° 47,40' W	MUC	
MSM58-38-3	MSM58/694-3	28.09.16	08:45	35° 17,12' N	35° 47,40' W	GC	
MSM58-38-4	MSM58/694-4	28.09.16	10:19	35° 17,12' N	35° 47,40' W	GKG	

Station No	ship Station	Date	Time	Position Lat	Position Lon	Gear	Comment
MSM58-38-5	MSM58/694-5	28.09.16	12:40	35° 17,09' N	35° 47,16' W	CTD/ RO	
MSM58-39-1	MSM58/695-1	28.09.16	21:36	34° 3,78' N	36° 15,22' W	MB+ PS CTD/	
MSM58-40-1	MSM58/696-1	29.09.16	06:13	33° 56,84' N	36° 15,24' W	RO	
MSM58-40-2	MSM58/696-2	29.09.16	08:30	33° 56,84' N	36° 15,24' W	MN	
MSM58-40-3	MSM58/696-3	29.09.16	08:45	33° 56,83' N	36° 15,24' W	MN	
MSM58-40-4	MSM58/696-4	29.09.16	09:42	33° 56,72' N	36° 15,24' W	MUC	
MSM58-40-5	MSM58/696-5	29.09.16	11:53	33° 56,84' N	36° 15,24' W	GC	
MSM58-41-1	MSM58/697-1	29.09.16	14:12	33° 52,34' N	36° 15,94' W	MUC	
MSM58-41-2	MSM58/697-2	29.09.16	16:07	33° 52,33' N	36° 15,94' W	GC MB+ PS	
MSM58-42-1	MSM58/698-1	29.09.16	18:55	34° 4,41' N	36° 31,07' W	CTD/	
MSM58-43-1	MSM58/699-1	30.09.16	07:36	33° 54,89' N	38° 39,36' W	RO	
MSM58-43-2	MSM58/699-2	30.09.16	09:43	33° 54,89' N	38° 39,36' W	MN	
MSM58-43-3	MSM58/699-3	30.09.16	09:59	33° 54,89' N	38° 39,35' W	MN	
MSM58-43-4	MSM58/699-4	30.09.16	11:03	33° 54,89' N	38° 39,36' W	GKG	
MSM58-43-5	MSM58/699-5	30.09.16	13:07	33° 54,89' N	38° 39,36' W	GC MB+ PS	
MSM58-44-1	MSM58/700-1	30.09.16	16:04	33° 45,01' N	38° 51,58' W	PS	
MSM58-45-1	MSM58/701-1	30.09.16	18:30	33° 44,73' N	38° 52,41' W	GKG	
MSM58-45-2	MSM58/701-2	30.09.16	20:40	33° 44,73' N	38° 52,41' W	GC MB+ PS	
MSM58-46-1	MSM58/702-1	01.10.16	02:56	32° 50,54' N	39° 8,51' W	PS	
MSM58-47-1	MSM58/703-1	01.10.16	15:19	32° 19,82' N	39° 39,51' W	GKG	
MSM58-47-2	MSM58/703-2	01.10.16	17:11	32° 19,82' N	39° 39,51' W	GC MB+ PS	
MSM58-48-1	MSM58/704-1	01.10.16	19:15	32° 12,23' N	39° 34,19' W	CTD/	
MSM58-49-1	MSM58/705-1	02.10.16	06:25	31° 22,39' N	39° 17,01' W	RO	
MSM58-49-2	MSM58/705-2	02.10.16	09:05	31° 22,39' N	39° 17,02' W	MN	
MSM58-49-3	MSM58/705-3	02.10.16	09:18	31° 22,39' N	39° 17,02' W	MN	
MSM58-49-4	MSM58/705-4	02.10.16	10:18	31° 22,42' N	39° 17,01' W	GKG	
MSM58-49-5	MSM58/705-5	02.10.16	12:51	31° 22,39' N	39° 17,02' W	GC	
MSM58-50-1	MSM58/706-1	02.10.16	19:08	31° 40,33' N	38° 32,98' W	GKG	
MSM58-50-2	MSM58/707-1	02.10.16	21:22	31° 39,62' N	38° 34,75' W	GC	
MSM58-50-3	MSM58/707-2	02.10.16	23:00	31° 39,62' N	38° 34,75' W	GKG MB+ PS	
MSM58-51-1	MSM58/708-1	03.10.16	10:37	32° 43,97' N	36° 29,18' W	PS	
MSM58-52-1	MSM58/709-1	03.10.16	14:22	32° 38,45' N	36° 15,36' W	GKG	
MSM58-52-2	MSM58/709-2	03.10.16	16:38	32° 38,45' N	36° 15,36' W	GC CTD/	
MSM58-52-3	MSM58/709-3	03.10.16	18:27	32° 38,53' N	36° 15,57' W	RO MB+ PS	
MSM58-53-1	MSM58/710-1	04.10.16	19:00	33° 59,45' N	31° 24,20' W	CTD/	
MSM58-54-1	MSM58/711-1	05.10.16	06:22	34° 8,04' N	31° 8,92' W	RO	
MSM58-54-2	MSM58/711-2	05.10.16	08:36	34° 8,04' N	31° 8,92' W	MN	
MSM58-54-3	MSM58/711-3	05.10.16	08:54	34° 8,04' N	31° 8,92' W	MN	
MSM58-54-4	MSM58/711-4	05.10.16	09:51	34° 8,04' N	31° 8,92' W	GKG	
MSM58-54-5	MSM58/711-5	05.10.16	11:44	34° 8,04' N	31° 8,92' W	GC	
MSM58-55-1	MSM58/712-1	05.10.16	16:38	34° 3,76' N	30° 35,43' W	GKG	

Station No	ship Station	Date	Time	Position Lat	Position Lon	Gear	Comment
MSM58-55-2	MSM58/712-2	05.10.16	18:08	34° 3,77' N	30° 35,43' W	GC MB+	
MSM58-56-1	MSM58/713-1	05.10.16	20:17	34° 13,72' N	30° 32,49' W	PS	
MSM58-57-1	MSM58/714-1	06.10.16	09:20	34° 28,10' N	30° 17,72' W	GKG	
MSM58-57-2	MSM58/714-2	06.10.16	10:56	34° 28,10' N	30° 17,72' W	GC MB+	
MSM58-58-1	MSM58/715-1	06.10.16	19:04	34° 17,86' N	30° 14,60' W	PS	

Abbreviations:

CTD+RO: CTD with Rosette

GC: Gravity corer

GKG: Giant Box corer

MSN: Multi Plankton net

MUC: Multicorer

MB: Multibeam EM122

PS: Parasound