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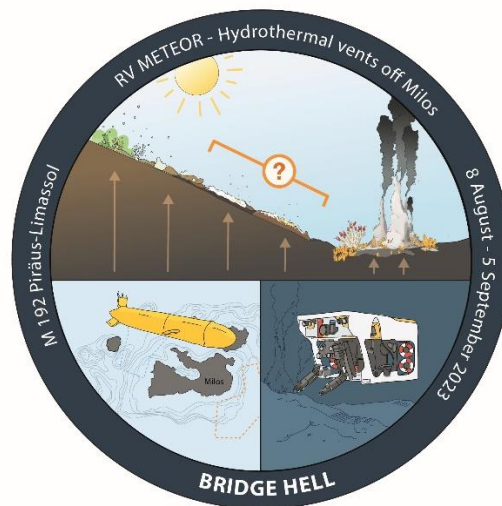
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Short Cruise Report
RV METEOR M192-1/-2

Bridging hydrothermal sites along the Hellenic Arc off Milos from shallow to deep



Pireus – Limassol
August 08 – September 05, 2023
Chief Scientist: Solveig I. Bühring
Captain: Detlef Korte

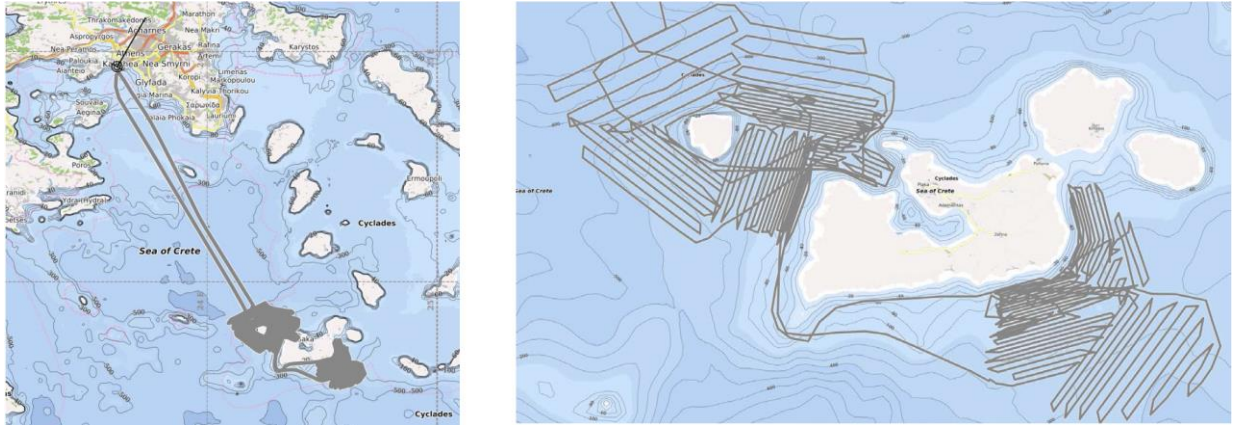


Figure 1. Track chart of R/V METEOR cruise M192-1, Piraeus-Piraeus, August 08.-18., 2023.

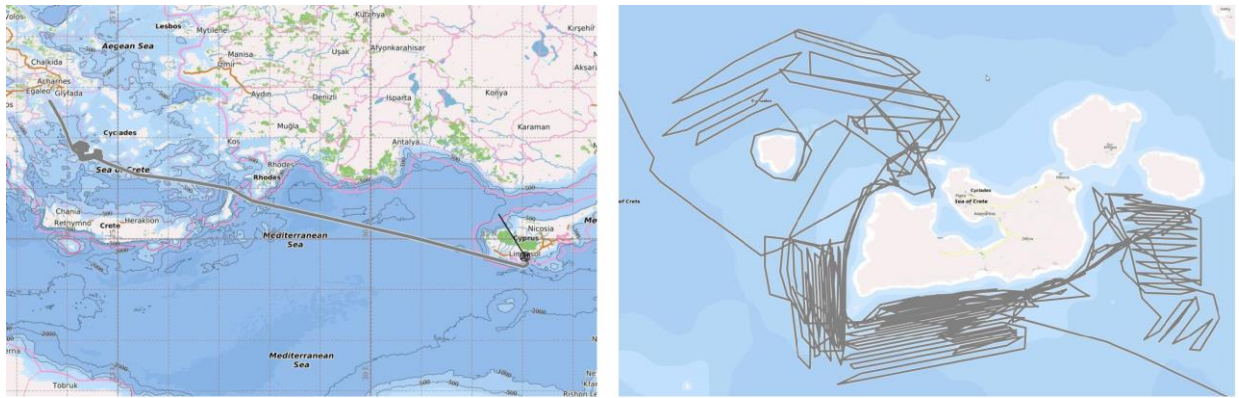


Figure 2. Track chart of R/V METEOR cruise M192-2, Piraeus-Limassol, August 20.- September 05., 2023.

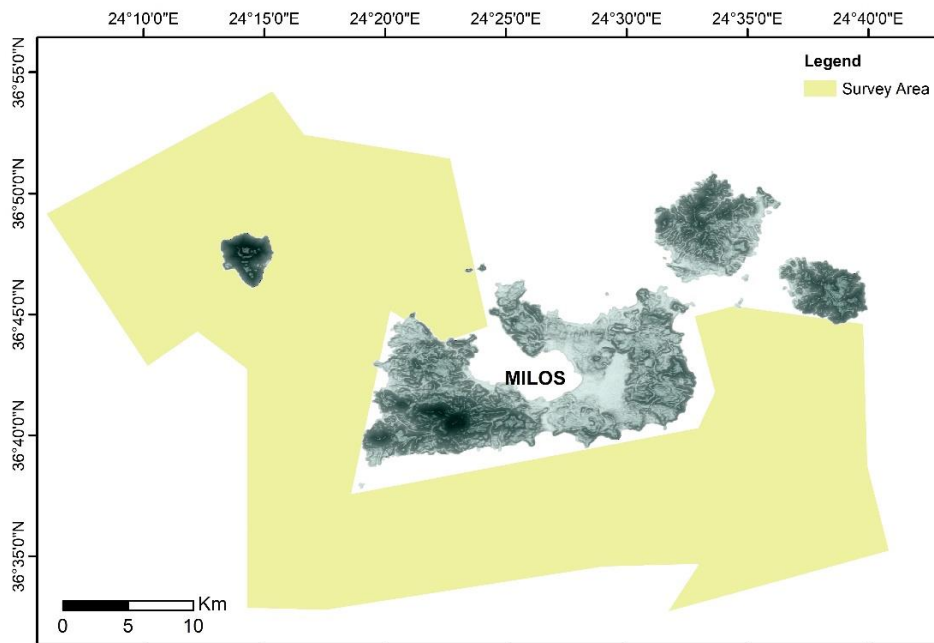


Figure 3. Survey area around Milos Island.

Objectives

The Hellenic Volcanic Arc in the Mediterranean is characterized by intense seismic activity, generated by the subduction of the African Plate beneath the Aegean microplate, which leads i.e. to abundantly present shallow water hydrothermalism around the island Milos. This island was created about 90,000 years ago, leaving two inactive craters on land. The marine hydrothermal field in shallow waters off the southern coast of Milos has been studied extensively and is known to be fed by hot, reduced fluids from a larger reservoir, loaded with arsenite and sulfide, percolating upwards through fissures. This creates venting zones in the sandy sediment with well-defined thermal gradients in two dimensions. The deeper areas around Milos were never systematically mapped or sampled so far. This cruise was designated to systematically map the so far uncharted areas at medium water depth (100-800 m) around Milos (M192-1) and sample hydrothermal systems that could be detected (M192-2).

The major aims of the first leg of the M192 cruise of R/V Meteor was to map areas around Milos in the southeast and in the northwest by means of the ship-board shallow-water multibeam system Kongsberg EM710 and the autonomous underwater vehicle AUV MARUM-SEAL 5000 in order to find hydrothermal vents at medium depths. Furthermore, the detected hydrothermal plumes were a target to be sampled by using the shipboard CTD-water sampler and MacLean in situ pumps. On the second leg (M192-2) the hydrothermal vent areas identified during the first leg were systematically sampled by multicorer, Van Veen grab and with the remotely operated vehicle ROV MARUM-SQUID. The ROV MARUM-SQUID was used to sample fluids, gases, sediments, rocks and biota from hydrothermal vent sites. The ROV-based trace-metal clean fluid sampling system KIPS was used for precise *in situ*-sampling of hydrothermal vent fluids. Rocks and some of the biota samples were collected with the ROV's manipulator. Biofilm and other biological samples were also collected with the scoop net. The ROV carried two 5-L Niskin bottles, which were used to sample water in the buoyant plume and above patches of diffuse venting. Gas bubble samplers were used to collect hydrothermal gases. Sampling with a variety of gears allowed a coordinated documentation and sampling of fluids and gases, sediments, biofilms, rocks and biota in order to systematically describe the changes that occur along a depth gradient and within the different fault zone around the island.

Our main aims/questions were:

1. Detection and detailed mapping of hydrothermal vents from shallow to deep

Are there vents along the faults from Milos southwards and northwestwards and eastwards off Antimilos?

What is the extent of venting?

2. Following and quantifying material export from hydrothermal vents to the ocean

What are the geochemical and biogeochemical transformation processes in the fluid/water mixing zone?

What are the far-field effects of the venting within the Aegean Sea?

3. Assessing geological, geochemical and biological trends in hydrothermal vents from shallow to deeper sites

How do geological and physico-chemical parameters change with depth?

How is this affecting the composition and function of microbial communities?

What drives endemism in deep-sea hydrothermal systems?

Narrative

The RV Meteor left the port of Piraeus at 9 a.m. on the 08th of August heading 150° towards Milos. The autonomous underwater vehicle AUV MARUM-SEAL was already set up during the harbor days, as well as the laboratories, because the transit to the working area lasted for only 8 hours. We started using the ship's multibeam echo sounder (Kongsberg EM710) in the area south of Milos, where most of the known hydrothermal activity occurs in shallow waters. Also on August 8th, the first CTD station was run, combined with sampling of the water column, at the eastern border of the study site. This station should be far away enough from the hydrothermal influence to serve as a reference. On the following day, the first SEAL dive was performed in the area southwards of *Kiriaki* Bay. SEAL maps the seafloor with a SONAR-based device, the multibeam, and can simultaneously record various sensor data. Unfortunately, the first dive mission failed to record the multibeam data due to a hard drive failure.

Thanks to the prompt evaluation of the multibeam echo sound data from the EM710, usually run overnight, by the Greek colleagues, we were able to find various discharge points of hydrothermal fluids and gases. On the 10th of August, we performed CTD and in situ pump work in the area of *Kiriaki* and on the 11th, we continued with first CTD-sampling and an AUV dive in the area off *Palaeochori*. On the next two days, we continued exploring the area *Thiorychia* by means of CTD-water sampling, in situ pumps and an AUV Seal dive. In the second week of the first leg, we moved the METEOR into the area northwest of Milos and continued mapping the area between Milos and Antimilos, as well as west and northwest of Antimilos with the EM 710. On the 14th of August, an AUV dive in the area off *Vani* had to be aborted due to a communication problem between AUV and ship, but the next dive on the 16th of August was successful and provided a detailed map that was used on the second leg to direct the remotely operated vehicle ROV MARUM-SQUID to interesting vent sites. On August 15th sampling off *Vani* was performed using CTD-water sampler and in situ pumps and on the 16th the same sampling devices were used in the *Arkadi* area. Before beginning the return journey to Piraeus in the afternoon of the 17th of August, water samples were taken in *Vani* and a non-hydrothermally influenced station was sampled westwards of Antimilos by means of CTD-water sampler and in situ pumps. In the morning of the 18th, we entered Piraeus again. The two harbor days were used to change from the autonomous underwater vehicle MARUM-SEAL to the remote operated vehicle MARUM-SQUID. Along with this, part of the crew also changed.

In the morning of August, the 20th, the METEOR sailed again off Piraeus southeastwards to Milos to continue with systematically sampling the hydrothermal systems that have been detected during the first leg of M192. For this purpose, the Van Veen Grab (VVG), and the multicorer (MUC) were used alongside the CTD-water sampler rosette and the ROV MARUM-SQUID. After 9 h of transect, we started within the area of *Palaeochori* (45-100 m water depth) using the VVG to search the seafloor for sulfidic sediments or volcanic rocks. In case a VVG retrieved promising sediments, additional sampling was done with the MUC. We continued with this systematic exploration in *Palaeochori* and in the *Kiriaki* area (between 94-110 m) also on the following day, until the first dive was performed on August 22th in the *Kiriaki* area. Here we followed a north-south trending flare field and were able to sample several diffuse hydrothermal fields, with sediments that were partly covered with white microbial mats. The temperature within the sediment was 132 °C at 20 cm depth (determined with a temperature logger). Unfortunately, push core sampling was unsuccessful, because the sandy sediment did not remain in the core liner. Diffuse fluids could be sampled successfully using a funnel that was placed on the sediment surface of a venting site and by using the KIPS-System to retrieve the fluids collected within the funnel.

Unfortunately, the second dive had to be aborted twice due to technical issues before the sampling started, so we continued exploring the area *Thiorychia* (approx. 150-200 m water depth) using the VVG and the MUC on the 23th of August, before we had very successful ROV dives on the 24th, 25th, and 26th of August in the area *Thiorychia*, following E-W trending flare field. We discovered hydrothermal vents with vent chimney structures, sometimes reaching

several meters in height. These vents showed gas emissions as well as fluids with temperatures between 40 and 180 °C. Besides the successful sampling of fluids with the KIPS system, the gas bubble sampler was used to sample rising gas bubbles. Furthermore, pieces of vents were recovered whose initial optical examination revealed arsenic and antimony sulfides. In between the dives, sampling using the VVG and MUC were performed, as well as filling gaps in the mapping from the first leg with the Kongsberg EM 710.

On the 27th and 28th of August, we returned to *Kiriaki* and performed a dive in the zones of this area that are further away from the coastline (approx. 107 m water depth) and continued working in the close-by area *Palaeochori* with a CTD-water sampling station and VVG and MUC at 47 m water depth. On the 28th, we sailed to *Thiorychia* and sampled the deeper parts (down to 207 m water depth) by means of CTD-water sampler, VVG and MUC. We furthermore did a VVG survey sampling the slope along a dome structure up to 121 m water depth.

On the 28th of August, after facing technical problems with the ROV, we continued sampling in the *Kiriaki* area using CTD, VVG and MUC, before relocating to the northwestern area of Milos. The northern work area includes the western and eastern shoulders of the Milos Bay graben structure as well as the two volcanoes east of Antimilos. After a series of VVG between 109-133 m water depth in the *Vani* area in the morning of the 29th, the ROV was successfully repaired and could be released into the water for an afternoon dive. The area proved to be very active, so another dive was performed at this spot on the 30th of August. This dive along the western margin fault zone of the graben showed evidence of young tectonic activity and abundant CO₂ gassing. Ten stations with the VVG yielded three samples of hydrothermally altered volcanic rocks, 13 volcanic samples ranging from glassy lava to finely laminated volcanic ash, and two carbonate crusts. The samples were largely recovered along the NW fault zone of the Milos Bay graben structure, but the apparently freshest lavas occurred in the center of the basin, possibly indicating young eruptions in the area. The sampling of the supposedly youngest volcano east of Antimilos recovered carbonate in water depths less than 150 m and sediments in greater depths.

Due to technical problems, which unfortunately could not be resolved by the day of departure from our study area, we were unable to conduct any more dives on the following days. Instead, the remaining time was used to deploy the VVG and MUC in the *Arkadi* area. Although the MUC has no video support, we still managed to sample a hydrothermal field directly. In order to do so, we used the ship's EM710 multibeam echo sounder, which is installed about 35 m forward of the sliding beam in Meteor's hull. However, by varying the beams angle 10° aft, we were able to adjust it, so that we could see the seafloor at 200 m water depth just below the MUC's deployment point. With the help of the DP (Dynamic Positioning) of the Meteor, we were able to place the MUC precisely in the fields of gas emission.

The old volcanic domes between Milos and Antimilos were the last station to be sampled using the VVG (GeoB25542), before the transit to Limassol was started on September 2nd. We arrived on time to dock the METEOR and unloaded our gear in the morning hours of September 5th.

Cruise activities

Table 1: Overview of M192-1 events, including transit and 9.5 days of station work. (PAL: Paleochori, THIO: Thiorychia, AM: Antimilos, BG: background) (EM 710: ships multibeam system Kongsberg EM 710, CTD: Conductivity-temperature-density-water sampler rosette, AUV: automated underwater vehicle MARUM-SEAL)

Day	0	2	4	6	8	10	12	14	16	18	20	22
Aug. 08.							transit					EM 710
Aug. 09.			CTD <i>background</i>				AUV <i>Kiriaki</i>					
Aug. 10.	EM 710		CTD <i>Kiriaki</i>				ISP <i>Kiriaki</i>		EM 710			
Aug. 11.	EM 710		CTD <i>PAL</i>				AUV <i>PAL</i>				CTD <i>PAL</i>	
Aug. 12.	EM 710						CTD <i>THIO</i>		ISP <i>THIO</i>		AUV <i>THIO</i>	
Aug. 13.	AUV <i>THIO</i>		CTD <i>THIO</i>								EM 710	
Aug. 14.	EM 710						AUV <i>Vani</i>					
Aug. 15.	AUV <i>Vani</i>		CTD <i>Vani</i>				ISP <i>Vani</i>		EM 710			
Aug. 16.	EM 710						AUV <i>Vani+Arkadi</i>					
Aug. 17.	CTD <i>Arkadi</i>	ISP <i>Arkadi</i>	CTD <i>Arkadi</i>	ISP <i>Arkadi</i>	CTD <i>Vani</i>	CTD <i>AM</i>	ISP <i>AM</i>					
Aug. 18.	transit											

Table 2: Overview of M192-2 events, including transit and 12.5 days of station work. (PAL: Paleochori, THIO: Thiorychia, KIRI: Kiriaki, ARK: Arkadi, OVD: Old Volcanic Domes between Milos and Antimilos, BG: background) (EM 710: ships multibeam system Kongsberg EM 710, CTD: Conductivity-temperature-density-water sampler rosette, VVG: Van Veen Grab, MUC: Multicorer, ROV: remotely operated vehicle MARUM-SQUID)

Day	0	2	4	6	8	10	12	14	16	18	20	22	
Aug. 20.					transit								VVG MUC BG
Aug. 21.	EM 710				VVG + MUC PAL + KIRI								
Aug. 22.	EM 710				ROV KIRI				EM 710				
Aug. 23.	EM 710				VVG + MUC THIO				EM 710				
Aug. 24.	EM 710				ROV THIO				CTD THIO		VVG THIO		
Aug. 25.	EM 710				ROV THIO				VVG, MUC THIO				
Aug. 26.	EM 710				ROV THIO				VVG THIO				
Aug. 27.	EM 710				ROV KIRI				MUC PAL		CTD PAL		VVG MUC PAL
Aug. 28.	EM 710				CTD, VVG PAL		VVG, MUC THIO				CTD KIRI		
Aug. 29.	VVG MUC KIRI	EM 710				VVG Vani		ROV Vani					
Aug. 30.	EM 710		CTD Vani		VVG Vani	MUC Vani	ROV Vani		VVG, MUC Vani				
Aug. 31.	EM 710		CTD ARK		VVG ARK		CTD ARK		VVG ARK				
Sept. 01.	EM 710				CTD ARK		VVG ARK		CTD, MUC ARK				
Sept. 02.	EM 710				VVG CTD	transit							
Sept. 03.	transit												
Sept. 04.	transit												
Sept. 05.	transit												

Acknowledgements

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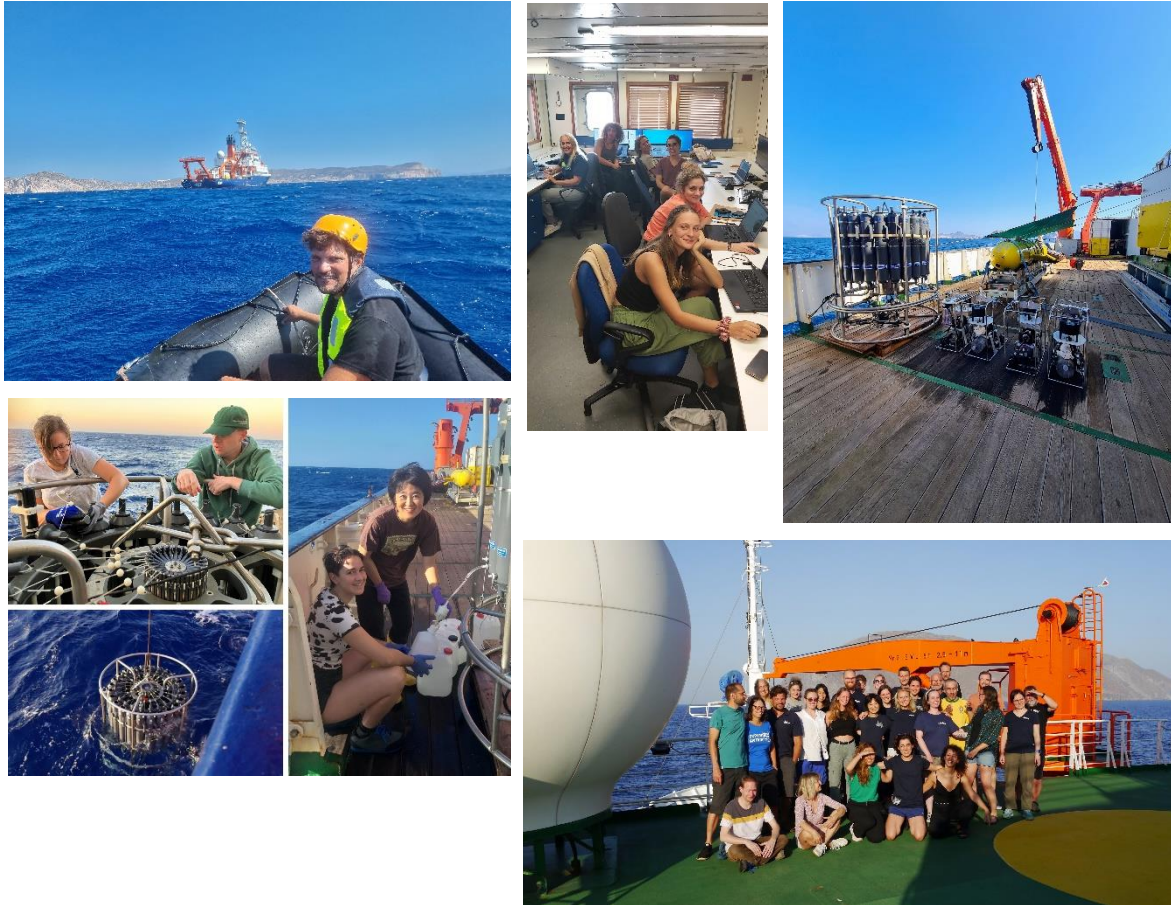


Figure 4. M192-1, top left: the AUV zodiac view on the R/V METEOR (photo: Gerrit Ubben), top middle: the Greek bathymetry team working in the Lotzentrale (photo: Paraskevi Nomikou), top right: main equipment used during the first leg (left: CTD water sampler rosette, right: in-situ pumps and behind it the AUV MARUM-SEAL under its sun sail) (photo: Solveig Bühring), lower left: the CTD-water sampler rosette (photos: Erika Kurahashi), lower right: M192-1 scientific party (photo: Stefan Seidel).



Figure 5. M192-2, top left: the remotely operated vehicle ROV MARUM-SQUID (photo: Solveig Bühring), top middle: the ROV control center on METEOR (photo: Joely Maak), top right: impression from the Thiorychia hydrothermal vent system (photo: MARUM), middle right: Van Veen Grab (photo: Solveig Bühring) and multicorer (photo: Eva-Maria Meckel), middle right: M192-2 scientific party (photo: Stefan Seidel), lower left: the island of Antimilos with a cap in the form of Cumulus lenticularis clouds (photo: Andreas Raeke), lower left: Sampling of sediment and pore water from the cores obtained with the ROV and multicorer (photo: Jianlin Liao).

Participants M192-1

Name	Discipline	Institution
Bühning, Solveig, Dr.	Geomicrobiology / Chief	UHB/MARUM
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Spiesecke, Ulli	AUV team	UHB/MARUM
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Bach, Alissa	Seafloor Mapping	UHB/MARUM
Benecke, Lea	DOM	ICBM/VO
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Raeke, Andreas	Meteorology	DWD
Rehage, Ralf	ROV team	UHB/MARUM
Röttgen, Clemens	Organic Geochemistry	UHB/MARUM
Sadowski, Miriam	Biology	MPIMM
Schäfer, Wiebke	Geology	FAU
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Participating Institutions

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CUB	Constructor University, Bremen, Germany
MPIMM	Max Planck Institute for Marine Microbiology, Bremen, Germany
ICBM/VO	Institute for Chemistry and Biology of the Marine Environment, University of Oldenburg, Germany
ATH	National and Kapodistrian University of Athens, Greece
AWI	Alfred-Wegener-Institute for Marine and Polar Research, Bremerhaven, Germany
DWD	German Weather Service (Deutscher Wetterdienst, DWD), Geschäftsfeld Seeschifffahrt, Germany
FAU	Friedrich-Alexander-Universität Erlangen-Nürnberg
ZDF	Zweites Deutsches Fernsehen, Documentary for „37° Leben“

Station List

M192	Site	gear	date	time	Lat	Lon
M192/1_2-1	Background South East	CTD+RO	09.08.23	04:14:00	36°39.417'N	24°36.621' E
M192/1_2-1	Background South East	CTD+RO				
M192/1_3-1	Kiriaki	AUV	09.08.23	07:27:00	36°38.475'N	24°30.750' E
M192/1_4-1	Kiriaki	CTD+RO	10.08.23	07:36:00	36°38.515'N	24°29.693' E
M192/1_5-1	Kiriaki	CTD+RO	10.08.23	09:53:00	36°38.492'N	24°29.590' E
M192/1_5-1	Kiriaki	CTD+RO	10.08.23	09:53:00	36°38.492'N	24°29.590' E
M192/1_6-1	Kiriaki	ISP	10.08.23	10:39:00	36°38.488'N	24°29.592' E
M192/1_7-1	Paleochori	CTD+RO	11.08.23	05:12:00	36°38.486'N	24°29.593' E
M192/1_8-1	Paleochori	AUV	11.08.23	06:56:00	36°38.485'N	24°30.709' E
M192/1_10-1	Paleochori	CTD+RO	11.08.23	18:30:00	36°39.154'N	24°30.011' E
M192/1_11-1	Thiorychia	CTD+RO	12.08.23	09:20:00	36°40.715'N	24°35.123' E
M192/1_12-1	Thiorychia	CTD+RO	12.08.23	10:25:00	36°40.737'N	24°35.126' E
M192/1_13-1	Thiorychia	ISP	12.08.23	11:18:00	36°40.736'N	24°35.126' E
M192/1_14-1	Thiorychia	AUV	12.08.23	15:03:00	36°41.165'N	24°35.319' E
M192/1_15-1	Thiorychia	CTD+RO	13.08.23	04:46:00	36°41.828'N	24°35.207' E
M192/1_16-1	Thiorychia	CTD+RO	13.08.23	05:36:00	36°41.827'N	24°35.207' E
M192/1_18-1	Vani	AUV	14.08.23	17:30:00	36°47.294'N	24°20.286' E
M192/1_19-1	Vani	CTD+RO	15.08.23	09:27:00	36°46.807'N	24°20.945' E
M192/1_20-1	Vani	CTD+RO	15.08.23	10:25:00	36°46.811'N	24°20.949' E
M192/1_21-1	Vani	ISP	15.08.23	11:45:00	36°46.808'N	24°20.943' E
M192/1_22-1	single AUV dive	AUV	16.08.23	06:07:00	36°47.217'N	24°20.323' E
M192/1_23-1	Arkadi Fault	CTD+RO	16.08.23	21:02:00	36°47.590'N	24°22.202' E
M192/1_24-1	Arkadi Fault	ISP	16.08.23	21:50:00	36°47.596'N	24°22.203' E
M192/1_25-1	Arkadi Fault	CTD+RO	17.08.23	04:54:00	36°47.596'N	24°22.207' E
M192/1_26-1	Arkadi Fault	ISP	17.08.23	06:00:00	36°47.595'N	24°22.207' E
M192/1_27-1	Vani CTD-T	CTD+RO	17.08.23	09:41:00	36°45.104'N	24°21.967' E
M192/1_28-1	Antimilos Background (deep)	CTD+RO	17.08.23	13:16:00	36°47.614'N	24°10.870' E
M192/1_29-1	Antimilos Background (deep)	ISP	17.08.23	15:00:00	36°47.608'N	24°10.894' E
M192/1_01-1	Near Kiriaki Background	GS	20.08.23	21:37:00	36°37.959'N	24°29.282' E
M192/2_03-1	Near Kiriaki Background	MUC	20.08.23	20:03:00	36°37.971'N	24°30.070' E
M192/2_02-1	Near Kiriaki Background	GS	20.08.22	19:27:00	36°38.000'N	24°30.079' E
M192/2_04-1	Near Kiriaki Background	GS	20.08.23	20:59:00	36°38.311'N	24°29.564' E
M192/2_05-1	Paleochori	GS	21.08.23	07:34:00	36°38.881'N	24°29.413' E
M192/2_06-1	Paleochori	GS	21.08.23	08:08:00	36°38.864'N	24°29.433' E
M192/2_07-1	Paleochori	MUC	21.08.23	08:58:00	36°38.865'N	24°29.432' E
M192/2_08-1	Paleochori	GS	21.08.23	09:48:00	36°39.203'N	24°30.995' E
M192/2_09-1	Paleochori	GS	21.08.23	10:35:00	36°39.499'N	24°31.092' E
M192/2_10-1	Paleochori	GS	21.08.23	10:43:00	36°39.499'N	24°31.092' E
M192/2_11-1	Paleochori	GS	21.08.23	11:06:00	36°39.602'N	24°30.988' E
M192/2_12-1	Near Paleochori (far)	GS	21.08.23	12:37:00	36°38.618'N	24°33.191' E
M192/2_16-1	Kiriaki	GS	21.08.23	14:38:00	36°38.444'N	24°29.542' E
M192/2_17-1	Kiriaki	GS	21.08.23	15:07:00	36°38.598'N	24°29.541' E
M192/2_18-1	Kiriaki	GS	21.08.23	15:31:00	36°38.727'N	24°29.533' E
M192/2_19-1	Kiriaki	GS	21.08.23	16:10:00	36°38.910'N	24°29.406' E

M192/2_20-1	Kiriaki	GS	21.08.23	16:34:00	36°39.019'N	24°29.329' E
M192/2_22-1	Kiriaki ROV Dive 1	ROV	22.08.23	06:01:00	36°38.832'N	24°29.387' E
M192/2_22-1	Kiriaki ROV Dive 1	KIPS	22.08.23	09:36:00	36°38.888'N	24°29.446' E
M192/2_22-1	Kiriaki ROV Dive 1	Claw	22.08.23	10:40:00	36°38.883'N	24°29.451' E
M192/2_22-1	Kiriaki ROV Dive 1	HN	22.08.23	12:09:00	36°38.895'N	24°29.417' E
M192/2_22-1	Kiriaki ROV Dive 1	Claw	22.08.23	12:21:00	36°38.901'N	24°29.417' E
M192/2_22-1	Kiriaki ROV Dive 1	Claw	22.08.23	12:25:00	36°38.901'N	24°29.417' E
M192/2_24-1	Thiorychia	GS	23.08.23	08:47:00	36°41.999'N	24°35.676' E
M192/2_33-1	Thiorychia	GS	23.08.23	14:56:00	36°41.280'N	24°33.694' E
M192/2_34-1	Thiorychia	GS	23.08.23	15:33:00	36°40.914'N	24°33.390' E
M192/2_35-1	Thiorychia	GS	23.08.23	15:43:00	36°40.914'N	24°33.388' E
M192/2_37-1	Thiorychia	MUC	23.08.23	17:13:00	36°41.809'N	24°35.279' E
M192/2_25-1	Thiorychia	GS	23.08.23	09:30:00	36°41.688'N	24°35.337' E
M192/2_26-1	Thiorychia	GS	23.08.23	10:06:00	36°41.635'N	24°35.018' E
M192/2_27-1	Thiorychia	GS	23.08.23	10:32:00	36°41.819'N	24°35.227' E
M192/2_28-1	Thiorychia	GS	23.08.23	11:13:00	36°41.610'N	24°34.259' E
M192/2_29-1	Thiorychia	GS	23.08.23	11:34:00	36°41.656'N	24°34.300' E
M192/2_30-1	Thiorychia	GS	23.08.23	11:56:00	36°41.736'N	24°34.268' E
M192/2_31-1	Thiorychia	GS	23.08.23	12:16:00	36°41.526'N	24°34.297' E
M192/2_32-1	Thiorychia	MUC	23.08.23	12:51:00	36°41.531'N	24°34.300' E
M192/2_39-1	Thiorychia ROV Dive 2	ROV				
M192/2_39-1	Thiorychia ROV Dive 2	Claw	24.08.23	13:12:00	36°42.023'N	24°35.655' E
M192/2_39-1	Thiorychia ROV Dive 2	NB	24.08.23	13:18:00	36°42.023'N	24°35.655' E
M192/2_39-1	Thiorychia ROV Dive 2	Claw				
M192/2_39-1	Thiorychia ROV Dive 2	KIPS	24.08.23	07:45:00	36°42.022'N	24°35.683' E
M192/2_39-1	Thiorychia ROV Dive 2	NB	24.08.23	10:05:00	36°42.022'N	24°35.684' E
M192/2_39-1	Thiorychia ROV Dive 2	ROV_PC	24.08.23	10:08:00	36°42.022'N	24°35.684' E
M192/2_39-1	Thiorychia ROV Dive 2	HN	24.08.23	11:04:00	36°42.033'N	24°35.718' E
M192/2_39-1	Thiorychia ROV Dive 2	Claw	24.08.23	11:30:00	36°42.034'N	24°35.721' E
M192/2_39-1	Thiorychia ROV Dive 2	KIPS	24.08.23	12:57:00	36°42.023'N	24°35.655' E
M192/2_39-1	Thiorychia ROV Dive 2	KIPS	24.08.23	12:57:00	36°42.023'N	24°35.655' E
M192/2_39-1	Thiorychia ROV Dive 2	Claw	24.08.23	13:06:00	36°42.023'N	24°35.655' E
M192/2_40-1	Thiorychia	CTD+RO	24.08.23	15:50:00	36°42.018'N	24°35.621' E
M192/2_41-1	Thiorychia	GS	24.08.23	17:54:00	36°42.023'N	24°35.633' E
M192/2_44-1	Thiorychia ROV Dive 3	ROV	25.08.23	07:30:00	36°42.018'N	24°35.634' E
M192/2_44-1	Thiorychia ROV Dive 3	Claw	25.08.23	12:24:00	36°41.990'N	24°35.518' E
M192/2_44-1	Thiorychia ROV Dive 3	GBS	25.08.23	12:39:00	36°41.990'N	24°35.518' E
M192/2_44-1	Thiorychia ROV Dive 3	NB	25.08.23	12:51:00	36°41.990'N	24°35.518' E
M192/2_44-1	Thiorychia ROV Dive 3	KIPS	25.08.23	10:13:00	36°42.026'N	24°35.659' E
M192/2_44-1	Thiorychia ROV Dive 3	Claw	25.08.23	10:16:00	36°42.026'N	24°35.659' E
M192/2_44-1	Thiorychia ROV Dive 3	Claw	25.08.23	10:25:00	36°42.026'N	24°35.659' E
M192/2_44-1	Thiorychia ROV Dive 3	Claw	25.08.23	10:58:00	36°41.986'N	24°35.591' E
M192/2_44-1	Thiorychia ROV Dive 3	KIPS	25.08.23	11:34:00	36°42.026'N	24°35.659' E
M192/2_44-1	Thiorychia ROV Dive 3	KIPS	25.08.23	11:34:00	36°42.026'N	24°35.659' E
M192/2_44-1	Thiorychia ROV Dive 3	NB	25.08.23		36°42.026'N	24°35.659' E
M192/2_44-1	Thiorychia ROV Dive 3	Claw	25.08.23	11:56:00	36°41.972'N	24°35.516' E

M192/2_45-1	Thiorychia	GS	25.08.23	15:17:00	36°40.759'N	24°35.115' E
M192/2_46-1	Thiorychia	GS	25.08.23	15:42:00	36°40.748'N	24°35.130' E
M192/2_47-1	Thiorychia	GS	25.08.23	15:56:00	36°40.748'N	24°35.129' E
M192/2_48-1	Thiorychia	MUC	25.08.23	16:34:00	36°40.760'N	24°35.115' E
M192/2_50-1	Thiorychia ROV Dive 4	ROV	26.08.23	05:36:00	36°41.978'N	24°35.488' E
M192/2_50-1	Thiorychia ROV Dive 4	Claw	26.08.23	08:28:00	36°41.990'N	24°35.517' E
M192/2_50-1	Thiorychia ROV Dive 4	ROV_PC	26.08.23	10:29:00	36°41.823'N	24°35.284' E
M192/2_50-1	Thiorychia ROV Dive 4	ROV_PC	26.08.23	11:04:00	36°41.829'N	24°35.284' E
M192/2_50-1	Thiorychia ROV Dive 4	HN	26.08.23	11:29:00	36°41.838'N	24°35.277' E
M192/2_50-1	Thiorychia ROV Dive 4	NB	26.08.23	11:57:00	36°41.886'N	24°35.230' E
M192/2_50-1	Thiorychia ROV Dive 4	Claw	26.08.23	12:33:00	36°41.834'N	24°35.215' E
M192/2_50-1	Thiorychia ROV Dive 4	KIPS	26.08.23	06:58:00	36°41.989'N	24°35.518' E
M192/2_50-1	Thiorychia ROV Dive 4	Claw	26.08.23	07:19:00	36°41.989'N	24°35.518' E
M192/2_50-1	Thiorychia ROV Dive 4	KIPS	26.08.23	07:30:00	36°41.989'N	24°35.518' E
M192/2_50-1	Thiorychia ROV Dive 4	KIPS	26.08.23	07:38:00	36°41.989'N	24°35.518' E
M192/2_50-1	Thiorychia ROV Dive 4	KIPS	26.08.23	07:38:00	36°41.989'N	24°35.518' E
M192/2_50-1	Thiorychia ROV Dive 4	NB	26.08.23	07:52:00	36°41.989'N	24°35.519' E
M192/2_50-1	Thiorychia ROV Dive 4	Claw	26.08.23	08:05:00	36°41.996'N	24°35.513' E
M192/2_51-1	Thiorychia	GS	27.08.23	13:39:00	36°42.051'N	24°35.966' E
M192/2_52-1	Thiorychia	GS	26.08.23	14:05:00	36°42.106'N	24°36.008' E
M192/2_53-1	Thiorychia	GS	26.08.23	14:49:00	36°42.470'N	24°36.939' E
M192/2_54-1	Thiorychia	GS	26.08.23	15:01:00	36°42.472'N	24°36.941' E
M192/2_55-1	Thiorychia	GS	26.08.23	15:21:00	36°42.424'N	24°36.978' E
M192/2_56-1	Thiorychia	GS	26.08.23	15:56:00	36°42.490'N	24°37.579' E
M192/2_57-1	Thiorychia	GS	26.08.23	16:28:00	36°42.292'N	24°37.614' E
M192/2_58-1	Near Kiriaki ROV Dive 5	ROV				
M192/2_58-1	Near Kiriaki ROV Dive 5	HN	27.08.23	11:44:00	36°40.148'N	24°32.902' E
M192/2_58-1	Near Kiriaki ROV Dive 5	NB	27.08.23	11:51:00	36°40.148'N	24°32.902' E
M192/2_58-1	Near Kiriaki ROV Dive 5	Claw	27.08.23	12:05:00	36°40.148'N	24°32.899' E
M192/2_58-1	Near Kiriaki ROV Dive 5	KIPS	27.08.23	12:27:00	36°40.147'N	24°32.899' E
M192/2_58-1	Near Kiriaki ROV Dive 5	KIPS	27.08.23	12:27:00	36°40.147'N	24°32.899' E
M192/2_58-1	Near Kiriaki ROV Dive 5	ROV_PC	27.08.23	07:01:00	36°40.050'N	24°32.854' E
M192/2_58-1	Near Kiriaki ROV Dive 5	Claw	27.08.23	07:06:00	36°40.050'N	24°32.894' E
M192/2_58-1	Near Kiriaki ROV Dive 5	ROV_PC	27.08.23	07:52:00	36°40.082'N	24°32.898' E
M192/2_58-1	Near Kiriaki ROV Dive 5	KIPS	27.08.23	08:57:00	36°40.082'N	24°32.898' E
M192/2_58-1	Near Kiriaki ROV Dive 5	NB	27.08.23	09:16:00	36°40.083'N	24°32.898' E
M192/2_58-1	Near Kiriaki ROV Dive 5	ROV_SWL	27.08.23	09:33:00	36°40.096'N	24°32.892' E
M192/2_58-1	Near Kiriaki ROV Dive 5	Claw	27.08.23	10:34:00	36°40.145'N	24°32.901' E
M192/2_58-1	Near Kiriaki ROV Dive 5	KIPS	27.08.23	11:14:00	36°40.148'N	24°32.902' E
M192/2_60-1	Paleochori	MUC	27.08.23	15:31:00	36°40.082'N	24°32.892' E
M192/2_62-1	Paleochori	CTD+RO	27.08.23	16:24:00	36°39.571'N	24°31.234' E
M192/2_63-1	Paleochori	GS	27.08.23	17:20:00	36°39.599'N	24°31.199' E
M192/2_64-1	Paleochori	GS	27.08.23	17:37:00	36°39.589'N	24°31.168' E
M192/2_65-1	Paleochori	GS	27.08.23	17:53:00	36°39.580'N	24°31.135' E
M192/2_66-1	Paleochori	MUC	27.08.23	18:14:00	36°39.580'N	24°31.137' E
M192/2_67-1	Paleochori	GS	27.08.23	18:25:00	36°39.580'N	24°31.136' E

M192/2_67-1	Paleochori	CTD+RO	28.08.23	07:54:00	36°39.598'N	24°31.193' E
M192/2_68-1	Paleochori	GS	28.08.23	08:41:00	36°39.590'N	24°31.166' E
M192/2_67-1	Paleochori	CTD+RO	28.08.23	09:59:00	36°39.598'N	24°35.516' E
M192/2_68-1	Paleochori	GS	28.08.23	08:41:00	36°39.590'N	24°31.165' E
M192/2_69-1	Thiorychia	CTD+RO	28.08.23	09:59:00	36°41.980'N	24°35.519' E
M192/2_70-1	Thiorychia	GS	28.08.23	11:02:00	36°41.986'N	24°35.511' E
M192/2_71-1	Thiorychia	GS	28.08.23	11:56:00	36°40.144'N	24°32.896' E
M192/2_72-1	Thiorychia	MUC	28.08.23	12:23:00	36°40.145'N	24°32.897' E
M192/2_73-1	Thiorychia	GS	28.08.23	15:13:00	36°42.030'N	24°35.649' E
M192/2_74-1	Thiorychia (shallow)	GS	28.08.23	15:40:00	36°41.988'N	24°35.580' E
M192/2_75-1	Thiorychia (shallow)	GS	28.08.23	16:08:00	36°42.127'N	24°35.505' E
M192/2_76-1	Thiorychia (shallow)	GS	28.08.23	16:44:00	36°41.769'N	24°35.107' E
M192/2_78-1	Thiorychia (shallow)	GS	29.08.23	17:13:00	36°41.806'N	24°35.242' E
M192/2_80-1	Thiorychia (shallow)	GS	28.08.23	18:24:00	36°41.882'N	24°35.228' E
M192/2_81-1	Kiriaki	CTD+RO	28.08.23	19:56:00	36°38.536'N	24°29.538' E
M192/2_82-1	Kiriaki	GS	28.08.23	20:27:00	36°38.535'N	24°29.540' E
M192/2_83-1	Kiriaki	MUC	28.08.23	21:05:00	36°38.535'N	24°29.540' E
M192/2_84-1	Kiriaki	MUC	28.08.23	21:21:00	36°38.541'N	24°29.533' E
M192/2_85-1	Vani	GS	29.08.23	08:39:00	36°45.358'N	24°21.539' E
M192/2_87-1	Vani	GS	29.08.23	09:31:00	36°45.598'N	24°21.580' E
M192/2_88-1	Vani	GS	29.08.23	10:24:00	36°45.582'N	24°21.578' E
M192/2_89-1	Vani	GS	29.08.23	10:55:00	36°45.720'N	24°21.120' E
M192/2_90-1	Vani ROV-Dive 6	ROV	29.08.23	12:16:00	36°45.352'N	24°21.568' E
M192/2_90-1	Vani ROV-Dive 6	NB	29.08.23	15:55:00	36°45.332'N	24°21.573' E
M192/2_90-1	Vani ROV-Dive 6	GBS	29.08.23	13:59:00	36°46.346'N	24°21.572' E
M192/2_90-1	Vani ROV-Dive 6	KIPS	29.08.23	14:27:00	36°45.346'N	24°21.572' E
M192/2_90-1	Vani ROV-Dive 6	HN	29.08.23	15:05:00	36°45.346'N	24°21.572' E
M192/2_90-1	Vani ROV-Dive 6	NB	29.08.23	14:56:00	36°45.346'N	24°21.572' E
M192/2_90-1	Vani ROV-Dive 6	GBS	29.08.23	15:17:00	36°45.332'N	24°21.573' E
M192/2_90-1	Vani ROV-Dive 6	KIPS	29.08.23	15:32:00	36°45.332'N	24°21.573' E
M192/2_90-1	Vani ROV-Dive 6	KIPS	29.08.23	15:42:00	36°45.332'N	24°21.573' E
M192/2_90-1	Vani ROV-Dive 6	HN	29.08.23	15:51:00	36°45.332'N	24°21.573' E
M192/2_91-1	Vani	CTD+RO	30.08.23	05:02:00	36°45.358'N	24°21.564' E
M192/2_92-1	Vani	GS	30.08.23	05:38:00	36°45.357'N	24°21.555' E
M192/2_93-1	Vani	MUC	30.08.23	06:03:00	36°45.385'N	24°21.558' E
M192/2_94-1	Vani ROV-Dive 7	ROV				
M192/2_94-1	Vani ROV-Dive 7	KIPS	30.08.23	13:03:00	36°46.860'N	24°20.981' E
M192/2_94-1	Vani ROV-Dive 7	KIPS	30.08.23	13:13:00	36°46.860'N	24°20.981' E
M192/2_94-1	Vani ROV-Dive 7	Claw	30.08.23	13:03:00	36°46.860'N	24°20.981' E
M192/2_94-1	Vani ROV-Dive 7	NB	30.08.23	13:17:00	36°46.858'N	24°20.981' E
M192/2_94-1	Vani ROV-Dive 7	HN	30.08.23	08:41:00	36°46.669'N	24°20.908' E
M192/2_94-1	Vani ROV-Dive 7	Claw	30.08.23	09:08:00	36°46.681'N	24°20.913' E
M192/2_94-1	Vani ROV-Dive 7	ROV_PC	30.08.23	09:24:00	36°46.676'N	24°20.920' E
M192/2_94-1	Vani ROV-Dive 7	KIPS	30.08.23	09:50:00	36°46.687'N	24°20.917' E
M192/2_94-1	Vani ROV-Dive 7	Claw	30.08.23	10:15:00	36°46.687'N	24°20.917' E
M192/2_94-1	Vani ROV-Dive 7	Claw	30.08.23	10:26:00	36°46.687'N	24°20.917' E

M192/2_94-1	Vani ROV-Dive 7	NB	30.08.23	10:30:00	36°46.687'N	24°20.917'E
M192/2_94-1	Vani ROV-Dive 7	HN	30.08.23	11:26:00	36°46.723'N	24°20.939'E
M192/2_95-1	Vani	GS	30.08.23	16:11:00	36°46.663'N	24°20.910'E
M192/2_96-1	Vani	GS	30.08.23	16:40:00	36°46.654'N	24°20.900'E
M192/2_97-1	Vani	MUC	30.08.23	17:03:00	36°46.656'N	24°20.900'E
M192/2_98-1	Vani	GS	30.08.23	17:34:00	36°46.672'N	24°20.913'E
M192/2_99-1	Vani	GS	30.08.23	17:54:00	36°46.681'N	24°20.916'E
M192/2_101-1	Vani	GS	30.08.23	18:31:00	36°46.689'N	24°20.920'E
M192/2_102-1	Akardi	CTD+RO	31.08.23	05:22:00	36°46.691'N	24°20.914'E
M192/2_103-1	Akardi	GS	31.08.23	09:35:00	36°47.590'N	24°22.210'E
M192/2_104-1	Akardi	GS	31.08.23	09:59:00	36°47.561'N	24°22.237'E
M192/2_105-1	Akardi	GS	31.08.23	10:25:00	36°47.731'N	24°22.376'E
M192/2_106-1	Akardi	GS	31.08.23	10:46:00	36°47.710'N	24°22.376'E
M192/2_107-1	Akardi	GS	31.08.23	11:16:00	36°47.711'N	24°22.539'E
M192/2_108-1	Akardi	GS	31.08.23	11:34:00	36°47.688'N	24°22.560'E
M192/2_109-1	Akardi	CTD+RO	31.08.23	12:50:00	36°45.870'N	24°21.536'E
M192/2_119-1	Akardi	GS	31.08.23	17:55:00	36°46.869'N	24°20.978'E
M192/2_120-1	Akardi	GS	31.08.23	18:18:00	36°46.898'N	24°20.970'E
M192/2_121-1	Akardi	GS	31.08.23	18:40:00	36°46.843'N	24°20.884'E
M192/2_111-1	Akardi	GS	31.08.23	13:32:00	36°45.873'N	24°21.535'E
M192/2_112-1	Akardi	GS	31.08.23	13:52:00	36°45.864'N	24°21.528'E
M192/2_113-1	Akardi	GS	31.08.23	14:03:00	36°45.865'N	24°21.527'E
M192/2_114-1	Akardi	GS	31.08.23	15:02:00	36°46.004'N	24°22.346'E
M192/2_115-1	Akardi	MUC	31.08.23	15:33:00	36°46.008'N	24°22.345'E
M192/2_116-1	Akardi	GS	31.08.23	16:12:00	36°46.224'N	24°20.948'E
M192/2_117-1	Akardi	GS	31.08.23	16:47:00	36°46.590'N	24°20.916'E
M192/2_118-1	Akardi	GS	31.08.23	17:38:00	36°46.865'N	24°20.956'E
M192/2_127-1	Akardi	CTD+RO	01.09.23	11:12:00	36°47.588'N	24°22.613'E
M192/2_128-1	Akardi	CTD+RO	01.09.23	12:00:00	36°47.590'N	24°22.308'E
M192/2_129-1	Akardi	GS	01.09.23	12:40:00	36°47.588'N	24°22.206'E
M192/2_130-1	Akardi	GS	01.09.23	13:35:00	36°47.491'N	24°22.672'E
M192/2_131-1	Akardi	GS	01.09.23	14:07:00	36°47.775'N	24°22.559'E
M192/2_132-1	Akardi	GS	01.09.23	14:38:00	36°47.791'N	24°22.552'E
M192/2_133-1	Akardi	GS	01.09.23	14:55:00	36°47.870'N	24°22.540'E
M192/2_134-1	Akardi	CTD+RO	01.09.23	15:41:00	36°46.007'N	24°22.346'E
M192/2_135-1	Akardi	MUC	01.09.23	16:26:00	36°46.007'N	24°22.347'E
M192/2_136-1	Old Volcanic Domes	GS	02.09.23	05:02:00	36°49.233'N	24°18.867'E
M192/2_137-1	Old Volcanic Domes	GS	02.09.23	05:48:00	36°48.960'N	24°18.972'E
M192/2_138-1	Old Volcanic Domes	GS	02.09.23	06:29:00	36°48.447'N	24°19.709'E