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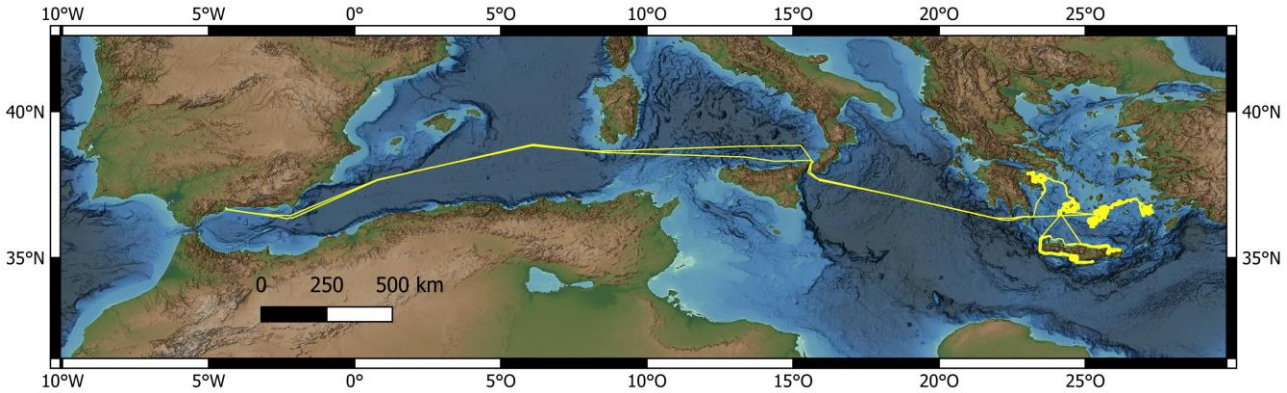
Short Cruise Report
RV MARIA S. MERIAN MSM135

Malaga (Spain) – Malaga (Spain)
5th March – 17th April 2025
Chief Scientist: Prof. Dr. Christian Hübscher
Captain: Björn Maas



Objectives

The cruise contributes to the collaborative project MULTI-MAREX within the framework of the DAM mission “mareXtreme”. The aim of the collaborative project MULTI-MAREX is to create a living lab for the investigation of extreme geological events and associated hazards to develop the necessary knowledge for action to manage these hazards at different levels. With this cruise, data will be mainly collected for two sub-projects within the framework of the MULTI-MAREX project: i) Extreme events along the Aegean Volcanic Arc and ii) Submarine landslides in the Hellenic Arc. The DAM mission-related motivation for this cruise is simple but important: The more and precise geohazards can be documented, the easier it will be to motivate political or administrative decision-makers to fund monitoring programs or mitigation measures.

The main objective of the sub-project “Extreme events along the Aegean Volcanic Arc” is to carry out an inventory of geological evidence of extreme events along the Aegean Volcanic Arc. While the extreme events in the CSKVF are already well mapped and understood due to the extensive seismic reflection data and IODP drilling, the frequency of volcanic eruptions and causative and resultant extreme events in the other volcanic centers is under-researched. Most of the previous studies in other areas are based on sediment cores of about 10 m length and analog single-channel vintage seismics. The most important goal of this sub-project is to expand the knowledge of previously unknown, possibly sedimented underwater volcanoes through geophysical reconnaissance measurements and thus to motivate transdisciplinary studies in the course of a DAM follow-up mission. Therefore, reflection seismic and hydroacoustic data as well as geological samples were collected along the volcanic arc. Geological sampling for age dating and geochemical fingerprint analysis by cooperation partner Steffen Kutterolf at GEOMAR were carried out where shallow volcanic sediments are present in the uppermost few meters.

The main objective of the sub-project 'Submarine landslides in the Hellenic Arc' is to investigate mass wasting events in the Hellenic Arc. Landslides are a significant hazard due to their potential to destroy offshore infrastructure and to trigger devastating tsunamis. Landslides are widespread in the Mediterranean Sea but landslides in the Hellenic arc are only poorly investigated. It is especially important to include small landslides close to the coast in hazard assessments as such landslides represent a direct hazard for coastal areas despite their relatively small size. In addition, such landslides may occur more frequently than larger landslides on the open slope. For this purpose, new hydroacoustic, seismic, and sedimentological data were be collected during the cruise.

Narrative

The technical preparations for expedition MSM135 aboard the research vessel MARIA S. MERIAN began in the port of Málaga on the morning of March 3, with the unloading of scientific equipment from containers and a truck bed—carried out with the usual competent assistance of the crew. Winches were positioned on deck, and the hangar quickly filled with numerous pallets, most of them lashed with aluminum boxes containing equipment. The main group of scientists arrived on board the following day, and the installation of various devices on deck and in the laboratories progressed to the point that by evening the ship was reported “ready to sail.” That evening, the team—comprising researchers from Hamburg, Kiel, and Athens—gathered in Málaga’s old town for introductions and a final farewell to solid ground. On March 5, a five-day transit to the operational area in the southern Aegean Sea began. The eastward route ran against wind and waves, giving all participants time to acclimate to the sea conditions. The transit days were used to finalize technical setups and to brief everyone on the scientific objectives of the expedition. On the evening of March 8, the ship passed Stromboli—a towering volcanic cone north of Sicily—which offered a striking reminder of the immense forces involved in volcanic activity. The route continued through the Strait of Messina, and by week’s end, the Peloponnese came into view. On March 10, research activities commenced at the southern entrance of the Saronic Gulf. Following the survey of a sound velocity profile, the experienced teams deployed the reflection seismic equipment, activated the parametric sediment echosounder and the multibeam system, and began geophysical profiling. Initial measurement profiles passed the island of Poros into the Methana Basin, then continued past Methana into the Epidaurus Basin, which is bounded to the west by the Peloponnese. The objective of this leg was to gain a better understanding of volcanic and hydrothermal processes in the region. On Wednesday, March 12, all towed instruments were recovered to initiate sediment sampling using a gravity corer around Methana. All four coring stations were successful. On March 13, a live broadcast connected the expedition to the geo-show “Unterirdisch” in Tübingen, attended by over 450 schoolchildren. Thanks to the media team from the "Immersive Media Lab cabu:ff at CeOS" at Kiel University, both prerecorded segments and live interviews were transmitted in HD quality. Meanwhile, the seismic team resumed work with profile-based surveys in the western Saronic Gulf. The geophysical program concluded on the morning of March 14. Two more gravity coring stations followed before the vessel began transit toward Milos. While the hydroacoustics lab remained in continuous operation, the seismic team had a brief opportunity to analyze data and perform maintenance. Around 21:00 ship time, seismic operations resumed to start profiling tectonic fault systems and hydrothermal fields. After completing the geophysical exploration of hydrothermal processes north and south of Milos, which had begun the previous week, gravity coring resumed on the morning of March 18. Hydroacoustic surveys conducted during the night of March 19 allowed for the creation of high-resolution seafloor maps. The following morning, the ship transited to the coastal waters of Crete, where reflection seismic and hydroacoustic profiling took place along the island’s west and south coasts. The primary focus was the Gulf of Messara, with the aim of mapping and better understanding the offshore continuation of tectonic faults. Crete has a long geological history marked by severe earthquakes, many of which occurred along these fault zones. Reflection seismic measurements south of Crete concluded on the evening of March 21. After rounding Crete’s western coast, profiling resumed north of the island in the Mirabello Bay, where seismic and hydroacoustic surveying continued until the evening of March 24. During the night, the vessel transited back to the Saronic Gulf. Upon arrival on March 25, research resumed with gravity coring stations in the Epidaurus Basin. These were followed by sound velocity measurements in the water column to calibrate the hydroacoustic systems. Due to numerous fishing devices in the area, the planned seismic

and magnetic surveys could not be conducted, prompting a shift of the operational area further north. An inspection of the Epidaurus Basin the next morning revealed significantly fewer fishing obstacles, allowing the deployment of both the streamer and the magnetometer. After another successful gravity coring station, scientific operations in the Saronic Gulf concluded. On March 27, another gravity core was taken near the island of Milos. In the afternoon, the reflection seismic system was again deployed to investigate a circular structure just 5 km off the coast. Two more gravity coring stations were conducted on the morning of March 28 to search for evidence of past volcanic eruptions. The subsequent reflection seismic and hydroacoustic mapping extended into the Bay of Milos. By midday on March 29, this work package was complete. After a brief transit, the RV Maria S. Merian entered the caldera of Santorini. A stationary hydroacoustic survey of the water column was carried out over a suspected hydrothermal vent. That night, multibeam mapping began around the underwater volcano Kolumbo, aiming to assess the effects of recent seismic activity. On the afternoon of March 30, seismic measurements started in the Christiana Basin southwest of Santorini. The geophysical survey of the Christiana Basin, which had begun the previous week, continued through April 1. During the night of April 2, the research area shifted farther south, circling Santorini and focusing on the Kolumbo Volcano and the Anydros Horst—the epicenter of the earthquake swarm that had affected the island group since the beginning of the year. Initial seismic profiles captured the Kolumbo submarine volcano. By day, the focus moved to the Anydros Horst and the adjacent northwest half-grabens. On the morning of April 3, measurements began in the Amorgos Basin and the northeastern adjacent half-grabens. Around midday, the seismic gear was recovered and the magnetometer was deployed—an instrument capable of detecting deep-seated magma chambers. On the morning of April 4, a rapid transit brought the vessel to the island group of Nisyros, Kos, and Yali in the eastern Aegean. From April 4 to 6, the seismic program aimed to locate and map an earlier caldera. In the afternoon, gravity coring stations followed, and seismic profiling resumed in the evening. Seismic surveys between Nisyros, Kos, and Yali concluded on the morning of April 7. A total of five gravity cores were collected, aimed at capturing deposits from past volcanic eruptions. After the final station in the afternoon, the vessel transited for about five hours to the Santorini region. Throughout much of this transit and into the early afternoon of April 8, magnetometer measurements were conducted. That afternoon, the final seismic survey began. The area northeast of Santorini was of particular interest due to the noticeable concentration of earthquakes there since the beginning of the year. On April 9, operations shifted to the Christiana Basin southwest of Santorini to locate the presumed Archaeos Caldera. The magnetometer was redeployed the following morning, April 10. At 13:00, it was recovered, and the RV Maria S. Merian entered the Santorini caldera once more to conduct photogrammetric imaging of the inner caldera wall from aboard the ship. At 16:30 local time on April 10, the scientific program of expedition MSM135 officially concluded, and the return transit westward to Málaga began. The route ran south of the Peloponnese, through the Strait of Messina on April 12, and south of Sardinia on April 13. During this time, equipment on deck and in the labs was dismantled and packed. Multiple terabytes of data were also duplicated and secured. Upon entering the Alboran Sea on April 14, wind and wave activity increased—along with the ship’s movements—but this did not hinder the ongoing cleanup efforts. Just days earlier, the labs had been hubs of data acquisition; now they had become workspaces for writing reports and logs. On April 16, nearly a full day ahead of schedule, the ship docked at the pier in Málaga around midday. Given the upcoming Easter holidays, it had been uncertain whether unloading on the official final day of the expedition would be feasible. Everything went smoothly, and by the afternoon, the working deck was cleared of containers and equipment. On April 17, the main group bid farewell to Captain Maas and his crew—expedition MSM135 had come to an end.

Acknowledgements

We like to thank Captain Björn Maas and the professional crew of the RV MARIA S. MERIAN for their enthusiastic support during the entire cruise that enabled us to complete our working program in a good atmosphere on board. We would also like to thank the staff of the German Research Fleet Coordination Centre, the German Embassy in Athens, and Prof. Dr. Paraskevi Nomikou for their support before and during the expedition in all diplomatic matters.

Cruise Participants

Name	Discipline	Institution
Hübscher, Christian, Prof. Dr.	Marine Geophysics / Chief Scientist	UHH
Gros, Felix, Dr.	Hydroacoustics / Co-Chief Scientist	CAU
Kutterolf, Steffen, Dr.	Lead Volcanology	GEOMAR
Dittmers, Carina	Marine Geophysics	UHH
Ford, Jonathan, Dr.	Supervisor	UHH
Friedrich, Annalena	Marine Geophysics	UHH
Grob, Henrik, Dr.	Marine Geology/Geophysics	CAU
Haimerl, Benedikt	Marine Geophysics	UHH
Hartge, Matthias	Marine Geophysics	UHH
Ischebeck, Lisa	Marine Geophysics	UHH
Jähmlich, Heiko	Marine Geology/Geophysics	CAU
Kreh, Janina	Marine Geophysics	UHH
Lackner, Max	Marine Geophysics	UHH
Papazoi, Amalia-Georgia	Hydroacoustics	NKUA
Scheffler, Janne	Volcanolopgy	GEOMAR
Theden, Christian	Hydroacoustics/Volcanology	CAU
Vollert, Jannes	Media	CAU
Winter, Sven	Marine Geophysics	UHH
Wolf, Josephin	Media	CAU

UHH	University of Hamburg
CAU	Christian-Albrechts-Universität zu Kiel
GEOMAR	Helmholtz-Zentrum für Ozeanforschung Kiel
NKUA	National and Kapodistrian University of Athens

Station List

Seismic

Station Number MSM135_	MCS Profile	Start Date	Start Time (UTC)	Start Latitude (°N)	Start Longitude (°E)	End Date	End Time (UTC)	End Latitude (°N)	End Longitude (°E)
2-1+ 2-2	001A	10.03.	10:27	32°12.2'	23°31.90'	10.03	13:24	37°40.00'	23°59.00'
2-1+ 2-2	001B	10.03.	16:08	37 °34.12'	23° 33.21'	10.03	16:23	37° 35.27'	23° 32.80'
2-1+ 2-2	002+003	10.03.	16:23	37° 35.27'	23° 32.80'	10.03	19:09	37° 40.76'	23° 26.70'
2-1+ 2-2	004	10.03.	19:09	37° 40.76'	23° 26.70'	10.03	20:02	37°39.35'	23°23.23'
2-1+ 2-2	005	10.03.	20:02	37°39.35'	23°23.23'	10.03	21:04	37°40.32'	23°23.03'
2-1+ 2-2	006	10.03.	21:04	37°40.32'	23°23.03'	11.03	2:33	37°49.51'	23°24.48'
2-1+ 2-2	007	11.03.	2:33	37°49.51'	23°24.48'	11.03	3:33	37°45.02'	23°23.39'
2-1+ 2-2	008	11.03.	3:33	37°45.02'	23°23.39'	11.03	6:04	37°46.93'	23°11.70'
2-1+ 2-2	009	11.03.	6:04	37°46.93'	23°11.70'	11.03	8:40	37° 46.90'	23° 26.26'
2-1+ 2-2	010	11.03.	8:40	37° 46.90'	23° 26.26'	11.03	10:22	37° 51.87'	23° 29.64'
2-1+ 2-2	011	11.03.	10:22	37° 51.87'	23° 29.64'	11.03	11:43	37°47.27'	23°32.08'
2-1+ 2-2	012	11.03.	11:43	37°47.27'	23°32.08'	11.03	12:53	37°47.16'	23°35.70'
2-1+ 2-2	013	11.03.	12:53	37°47.16'	23°35.70'	11.03	14:01	37°45.45'	23°38.38'
2-1+ 2-2	014	11.03.	14:01	37°45.45'	23°38.38'	11.03	14:55	37°42.28'	23°39.91'
2-1+ 2-2	015	11.03.	14:55	37°42.28'	23°39.91'	11.03	16:23	37°42.50'	23°32.34'
2-1+ 2-2	016	11.03.	16:23	37°42.50'	23°32.34'	11.03	19:21	37°41.00'	23°31.22'
2-1+ 2-2	017	11.03.	19:21	37°41.00'	23°31.22'	11.03	21:08	37°33.77'	23°31.48'
2-1+ 2-2	018	11.03.	21:08	37°33.77'	23°31.48'	11.03	23:03	37°38.44'	23°25.54'
2-1+ 2-2	019	11.03.	23:03	37°38.44'	23°25.54'	12.03	0:22	37°36.81'	23°31.00'
2-1+ 2-2	020	12.03.	0:22	37°36.81'	23°31.00'	12.03	2:14	37°39.77'	23°21.46'
2-1+ 2-2	021	12.03.	2:14	37°39.77'	23°21.46'	12.03	3:44	37°37.97'	23°15.60'
2-1+ 2-2	022	12.03.	3:44	37°37.97'	23°15.60'	12.03	4:50	37°36.22'	23°15.73'
2-1+ 2-2	023	12.03.	4:50	37°36.22'	23°15.73'	12.03	6:14	37°40.16'	23°18.10'
2-1+ 2-2	024	12.03.	6:14	37°40.16'	23°18.10'	12.03	7:13	37°36.72'	23°16.03'
7-1+ 7-2	101	12.03.	18:03	37°35.14'	23°18.80'	12.03	19:59	37° 38.81'	23° 15.76'
7-1+ 7-2	102	12.03.	19:59	37° 38.81'	23° 15.76'	12.03	20:48	37°36.09'	23°16.94'
7-1+ 7-2	103	12.03.	20:48	37°36.09'	23°16.94'	12.03	21:13	37°38.39'	23°18.04'
7-1+ 7-2	103B	12.03.	21:13	37°38.39'	23°18.04'	12.03	21:48	37°39.50'	23°19.98'
7-1+ 7-2	104	12.03.	21:48	37°39.50'	23°19.98'	12.03	23:23	37°36.48'	23°12.35'
7-1+ 7-2	105	12.03.	23:23	37°36.48'	23°12.35'	13.03	3:31	37°56.64'	23°12.40'
7-1+ 7-2	106	13.03.	3:31	37°56.64'	23°12.40'	13.03	6:50	37°53.29'	23°04.02'
7-1+ 7-2	107	13.03.	6:50	37°53.29'	23°04.02'	13.03	8:42	37° 52.11'	23° 14.42'

7-1+ 7-2	108	13.03.	8:42	37° 52.11'	23° 14.42'	13.03	10:58	37°51.82'	23°02.06'
7-1+ 7-2	109	13.03.	10:58	37°51.82'	23°02.06'	13.03	11:37	37°53.75'	23°02.90'
7-1+ 7-2	110	13.03.	11:37	37°53.75'	23°02.90'	13.03	13:29	37°49.72'	23°09.56'
7-1+ 7-2	111	13.03.	13:29	37°49.72'	23°09.56'	13.03	15:43	37°40.49'	23°17.21'
7-1+ 7-2	112	13.03.	15:43	37°40.49'	23°17.21'	13.03	16:45	37°37.27'	23°17.04'
7-1+ 7-2	113	13.03.	16:45	37°37.27'	23°17.04'	13.03	17:45	37°37.64	23°10.49'
7-1+ 7-2	114	13.03.	17:45	37°37.64	23°10.49'	13.03	19:12	37° 38.45'	23° 19.70'
7-1+ 7-2	115	13.03.	19:12	37° 38.45'	23° 19.70'	13.03	20:07	37° 38.86'	23° 21.80'
7-1+ 7-2	116	13.03.	20:07	37° 38.86'	23° 21.80'	13.03	21:59	37° 40.02'	23° 17.76'
7-1+ 7-2	117	13.03.	21:59	37° 40.02'	23° 17.76'	13.03	23:14	37° 36.00'	23° 14.76'
7-1+ 7-2	118	13.03.	23:14	37° 36.00'	23° 14.76'	14.03	0:28	37°40.24'	23°17.37'
7-1+ 7-2	119	14.03.	0:28	37°40.24'	23°17.37'	14.03	1:45	37°36.70'	23°14.38'
7-1+ 7-2	120	14.03.	1:45	37°36.70'	23°14.38'	14.03	2:51	37°40.14'	23°16.73'
7-1+ 7-2	121	14.03.	2:51	37°40.14'	23°16.73'	14.03	4:10	37°37.02'	23°15.22'
7-1+ 7-2	122	14.03.	4:10	37°37.02'	23°15.22'	14.03	5:35	37°38.93'	23°21.86'
7-1+ 7-2	123	14.03.	5:35	37°38.93'	23°21.86'	14.03	7:03	37°36.15'	23°12.75'
10-2+ 10-3	201	14.03.	19:30	37° 01.45'	24° 34.51'	15.03	1:02	36°46.05'	24°18.63'
10-2+ 10-3	202	15.03.	1:02	36°46.05'	24°18.63'	15.03	1:58	36°46.78'	24°22.83'
10-2+ 10-3	203	15.03.	1:58	36°46.78'	24°22.83'	15.03	2:15	36°47.75'	24°23.84'
10-2+ 10-3	204	15.03.	2:15	36°47.75'	24°23.84'	15.03	2:36	36°44.87'	24°22.24'
10-2+ 10-3	205	15.03.	2:36	36°44.87'	24°22.24'	15.03	3:01	36°45.30'	24°20.00'
10-2+ 10-3	206	15.03.	3:01	36°45.30'	24°20.00'	15.03	3:32	36°45.34'	24°19.29'
10-2+ 10-3	207	15.03.	3:32	36°45.34'	24°19.29'	15.03	4:25	36°45.78'	24°23.57'
10-2+ 10-3	208	15.03.	4:25	36°45.78'	24°23.57'	15.03	4:56	36°45.38'	24°21.60'
10-2+ 10-3	209	15.03.	4:56	36°45.38'	24°21.60'	15.03	5:27	36°45.55'	24°23.82'
10-2+ 10-3	210	15.03.	5:27	36°45.55'	24°23.82'	15.03	5:42	36°44.96'	24°22.77'
10-2+ 10-3	211	15.03.	5:42	36°44.96'	24°22.77'	15.03	6:29	36°47.57'	24°20.28'
10-2+ 10-3	212	15.03.	6:29	36°47.57'	24°20.28'	15.03	7:22	36°35.23'	24°23.77'
10-2+ 10-3	213	15.03.	7:22	36°35.23'	24°23.77'	15.03	8:50	36°50.90'	24°21.16'
10-3 + 10-4	301	15.03.	9:57	36°51.66'	24°17.35'	15.03	12:48	36°58.47'	24°34.54'
10-3 + 10-4	302	15.03.	12:48	36° 49.72'	24° 36.54'	15.03	14:34	36° 49.72'	24° 36.54'
10-3 + 10-4	303	15.03.	14:34	36° 40.10'	24°33.64'	15.03	19:22	36° 40.10'	24°33.64'
10-3 + 10-4	304	15.03.	19:22	36°41.44'	24°34.74'	16.03	0:55	36°41.44'	24°34.74'
10-3 + 10-4	305	16.03.	0:55	36°42.96'	24°37.85'	16.03	5:23	36°42.96'	24°37.85'
10-3 + 10-4	306	16.03.	5:23	36°40.34'	24°37.36'	16.03	5:50	36°40.34'	24°37.36'
10-3 + 10-4	306B	16.03.	8:52	36°33.72'	24°34.87'	16.03	10:57	36°33.72'	24°34.87'
10-3 + 10-4	306B1	16.03.	11:55	36°38.26'	24°20.88'	16.03	15:35	36°38.26'	24°20.88'
10-3 + 10-4	307	16.03.	15:35	36° 29.30'	24° 09.28'	16.03	19:47	36° 29.30'	24° 09.28'
10-3 + 10-4	307B	16.03.	19:47	36°43.63'	24°14.63'	16.03	22:22	36°43.63'	24°14.63'
10-3 + 10-4	308	16.03.	22:22	36°49.72'	24°24.21'	17.03	0:18	36°49.72'	24°24.21'
10-3 + 10-4	309	17.03.	0:18	36°44.37'	24°17.91'	17.03	5:58	36°44.37'	24°17.91'
20-1 + 20-2	401	18.03.	14:56	35°43.19'	23°32.76'	18.03	18:04	35°28.74'	23°26.29'
20-1 + 20-2	402	18.03.	18:04	35°28.74'	23°26.29'	19.03	0:15	35°15.39'	23°83.33'

20-1 + 20-2	403+403B	19.03.	0:20	35°15.39'	23°83.33'	19.03	2:55	35°06.05'	24°09.39'
20-1 + 20-2	404	19.03.	2:55	35°06.05'	24°09.39'	19.03	7:17	35°10.55'	24°09.89'
20-1 + 20-2	405	19.03.	7:17	35°10.55'	24°09.89'	19.03	12:02	35°04.58'	24°27.05'
20-1 + 20-2	406	19.03.	12:02	35°04.58'	24°27.05'	19.03	14:14	35°04.38'	24°42.75'
20-1 + 20-2	407	19.03.	14:14	35°04.38'	24°42.75'	19.03	16:01	34°52.56'	24°44.14'
20-1 + 20-2	408	19.03.	16:01	34°52.56'	24°44.14'	19.03	20:18	35°04.82'	24°37.94'
20-1 + 20-2	409	19.03.	20:18	35°04.82'	24°37.94'	19.03	22:11	34°54.43'	24°35.43'
20-1 + 20-2	410	19.03.	22:11	34°54.43'	24°35.43'	20.03	1:08	35°06.51'	24°31.50'
20-1 + 20-2	411	20.03.	1:08	35°06.51'	24°31.50'	20.03	3:19	34°56.58'	24°30.19'
20-1 + 20-2	412	20.03.	3:19	34°56.58'	24°30.19'	20.03	5:18	34°57.91'	24°44.03'
20-1 + 20-2	413	20.03.	5:18	34°57.91'	24°44.03'	20.03	7:24	34°57.46'	24°28.00'
20-1 + 20-2	414	20.03.	8:00	34°57.46'	24°28.00'	20.03	10:12	35° 01.45'	24°43.90'
20-1 + 20-2	415	20.03.	10:12	35° 01.45'	24°43.90'	20.03	12:55	35°02.18'	24°27.52'
20-1 + 20-2	416	20.03.	12:55	35°02.18'	24°27.52'	20.03	15:27	35°03.55'	24°43.47'
20-1 + 20-2	417	20.03.	15:27	35°03.55'	24°43.47'	20.03	17:41	34°50.89'	24°42.42'
20-1 + 20-2	418	20.03.	17:41	34°50.89'	24°42.42'	20.03	23:19	34°52.79'	25°15.85'
20-1 + 20-2	419	20.03.	23:19	34°52.79'	25°15.85'	21.03	5:36	34°51.61'	24°39.54'
20-1 + 20-2	420	21.03.	5:36	34°51.61'	24°39.54'	21.03	9:21	34°50.77'	25°01.26'
20-1 + 20-2	421	21.03.	9:21	34°50.77'	025°01.26'	21.03	13:00	34°50.70'	24°39.65'
24-1 + 24-2	501	22.03.	15:48	34°27.11'	24°25.87'	22.03	17:24	35°27.95'	24°35.37'
24-1 + 24-2	502	22.03.	17:52	35°27.95'	24°35.37'	22.03	18:20	35°28.51'	24°39.79'
24-1 + 24-2	503	22.03.	21:02	35°28.51'	24°39.79'	23.03	5:18	35°24.70'	25°47.97'
24-1 + 24-2	504	23.03.	5:18	35°24.70'	25°47.97'	23.03	9:27	35° 14.90'	26° 11.20'
24-1 + 24-2	505	23.03.	9:27	35° 14.90'	26° 11.20'	23.03	14:11	35°25.33'	25°44.15'
24-1 + 24-2	506	23.03.	14:11	35°25.33'	25°44.15'	23.03	17:39	35°13.09'	25°59.62'
24-1 + 24-2	507	23.03.	17:39	35°13.09'	25°59.62'	23.03	19:45	35°13.61'	25°45.08'
24-1 + 24-2	508	23.03.	19:45	35°13.61'	25°45.08'	23.03	21:37	35°09.07'	25°45.31'
24-1 + 24-2	509	23.03.	21:37	35°09.07'	25°45.31'	23.03	23:37	35°17.18'	25°55.19'
24-1 + 24-2	510	23.03.	23:37	35°17.18'	25°55.19'	23.03	1:45	35°08.90'	25°45.44'
24-1 + 24-2	511	23.03.	1:45	35°08.90'	25°45.44'	24.03	6:26	35°16.08'	26°11.51'
24-1 + 24-2	512	24.03.	6:26	35°16.08'	26°11.51'	24.03	11:00	35°26.01'	25°45.89'
24-1 + 24-2	513	24.03.	11:00	35°26.01'	25°45.89'	24.03	17:49	35°26.50'	24°56.68'
31-1 + 31-2	601	25.03.	17:40	37°46.31'	23°18.42'	25.03	20:51	37° 46.91'	23° 18.67'
31-1 + 31-2	602	25.03.	20:51	37° 46.91'	23° 18.67'	25.03	23:36	37°47.33'	23°14.65'
31-1 + 31-2	603	25.03.	23:36	37°47.33'	23°14.65'	26.03	2:07	37°46.71'	23°11.94'
31-1 + 31-2	604	26.03.	2:07	37°46.71'	23°11.94'	26.03	4:12	37°45.78'	23°22.46'
31-1 + 31-2	605	26.03.	4:12	37°45.78'	23°22.46'	26.03	6:17	37°43.78'	23°11.75'
32-1 + 32-2	701	26.03.	9:11	37° 45.20'	23° 12.10'	26.03	11:14	37°36.87'	23°12.95'
32-1 + 32-2	702	26.03.	11:14	37°36.87'	23°12.95'	26.03	13:09	37°45.19'	23°13.49'
38-1 + 38-2	801	27.03.	17:19	36°49.60'	24°23.93'	27.03	20:13	36°53.93'	24°39.88'
38-1 + 38-2	802	27.03.	20:13	36°53.93'	24°39.88'	27.03	22:10	36°43.93'	24°43.14'
38-1 + 38-2	803	27.03.	22:10	36°43.93'	24°43.14'	27.03	23:48	36°42.19'	24°33,54'
38-1 + 38-2	804	27.03.	23:48	36°42.19'	24°33,54'	28.03	1:20	36°39.89'	24°41.12'
38-1 + 38-2	805	28.03.	1:20	36°39.89'	24°41.12'	28.03	2:32	36°43.97'	24°36.40'
38-1 + 38-2	806	28.03.	2:32	36°43.97'	24°36.40'	28.03	3:46	36°42.25'	24°35.30'
38-1 + 38-2	807	28.03.	3:46	36°42.25'	24°35.30'	28.03	6:06	36°40.68'	24°33.56'

42-1 + 42-2	901	28.03.	15:30	36°39.25'	24°31.69'	28.03	18:10	36°43.66'	24°41.37'
42-1 + 42-2	902	28.03.	18:10	36°43.66'	24°41.37'	28.03	19:48	36°40.76'	24°33.66'
42-1 + 42-2	903	28.03.	19:48	36°40.76'	24°33.66'	28.03	21:19	36°37.32'	24°28.36'
42-1 + 42-2	904	28.03.	21:19	36°37.32'	24°28.36'	28.03	23:01	36°39.87'	24°34.69'
42-1 + 42-2	905	28.03.	23:01	36°39.87'	24°34.69'	29.03	1:43	36°36.71'	24°18.51'
42-1 + 42-2	906	29.03.	1:43	36°36.71'	24°18.51'	29.03	2:33	36°39.58'	24°17.17'
42-1 + 42-2	907	29.03.	5:29	36°39.58'	24°17.17'	29.03	8:16	36°46.84'	24°21.22'
45-1 + 45-2	1001	30.03.	13:01	36°31.93'	25°27.43'	30.03	15:53	36°34.03'	25°17.91'
45-1 + 45-2	1002	30.03.	15:54	36°34.03'	25°17.91'	30.03	19:08	36°22.91'	25°17.58'
45-1 + 45-2	1003	30.03.	19:08	36°22.91'	25°17.58'	30.03	20:58	36°18.12'	25°05.84'
45-1 + 45-2	1004	30.03.	20:58	36°18.12'	25°05.84'	30.03	23:04	36°21.88'	25°19.84'
45-1 + 45-2	1005	30.03.	23:04	36°21.88'	25°19.84'	31.03	1:23	36°15.61'	25°05.19'
45-1 + 45-2	1006	31.03.	1:23	36°15.61'	25°05.19'	31.03	3:13	36°07.88'	25°13.07'
45-1 + 45-2	1007	31.03.	3:13	36°07.88'	25°13.07'	31.03	4:42	36°14.99'	25°07.03'
45-1 + 45-2	1008	31.03.	4:42	36°14.99'	25°07.03'	31.03	7:07	36°19.85'	25°22.32'
45-1 + 45-2	1009	31.03.	7:07	36°19.85'	25°22.32'	31.03	8:44	36°15.72'	25°12.55'
45-1 + 45-2	1010	31.03.	8:44	36°15.72'	25°12.55'	31.03	10:40	36°19.31'	25°23.93'
45-1 + 45-2	1011	31.03.	10:40	36°19.31'	25°23.93'	31.03	13:41	36°10.44'	25°07.39'
45-1 + 45-2	1012	31.03.	13:41	36°10.44'	25°07.39'	31.03	17:04	36°18.81'	25°25.36'
45-1 + 45-2	1013	31.03.	17:04	36°18.81'	25°25.36'	31.03	20:28	36°08.19'	25°15.44'
45-1 + 45-2	1014	31.03.	20:28	36°08.19'	25°15.44'	31.03	22:49	36°20.00'	25°07.68'
45-1 + 45-2	1015	31.03.	22:49	36°20.00'	25°07.68'	31.03	23:51	36°16.03'	25°12.09'
45-1 + 45-2	1016	31.03.	23:51	36°16.03'	25°12.09'	31.03	0:47	36°12.80'	25°10.28'
45-1 + 45-2	1017	31.03.	0:47	36°12.80'	25°10.28'	01.04.	3:08	36°10.23'	25°19.37'
45-1 + 45-2	1018	01.04.	3:08	36°10.23'	25°19.37'	01.04.	5:20	36°21.64'	25°13.70'
45-1 + 45-2	1019	01.04.	5:20	36°21.64'	25°13.70'	01.04.	7:18	36°12.17'	25°20.24'
45-1 + 45-2	1020	01.04.	7:18	36°12.17'	25°20.24'	01.04.	9:26	36°23.11'	25°15.81'
45-1 + 45-2	1021	01.04.	9:26	36°23.11'	25°15.81'	01.04.	11:48	36°14.85'	25°27.37'
45-1 + 45-2	1022	01.04.	11:48	36°14.85'	25°27.37'	01.04.	14:42	36°20.22'	25°07.97'
45-1 + 45-2	1023	01.04.	14:42	36°20.22'	25°07.97'	01.04.	18:17	36°16.78'	25°33.09'
45-1 + 45-2	1024	01.04.	18:17	36°16.78'	25°33.09'	01.04.	20:47	36°27.15'	25°35.17'
45-1 + 45-2	1025	01.04.	20:47	36°27.15'	25°35.17'	01.04.	23:24	36°36.20'	25°20.71'
45-1 + 45-2	1026	01.04.	23:24	36°36.20'	25°20.71'	02.04.	1:55	36°25.91'	25°32.71'
45-1 + 45-2	1027	02.04.	1:55	36°25.91'	25°32.71'	02.04.	4:17	36°34.45'	25°19.53'
45-1 + 45-2	1028	02.04.	4:17	36°34.45'	25°19.53'	02.04.	8:00	36°45.78'	25°37.40'
45-1 + 45-2	1029	02.04.	8:00	36°45.78'	25°37.40'	02.04.	10:27	36°32.93'	25°45.71'
45-1 + 45-2	1030	02.04.	10:27	36°32.93'	25°45.71'	02.04.	12:27	36°36.14'	25°33.70'
45-1 + 45-2	1031	02.04.	12:27	36°36.14'	25°33.70'	02.04.	16:43	36°42.22'	25°54.65'
45-1 + 45-2	1032	02.04.	16:43	36°42.22'	25°54.65'	02.04.	18:12	36°49.65'	25°56.69'
45-1 + 45-2	1033	02.04.	18:12	36°49.65'	25°56.69'	02.04.	19:39	36°48.16'	26°07.13'
45-1 + 45-2	1034	02.04.	19:39	36°48.16'	26°07.13'	02.04.	21:37	36°57.24'	26°12.04'
45-1 + 45-2	1035	02.04.	21:37	36°57.24'	26°12.04'	03.04.	0:14	36°58.79'	26°25.11'
45-1 + 45-2	1036	03.04.	0:14	36°58.79'	26°25.11'	03.04.	2:16	36°59.19'	26°33.83'
45-1 + 45-2	1037	03.04.	2:16	36°59.19'	26°33.83'	03.04.	5:41	36°50.06'	26°11.28'
45-1 + 45-2	1038	03.04.	5:41	36°50.06'	26°11.28'	03.04.	10:00	36°41.40'	25°47.11'
53-1 + 53-2	1101	04.04.	13:17	36°52.92'	26°51.54'	04.04.	15:16	36°46.44'	26°52.36'

53-1 + 53-2	1102	04.04.	15:16	36°46.44'	26°52.36'	04.04.	18:51	36°25.99'	26°59.62'
53-1 + 53-2	1103	04.04.	18:51	36°25.99'	26°59.62'	04.04.	22:17	36°45.35'	27°01.37'
53-1 + 53-2	1104	04.04.	22:17	36°45.35'	27°01.37'	04.04.	23:59	36°35.93'	27°02.97'
53-1 + 53-2	1105	04.04.	23:59	36°35.93'	27°02.97'	05.04.	1:40	36°45.16'	27°04.40'
53-1 + 53-2	1106	05.04.	1:40	36°45.16'	27°04.40'	05.04.	2:59	36°38.24'	27°05.35'
53-1 + 53-2	1107	05.04.	2:59	36°38.24'	27°05.35'	05.04.	4:04	36°39.27'	26°58.44'
53-1 + 53-2	1108	05.04.	4:04	36°39.27'	26°58.44'	05.04.	5:02	36°40.34'	27°04.78'
53-1 + 53-2	1109	05.04.	5:02	36°40.34'	27°04.78'	05.04.	6:02	36°41.82'	26°58.74'
53-1 + 53-2	1110	05.04.	6:02	36°41.82'	26°58.74'	05.04.	8:00	36°41.02'	26°59.24'
53-1 + 53-2	1111	05.04.	8:00	36°41.02'	26°59.24'	05.04.	10:00	36°41.02'	26°59.24'
53-1 + 53-2	1112	05.04.	10:00	36°41.02'	26°59.24'	05.04.	11:35	36°41.19'	26°08.11'
53-1 + 53-2	1113	05.04.	11:35	36°41.19'	26°08.11'	05.04.	13:19	36°48.57'	27°15.65'
53-1 + 53-2	1114	05.04.	13:19	36°48.57'	27°15.65'	05.04.	15:39	36°37.53'	27°11.81'
53-1 + 53-2	1115	05.04.	15:39	36°37.53'	27°11.81'	05.04.	16:58	36°36.40'	27°12.60'
53-1 + 53-2	1116	05.04.	16:58	36°36.40'	27°12.60'	05.04.	18:14	36°35.66'	27°13.18'
53-1 + 53-2	1117	05.04.	18:14	36°35.66'	27°13.18'	05.04.	20:13	36°33.44'	27°12.16'
53-1 + 53-2	1118	05.04.	20:13	36°33.44'	27°12.16'	05.04.	22:22	36°33.35'	27°07.80'
53-1 + 53-2	1119	05.04.	22:22	36°33.35'	27°07.80'	06.04.	0:01	36°34.55'	27°59.53'
53-1 + 53-2	1120	06.04.	0:01	36°34.55'	27°59.53'	06.04.	1:32	36°36.55'	27°06.48'
53-1 + 53-2	1121	06.04.	1:32	36°36.55'	27°06.48'	06.04.	4:48	36°31.69'	27°06.73'
53-1 + 53-2	1122	06.04.	4:48	36°31.69'	27°06.73'	06.04.	7:10	36°44.75'	27°00.74'
53-1 + 53-2	1123	06.04.	7:10	36°44.75'	27°00.74'	06.04.	9:09	36°43.11'	27°11.76'
53-1 + 53-2	1124	06.04.	9:09	36°43.11'	27°11.76'	06.04.	12:01	36°43.71'	27°57.50'
57-1 + 57-2	1201	06.04.	17:18	36°36.48'	27°16.66'	06.04.	18:29	36°37.83'	27°11.17'
57-1 + 57-2	1202	06.04.	18:29	36°37.83'	27°11.17'	06.04.	19:25	36°40.31'	27°10.27'
57-1 + 57-2	1203	06.04.	19:25	36°40.31'	27°10.27'	06.04.	20:12	36°37.29'	27°09.10'
57-1 + 57-2	1204	06.04.	20:12	36°37.29'	27°09.10'	06.04.	20:50	36°39.82'	27°09.25'
57-1 + 57-2	1205	06.04.	20:50	36°39.82'	27°09.25'	06.04.	21:32	36°37.17'	27°07.96'
57-1 + 57-2	1206	06.04.	21:32	36°37.17'	27°07.96'	06.04.	22:08	36°39.05'	27°08.33'
57-1 + 57-2	1207	06.04.	22:08	36°39.05'	27°08.33'	06.04.	23:12	36°39.03'	27°08.33'
57-1 + 57-2	1208	06.04.	23:12	36°39.03'	27°08.33'	06.04.	23:59	36°37.77'	27°06.78'
57-1 + 57-2	1209	06.04.	23:59	36°37.77'	27°06.78'	07.04.	0:48	36°37.84'	27°12.23'
57-1 + 57-2	1210	07.04.	0:48	36°37.84'	27°12.23'	07.04.	1:40	36°36.44'	27°06.15'
57-1 + 57-2	1211	07.04.	1:40	36°36.44'	27°06.15'	07.04.	2:49	36°40.37'	27°02.73'
57-1 + 57-2	1212	07.04.	2:49	36°40.37'	27°02.73'	07.04.	4:00	36°45.35'	27°03.80'
57-1 + 57-2	1213	07.04.	4:00	36°45.35'	27°03.80'	07.04.	6:41	36°33.70'	27°06.83'
63-1 + 63-2	1301	08.04.	12:09	36°43.36'	25°35.24'	08.04.	14:54	36°29.67'	25°27.08'
63-1 + 63-2	1302	08.04.	14:54	36°29.67'	25°27.08'	08.04.	18:23	36°45.28'	25°37.64'
63-1 + 63-2	1303	08.04.	18:23	36°45.28'	25°37.64'	08.04.	20:11	36°37.91'	25°46.78'
63-1 + 63-2	1304	08.04.	20:11	36°37.91'	25°46.78'	08.04.	22:50	36°41.02'	25°29.79'
63-1 + 63-2	1305	08.04.	22:50	36°41.02'	25°29.79'	09.04.	1:25	36°31.78'	25°44.72'
63-1 + 63-2	1306	09.04.	1:25	36°31.78'	25°44.72'	09.04.	3:50	36°21.83'	25°39.94'
63-1 + 63-2	1307	09.04.	3:50	36°21.83'	25°39.94'	09.04.	5:30	36°27.55'	25°34.67'
63-1 + 63-2	1308	09.04.	5:30	36°27.55'	25°34.67'	09.04.	6:52	36°25.05'	25°41.86'
63-1 + 63-2	1309	09.04.	6:52	36°25.05'	25°41.86'	09.04.	10:11	36°37.91'	25°23.23'
63-1 + 63-2	1310	09.04.	10:11	36°37.91'	25°23.23'	09.04.	13:02	36°28.49'	25°40.86'

63-1 + 63-2	1311	09.04.	13:02	36°28.49'	25°40.86'	09.04.	14:33	36°19.27'	25°31.21'
63-1 + 63-2	1312	09.04.	14:33	36°19.27'	25°31.21'	09.04.	18:57	36° 04.45'	25°10.44'
63-1 + 63-2	1313	09.04.	18:57	36° 04.45'	25°10.44'	09.04.	21.59	36°14.61'	25°18.21'
63-1 + 63-2	1314	09.04.	21.59	36°14.61'	25°18.21'	09.04.	23:24	36°17.12'	25°24.19'
63-1 + 63-2	1315	09.04.	23:24	36°17.12'	25°24.19'	10.04.	0:46	36°17.74'	25°14.37'
63-1 + 63-2	1316	10.04.	0:46	36°17.74'	25°14.37'	10.04.	2:26	36°16.47'	25°24.16'
63-1 + 63-2	1317	10.04.	2:26	36°16.47'	25°24.16'	10.04.	3:45	36°14.54'	25°15.59'
63-1 + 63-2	1318	10.04.	3:45	36°14.54'	25°15.59'	10.04.	5:49	36°19.12'	25°18.04'
63-1 + 63-2	1319	10.04.	5:49	36°19.12'	25°18.04'	10.04.	6:54	36°14.38'	25°23.02'

Magnetic

Station Number MSM135_	MAG Leg	Start Date	Start Time (UTC)	Start Latitude (°N)	Start Longitude (°E)	End Date	End Time (UTC)	End Latitude (°N)	End Longitude (°E)
19-1	Leg_A	17.03.	17:09	36° 33,763'	024° 36,330'	18.03.	7:05	36° 50,618'	024° 25,063'
31-3	Leg_B	25.03.	16:57	37° 45,201'	023° 15,493'	26.03.	6:56	37° 45,512'	023° 12,873'
32-3	Leg_C	26.03.	9:35	37° 43,781'	023° 11,319'	26.03.	13:30	37° 45,627'	023° 14,961'
35-1	Leg_D	27.03.	8:40	36° 52,685'	024° 31,046'	27.03.	10:25	36° 57,956'	024° 34,292'
37-1	Leg_E	27.03.	12:19	36° 53,230'	024° 34,432'	10.03.	14:07	36° 53,030'	024° 30,239'
41-1 + 42-3	Leg_F	28.03.	10:14	36° 42,702'	024° 37,249'	29.03.	4:46	36° 46,304'	024° 19,006'
49-1	Leg_G	03.04.	2:33	36° 44,317'	025° 45,102'	04.04.2025	7:26	36° 32,728'	025° 42,619'
62-1	Leg_H	07.04.	17:47	37° 00,546'	026° 36,439'	08.04.2026	11:12	36° 40,498'	025° 35,146'
65-1	Leg_I	10.04.	8:06	36° 16,675'	025° 20,747'	04.04.2027	11:16	36° 20,023'	025° 20,875'

Gravity Core Stations

Station Number MSM135_	Event Time	Length	Depth (m)	Latitude (deg)	Longitude (deg)
11-1	17.03. 09:39	5m	263	36° 42,00'N	24° 40,57'E
3-1	12.03. 09:17	5m	257	37° 35,71'N	23° 28,63'E
3-3	12.03. 10:02	5m	259	37° 35,68'N	23° 28,69'E
4-1	12.03. 12:03	10m	230	37° 41,37'N	23° 37,15'E
5-1	12.03. 13:53	10m	222	37° 37,92'N	23° 31,85'E
6-1	12.03.2025 15:43	10m	391	37° 36,60'N	23° 16,23'E
8-1	14.03.2025 08:38	10m	415	37° 38,40'N	23° 14,20'E
9-1	14.03.2025 09:57	10m	358	37° 39,46'N	23° 12,32'E
12-1	17.03.2025 10:37	5m	237	36° 42,09'N	24° 39,73'E
13-1	17.03.2025 11:30	5m	215	36° 42,12'N	24° 39,44'E
14-1	17.03.2025 12:19	5m	174	36° 42,17'N	24° 38,82'E
15-1	17.03.2025 13:02	5m	229	36° 41,85'N	24° 37,67'E
16-1	17.03.2025 14:07	5m	229	36° 42,04'N	24° 37,68'E
17-1	17.03.2025 14:49	5m	212	36° 41,15'N	24° 35,32'E
18-1	17.03.2025 16:19	5m	314	36° 33,24'N	24° 37,23'E
26-1	25.03.2025 11:04	5m	301	37° 38,78'N	23° 18,79'E
27-1	25.03.2025 12:16	5m	151	37° 38,36'N	23° 17,51'E
28-1	25.03.2025 12:56	5m	201	37° 37,57'N	23° 17,25'E
29-1	25.03.2025 13:53	10m	300	37° 38,78'N	23° 18,77'E
30-1	25.03.2025 16:04	10m	150	37° 44,99'N	23° 14,78'E

33-1	26.03.2025 14:39	5m	161	37° 38,15'N	23° 18,45'E
34-1	27.03.2025 06:29	10m	258	36° 41,87'N	24° 40,33'E
39-1	28.03.2025 07:57	10m	288	36° 35,21'N	24° 36,75'E
40-1	28.03.2025 09:31	5m	136	36° 43,41'N	24° 38,33'E
54-1	06.04.2025 13:54	10m	434	36° 28,96'N	27° 8,85'E
55-1	06.04.2025 15:20	10m	354	36° 32,32'N	27° 15,06'E
56-2	06.04.2025 16:21	10m	315	36° 34,76'N	27° 17,00'E
58-1	07.04.2025 07:52	10m	294	36° 29,06'N	27° 11,71'E
59-1	07.04.2025 08:48	5m	328	36° 29,94'N	27° 11,63'E
60-1	07.04.2025 10:22	10m	389	36° 32,78'N	27° 20,50'E
61-1	07.04.2025 12:50	10m	358	36° 40,96'N	27° 5,05'E
61-2	07.04.2025 13:28	5m	358	36° 40,96'N	27° 5,05'E