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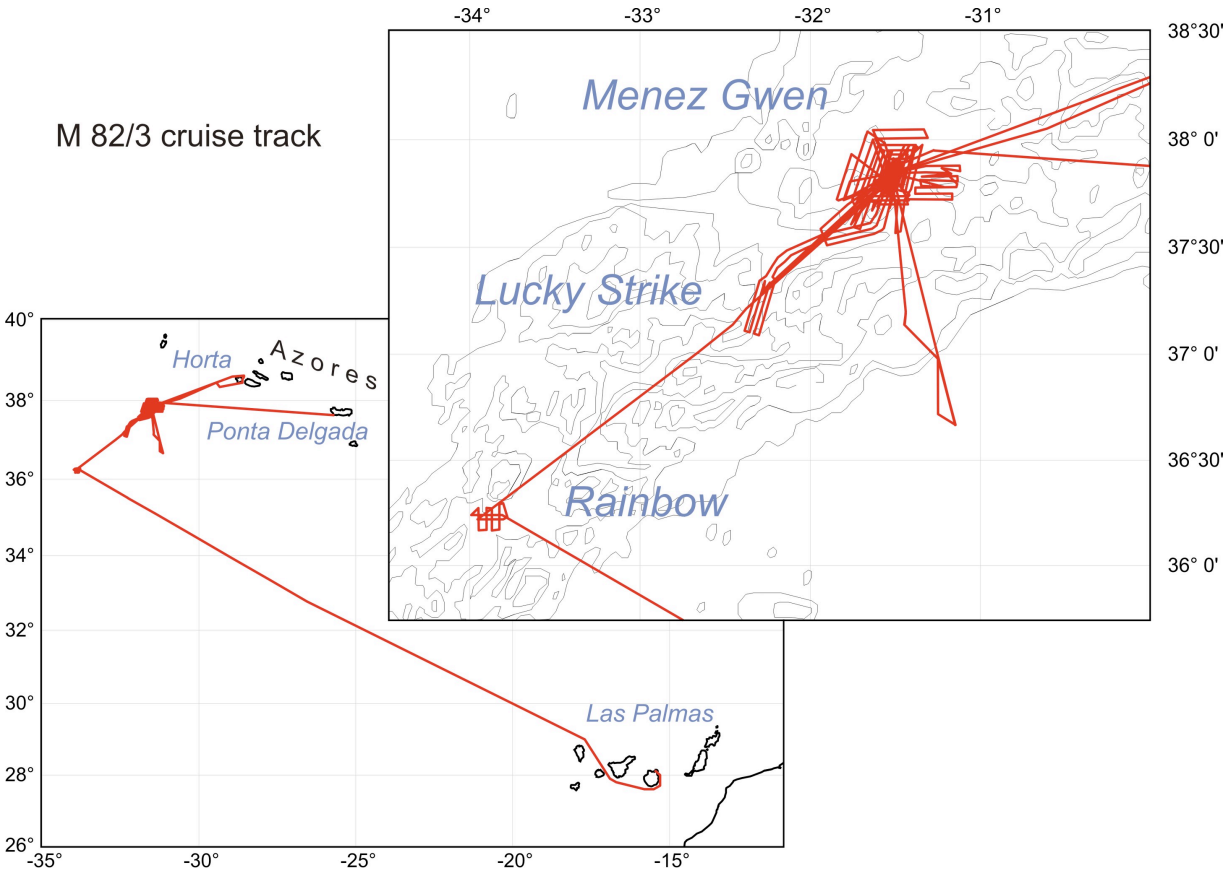
Short Cruise Report

Meteor Cruise No. 82, Leg 3

06.09. – 11.10.2010
Ponta Delgada (Portugal) – Las Palmas (Spain)

Chief Scientist: Dr. Nicole Dubilier
Captain: Walter Baschek



1.1 Objectives

The MenezMAR M82/3 cruise with the RV Meteor focused on the geology, chemistry, and biology of the Menez Gwen hydrothermal vent field at 37°N on the Mid-Atlantic Ridge (MAR). Menez Gwen was chosen as a key study site for interdisciplinary studies within the DFG Cluster of Excellence research on hydrothermal vents at

MARUM, Bremen (Research Area Geo-Biosphere Interactions). The goal of Meteor cruise M 82/3 was to gain a better understanding of the hydrothermal processes at the young Menez Gwen volcanic system. Such young systems are of particular interest because their chemistry and biology can change very rapidly and only very little is known about how vents evolve over time on slow-spreading ridges such as the MAR. Closely integrated geochemical and biological sampling with the Remotely Operated Vehicle (ROV) Quest (MARUM) together with interdisciplinary analyses on board provided the basis for research on the following major questions of the cruise:
- Why are methane concentrations at Menez Gwen so unusually high for a basalt-hosted system?
- How does conductive heating of seawater and conductive cooling of hydrothermal fluids contribute to the composition of diffuse fluids and how do these processes influence the composition of the microbial biota?
- What are the dominant geofuels in the subsurface, surface, and plume of Menez Gwen and how do these influence the microbial community in these environments?
- Has the fluid composition at Menez Gwen changed since the discovery of this geologically young vent field in 1994?

1.2 Narrative

06th September: Left Ponta Delgada at 12:00. Transit to Menez Gwen with test deployments of the CTD and release transponders en route.
07th September: Arrived at the working area at 37° 51.85' N, 31° 32.10' W at ca. 20:30 and began bathymetry profiling.
08th – 10th September: Station work at the Menez Gwen volcano at the northern end of the main rift valley with three ROV dives, CTD stations, a test deployment of the instrument shuttle (lift) and two all-night bathymetry surveys. Left the Menez Gwen working area on 10th September at 20:15 for a port stop in Horta.
11th September: Arrived around 10:00 in Horta, exchanged five scientists and took on additional equipment of the University of the Azores. Left port 17:00 and returned to Menez Gwen working area.
12th – 14th September: Resumed station work with three ROV dives of which one was accompanied by a lift deployment. CTD stations on the small volcano and four multibeam echosounder surveys were used for mapping of gas bubble flares associated with venting in the rift valley and the periphery of the Menez Gwen segment.
15th – 16th September: Multibeam surveys and CTD work at the Lucky Strike hydrothermal vent at 37° 20’ N, 32° 15’ W.
17th - 23th September: Station work at the small Menez Gwen volcano with five ROV dives accompanied by two lift deployments. CTD work and five multibeam echosounder surveys for gas bubble flare detection and location of the sources emitting the gas bubbles.
24th September: Aborted ROV dive in the morning after technical problems. Calibration tests of the multibeam echosounder as requested by the R/V METEOR

coordinating office (Leitstelle) in deep off-ridge waters S-E of the working area around 36° 40' N, 31° 09' W.
25th - 30th September: Station work on the small Menez Gwen volcano with six ROV dives, CTD work, deployments of two moored cages for in situ experiments with mussels and seven gas bubble surveys with the multibeam echosounder.
01st – 5th October: Station work on the Menez Gwen volcano as above with ROV, lift and CTD. CTD/MAPR tow-yows and multibeam echosounder surveys in the southern rift valley and along the eastern rift valley walls. On 02nd October detection of the new "Bubbylon" vents with an ROV dive at 37° 48.8' N, 31° 32.24' W. In the morning of 5th October, aborted last ROV dive (#23) because of bad weather. Left Menez Gwen at noon and headed towards the Rainbow hydrothermal vent field.
06th October: 00:30 Arrival at Rainbow at 36° 13.16' N, 33° 57.28' W; multibeam echosounder survey until 10:40. In the evening a final CTD cast at 35° 30.83' N, 32° 16.03' W and end of station work at 19:40. Left Rainbow with direction Las Palmas.
07th – 09th October: Transit.
10th October: Arrived in the early morning on roadstead Las Palmas and entered harbor at 08:00.

1.3 Summary

The main research goals for the MenezMar cruise were achieved thanks to the excellent team work with the RV Meteor crew and Captain, the ROV Quest Team, the scientific crew, the good weather conditions, and the Portuguese authorities that allowed us to work in their waters. A total of 23 ROV dives were used for video mosaicking of hydrothermal vent habitats, detailed measurements of physico-chemical environmental parameters with various state of the art in situ instruments, coordinated sampling of hot and diffuse hydrothermal vent fluids, macro- and microbiota and geological samples, performance of various biological in situ experiments, and the recovery of experiments deployed during a preceding R/V POSEIDON cruise in August 2010. A further milestone of the cruise was the discovery of a new hydrothermal vent site about 5 kilometers away from the known vent field Menez Gwen by gas bubble flare detection with R/V METEOR's new EM 122 multibeam echosounder in combination with the analyses of water column-sample and sensor data. Only a single ROV dive with QUEST was needed to locate the site on the seafloor, and hot smokers and animals typically found at vents on the Mid-Atlantic Ridge were discovered. Gas bubble analyses revealed at least five other vent plumes in the vicinity, indicating that many more of these small active sites exist along the Mid-Atlantic Ridge than previously assumed.

1.4 Acknowledgements

We thank Captain Walter Baschek, his officers and the crew of RV METEOR for their support of our program and for creating a very friendly and professional work atmosphere on board. Ship time of R/V METEOR was provided by the German

Science Foundation (DFG) within the core program METEOR/MERIAN. Financial support of the cruise program was provided by the Geosphere-Biosphere Interactions project within the DFG funded Cluster of Excellence “The Ocean in the Earth System” at MARUM, Bremen. We also benefited from the participation of Ana Colaço and Silvia Lino from the University of the Azores (Portugal), Stephane Hourdez from the Biological Station Roscoff (France), and Nadine LeBris, Frank Lartaud and Leonardo Contreira from the Laboratory of Biological Oceanography of Banyuls (France) who considerably contributed to the scientific success of the cruise. We gratefully acknowledge all this support.

2. Participants

06. – 11.09. 2010, Ponta Delgada - Horta

Name	Disciplin	Institution
Nicole Dubilier	Chief Scientist	MPI/MARUM
Ana Colaço	Zoology	IMAR
Christian Borowski	Symbiosis	MPI/MARUM
Dennis Fink	Symbiosis	MPI
Christian Lott	Symbiosis	MPI
Eoghan Reeves	In situ samplers	MARUM
Xavier Prieto Mollar	Gas chemistry	MARUM
Julia Köhler	CTD	MPI
Philipp Hach	Fluid chemistry	MPI/JUB
Anke Meyerdierks	Molecular microbiology	MPI
Matthias Winkel	Microbial ecology	MPI
Christian dos Santos Ferreira	Bathymetry/Gas flare detection	MARUM
Yann Marcon	GIS, Mimosa, Video Mosaicking	MARUM
Sven Petersen	Geology	IFM-GEOMAR
Stephane Hourdez	In situ mass spec, Physiology	ROSCOFF
Nadine LeBris	In situ sensors	BANYULS
Leonardo Contreira	In situ sensors	BANYULS
Tomas Wilkop	Lift shuttle	MPI
Florian Guthknecht	Film Team	Flowmotion Film
Michael Boxrucker	Film Team	Flowmotion Film
Julian Arayapong	Film Team	Flowmotion Film
Volker Ratmeyer	ROV Team	MARUM
Michael Reuter	ROV Team	MARUM
Ralf Rehage	ROV Team	MARUM
Marcel Zarrouk	ROV Team	MARUM
Christian Reuter	ROV Team	MARUM
Anh Hong Mai	ROV Team	MARUM
Phillip Franke	ROV Team	MARUM
Hauke Büttner	ROV Team	MARUM
Thorsten Truscheit	Technik Meteorologie	DWD

11.09.- 11.10.2010, Horta – Las Palmas

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Dennis Fink	Symbiosis	MPI
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Eoghan Reeves	In situ samplers	MARUM
Xavier Prieto Mollar	Gas chemistry	MARUM
Julia Köhler	CTD	MPI
Philipp Hach	Fluid chemistry	MPI/JUB
Anke Meyerdierks	Molecular microbiology	MPI
Matthias Winkel	Microbial ecology	MPI
Heide Schulz	Microbiology	MPI
Christian dos Santos Ferreira	Bathymetry/Gas flare detection	MARUM
Yann Marcon	GIS, Mimosa, Video Mosaicking	MARUM

Sven Petersen	Geology	IFM-GEOMAR
Stephane Hourdez	In situ mass spec, Physiology	ROSCOFF
Charles Vidoudez	In situ mass spec	MPI
Frank Lartaud	In situ sensors	BANYULS
Leonardo Contreira	In situ sensors	BANYULS
Tomas Wilkop	Lift shuttle	MPI/Harvard
Michael Hentscher	Thermodynamics	MARUM
Volker Ratmeyer	ROV Team	MARUM
Michael Reuter	ROV Team	MARUM
Ralf Rehage	ROV Team	MARUM
Marcel Zarrouk	ROV Team	MARUM
Christian Reuter	ROV Team	MARUM
Anh Hong Mai	ROV Team	MARUM
Phillip Franke	ROV Team	MARUM
Hauke Büttner	ROV Team	MARUM
Thorsten Truscheit	Technik Meteorologie	DWD

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3. Stationlist

Station	Date	Time (UTC)	Position	Water depth (m)	Gear	Comment
ME823/680-1	07.09.2010	13:34	37° 57.02' N, 31° 16.49' W	2640.9	CTD/Rosette	At depth
ME823/681-1	07.09.2010	15:30	37° 57.04' N, 31° 16.56' W	2638.3	Posidonia releaser	Test at depth
ME823/682-1	07.09.2010	20:55	37° 51.85' N, 31° 32.10' W	1034.7	Multibeam profile	Begin profile
ME823/683-1	08.09.2010	08:23	37° 50.64' N, 31° 31.15' W	822	LIFT	Lift test at surface
ME823/684-1	08.09.2010	15:10	37° 50.57' N, 31° 31.15' W	743	ROV	On Seafloor
ME823/685-1	08.09.2010	20:30	37° 48.10' N, 31° 32.48' W	928.7	Multibeam profile	Begin profile
ME823/686-1	09.09.2010	12:02	37° 50.92' N, 31° 31.31' W	-	ROV	On Seafloor
ME823/687-1	09.09.2010	21:57	37° 50.11' N, 31° 31.49' W	987	CTD/Rosette	At depth
ME823/688-1	10.09.2010	00:25	37° 49.60' N, 31° 31.68' W	1017.5	CTD/Rosette	At depth
ME823/689-1	10.09.2010	02:32	37° 54.87' N, 31° 28.71' W	1557.9	Multibeam profile	Begin profile
ME823/690-1	10.09.2010	11:03	37° 50.69' N, 31° 31.29' W	860	ROV	On Seafloor
ME823/691-1	12.09.2010	10:23	37° 50.68' N, 31° 31.24' W	835	ROV	On Seafloor

ME823/692-1	12.09.2010	20:50	37° 50.17' N, 31° 31.69' W	983.7	Multibeam profile	Begin profile
ME823/693-1	13.09.2010	01:26	37° 50.68' N, 31° 31.16' W	819.1	CTD/Rosette	At depth
ME823/694-1	13.09.2010	03:20	37° 50.42' N, 31° 31.28' W	887.5	CTD/Rosette	At depth
ME823/695-1	13.09.2010	04:24	37° 50.75' N, 31° 35.06' W	1198.6	Multibeam profile	Begin profile
ME823/696-1	13.09.2010	08:21	37° 50.66' N, 31° 31.17' W	818.8	LIFT	On bottom
ME823/697-1	13.09.2010	09:46	37° 50.64' N, 31° 31.19' W	805.1	ROV	On Seafloor
ME823/698-1	13.09.2010	21:31	37° 50.67' N, 31° 31.13' W	839.1	CTD/Rosette	At depth
ME823/699-1	13.09.2010	22:52	37° 46.32' N, 31° 31.72' W	1094	Multibeam profile	Begin profile
ME823/700-1	14.09.2010	06:27	37° 50.75' N, 31° 31.57' W	988.1	LIFT	Off bottom
ME823/701-1	14.09.2010	09:34	37° 50.68' N, 31° 31.11' W	842	ROV	On Seafloor
ME823/702-1	14.09.2010	16:52	37° 50.68' N, 31° 31.16' W	820.3	CTD/Rosette	At depth
ME823/703-1	14.09.2010	18:05	37° 48.33' N, 31° 37.60' W	1641.1	Multibeam profile	Begin profile
ME823/704-1	15.09.2010	14:44	37° 50.68' N, 31° 31.16' W	821.8	CTD/Rosette	At depth
ME823/705-1	15.09.2010	19:44	37° 50.48' N, 31° 32.62' W	839.9	CTD/Rosette	At depth
ME823/706-1	15.09.2010	21:05	37° 46.33' N, 31° 33.48' W	1223.3	Multibeam profile	Begin profile
ME823/707-1	16.09.2010	16:22	37° 17.50' N, 32° 16.50' W	1632.7	CTD/Rosette	At depth
ME823/708-1	16.09.2010	21:27	37° 20.11' N, 32° 14.26' W	2187.1	Multibeam profile	Begin profile
ME823/709-1	17.09.2010	13:52	37° 50.68' N, 31° 31.12' W	845	ROV	On Seafloor
ME823/710-1	17.09.2010	22:05	37° 54.62' N, 31° 32.36' W	1389.5	Multibeam profile	Begin profile
ME823/711-1	18.09.2010	07:00	37° 50.68' N, 31° 31.16' W	821.8	CTD/Rosette	At depth
ME823/712-1	18.09.2010	10:13	37° 50.71' N, 31° 31.14' W	844	ROV	On Seafloor
ME823/713-1	18.09.2010	19:34	37° 57.04' N, 31° 26.43' W	1900.3	Multibeam profile	Begin profile
ME823/714-1	19.09.2010	07:57	37° 50.65' N, 31° 31.17' W	817.1	LIFT	On bottom
ME823/715-1	19.09.2010	09:28	37° 50.65' N, 31° 31.17' W	815	ROV	On Seafloor
ME823/716-1	19.09.2010	22:13	37° 50.67' N, 31° 31.20' W	811.8	CTD/Rosette	At depth
ME823/717-1	20.09.2010	00:30	37° 43.23' N, 31° 43.21' W	-	Multibeam profile	Begin profile
ME823/718-1	20.09.2010	07:18	37° 50.67' N, 31° 31.15' W	822.9	CTD/Rosette	At depth

ME823/719-1	20.09.2010	10:04	37° 50.61' N, 31° 31.20' W	835	ROV	On Seafloor
ME823/720-1	20.09.2010	19:23	37° 58.51' N, 31° 26.80' W	2040.2	Multibeam profile	Begin profile
ME823/721-1	21.09.2010	07:16	37° 50.34' N, 31° 31.33' W	804	LIFT	Off bottom
ME823/722-1	21.09.2010	09:19	37° 50.68' N, 31° 31.20' W	811	ROV	On Seafloor
ME823/723-1	21.09.2010	19:52	37° 49.26' N, 31° 33.85' W	956.5	Multibeam profile	Begin profile
ME823/724-1	22.09.2010	11:55	37° 50.67' N, 31° 31.20' W	809.3	CTD/Rosette	At depth
ME823/725-1	22.09.2010	13:39	37° 51.80' N, 31° 31.07' W	1122.4	Multibeam profile	Begin profile
ME823/726-1	22.09.2010	17:03	37° 50.68' N, 31° 31.15' W	819.7	CTD/Rosette	At depth
ME823/727-1	22.09.2010	19:24	37° 50.66' N, 31° 31.18' W	809.4	CTD/Rosette	At depth
ME823/728-1	22.09.2010	22:01	37° 36.80' N, 31° 45.39' W	2515	Multibeam profile	Begin profile
ME823/729-1	23.09.2010	09:19	37° 50.66' N, 31° 31.08' W	825	ROV	On Seafloor
ME823/730-1	23.09.2010	22:02	37° 50.67' N, 31° 31.22' W	-	CTD/Rosette	At depth
ME823/731-1	24.09.2010	00:15	37° 58.55' N, 31° 20.49' W	2342.6	Multibeam profile	Begin profile
ME823/732-1	24.09.2010	09:32	37° 50.64' N, 31° 31.17' W	815.3	ROV	Dive aborted
ME823/733-1	24.09.2010	15:21	37° 11.90' N, 31° 26.35' W	453.6	Multibeam profile	Begin profile
ME823/734-1	25.09.2010	13:48	37° 50.60' N, 31° 31.12' W	839	ROV	On Seafloor
ME823/735-1	25.09.2010	23:04	37° 43.66' N, 31° 31.42' W	1337	Multibeam profile	Begin profile
ME823/736-1	26.09.2010	09:20	37° 50.68' N, 31° 31.20' W	835	ROV	On Seafloor
ME823/737-1	26.09.2010	20:24	37° 50.67' N, 31° 31.22' W	802.8	CTD/Rosette	At depth
ME823/738-1	26.09.2010	22:09	37° 52.67' N, 31° 19.20' W	1299.3	Multibeam profile	Begin profile
ME823/739-1	27.09.2010	09:41	37° 50.63' N, 31° 31.14' W	856.9	ROV	On Seafloor
ME823/740-1	27.09.2010	21:04	37° 50.67' N, 31° 31.19' W	811.8	CTD/Rosette	At depth
ME823/741-1	27.09.2010	22:34	37° 50.93' N, 31° 19.24' W	1117.8	Multibeam profile	Begin profile
ME823/742-1	28.09.2010	09:08	37° 50.68' N, 31° 31.16' W	820.3	Cage mooring	released
ME823/743-1	28.09.2010	10:25	37° 50.67' N, 31° 31.19' W	826	ROV	On Seafloor
ME823/744-1	29.09.2010	01:15	37° 50.67' N, 31° 31.15' W	819	Cage mooring	released
ME823/745-1	29.09.2010	03:45	38° 2.66' N, 31° 37.95' W	2164.4	Multibeam profile	Begin profile

ME823/746-1	29.09.2010	10:48	37° 50.72' N, 31° 31.14' W	813	ROV	On Seafloor
ME823/747-1	29.09.2010	23:50	37° 46.74' N, 31° 32.89' W	1222.4	CTD/Rosette	At depth
ME823/748-1	30.09.2010	05:22	37° 40.87' N, 31° 43.76' W	1784.5	Multibeam profile	Begin profile
ME823/749-1	30.09.2010	13:28	37° 47.15' N, 31° 32.70' W	1124.1	Multibeam profile	Begin profile
ME823/750-1	30.09.2010	17:01	37° 50.70' N, 31° 31.22' W	850	ROV	On Seafloor
ME823/751-1	30.09.2010	22:15	37° 47.88' N, 31° 32.30' W	999	Multibeam profile	Begin profile
ME823/752-1	01.10.2010	02:49	37° 48.11' N, 31° 32.29' W	1000	CTD/MAPR-TowYo	At depth
ME823/753-1	01.10.2010	06:16	37° 43.18' N, 31° 48.24' W	1411	Multibeam profile	Begin profile
ME823/754-1	01.10.2010	10:08	37° 50.67' N, 31° 31.14' W	852	ROV	On Seafloor
ME823/755-1	01.10.2010	20:50	37° 43.25' N, 31° 47.96' W	1480	Multibeam profile	Begin profile
ME823/756-1	02.10.2010	10:31	37° 48.08' N, 31° 32.24' W	994	ROV	On Seafloor
ME823/757-1	02.10.2010	21:34	37° 47.69' N, 31° 32.39' W	-	Multibeam profile	Begin profile
ME823/758-1	03.10.2010	15:01	37° 49.48' N, 31° 30.73' W	793.3	CTD/MAPR-TowYo	At depth
ME823/759-1	03.10.2010	21:29	37° 45.89' N, 31° 33.54' W	1260.8	Multibeam profile	Begin profile
ME823/760-1	04.10.2010	07:40	37° 50.62' N, 31° 31.19' W	806	LIFT	On bottom
ME823/761-1	04.10.2010	09:37	37° 50.64' N, 31° 31.20' W	845	ROV	On Seafloor
ME823/762-1	04.10.2010	21:08	37° 50.56' N, 31° 30.93' W	806	LIFT	Off bottom
ME823/763-1	04.10.2010	23:57	37° 48.90' N, 31° 30.65' W	778	CTD/MAPR-TowYo	At depth
ME823/764-1	05.10.2010	03:42	37° 48.92' N, 31° 30.06' W	854.9	Multibeam profile	Begin profile
ME823/765-1	05.10.2010	06:08	37° 48.88' N, 31° 30.76' W	760	CTD/MAPR-TowYo	At depth
ME823/766-1	05.10.2010	09:39	37° 50.46' N, 31° 31.36' W	850	ROV	On Seafloor
ME823/767-1	05.10.2010	11:20	37° 47.92' N, 31° 32.69' W	932.8	Multibeam profile	Begin profile
ME823/768-1	06.10.2010	18:58	35° 30.74' N, 32° 16.12' W	2716.9	CTD/Rosette	At depth