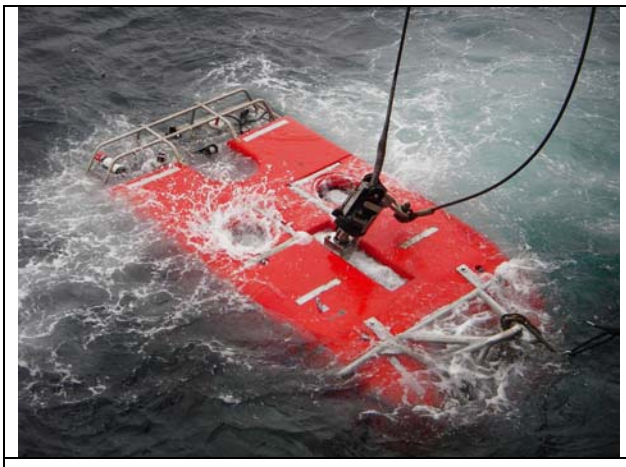
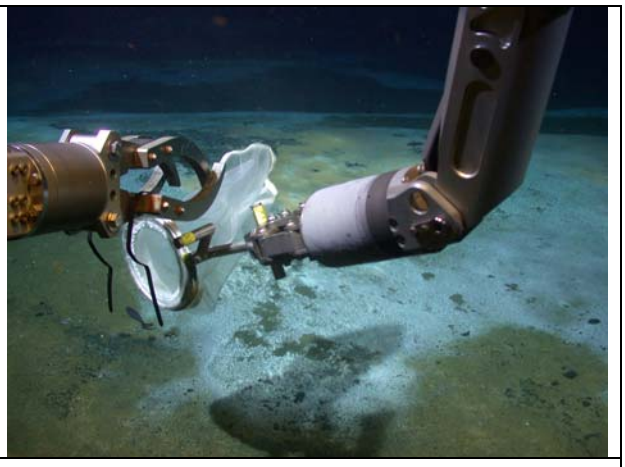
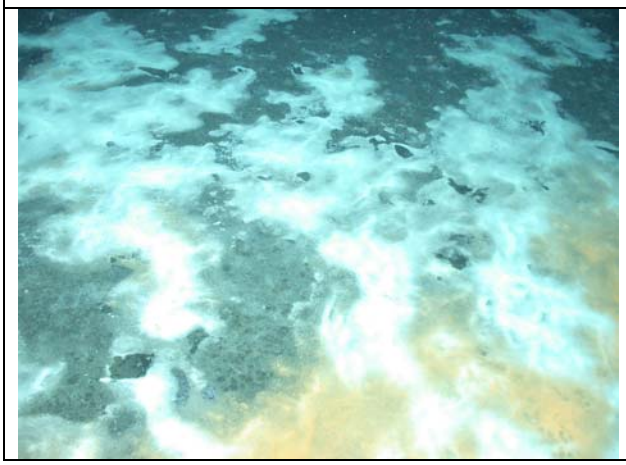
Meteor Expedition M66/2

September 22nd to October 23rd, 2006

Curacao (Netherlands Antilles) – Corinto (Nicaragua – Caldera (Costa Rica)

Short Cruise Report


Scientific Program and Cruise Narrative

September 22nd to September 25th

The first task of the cruise, stowage of the scientific equipment in the port of Curacao, was completed swiftly and successfully. A small advance party, supported by the port crew, started unloading 3 containers of scientific equipment (one of them 40 ft long) in the morning of September 20th. In addition, the isotope container and the geophysics container were taken on board, followed by the control unit and the material container of the Bremen QUEST system. Further members of the scientific crew arrived in the evening of September 20th, and 24 hours later, in the evening before the planned sailing date, the largest part of the laboratories had been set up.

At 09:00 sharp on September 22nd, R/V METEOR left the port of Curacao. During the transit to Cristobal, thanks to a good performance of the engines, we managed to complete our tight schedule of five shallow (1000 m) CTD/rosette stations at a spacing of 120 nm along the southern rim of the Columbia Basin. The samples were taken to determine the concentrations of nutrients as well as the trace gases methane and N_2O (the latter to be measured in land-based laboratories after the cruise). The programme was completed by continuous monitoring of methane concentrations within surface waters and the marine atmosphere. We found an oversaturation by 10-20 percent which, according to the data from the CTD samples, can be attributed to methane concentration maxima at water depths between 30 and 100 m.

At 09:00 sharp in the morning of September 25th, after exactly 3 days at sea, we arrived in Cristobal. The scientific crew of M66/2a was completed by five members of the Bremen ROV team and 3 students from Costa Rica joining us.

September 26th to October 1st

After a 10-hour waiting time, we started for our passage through the Panama Canal on September 25th. The passage ended on September 26th at 04:00 local time. Another one and a half days of transit later, around noon of September 27th, we started recovering some of the OBS/OBT (Ocean Bottom Seismometers/ Pressure Samplers) that had been deployed west of Osa Peninsula in April 2005. They are part of a teleseismic transect across the southern part of Costa Rica that has been designed with the objective of studying the relationship between fronts of metamorphic fluid venting and seismicity on the one hand and the seismic structure of crust and upper mantle on the other hand. The instruments serve as the seaward prolongation of an on-land transect that is currently being monitored by an array of 16 seismometers and will be complemented by 3 more stations in October.

The teleseismic transect passes the immediate vicinity of Mound 12, a mud diapir on the summit of which several fluid samplers were deployed by US colleagues in cooperation with the SFB 574, using the ALVIN submersible. These instruments are recording the activity of fluid vents and the composition of the fluids venting from Mound 12. Two OBS were deployed immediately next to fluid samplers with the aim of establishing correlations between microseismic activity and the extent of fluid flow. Within 8 hours, 7 instruments were recovered and 2 OBS were deployed 20 nm away at Mound 12.

Afterwards, R/V SONNE went on a 213-nm-transit for our next working area off the Nicaraguan coast, where 24 OBH/S were deployed in a symmetric rectangular pattern to form a seismological network at 10°40'N and 80°W above the summit of the Outer Rise. This experiment focuses on recording local earthquakes taking place in the oceanic crust below this

area. Previous studies have shown that a large number of local earthquakes are triggered in the area of the Outer Rise. This network was designed to constrain the distribution of depth and the source area of these earthquakes. A spatial correlation of this distribution pattern will subsequently be used to get further insight into the activity of the fracture zones.

As the geophysical program went extraordinarily well, we were able to schedule a first 13-hour QUEST dive above Mound Iguana at 11°12'N;087°09'W at a water depth of about 1200m. Mound Iguana's topographic elevation above the surrounding seafloor is not very pronounced, yet it is characterized by a large carbonate-dominated area. The carbonates are partly exposed and partly covered by sediments. In spite of a failure of the GAPS subpositioning system, we were able to map this seafloor using the Doppler log. In the southwesern part of the structure several bacterial mats were found as well as fields of calyptogenae and some accumulations of mytilidae. QUEST observation added a completely new dimension to our understanding of the spatial distribution of active areas along faults and rupture zones. In addition, we were able to extract some first water and sediment samples.

The scientific programme of leg M66/2a was complemented by a CTD/rosette station on September 30th at 23:50. After an 8-hour transit, the leg ended in the port of Corinto, Nicaragua in the morning of October 1st.

October 2nd to October 9th

After leaving Corinto, we headed straight back for Mound Iguana. Due to the swell caused by Hurricane "Stan", however, the ROV dive scheduled for the evening had to be postponed. The TV-MUC was deployed for 6 hours, yet samples were not taken, as the seafloor was mainly covered by carbonates. After detailed PARASOUND mapping and sampling of one CTD station, QUEST was deployed for a 24-hour-dive at Mound Iguana. Extensive mapping of the mound showed that mytilidae are far more common in this region than bacterial mats, the latter being mostly small and sometimes growing directly on the carbonates. At the end of the dive, however, a large bacterial mat was found and identified as a target for the following deployment of the Benthic Chambers. In addition, further push cores and water samples were taken. On October 4th, first the DOS lander and, after sampling of another CTD station, the Benthic Chamber mooring were deployed. Unfortunately, one of the floats was torn off during the deployment, which started a series of events that was to keep us busy for two days. In the evening of October 4th, QUEST was deployed for Dive 66 with the aim of getting samples from a line of sites crossing a bacterial mat in order to complement our standard set of samples. The dive was successful, yet in the morning of October 5th, after a very fruitful sampling programme it showed that the chambers had toppled over because the seafloor was carbonated and very hard and thus, did not allow the chambers to penetrate to full sediment depth (12cm). Two of the chambers could be recovered and placed into the mooring with its reduced buoyancy. The third was latched into a shackle that had been lowered on the winch rope and could thus be recovered using the ROV and the ship, controlling two ropes in the water. The subsequent attempt to retrieve the mooring failed in spite of a double release.

Afterwards, we performed a CTD sampling and a long OFOS track 2 nm away at Mound Quetzal. Mound Quetzal is a circular mound with a distinct topography and steep downslope flanks, while the upslope flanks are markedly less steep. CTD samples taken above the south-eastern part of the structure show a strong CH_4 plume. The OFOS survey revealed that in a small area in the north-east of the structure, scattered between massive and sometimes piled-up carbonates, there are larger accumulations of pogonophora and single fields of bacterial mats and calyptogenae. Following a successful deployment of the TV-MUC and CTD

sampling above Mound 12, QUEST was deployed for dive 67, during which first of all the benthic chamber mooring was freed and recovered. The first deployment of a new system for in-situ measurement of sulfate reduction (N'Sync) designed by the Bremen MPI that had been fixed to the mooring turned out to have been successful. Afterwards, further sampling was performed on Mound Iguana. The work in the northern study area was preliminarily completed by one more CTD sampling in the morning of October 7th, after which we headed for Mound 12 in the southern working area.

The data from Mound Iguana, including a total of 11 pore water profiles, indicate some interesting results. A strong decrease of sulfate concentrations and production of sulfide indicate active AOM. In addition, the distribution of nutrients and chloride does not suggest a transport of deep fluids, so that it can be assumed that methane ascends in the form of a free gas phase, analogous to the situation found, for example, at Hydrate Ridge off Oregon. Furthermore, three cores show a slight enrichment of chloride and bromide concentrations in depth, corroborating the suspicion of near-surface gas hydrate formation.

After a transit of almost one day to Mound 12 two of our long-term CTD stations that we have been revisited consistently for years, were sampled. Afterwards, a deployment of the bottom water sampler was performed, followed by a QUEST dive above the already well-studied Mounds 11 and 12. A mass spectrometer of our Hawaiian colleagues, which was positioned on the seafloor was checked as we had promised to recover it within the next days. Subsequently, several extended bacterial mats located in the south-west of Mound 12 along a central fault were mapped. We then went on to Mound 11, where we managed to sample some sediment cores along a bacterial mat. First results show a clear zoning of geochemical parameters along a gradient, which will serve as data basis for two-dimensional modelling of the fluid venting. October 9th was used for OFOS mapping along the north-western flank of Parrita Scarp, which is located 20 nm away from Mds 11 and 12. However, we did not find a location that seemed suitable for an ROV dive, although single communities of calytpogena were found in the area between 1400m and 1700m water depth.

October 9th to October 16th

In the evening of October 9th, we resumed our work with QUEST Dive 69 at Mound 12. The sampling program was preceded by the recovery of the in situ mass spectrometer that had been deployed in April during an ATLANTIS/ALVIN leg with participation of the SFB 574. The recovery was successful. Like a few days earlier, this manoeuvre was performed by lowering a second rope and using the ROV to attach the instrument to a shackle directly at the seafloor.

Following some further mapping of Mound 12, several push cores were taken from a bacterial mat. Additional cores were taken away from the mat for reference. Fluid sampling was performed along a longish bacterial mat. 3 stations were additionally used for sampling with a newly developed pressure-retaining water sampler that worked successfully.

On October 10th, a CTD cast was performed directly above the active south-western part of Mound 12, yet the enrichment of methane in the near-bottom water column was markedly less than found in the bottom values of the seemingly much less active north-western station. The Benthic Chamber shuttle was deployed with three chambers, again complemented by the sulfate measuring device N'Sync, and in the evening the next QUEST dive (70) was performed. The BC chambers were deployed at the beginning of the dive to be recovered at the end, a manoeuvre that was a great challenge for the ROV team. Two of the chambers

worked faultlessly, but in the third one the program controlling the penetration of the chamber into the sediment failed. Again, a push core was taken for the N'Sync tracer addition, complemented with a second push core taken next to it. In both cases, coring was accompanied by an ascent of free gas from the sediment, which was a confirmation of our assumption from the geochemical data that we are dealing with a system controlled by the ascent of gas. Further coring and sampling of fluids/water with the KIPS fluid sampler was designed to form a transect from the centre of a bacterial mat to its edge. The retrieval of the BC mooring meant a preliminary conclusion of our work at Mound 12 in the afternoon of October 11th and we headed for Quepos Slide.

Quepos Slide is a slide in the upper area of the continental slope. It resulted in the formation of a plateau at a water depth of approximately 400m that had already been sampled extensively during cruise SO 173. The presence of bacterial mats and venting of deep, salt-depleted fluids has been documented here. Its geochemical environment is distinct. Due to the hydrographic conditions, active fluid venting meets an almost anoxic water column. In the afternoon, the Quepos Slide scientific program started with CTD deployments at three successive stations. They were part of an extensive sampling program from October 11th to 14th, comprising a total of 14 CTD stations on Quepos Slide in order to make a survey of the methane emitted into the water column from this structure. In the evening of October 11th, QUEST was deployed for its first dive (71) at Quepos Slide. Mapping the slide, we found that especially in the north-western part of the plateau, some areas are almost completely covered with bacterial mats. In north-eastern direction towards the slope there, is a slight depression filled with sediments where there are no bacterial mats. Above 400 m, there are only single spots of bacterial mats, especially in the direction of the north-western slope, which is less steep. White and orange mats alternate, with the orange ones often concentrating in the centre. Therefore, sampling focused on a 1.5-m-broad extended bacterial mat that was transected by a series of sediment cores and water samples. The zoning of the bacterial mats from orange (inner area) to white (outer area) was given attention as well. After the dive had ended in the morning of October 12th, the day was used for further CTD sampling and a deployment of the DOS lander. The latter is used to record currents within the water column as a basis for later interpretation. Apart from a camera directed at the seafloor, it is equipped with an array of ADCPs with various frequencies, providing for a whole range of different coverages and resolutions. The BC lander was deployed on a bacterial mat on Quepos Slide as well. It was equipped with two chambers, yet as we were encountering very soft seafloor, one of the chambers was completely filled with sediment. In the night of October 12th, a long OFOS survey was run on Parrita Scarp, yet apart from some single calyptogenae there was no indication of active fluid venting, so that Parrita Scarp was no longer considered as a potential QUEST site. On October 13th, the water column program was continued during daytime, the BC lander was deployed once more with two chambers as well as an additional oxygen optode and the subbottom of Quepos Slide was mapped with Parasound.

A subsequent dive above Quepos Slide was first used for further mapping of the active area in north-western direction. It showed that, starting from the longish bacterial mats the active structures found here show a transition to round, sometimes slightly elevated structures that often show black depressions in their centre, which are not covered by bacterial mats but rather enclosed by centric rings of bacterial mats. Again, we took bottom-near water samples using KIPS and push core samples along a transect across a bacterial mat with a breadth of just under one meter. Special attention was paid to the gradient into the marginal area and the surrounding sediments.

In the course of October 14th, the CTD program was continued. It now covers the entire active area. The BC lander and the DOS lander were recovered and the deployments were found to be successful. This meant that our work at Quepos Slide was done for the moment, and we made a transit of 40 nm for a QUEST dive at Jaco Scarp in the evening. Jaco Scarp is a slide that originates from subduction of a seamount on the subducting plate. The Dive 73 was focused on detailed mapping and sampling of an area known from previous cruises. Here, large fields of Pogonophora have accumulated around the faulted area, the water column above which also shows a strong emission of methane. The dive started 700 m to the north-west. More active areas were found here, smaller but often showing large outcrops of calyptogena and also bacterial mats. On this occasion, we were able to retrieve the first sediment samples taken from this area ever. The rest of the dive was mainly dedicated to measuring the depth range of the pogonophora field and video mapping. Numerous water samples were taken directly within the field using the KIPS system, and some specimens were taken from the vent fauna, among them pogonophora of more than 1m in length.

October 15th was used for CTD sampling at a site above Jaco Scarp that had already been visited several times in earlier years, and deploying the DOS lander at the debris fan south of the active area. In addition, CTD data were collected in order to search for indications of fluid venting at a circular, crater-like structure of about 500 m in diameter 10 nm west of Parrita Scarp that we call "mud pie" so far. The structure does not show strong bathymetric characteristics, however, in the DTS data it stands out for its high backscatter. The CTD showed a clear elevation of methane concentrations in the bottom water. In the evening of October 15th, QUEST was launched for Dive 74 above Jaco Scarp, with the main objective of mapping the horizontal extension of the pogonophora field. The program was complemented by recording detailed video mosaic pictures and finding additional fields in the north-west. While the sediment was too compact to allow for further push coring, samples could be taken with the pressure-retaining system. The sample was taken directly from the field of pogonophora, and on sampling there was a spontaneous degassing that stressed the importance of pressure-retaining sampling. Our scientific program in this area was concluded when QUEST surfaced in the morning of October 16th and the water column had been sampled at our second long –term station at Jaco Scarp by CTD/rosette.

October 16th to October 23rd

After finishing our work on Jaco Scarp, we returned to the Quepos Slide working area for two more days. The first day was dedicated to a concerted program with the aim of finding out if there is a physiological necessity for bacterial mats that are found in an almost anoxic environment (< 2µmole of oxygen in the bottom water) to produce oxygen. This question had come up due to observations made during a lander deployment on SO173 and from the data gained by the oxygen optode a few days earlier during our expedition. It was approached by taking some CTD profiles and bottom water samples followed by ROV Dive 75 in the evening of October 16th, which was mainly used for a deployment of the oxygen consumption chamber “Elinor” and for taking 10 sediment cores for incubation experiments. A deployment of the Benthic Chamber Lander performed on the next day was also dedicated to this question. Yet, the results were contradictory, so that it was not possible to find a definite answer.

On October 17th, a three man television team from the Deutsche Welle joined us in order to document our onboard “everyday life”. Further CTD stations were sampled above Quepos slide to extend our coverage of the methane plume of this area. In the night of October 17th, a last dive (76) was performed above Quepos Slide. During the dive, a structure was examined

that shows a black center encircled by bacterial mats in an almost concentrical pattern. Again, we made a transect across the gradient with a series of fluid samples and sediment cores. In addition, a video mosaic was recorded for visual documentation of a larger area to enable a better spatial understanding. The BC lander was then recovered from its site at Quepos Slide and the DOS lander from Jaco Scarp, 49nm away. The rest of the night was used for a long OFOS survey of the "mud pie" (8:59.6N; 84:43.7W). It confirmed our assumption from comparison of the DTS data and the bathymetrical data that the DTS image shows a south-western displacement of about 300m compared to the actual position. At the northern margin of the area, we mapped a steep flank covered by carbonates. Larger areas showing fields of calyptogena and pogonophora were documented. The work was completed at two o'clock in the night, and we set course for the last site of investigation of this cruise, Mound Culebra, which is located 130 nm in the north-west. We arrived there in the afternoon of October 19th. Mound Culebra is a mound with a strong morphological expression, about 100 m high and 1.6 km x 1 km wide, and it is crossed by a fault in NW-SE direction. We started by taking samples from two long-term stations with the CTD/rosette, followed by QUEST Dive 77. Mound Culebra is especially interesting because here, vent-specific and ordinary deep-sea fauna exist simultaneously. Sampling turned out to be difficult. Bacterial mats were not found, and the abundant calyptogenae often sat on hard, carbonated ground. However, we managed to use the pressure-retaining water sampler and to position "Elinor" above a field of calyptogenae for a long-term deployment. The course of the last two days made us change our plans for the remaining time of the cruise and we made a transit back to the the "mud pie" in the south-west ,where on the basis of the data collected previously, a final dive was made in the evening of October 20th. As documented by OFOS before, we found large fields of calyptogena and pogonophora. The most important discovery was a depression similar to a pockmark, several meters large and located on the southern extension of the carbonate flank. Its sides as well as its bottom were covered by bacterial mats. The area was mapped by a video mosaic, water samples were taken with the KIPS system as well as with the pressure-retaining sampler. The sediment showed to be rich in water, yet we managed to take some samples. The program was complemented by further samples of bacterial mats and an "Elinor" deployment. In the morning of October 21st, a last CTD was run directly above the "pockmark", and in the afternoon the DOS lander was deployed on mound 12 to sit for a few weeks in the immediate vicinity of the SCRIPPS fluid samplers and our seismometers that had been placed there at the beginning of M66 Leg 2a. During this period, rates of fluid venting, seismic events, and hydrographic parameters will thus be recorded simultaneously at the site. After a 14 hour Hydrosweep survey to close some gaps in our high-resolution bathymetric data of the Costa Rican continental margin we reached the roadstead of Caldera on October 23rd at 07:00 am.

Attachments: - Maps with cruise tracks of expedition M66-2, Leg a and b (Page 7)
- Complete station list (Pages 8 – 11)

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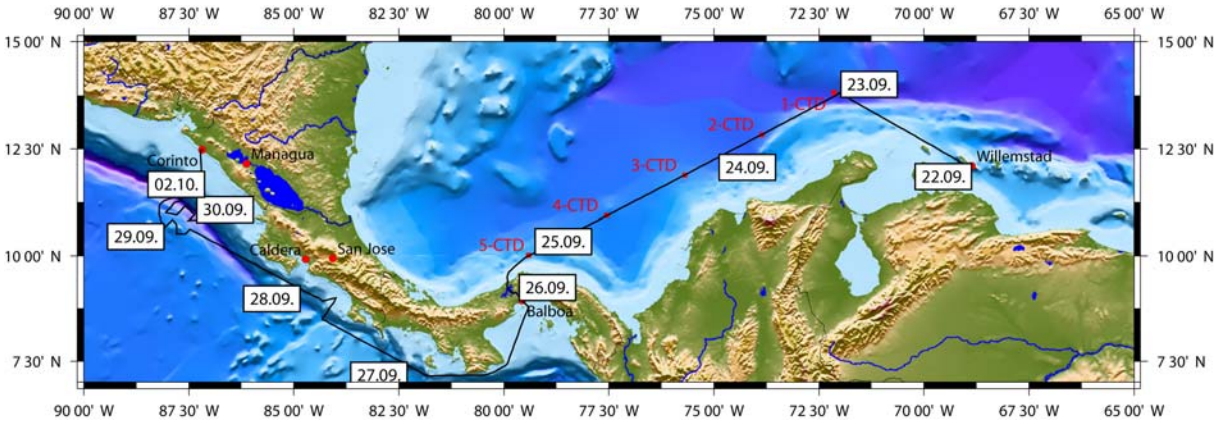
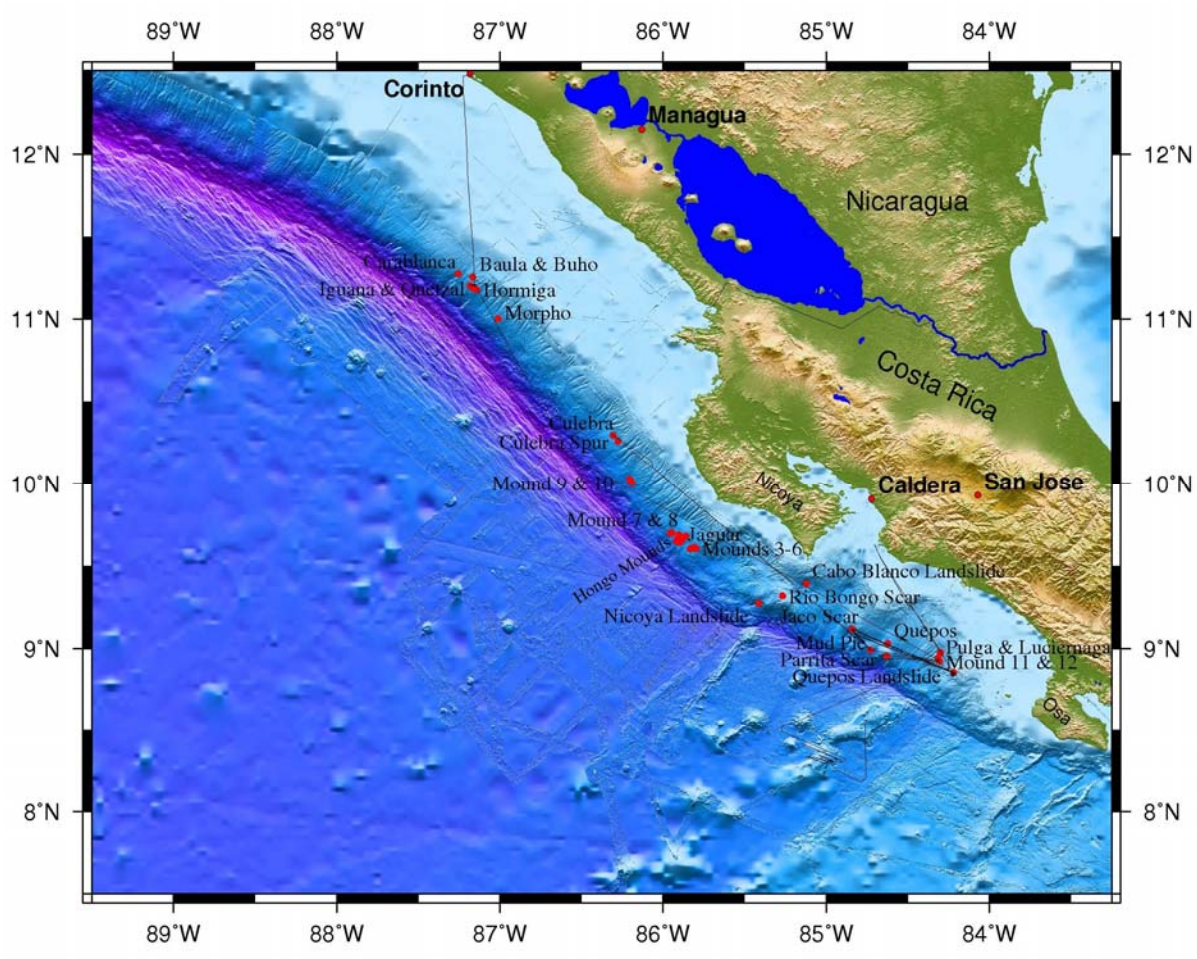


Cruise track of M66, Leg 2a. Also indicated are the 5 CTD Stations in the Carribean Sea and the midnight UTC positions.



Cruise track of M66, Leg 2b. Also indicated are some of the know cold vent sites in the area, including the sites investigated during the expedition.

Meteor 66								Station List										
				Time (UTC)					Begin / on seafloor		End / off seafloor							
Date	St. No.	St. No.			Start Sci.	End Sci.		Duration	Latitude	Longitude	Latitude	Longitude	Water	Recovery	Supervisor	Area	Target
2005	M66	Meteor	Instrument	Begin	Program	Program	End	hh:mm	N°	W°	N°	W°	depth (m)	Remarks			Feature
23.09.2005	1	620	CTD 01	06:29	06:29	07:18	07:18	00:49	13:48.65	72:08.40	13:48.37	72:00.59	4041		Brentführer	Karibik	Transect
23.09.2005	2	621	CTD 02	17:37	17:37	18:30	18:30	00:52	12:49.91	73:51.65	12:49.91	73:51.65	3807	Releaser Test	Brentführer	Karibik	Transect
24.09.2005	3	622	CTD 03	05:20	05:20	06:43	06:43	01:22	11:53.02	75:41.68	11:53.06	75:41.63	3231		Brentführer	Karibik	Transect
24.09.2005	4	623	CTD 04	17:34	17:34	18:19	18:19	00:44	10:56.11	77:32.85	10:56.11	77:32.85	3266		Brentführer	Karibik	Transect
25.09.2005	5	624	CTD 05	08:21	08:33	09:18	09:18	00:57	09:59.98	07:24.49	09:59.98	07:24.39	2228		Brentführer	Karibik	Transect
27.09.2005	6-1	625-1	OBS05			18:20			08:29.89	84:19.51			2497	Recovery	Bialas	Quepos	Profil Breitband 2005
27.09.2005	6-2	625-2	OBT07			18:19	18:57	00:38	8:30.61	84:19.37	8:30.93	84:19.33	2572	Recovery	Bialas	Quepos	Profil Breitband 2005
27.09.2005	7-1	626-1	OBS04			20:20			8:38.00	84:13.86	8:38.25	84:13.44	1437	Recovery	Bialas	Quepos	Profil Breitband 2005
27.09.2005	7-2	626-2	OBT06			20:20	20:58	00:38	8:37.90	84:13.61			1437	Recovery	Bialas	Quepos	Profil Breitband 2005
27.09.2005	8	627	OBS03			21:57			8:45.26	84:09.68			505	Recovery	Bialas	Quepos	Profil Breitband 2005
27.09.2005	9	628	OBS02			23:40	00:09	00:29	8:52.34	84:03.58			98	Recovery	Bialas	Quepos	Profil Breitband 2005
28.09.2005	10	629	OBS01			00:55			8:59.93	84:00.41	8:59.73	84:00.28	77	Recovery	Bialas	Quepos	Profil Breitband 2005
28.09.2005	11	630	OBS08	03:14					8:55.72	84:18.80			1018	Deployment	Bialas	Costa Rica	Profil Mounds
28.09.2005	12	631	OBS09	03:25					08:55.68	84:18.90			1028	Deployment	Bialas	Costa Rica	Profil Mounds
28.09.2005	13	632	OBH24	23:33					10:37.42	87:28.50			3292	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	14	633	OBS29	00:36					10:30.93	87:34.88			2913	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	15	634	OBH32	01:57					10:31.03	87:47.45			2996	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	16	635	OBS28	03:30					10:44.10	87:47.32			2967	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	17	636	OBH27	04:27					10:50.67	87:53.65			2980	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	18	637	OBH31	05:29					10:44.22	87:59.95			2894	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	19	638	OBH33	06:28					10:37.76	88:06.27			3020	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	20	639	OBS30	08:27					10:57.32	88:12.38			2820	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	21	640	OBH25	09:49					11:10.37	88:22.38			3440	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	22	641	OBH20	10:49					11:16.87	88:05.96			4170	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	23	642	OBH10	12:36					11:23.24	87:46.98			4840	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	24	643	OBH11	13:33					11:16.67	87:40.75			4984	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	25	644	OBH17	14:56					11:14.65	87:50.72			4863	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	26	645	OBH21	15:59					11:06.95	87:56.55			3771	Deployment	Bialas	Nicaragua	Outer Rise Net

29.09.2005	27	646	OBS26	17:01					11:00.47	88:02.91			3160	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	28-1	647-1	OBS22	18:38					10:57.15	87:47.20			3445	Deployment	Bialas	Nicaragua	Outer Rise Net
29.09.2005	28-2	647-2	CTD 06	18:53	18:58		23:27	04:29	10:57.20	87:47.22	10:57.10	87:47.24	3434	+ Transponder Test	Bialas	Nicaragua	Outer Rise Net
30.09.2005	29	648	OBS18	00:28					11:03.64	87:40.85			4202	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	30	649	OBP19	00:39					11:03.81	87:41.06			4011	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	31	650	OBS12	01:35					11:10.10	87:34.49			5296	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	32	651	OBH13	02:42					11:03.51	87:28.22			5091	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	33	652	OBS14	03:44					10:56.97	87:22.02			4892	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	34	653	OBP15	03:54					10:57.01	87:22.25			4871	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	35	654	OBH23	05:28					10:49.46	87:30.17			3880	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	36	655	OBH16	07:10					10:50.41	87:15.71			5077	Deployment	Bialas	Nicaragua	Outer Rise Net
30.09.2005	37	656	ROV 64	15:24	16:52	02:59	04:09	12:45	11:12.25	87:09.26	11:12.12	87:09.19	1228	Dive	Rehder	Mt Iguana	Mound Iguana
30.09.2005	38	657	CTD 07	04:21	04:25	05:47	05:47	01:26	11:12.19	87:09.25	11:12.19	87:09.38	1231	CTD-Bottom contact	Brentführer	Mt. Iguana	
02.10.2005	39	658	TV-MUC	23:40	00:22	05:55	06:36	06:54	11:12.17	87:09.30	11:12.33	87:09.42	1249	no cores	Linke	Mt. Iguana	Bakterial Mat
03.10.2005	40	659	Parasound	07:01	07:15	11:43	11:43	04:41	11:12.10	87:08.90	11:12.38	87:08.82	1173	no time for the last 3 lines left	Fromm	Mt. Iguana	
03.10.2005	41	660	CTD 08	12:07	12:07	13:06	13:06	00:58	11:12.16	87:09.21	11:12.16	87:09.21	1221	Gaps failure, no ADCP	Brentführer	Mt. Iguana	
03.10.2005	42	661	ROV 65	14:15	15:10	12:50	14:03	23:48	11:12.16	87:09.21	11:12.31	87:09.18	1215	Dive	Rehder	Mt. Iguana	
04.10.2005	43-1	662-1	DOS	16:25	17:17	18:26	19:20	02:01	11:12.22	87:09.21	11:12.27	87:09.20	1216	Deployment - Release Failure	Linke	Mt. Iguana	
04.10.2005	43-2	662-2	DOS	20:25	21:21		22:00	01:35	11:12.20	87:09.23	11:12.30	87:09.19	1226	Deployment	Linke	Mt. Iguana	Position
04.10.2005	44-1	663	CTD 09	22:19	22:19	23:22	23:28	01:02	11:12.22	87:09.15	11:12.23	87:09.16	1215		Brentführer	Mt. Iguana	
05.10.2005	44-2	664	BCS	00:00			01:08	01:08	11:12.27	87:09.20	11:12.27	87:09.20	1221	Deployment	Linke	Mt. Iguana	
05.10.2005	45	665	ROV 66	01:40	02:50	00:12	01:24	24:04	11:12.27	87:09.21	11:12.11	87:09.29	1230	Dive	Rehder	Mt. Iguana	
06.10.2005	46	666	BCS	01:35			04:15	02:40	11:12.27	87:09.15	11:12.33	87:08.94	1181	Recovery St.44-2- Release Failure	Linke	Mt. Iguana	
06.10.2005	47	667	CTD 10	05:07	05:09	06:10	06:15	01:08	11:12.27	87:10.74	11:12.23	87:10.82	1353	ADCP + GAPS / no gaps	Brentführer	Mt. Quetzal	Bacteria Mat
06.10.2005	48	668	OFOS	06:55	08:27	14:39	15:19	08:24	11:12.20	87:10.83	11:12.36	87:10.68	1368		Wallmann	Mt. Quetzal	
06.10.2005	49-1	669	TV-MUC	17:10	17:15	17:30	18:07	00:57	11:12.29	87:09.20	11:12.26	87:09.29	1221	4 cores	Linke	Mt. Iguana	
06.10.2005	49-2	670	TV-MUC	18:30	19:07	19:11	20:18	01:48	11:12.26	87:09.31	11:12.33	87:09.43	1256	hard ground	Linke	Mt. Iguana	
06.10.2005	49-3	671	TV-MUC	20:33	21:11	21:36	22:12	01:39	11:12.38	87:09.44	11:12.17	87:09.29	1225		Linke	Mt. Iguana	Bacteria Mat
06.10.2005	50	672	CTD 11	22:46	22:47	23:48	23:50	01:04	11:12.40	87:10.88	11:12.40	87:10.88	1327		Brentführer	Mt. Quetzal	Carbonat Peak
06.10.2005	51	673	ROV 67	03:33	04:23	12:20	13:19	09:46	11:12.27	87:09.26	11:12.22	87:09.23	1216	Dive	Rehder	Mt. Iguana	
07.10.2005	52	674	DOS	14:10		14:30	14:40	00:30	11:12.24	87:09.22	11:12.33	87:09.06	1202	Recovery St.43-2	Linke	Mt. Iguana	
07.10.2005	53	675	CTD 12	15:13	15:13	16:13	16:13	01:00	11:12.25	87:09.18	11:12.27	87:09.19	1213	ADCP	Linke	Mt. Iguana	Dos Lander Position
08.10.2005	54	676	CTD 13	14:02	14:02	14:51	14:51	00:49	08:55.82	84:18.64	08:55.70	84:18.70	1015	without ADCP	Brentführer	Mt. 12	

08.10.2005	55	677	DOS	15:50	17:30	19:55	20:30	04:40	08:55.72	84:18.90	08:55.96	84:18.71	1021	Deployment - release failure	Linke	Mt. 12	
08.10.2005	56	678	CTD 14	20:45	20:46	21:38	21:38	00:53	08:55.98	84:18.71	08:55.94	84:18.71	1003		Brentführer	Mt. 12	
08.10.2005	57	679	BWS	23:23	00:48	00:59	01:40	02:17	08:55.79	84:18.85	08:55.77	84:18.67	1007	16 watersamples	Linke	Mt. 12	
09.10.2005	58	680	ROV 68	01:49	02:35	14:40	15:46	13:57	08:55.78	84:18.66	08:55.06	84:18.27	1051	Dive	Rehder	Mt. 11,12	
09.10.2005	59	681	OFOS	18:02	18:52	22:56	00:00	05:58	08:57.97	84:38.37	08:56.53	84:39.83	2058		Linke	Parrita	
10.10.2005	60	682	ROV 69	02:00	02:43	15:10	16:17	14:17	08:55.74	84:18.82	08:55.73	84:18.61	1020	Dive	R,W,G-S	Mt. 12	DOMS recovery + sampling
10.10.2005	61	683	BCL	17:45	18:26	19:30	20:11	02:26	08:55.59	84:18.88	08:55.53	84:18.92	1030	Deployment - release failure	Linke	Mt. 12	
11.10.2005	62	684	CTD 15	20:40	20:40	21:53	21:53	01:13	08:55.76	84:18.82	08:55.78	84:18.84	1012		Brentführer	Mt. 12	Bakterial Mat
11.10.2005	63-1	685	BCS	23:16			23:30	00:14	08:55.67	84:18.82	08:55.66	84:18.83	1021	Deployment	Linke	Mt. 12	
11.10.2005	64	686	ROV 70	00:00	00:59	18:40	19:32	19:32	08:55.66	84:18.79	08:55.61	84:18.92	1022	Dive	Rehder	Mt. 12	
11.10.2005	63-2	687	BCS	19:37			21:50	02:13	08:55.60	84:19.02	08:54.71	84:18.11	1022	Recovery St.63-1	Linke	Mt. 12	
11.10.2005	65	688	CTD 16	22:43	22:45	23:14	23:14	00:31	08:51.06	84:13.47	08:51.08	84:13.47	404	no ADCP	Brentführer	Quepos Slide	
12.10.2005	66	689	CTD 17	00:20	00:24	00:50	00:50	00:30	08:51.17	84:13.33	08:51.18	84:13.34	460	no ADCP	Brentführer	Quepos Slide	
12.10.2005	67	690	CTD 18	01:58	02:02	02:28	02:28	00:30	08:51.28	84:13.17	08:51.29	84:13.16	396	no ADCP	Brentführer	Quepos Slide	
12.10.2005	68	691	ROV 71	02:47	03:11	15:08	15:42	12:55	08:51.04	84:13.10	08:51.00	84:12.89	400		R,W,G-S	Quepos Slide	Mapping + Sampling
12.10.2005	69	692	CTD 19	16:12	16:13	16:40	16:40	00:28	08:50.94	84:13.28	08:50.96	84:13.31	409		Brentführer	Quepos Slide	
12.10.2005	70	693	DOS	17:33		17:57	18:18	00:45	08:51.16	84:13.00	08:51.14	84:13.13	397	Deployment	Linke	Quepos Slide	
12.10.2005	71	694	CTD 20	18:48	18:50	19:22	19:27	00:39	08:50.83	84:13.17	08:50.87	84:13.24	404		Brentführer	Quepos Slide	
12.10.2005	72	695	BCL	20:42		20:59	21:21	00:39	08:51.11	84:13.00	08:50.96	84:12.98	408	Deployment	Linke	Quepos Slide	
12.10.2005	73	696	CTD 21	21:39	21:42	22:07	22:10	00:31	08:50.78	84:13.11	08:50.77	84:13.15	404		Brentführer	Quepos Slide	
12.10.2005	74	697	CTD 22	23:00	23:01	23:27	23:30	00:30	08:51.08	84:13.39	08:51.11	84:13.42	396		Brentführer	Quepos Slide	
13.10.2005	75	698	OFOS	03:23	04:21	11:29	12:24	09:01	08:05.04	84:49.1	08:07.00	84:50.18	1788		Rehder	Jaco Scarp	
13.10.2005	76	699	CTD 23	15:49	15:30	16:28	16:30	00:41	08:51.00	84:12.74	08:51.01	84:12.75	402	ADCP	Brentführer	Quepos Slide	
13.10.2005	77	700	BCL	16:32		16:36	18:58	02:26	08:51.02	84:12.71	08:50.98	84:12.64	392	Recovery St.72	Linke	Quepos Slide	
13.10.2005	78	701	CTD 24	17:36	17:37	18:02	18:02	00:26	08:50.91	84:12.88	08:50.90	84:12.88	412	ADCP	Brentführer	Quepos Slide	
13.10.2005	79	702	Parasound	18:09			21:38	03:29	08:50.94	84:12.90	08:49.50	84:13.69	623		Fromm	Quepos Slide	
13.10.2005	80-1	703	CTD 25	22:07	22:08	22:32	22:32	00:25	08:50.83	84:13.00	08:50.83	84:13.02	406	ADCP, GAPS	Brentführer	Quepos Slide	
13.10.2005	80-2	704	BCL	22:56	23:12	23:24	23:35	00:39	08:51.10	84:13.00	08:51.14	84:13.06	400	Deployment	Linke	Quepos Slide	
14.10.2005	81	705	ROV 72	01:04	01:32	13:12	14:02	12:58	08:51.26	84:13.26	08:51.13	84:13.09	400		R,W,G-S	Quepos Slide	
14.10.2005	82	706	CTD 26	14:18	14:19	14:48	14:51	00:33	08:51.12	84:13.23	08:51.09	84:13.23	401		Brentführer	Quepos Slide	
14.10.2005	83	707	BCL	15:15		15:19	15:40	00:25	08:50.97	84:12.78	08:50.94	84:12.83	416	Recovery St.80-2	Linke	Quepos Slide	
14.10.2005	84	708	CTD 26	16:09	16:09	16:37	16:40	00:31	08:51.15	84:13.07	08:51.16	84:13.08	397		Brentführer	Quepos Slide	
14.10.2005	85	709	CTD 27	17:35	17:36	18:04	18:09	00:34	08:51.04	84:12.98	08:51.01	84:13.00	407		Brentführer	Quepos Slide	

14.10.2005	86	710	DOS	18:16		18:17	18:45	00:29	08:51.02	84:12.98	08:50.98	84:12.80	417	Recovery St.70	Linke	Quepos Slide	
14.10.2005	87	711	CTD 28	19:19	19:20	19:40	19:52	00:33	08:50.93	84:13.09	08:50.96	84:13.11	403		Brentführer	Quepos Slide	