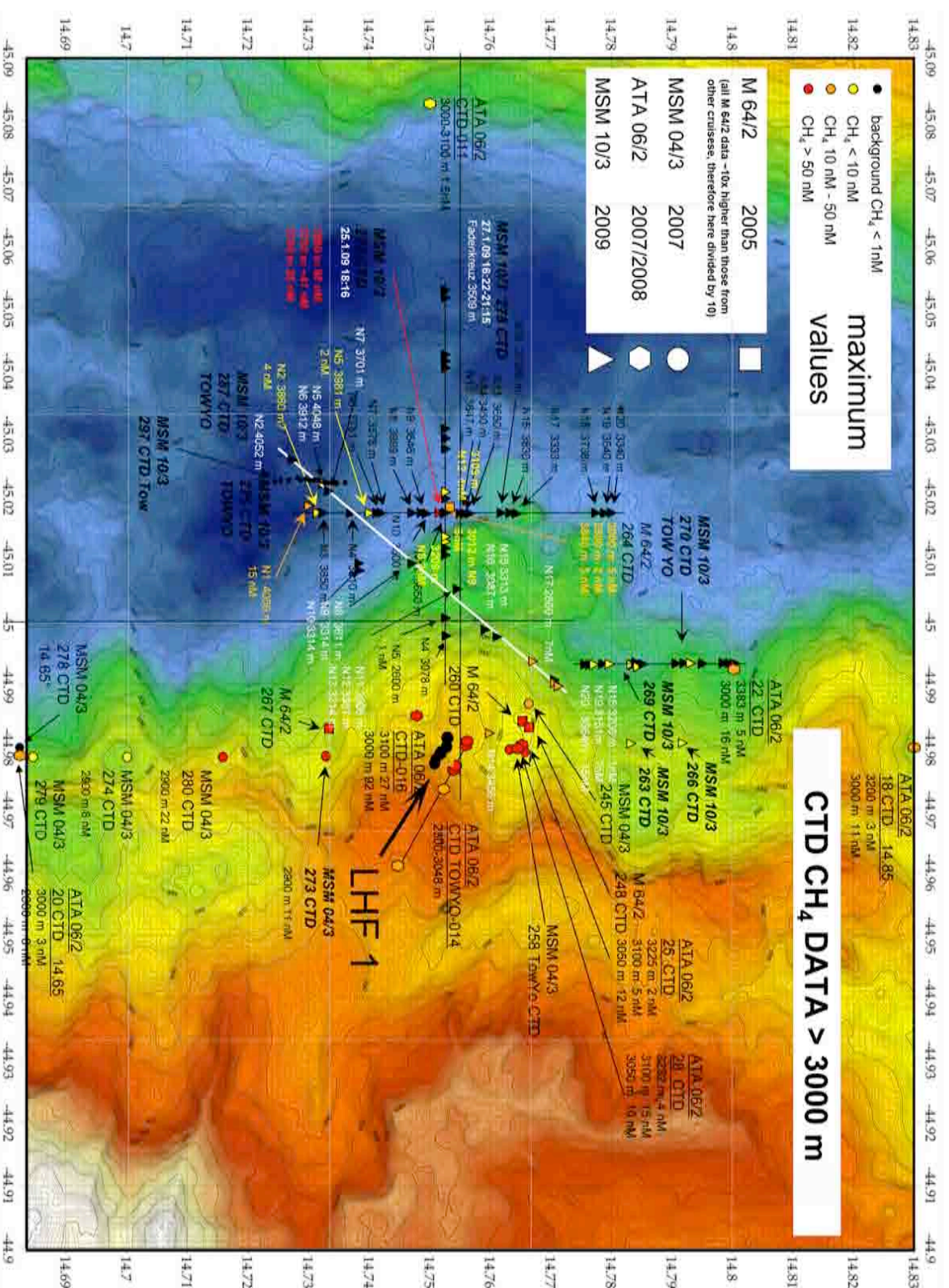


**Appendices Maria S. Merian-Berichte 10-3, Cruise 10, Leg 3, Las Palmas
– Fort de France, 11.01 –13.02.2009**

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Appendix 1



Appendix 2 Appendix to Section 5.4: Fluid Chemistry

Kiel Pumping System (KIPS)

One pre-requisite for an accurate estimate of the composition of hydrothermal fluids venting from high-temperature black smokers or from diffuse mussel-field sites is sampling of the hydrothermal fluids without entrainment of ambient seawater that would lead to immediate precipitation of sulphides, anhydrite and barite and, hence, loss of these compounds from solution. One measure of the purity of the sampled hydrothermal fluid is the fluid temperature. Consequently, real-time *in-situ* measurement of the temperature helps to guide the tip of the sampling nozzle to the hottest region within the vent orifice where the purity of the venting fluid is highest and least diluted with seawater. Another pre-requisite is that all materials coming into contact with the sampled fluid are inert and have lowest adsorption coefficients preventing systematic errors introduced by either contamination or losses due to adsorption. Precipitation during cooling of the sampled fluid, however, cannot completely be avoided, but transparency and the smooth surfaces of PFA allow a quantitative recovery of particles from the sample flasks. The Kiel Pumping System (KIPS-3) is a remotely controlled flow-through system mounted on the ROV's starboard tool sled (Garbe-Schönberg et al., 2006). The parts of the system getting into contact with the sample are entirely made of inert materials and withstand temperatures up to 260 °C (short-term 305 °C): perfluoralkoxy (PFA), polyetheretherketone (PEEK), polytetrafluorethylene (PTFE, Teflon®), and a short tube of high-purity titanium (99.9 % Ti). Fluid enters via this titanium tube (40 cm length, 6 mm I.D., bent to 45°) - the nozzle – inserted into a stainless steel protection tube and mounted to a T-handle that is guided by the ROV's ORION manipulator arm (Fig. 5.4-1, -2a). Parallel to the titanium nozzle is a high-temperature sensor (see below) delivering real-time temperature data for the tip of the nozzle. Coiled PFA tubing (3/8" O.D., 3 m length) connects the nozzle to a remotely controlled multi-port valve (PEEK/ PTFE) delivering the fluid to the respective sampling flask. The valve is driven by a stepper motor (electric actuator, Schilling Robotics, U.S.A.) and controlled from a separate laptop via RS232 tunneling through the ROV control system (Kiel 6000 ROV: Node 6, port #14). The software package used was FluidCtrl V. 3.0.0 by Jens Renken @ Marum Soft, Bremen.

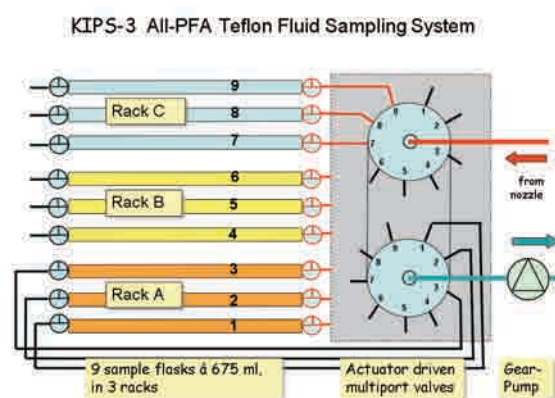


Fig. 3.5 Schematic configuration of the inert KIPS fluid sampling system (only tubing connections to flasks # 1 - # 3 are shown for clarity). Fluid entering the nozzle is distributed by a motorized multiport-synchro-valve into 9 PFA sample flasks à 675 ml. The gear pump is positioned downstream. Racks A, B, C with 3 flasks each can be quickly removed and sub-sampled in the lab. An additional peristaltic pump delivers dissolved reagents for in situ fixation (e.g., ZnAc for dissolved sulfide) of 1-3 samples.

The multiport synchro-valve has 9 inlet and 9 outlet ports connected to 9 PFA flasks with 675 ml volume each (Savillex, USA). Each bottle is equipped with stopcocks. The flasks are mounted in three racks A-C, with every rack containing three horizontally positioned bottles (A1-A3, B4-B6, C7-C9), allowing an easy transfer of the racks to the laboratory where sub-sampling was done. Flasks were pre-filled with ambient bottom seawater (Atlantic Deep Water, ADW) obtained from previous CTD hydrocasts. A 24 V deep sea mechanical gear-pump, switched on and off through the ROV's telemetry, is mounted downstream to the sample flasks, thus, avoiding contamination of the samples. The pumping rate was approx. 1 L/min at 24 VDC. The standard pumping time per sample was set to 4 min. making sure that the flask volume was exchanged at least 5 times. The outlet of the KIPS system is located on the porch at the front-side of the ROV, where video control allows the observation of warm shimmering fluids leaving the system. In addition, a flow mobile was attached to the outlet tube at diffuse vent sites.

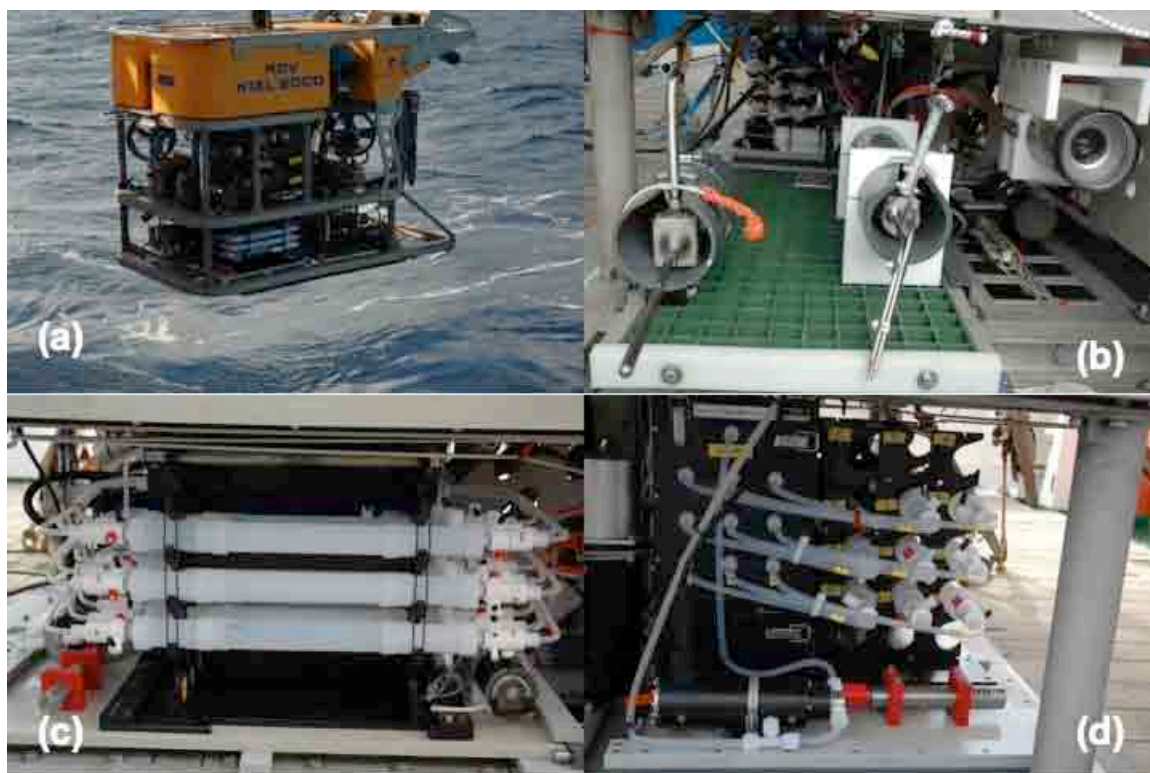


Fig. 3.6: (a) KIPS-3 mounted on the tool sled of ROV KIEL6000. (b) T-Handle with KIPS titanium nozzle, temperature probe, and ISMS titanium tube, all bent to 45°. To the left is the 8-channel T probe., to the right the HD video camera. (c) PFA sample flasks with stopcocks, mounted in 3 racks A-C; temperature data logger (left) and peristaltic pump (right). (d) Side view with connecting tubing between multiport synchro-valve housing and sample flasks. Mechanical gear pump (black, left) and temperature data logger (right).

A high-precision temperature probe (manufactured by H.-H. Gennerich, Bremen) in stainless steel pressure housing was attached parallel to the titanium nozzle (Fig. 5.4-2b). The probe is equipped with both a Pt-1000 and a NTC thermistor sensor mounted adjacent to each other. The two temperature sensors are characterized by opposite resistivity-temperature relationships. The 90% time constant of both sensors in water is better than 10 s. The probe is connected to a RBR logger TBR-

2050 (RBR Brancker, Canada) for real time data conversion to calibrated temperatures and data storage. A Y-splice cable connection accomplished real time data transfer through the ROV's RS232 data line and the display on a ROV control van monitor. Prior to the cruise a 23-points high-precision calibration covering 0-450 °C was performed at an ISO-certified calibration lab for each of the sensors.

A newly developed deep sea peristaltic pump has now been added to the KIPS system. The pump delivers 10 ml/min dissolved reagent from a polyethylene transfusion bag into one (up to 3) sample flask. The pump is switched on and off through the ROV telemetry. The pumping rate can be varied by choosing peristaltic tubing with different diameter.

Titanium syringe water samplers ("Majors")

In addition to the KIPS, two titanium syringes ("Majors" after von Damm et al., 1985; manufactured by IFREMER/ BREST-MECA) had been prepared to collect hot hydrothermal fluids at Turtle Pits, Comfortless Cove and Red Lion. The total sample volume for one major is 750 ml (Fig. 5.4-3). The samplers are made of titanium with seals made from Teflon and Viton. The syringes are not gas-tight, too: a simple lab test showed that bubbling from the samplers started at 1.5 bars overpressure. They are constructed to be self-flushing and are sent to the seafloor in chocked mode. To take a fluid sample, the snorkel is placed into the vent orifice. First, only the snorkel gets flushed by the fluid; a control for a good position within undiluted fluid is allowed by observing the small flushing vent opening above the snorkel inlet venting clear fluid without black smoke.

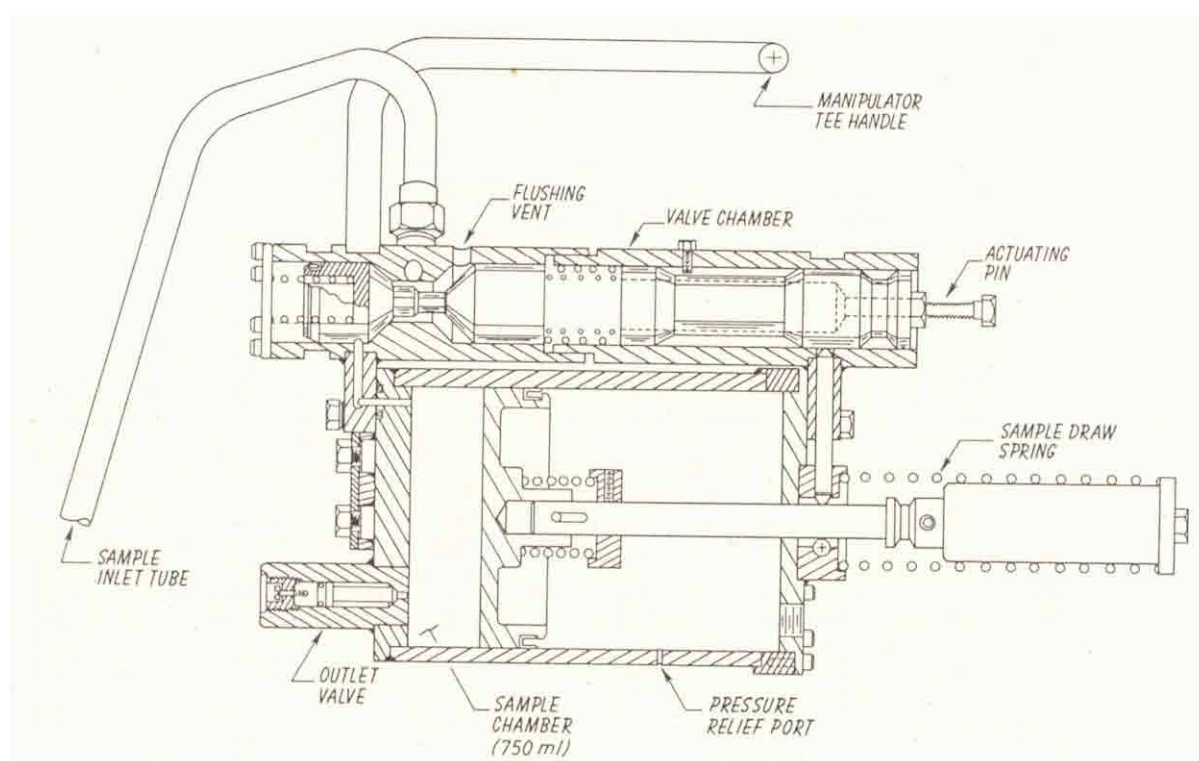


Fig. 3.7 Schematic drawing of the "Majors" titanium syringe sampler after von Damm, 1985 (*Geochimica et Cosmochimica Acta* **49**, 2197–2220).

Triggering the sampler is accomplished by pushing the releaser with a hydraulic piston mounted on the ROV manipulator arm. This releaser 1) closes the flushing valve, 2) opens the valve to the sample chamber, and 3) releases the pin holding the piston rod so that the large spring can pull the piston back soaking hydrothermal fluid into the sample chamber. To recover the sample on board tubing is connected to the small outlet valve of the sample chamber. For gas sampling, a vacuum extraction line can be connected. Usually, thin black coatings in the sample chamber and on sealings can be observed after sampling indicating that sulfides precipitated from the sampled fluid. These coatings are lost during sub-sampling and, hence, are not part of the analysis.

Sub-sampling and sample preparation for on-board analyses and subsequent measurements in the home laboratories

Immediately after recovery of the ROV on deck KIPS sample racks A-C were transferred to the laboratory for sub-sampling following a standardized protocol (see Appendix). In addition to the onboard analyses, further fluid sample aliquots were taken for measuring fluid chemical composition and selected isotopes.

Each sample was first transferred to one PFA bottle, homogenized by shaking and further distributed to the respective sub-sampling vials: (i) 2 ml for major elements incl. Mg, (ii) 60 ml of original fluid for anions, (iii) 60 ml original fluid, not filtrated, acidified with 1-5 ml subboiled HNO₃ per 100 ml fluid and stored in PFA bottles, (iv) 60 ml pressure filtrated (99.9990 nitrogen) through 0.2 µm Nuclepore PC membrane filters in a Sartorius filtration unit, acidified with 0.2 ml subboiled concentrated nitric acid per 100 ml and also stored in 100 ml PFA bottles until analyses. Procedural blanks were processed in regular intervals. All work was done in a class 100 clean bench (Slee, Germany) using all-plastic labware (HDPE, PC, FEP, PFA). Rinse water was ultrapure (>18.2 MOhm) dispensed from a Millipore Milli-Q system.

After return to the home labs in Kiel and Bremen samples will be analysed for major and minor elemental composition (Na, K, Ca, Mg, Sr, Ba, B, Fe, Mn, Cu, Zn) by means of ICP-optical emission spectrometry (Ciros SOP; Spectro) and trace elements (e.g., I, Br, B, Li, Al, Ti, Cs, Ba, Sr, Y-REE, Fe, Mn, Cr, V, Cu, Co, Ni, Pb, U, Mo, As, Sb, W) by ICP-mass spectrometry using both collision-cell quadrupole (U-Kiel: 7500 cs, Agilent, JU-Bremen: Elan DRC-e, Perkin Elmer) and high resolution sector-field instrumentation (U-Kiel: PlasmaTrace 2, Micromass). At Jacobs University in Bremen (JUB), complementary analyses on the speciation of metals will be carried out using voltammetry (Computrace VA 757, Metrohm). For Cu-ligand analysis non-filtered sub-samples were immediately frozen (-20°C) as 350 µl aliquots. For anion analyses (e.g., Cl⁻, Br⁻, I⁻, SO₄²⁻), aliquots of hot hydrothermal fluids containing particles were pressure-filtrated through 0.2 µm PC membrane filters (Nuclepore). Filters were kept in plastic containers. For SO₄²⁻ analysis a 3% zinc-acetate solution was added to aliquots of hot hydrothermal fluids and resulting precipitated zinc sulfides were filtered off to prevent the addition of oxidised H₂S to the initial sulfate content. Samples for the determination of dissolved inorganic silica were diluted 1:50 from the concentrated fluid (filtered and acidified) with DI water.

Further sub-samples were collected for stable isotope analyses. Filtered aliquots of hot hydrothermal fluids (2x2 ml) were stored with no headspace in crimp-sealed glass vials for hydrogen (d²H) and oxygen isotope measurements (d¹⁸O). Hydrogen sulfide dissolved in the hydrothermal fluids was precipitated as zinc sulfide with a 3% zinc-acetate solution, filtered and dried for

measuring the four stable sulfur isotopes (^{32}S , ^{33}S , ^{34}S , ^{36}S). For determining the carbon isotopic composition of inorganic carbon (d^{13}C) dissolved in hot and diffuse hydrothermal fluids, 20 ml aliquots were poisoned with two drops of HgCl_2 and stored in the dark. Stable isotope measurements will be carried out at the Geologisch-Paläontologisches Institut, Universität Münster, Germany. For Ca, Sr, and Cl isotope measurements, 50 ml of non-filtered hydrothermal fluid were stored in HDPE bottles.

Analytical procedures on-board ship

In general, on-board measurements were performed immediately after sample recovery on deck. Sampling followed a standardized protocol in order to avoid oxidation of highly redox-sensitive dissolved constituents in the hydrothermal fluids.

pH and Eh. Non-filtered aliquots of each sample were subjected to immediate pH and Eh measurements (Ag/AgCl reference electrode).

Dissolved oxygen. Dissolved oxygen was determined for diffuse hydrothermal fluids following the classical Winkler method as outlined in Grasshoff (1999). The method was slightly modified in order to utilize 10 ml volumetric flasks. The detection limit is approx. 0.5 ml/l O_2 , precision is in the range of ± 0.1 ml/l O_2 . The samples were analysed by Mirjam Perner and Nico Rychlik (see section on Microbiological Diversity).

Magnesium. The content of Ca and Mg was calculated after a sample titration using Erio T as an indicator and alkaline buffer medium (pH 10 with $\text{NH}_4\text{Cl}/\text{NH}_3$ buffer solution). The pH was first adjusted to 10 and after addition of a small amount of Erio T, the solution was titrated from red to blue with EDTA 0.1 M solution. Ca concentrations were determined using Murexid as an indicator and alkaline medium (pH ≥ 12 with NaOH 1 M solution). The pH was adjusted, Murexid was added, and the solution was titrated from red to violet with EDTA 0.1 M solution. The Ca content was then subtracted from the total content of Ca and Mg to obtain the Mg concentrations.

Dissolved sulfide. For onboard analysis of dissolved sulfide concentrations Spectrophotometry was used. Spectrophotometry of dissolved sulfide is based on the light absorption of methylene blue at a wavelength of 660 nm. Dissolved sulfide is stabilized in a colloidal form as zinc sulfide using zinc acetate gelatine solution (100 μl for 1 ml of hydrothermal fluid). The sulfide reacts with N,N-dimethyl-1,4-phenylene-diamine-dihydrochloride to colourless leucomethylene and – through oxidation by Fe(III) supplied by an FeCl_3 -solution – further to methylene blue. Photometric measurements were performed using a Biochrom Libra S12 spectrophotometer. Concentrations of the freshly prepared stock solution utilized for calibration were determined by titration with a 0,02N sodium-thiosulfate solution.

Dissolved trace metals. Concentrations of trace metals (Zn, Pb, Cd, Cu) in the diffuse fluids were analysed by voltammetry, a highly sensitive electrochemical method. Measurements were performed using a 757 VA Computrace stand (Metrohm) with a standard PC. The three-electrode configuration included a multi-mode electrode (MME) as the working electrode, an Ag/AgCl reference electrode (3 M KCl), and a glassy carbon electrode as the auxiliary electrode. Unfiltered fluid samples were submitted to a digestion process in a UV Digestor (Model 705, Metrohm), which contains a high-pressure mercury lamp (500 W), decomposing organic metal complexes. After two hours of UV irradiation, the total content of Zn, Cu, Cd, and Pb in selected samples were determined by the

standard addition method. Samples were buffered at pH 4.6 with 1 M acetate buffer solution and measured by ASV (Application on Bulletin Metrohm 231/ 2).

Table 3.3 Summary of hydrothermal fluid sub-samples taken during cruise MSM 10-3

Jacobs University Bremen, AG Koschinsky														Price, MARUM														Dittmar MPI														Westfälische Universität Münster, AG Strauß														Christian-Albrechts-Universität Kiel, AG Garbe-Schönberg														Location	Station Nr.	Sample ID	Bottle	Sample Type	Date	onboard	sulfate	cations NF	cations F	Si-det.	Ti-det.	AAS	Cu-ligands															Irina 2	272 ROV	3	A1	diffuse fluid	25.01.2009	x		x						4	A2	diffuse fluid	x								5	A3	diffuse fluid	x								6	B4	diffuse fluid	x								7	C8(ZnAc)	diffuse fluid	x								-	C8	diffuse fluid	x																			Irina 2, Microsmoker	290 ROV	9	A2	hot fluid	01.02.2009	x								10	A3	hot fluid	x								11	B4	hot fluid	x	x							12	B5	hot fluid	x								13	C9	hot fluid																															Irina 2, mussel patch	300 ROV	15	A1(ZnAc)	diffuse fluid	04.02.2009									16	A2	diffuse fluid	x		x						17	A3	diffuse fluid	x								18	B4	diffuse fluid	x								19	B5	diffuse fluid	x								20	B6	diffuse fluid	x								21	C7	diffuse fluid	x								22	C8	diffuse fluid	x								23	C9	diffuse fluid	x																																									site B	313 ROV	10	A1(ZnAc)	hot fluid	08.02.2009									11	A2	hot fluid	x								12	A3	hot fluid	x	x							13	B4	hot fluid	x								14	B5	hot fluid	x																														Anna Louise	315 ROV	14	A1(ZnAc)	hot fluid	09.02.2009	x								15	A2	hot fluid	x								16	A3 (gas)	hot fluid	x								17	B4	hot fluid	x		x						18	B5	hot fluid	x		x						19	B6	hot fluid	x	x																	
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Table 3.4 Summary of CTD-rosette samples taken for fluid chemistry

Stat. No.	Sample ID	description	volume	acidified	frozen	use, methods
233 CTD		far off Lgtch				
		depth (m)				
	4	3902	500ml		x	ligands
		Pressure (dbar)	25l			background seawater
260 CTD	1	3530	250ml	x		Fe, Mn
	2	2500	250ml	x		Fe, Mn
	3	3000	250ml	x		Fe, Mn
	4	2400	250ml	x		Fe, Mn
	5	2300	250ml	x		Fe, Mn
	6	2200	250ml	x		Fe, Mn
	7	2000	250ml	x		Fe, Mn
261 CTD		depth (m)				
	2	3100	250ml	x		Fe, Mn
	4	2950	250ml	x		Fe, Mn
	6	2850	250ml	x		Fe, Mn
	8	2750	250ml	x		Fe, Mn
	10	2650	250ml	x		Fe, Mn
263 CTD		Pressure (dbar)				
		N of Lgtch				
	1	3394	250ml	x		Fe, Mn
	2	3250	250ml	x		Fe, Mn
	3	3150	250ml	x		Fe, Mn
	4	3050	250ml	x		Fe, Mn
	5	2900	250ml	x		Fe, Mn
	6	2950	250ml	x		Fe, Mn
	7	2900	250ml	x		Fe, Mn
	8	2850	250ml	x		Fe, Mn
	9	2700	250ml	x		Fe, Mn
	10	2750	250ml	x		Fe, Mn
	12	2650	250ml	x		Fe, Mn
	14	2550	250ml	x		Fe, Mn
264 CTD		Pressure (dbar)				
		right over				
		Irina2				
	2	3047	250ml	x		Fe, Mn, sub-sample trace elements
	3	2950	2L		x	organics, T. Dittmar
			50ml	x		As, R.Price
	4	2950	250ml	x		Fe, Mn, sub-sample trace elements
	6	2850	500ml	x		Fe, Mn, sub-sample trace elements
	7	2750	2L		x	organics, T. Dittmar
			50ml	x		As, R.Price
	8	2750	500ml			Fe, Mn, sub-sample trace elements
266 CTD		Pressure (dbar)				
		N of Lgtch				
	1	3376	250ml	x		Fe, Mn
	3	3350	250ml	x		Fe, Mn
	5	3300	250ml	x		Fe, Mn
	6	3250	250ml	x		Fe, Mn
	7	3200	250ml	x		Fe, Mn
	9	3100	250ml	x		Fe, Mn
	10	3050	250ml	x		Fe, Mn
	11	3000	250ml	x		Fe, Mn
	13	2900	250ml	x		Fe, Mn
	14	2850	250ml	x		Fe, Mn
	15	2800	250ml	x		Fe, Mn
	17	2700	250ml	x		Fe, Mn
	18	2650	250ml	x		Fe, Mn

Appendix 3: Appendix to Microbial Ecology (5.6.1)**Table 1: Samples list of CTDs**

CTD	NISKIN	Pressure (dbar)	Depth (m)	FISH (4°C)	DNA (-80°C)	Cultures & others
264 CTD	1	3047.038		2x 200ml	2x 1000ml	
	7	2751.167		2x 200ml	2x 1000ml	Thermales; 4°C, 37°C, 75°C
						Desulfurobacterium; 4°C, 37°C, 75°C
						Methanococcales; 4°C, 37°C, 75°C
						Thermococcales; 4°C, 37°C, 75°C
						Aquifex & Epsilonproteo (H ₂ /CO ₂); 4°C, 37°C, 75°C
						Aquifex & Epsilonproteo (H ₂ /CO ₂ /O ₂); 4°C, 37°C, 75°C
						NOB, marine, 4°C ¹
						NOB, terrestrisch, 4°C ¹
						AOB, marine, 4°C ¹
	13	2540.84		2x 200ml	2x 1000ml	
	15	2050.743		2x 200ml	2x 1000ml	
295 CTD	2	2716	2683	2x 150ml	2x 1000ml	Thermales; 4°C, 75°C
						Desulfurobacterium; 4°C, 75°C
						Aquifex & Epsilonproteo (H ₂ /CO ₂ /O ₂); 4°C, 75°C
						Virus; 15ml filtrated (0,2µm) Eluat with 300µl Formaldehyd; fluorescence; 4°C; ²
						Virus; 400ml filtrated (0,2µm) Eluat ; genetics, 4°C; ²

CTD	NISKIN	Depth (m)	FISH (4°C)	DNA (-80°C)	Cultures & others
312 CTD	9	2800	1x 200ml MAR-FISH (15ml)	1x 1000ml	3x H ₂ oxic incubation + ¹⁴ C
			MAR-FISH (15ml)		3x H ₂ microaerophilic incubation + ¹⁴ C
			MAR-FISH (15ml)		3x H ₂ anoxic incubation + ¹⁴ C
			MAR-FISH (15ml)		3x fluid no amendment
			MAR-FISH (15ml)		3x H ₂ S incubation
			MAR-FISH (15ml)		3x fluid + formaldehyde (control)
	10		1x 200ml	1x 1000ml	

¹ samples will go to Dr. Eva Spieck, Microbiology, University of Hamburg for investigations on nitrite-oxidizers (NOB) and ammonium oxidizers (AOM)

² samples will go to Dr. Matt Sullivan, Ecology and Evolutionary Biology Department, University of Arizona for investigating viruses in hydrothermal habitats.

Table 2 Sample list of hydrothermal fluids taken with the KIPS during the ROV dives

ROV	Sampling site	KIPS	FISH (4°C)	DNA (-80°C)	RNA (-80°C)	Cultures & others
272 ROV 3-6	Irina II	A1, A2, B4	1x 150ml	1x 450ml	1x 450ml	Desulfurobacterium; 25°C, 55°C, 75°C
	Low-temperature fluids					Methanococcales; 25°C, 55°C, 75°C
						Aquifex & Epsilonproteo (H ₂ /CO ₂) 25°C, 55°C, 75°C
			MAR-FISH (15ml)			3x H ₂ oxic incubation + ¹⁴ C
			MAR-FISH (15ml)			3x H ₂ microaerophilic incubation + ¹⁴ C
			MAR-FISH (15ml)			3x H ₂ anoxic incubation + ¹⁴ C
			MAR-FISH (15ml)			3x fluid no amendment
			MAR-FISH (15ml)			3x H ₂ S incubation
			MAR-FISH (15ml)			3x fluid + formaldehyde
290 ROV 9-10						
	Irina II; hot fluids (Microsmoker)	A3, A4	1x 150ml	1x 500ml	--	Thermales; 75°C
						Desulfurobacterium; 75°C
						Methanococcales; 75°C
						Thermococcales; 75°C
						Aquifex & Epsilonproteo (H ₂ /CO ₂); 75°C
						Thermodesulfobacteria; 75°C
						AWS; 1% Trypton; aerob; 25°C; ³
						AWS; 2% Glucose; aerob; 25°C; ³
						AWS; 0,25% Acetat; aerob; 25°C; ³

						AWS; 0,25% Pyruvat; aerob; 25°C; ³
						AWS; 1% Lactat; aerob; 25°C; ³
						AWS; 0,3% MeOH; aerob; 25°C; ³
						AWS; 1% Trypton; anaerob; 25°C; ³
						AWS; 2% Glucose; anaerob; 25°C; ³
						AWS; 0,25% Acetat; anaerob; 25°C; ³
						AWS; 0,25% Pyruvat; anaerob; 25°C; ³
						AWS; 1% Trypton; aerob; +NO ₃ ; 25°C; ³
						AWS; 2% Glucose; aerob; +NO ₃ ; 25°C; ³
						AWS; 0,25% Acetat; aerob; +NO ₃ ; 25°C; ³
						AWS; 0,25% Pyruvat; aerob; +NO ₃ ; 25°C; ³
						AWS; 1% Lactat; aerob; +NO ₃ ; 25°C; Ruth
						AWS; 0,3% MeOH; aerob; +NO ₃ ; 25°C; ³
						AWS; 1% Trypton; anaerob; +NO ₃ ; 25°C; ³
						AWS; 2% Glucose; anaerob; +NO ₃ ; 25°C; ³
						AWS; 0,25% Acetat; anaerob; +NO ₃ ; 25°C; ³
						AWS; 0,25% Pyruvat; anaerob; +NO ₃ ; 25°C; ³
						Virus; 15ml filtrated (0,2µm) Eluat with 300µl Formaldehyd; fluorescence; 4°C; ²
						Virus; 500ml filtrated (0,2µm) Eluat ; genetics; 4°C; ²
						NOB, marin, 4°C; ¹
						NOB, terrestrisch, 4°C; ¹

						AOB, marin, 4°C; ¹
						AOB, terrestrisch; 4°C; ¹
ROV	Sampling site	KIPS	FISH (4°C)	DNA (-80°C)	RNA (-80°C)	Cultures & others
300 ROV 16-18	Irina II; mussel	A2, A3, B4	1x 100ml	1x 600ml		-
300 ROV 19-21	field, diffuse fluids	B5, B6, B7	1x 100ml	1x 570ml		-
300 ROV 22-23		C8, C9	1x 100ml	1x 600ml		-
300 ROV 16-23						Thermales; RT, 55°C, 75°C
						Methanococcales; RT, 55°C, 75°C
						Thermococcales; RT, 55°C, 75°C
						Aquifex & Epsilonproteo (H ₂ /CO ₂ /O ₂); RT, 55°C, 75°C
300 ROV 16-21		A2-B6				MJ AAs & Cu; 0 AAs & 0 Cu; RT; ⁴
						MJ AAs & Cu; 0 AAs & 100nM Cu; RT; ⁴
						MJ AAs & Cu; 0 AAs & 1µM Cu; RT; ⁴
						MJ AAs & Cu; 0 AAs & 10µM Cu; RT; ⁴
						MJ AAs & Cu; 100nM AAs & 0 Cu; RT; ⁴
						MJ AAs & Cu; 100nM AAs & 100nM Cu; RT; ⁴
						MJ AAs & Cu; 100nM AAs & 10µM Cu; RT; ⁴
						MJ AAs & Cu; 100nM AAs & 1µM Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 0 Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 100nM Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 1µM Cu; RT; ⁴

						MJ AAs & Cu; 1µM AAs & 10µM Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 0 Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 100nm Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 1µM Cu; RT; ⁴
						MJ AAs & Cu; 1µM AAs & 10µM Cu; RT; ⁴
						MJ AAs & Cu; ohne Inokulum; 1µM AAs & 0 Cu; RT; ⁴
						MJ AAs & Cu; ohne Inokulum; 1µM AAs & 100nm Cu; RT; ⁴
						MJ AAs & Cu; ohne Inokulum; 1µM AAs & 1µM Cu; RT; ⁴
						MJ AAs & Cu; ohne Inokulum; 1µM AAs & 10µM Cu; RT; ⁴
ROV	Sampling site	KIPS	FISH (4°C)	DNA (-80°C)	RNA (-80°C)	Cultures & others
300 ROV 22-23		C8, C9				Virus; 15ml filtrated (0,2µm) Eluat with 300µl Formaldehyd; fluorescence; 4°C; ²
						Virus; 600ml filtrated (0,2µm) Eluat ; genetics, 4°C; ²
313 ROV 9	Site B ; Chimney piece from B4 chimney at smoking crater; pyrite		ca. 0.5kg	ca. 1.5 kg		
313 ROV 13	Hot fluids, Site B	B4	1x 50ml	1x 400ml		

¹ samples will go to Dr. Eva Spieck, Microbiology, University of Hamburg for investigations of nitrite-oxidizers (NOB) and ammonium oxidizers (AOM)

² samples will go to Dr. Matt Sullivan, Ecology and Evolutionary Biology Department, University of Arizona for investigating viruses in hydrothermal habitats.

³ samples will go to Prof. Ruth Schmitz-Streit, Microbiology, University of Kiel for investigating developments in immunesystems

⁴ samples will go to Verena Klevenz, Jacobs University of Bremen for investigating co-komplexation

RT = room temperature (25°C); AWS = artificial seawater; MJ = artificial seawater; AA=amino acids; Cu = Copper

Appendix 4 Dive Protocols**272 ROV (Kiel 6000 dive #42)**

Cruise Number MSM 10/3
Station Number 272
Dive Number 42
Location Irina II
Coordinates 14°45'175N, 44°58'707W
Water Depth 3010.9
Vessel Maria S. Merian

Metadata	Observation	Actions	Posidonia data			
Timecode		Samples	Time	Lat	Lon	Depth
25.01.2009 11:52	Bottom contact, 30m above ground		11:52:00	14.75270	-44.97917	2980
25.01.2009 11:54	bottom sighting, Mussel field Irina II		11:54:00	14.75263	-44.97917	3004
25.01.2009 11:56	microsmoker, active venting, with S Moni		11:56:00	14.75272	-44.97902	3006
25.01.2009 11:59	abundant fish		11:59:00	14.75278	-44.97905	3009
25.01.2009 12:00	Musselfield with T data loggers, most mussels are dead, loggers are not overgrown w/ mussels		12:00:00	14.75272	-44.97910	3009
25.01.2009 12:01	almost no smoke venting from Irina II structure, still covered with living mussels		12:01:00	14.75277	-44.97914	3010
25.01.2009 12:04	dark colored chimney side arms with beehive chimneys, venting low T fluid, abundant shrimp at the base		12:04:00	14.75277	-44.97915	3007
25.01.2009 12:11	approaching musselfield near base of Irina II, S side 3032 m, ROV fixed on seafloor		12:11:00	14.75283	-44.97912	3009
25.01.2009 12:17	begin T measurement in musselfield: T = 7 °C		12:17:00	14.75278	-44.97905	3011
25.01.2009 12:23	T = 4.8 °C, on-line ISMS measurements, H, CH ₄ , CO ₂ rise	272 ROV-1	12:23:00	14.75285	-44.97915	3009
25.01.2009 12:30	new position: 3.4 - 4.4 °C		12:30:00	14.75277	-44.97915	3009
25.01.2009 12:34	searching for warmer spots; T = 13 °C, ISMS measurment	272 ROV-2	12:34:00	14.75275	-44.97908	3010
25.01.2009 12:38	T = 13.3; little mussel mound in front of Irina II mound, in the background in a crack between mound Irina II and flat mussel field are shrimps (<i>Rimicaris exoculata</i> , <i>Chorocaris chacei</i>) accumalated		12:38:00	14.75288	-44.97908	3010
25.01.2009 12:42	T = 14.4 °C, possible that warm fluids flowing across the field		12:42:00	14.75275	-44.97910	3009
25.01.2009 12:46	Kips bottle 1 pump on; t=11.8°C,	272 ROV-3	12:46:00	14.75285	-44.97912	3010
25.01.2009 12:51	KIPs bottle 1 pump off; t=9.7°		12:51:00	14.75280	-44.97918	3009
25.01.2009 12:51	KIPS bottle 2; pump on 13.7°C	272 ROV-	12:51:00	14.75280	-44.97918	3009

		4				
25.01.2009 12:55	t= 15.6°C		12:55:00	14.75282	-44.97908	3010
25.01.2009 12:55	KIPS bottle off		12:55:00	14.75282	-44.97908	3010
25.01.2009 12:55	KIPS bottle 3 on;	272 ROV-5	12:55:00	14.75282	-44.97908	3010
25.01.2009 12:55	pump off again, some problem		12:55:00	14.75282	-44.97908	3010
25.01.2009 12:56	pump on for bottle 3, continue pumping for bottle 3		12:56:00	14.75277	-44.97920	3009
25.01.2009 12:57	13.8°C		12:57:00	14.75277	-44.97915	3010
25.01.2009 13:00	pump off for bottle 3		13:00:00	14.75277	-44.97912	3009
25.01.2009 13:01	pump on bottle 4	272 ROV-6	13:01:00	14.75278	-44.97908	3010
25.01.2009 13:04	although pump is on its not pumping		13:04:00	14.75277	-44.97905	3010
25.01.2009 13:04	pump off, no fluid flow		13:04:00	14.75277	-44.97905	3010
25.01.2009 13:04	pump on; starts pumping then stops		13:04:00	14.75277	-44.97905	3010
25.01.2009 13:04	pump off again, problem with pumping		13:04:00	14.75277	-44.97905	3010
25.01.2009 13:05	ISMS mass spec recording		13:05:00	14.75278	-44.97918	3008
25.01.2009 13:05	pump on, very slow fluid flow		13:05:00	14.75278	-44.97918	3008
25.01.2009 13:05	pump off, is nozzle blocked?		13:05:00	14.75278	-44.97918	3008
25.01.2009 13:06	pump back on; pump is pumping slowly, probably blocked in the nozzle; filling now bottle 9	272 ROV-7	13:06:00	14.75282	-44.97908	3009
25.01.2009 13:08	T=13.8°C		13:08:00	14.75282	-44.97908	3010
25.01.2009 13:08	huge crab (<i>Segoncia mesatlantica</i>) in picture, very abundant brittle stars (<i>Ophionectes sp.?</i>), many snails (<i>Phymorhynchus ovatus</i>), limpets		13:08:00	14.75282	-44.97908	3010
25.01.2009 13:10	pumping now at a lower speed than before but continuously pumping		13:10:00	14.75277	-44.97908	3009
25.01.2009 13:11	pump off		13:11:00	14.75277	-44.97908	3009
25.01.2009 13:12	dosierpumpe an for 1 minute (ZnAc in situ fixation of sulfide)		13:12:00	14.75277	-44.97912	3009
25.01.2009 13:13	T = 13°C		13:13:00	14.75280	-44.97907	3010
25.01.2009 13:13	dosier pompe off, taken in situ fixation of sulfide fluid sample		13:13:00	14.75280	-44.97907	3010
25.01.2009 13:14	look at durchflussszähler		13:14:00	14.75282	-44.97907	3010
25.01.2009 13:14	pump on on FLUSH position is ok again		13:14:00	14.75282	-44.97907	3010
25.01.2009 13:24	going for the 8-chanal logger		13:24:00	14.75277	-44.97923	3008
25.01.2009 13:27	grabbed the 8-chanal logger		13:27:00	14.75282	-44.97908	3011
25.01.2009 13:29	still working on positioning 8-chanal logger		13:29:00	14.75280	-44.97914	3010
25.01.2009 13:34	still working on positioning 8-chanal logger		13:34:00	14.75282	-44.97912	3010
25.01.2009 13:37	problems with hydraulics on arm; testing		13:37:00	14.75278	-44.97917	3009
25.01.2009 13:38	problems because pressure dropping, probably half an hour until we have to ascend		13:38:00	14.75273	-44.97912	3009

25.01.2009 13:45	aborted collecting 8-chanal data because only half an hour left probably before ascending, will collect mussel scoop at the same position where we collectd fluids before		13:45:00	14.75283	-44.97912	3010
25.01.2009 13:55	Taking mussel net, 1/2 filled, plus loose mussels in the drawer	272 ROV-8	13:55:00	14.75277	-44.97908	3010
25.01.2009 14:14	Finished		14:14:00	14.75280	-44.97902	3011
25.01.2009 14:19	off bottom for HD video recording of the area S Irina II, musselfield w/ temperature loggers, HD on, taking still photos		14:19:00	14.75305	-44.97982	3007
25.01.2009 14:26	HD off		14:26:00	14.75278	-44.97917	3007
25.01.2009 14:26	Dive terminated due to hydraulic pressure failure		14:26:00	14.75278	-44.97917	3007

290 ROV (Kiel 6000 dive #43)

Cruise Number MSM 10-3
Station Number 290
Dive Number 43
Location LHF-1, OBT site and Irina II
Coordinates
Water Depth
Vessel Maria S.Merian

Metadata	Observation	Actions	Time	Lat	Lon	Depth
Timecode	Allowed	allowed				
01.02.2009 13:37	Bottom sight, GB on since beginning of dive, GB: 290-1	290 ROV-1	13:37:00	14.75330	-44.97973	3013
01.02.2009 13:38	drop down directly next to OBT 2		13:38:00	14.75330	-44.97973	3026
01.02.2009 13:38	turn around OBT to identify marker		13:38:00	14.75330	-44.97973	3026
01.02.2009 13:41	marker 29 50cm next to OBT 2		13:41:00	14.75328	-44.97970	3028
01.02.2009 13:43	homer beacon in sight		13:43:00	14.75328	-44.97977	3026
01.02.2009 13:43	go to homer beacon		13:43:00	14.75328	-44.97977	3026
01.02.2009 13:44	left hand marker 21		13:44:00	14.75328	-44.97968	3028
01.02.2009 13:45	approach marker 21, the one where oceanic push core samples originate		13:45:00	14.75330	-44.97963	3025
01.02.2009 13:46	former push core holes identified		13:46:00	14.75327	-44.97967	3025
01.02.2009 13:48	sit down next to marker 21		13:48:00	14.75328	-44.97965	3025
01.02.2009 13:49	pull out drawer for 8-channel T-lance measurement		13:49:00	14.75335	-44.97972	3025
01.02.2009 13:52	clouds of upwhirled sediment in front of cameras		13:52:00	14.75333	-44.97967	3025
01.02.2009 14:04	8-channel T-lance shows 80°C in water above sediment!		14:04:00	14.75328	-44.97960	3026
01.02.2009 14:06	KIPS temp: 3°C in water above sediment		14:06:00	14.75330	-44.97962	3026
01.02.2009 14:07	8-channel T-lance in sediment,	290 ROV-2	14:07:00	14.75330	-44.97953	3027
01.02.2009 14:09	ROV Team changes to Hannes and Inken		14:09:00	14.74968	-44.97348	2949
01.02.2009 14:10	no visible change on screen of temp with 8-channel		14:10:00	14.75327	-44.97962	3025
01.02.2009 14:16	T1 temp is 1.5 - 2°C warmer than other t-channels		14:16:00	14.75328	-44.97963	3025
01.02.2009 14:18	end of 8-channel T-lance measurements		14:18:00	14.75330	-44.97963	3026
01.02.2009 14:22	8-channel T-lance back in holder, end of GB measurements		14:22:00	14.75330	-44.97958	3027
01.02.2009 14:23	KIPS nozzle is about 10 cm above sediment, continuous measurements with GB (Gas Buster)		14:23:00	14.75330	-44.97962	3026
01.02.2009 14:25	Still trying to get 8 T-lance in holder		14:25:00	14.75323	-44.97962	3025
01.02.2009 14:35	8 T-lance in holder		14:35:00	14.75325	-44.97958	3027
01.02.2009 14:37	pull out drawer for push core, take core #27, 290-3	290 ROV-3	14:37:00	14.75327	-44.97965	3025

01.02.2009 14:41	HD camera on	14:41:00	14.75328	-44.97977	3027
01.02.2009 14:43	push core in sediment	14:43:00	14.75328	-44.97963	3025
01.02.2009 14:45	push core pulled out of sediment	14:45:00	14.75335	-44.97962	3025
01.02.2009 14:47	push core in holder	14:47:00	14.75337	-44.97958	3026
01.02.2009 14:50	draw doesn't close all the way, push core handle in the way	14:50:00	14.75335	-44.97957	3026
01.02.2009 14:52	drawer closes all the way after core handle pushed to the side	14:52:00	14.75327	-44.97960	3025
01.02.2009 14:54	looking for OBT or OBP	14:54:00	14.75337	-44.97960	3026
01.02.2009 14:59	OBP and OBT and beacon in view	14:59:00	14.75330	-44.97965	3025
01.02.2009 15:01	flying to OBP	15:01:00	14.75330	-44.97962	3025
01.02.2009 15:05	OBP picked up	15:05:00	14.75328	-44.97972	3025
01.02.2009 15:06	OBP on porch	15:06:00	14.75328	-44.97967	3027
01.02.2009 15:10	transit to Irina II	15:10:00	14.75330	-44.97970	3023
01.02.2009 15:21	ROV cable stuck on top left corner of ROV	15:21:00	14.75295	-44.97907	3017
01.02.2009 15:29	cable ok again	15:29:00	14.75297	-44.97912	3017
01.02.2009 15:30	Russian Irina microsmoke marker	15:30:00	14.75292	-44.97903	3015
01.02.2009 15:33	reach Irina II sulfide structure	15:33:00	14.75283	-44.97923	3014
01.02.2009 15:33	move towards T-loggers	15:33:00	14.75283	-44.97923	3014
01.02.2009 15:35	HD cam on	15:35:00	14.75280	-44.97923	3010
01.02.2009 15:35	pass T-logger field	15:35:00	14.75280	-44.97923	3010
01.02.2009 15:37	microsmoker	15:37:00	14.75285	-44.97923	3009
01.02.2009 15:37	S-Moni	15:37:00	14.75285	-44.97923	3009
01.02.2009 15:47	weight of OBP requires strong thruster propulsion. Consequence: sediment plumes	15:47:00	14.75283	-44.97898	3003
01.02.2009 15:49	back to microsmoker, search for place to drop OBP	15:49:00	14.75287	-44.97908	3009
01.02.2009 15:50	sit down next to microsmoker, ca 1 m S(?) of S-Moni	15:50:00	14.75283	-44.97903	3010
01.02.2009 16:01	placed OBP next to Smoni logger	16:01:00	14.75273	-44.97907	3010
01.02.2009 16:05	move to the right along Irina II sulfide structure	16:05:00	14.75277	-44.97905	3011
01.02.2009 16:05	in front of beehives	16:05:00	14.75277	-44.97905	3011
01.02.2009 16:06	abundance of shrimps dramatically reduced compared to earlier years	16:06:00	14.75287	-44.97907	3011
01.02.2009 16:07	top smokers of Irina II overgrown with mussels	16:07:00	14.75278	-44.97902	3010
01.02.2009 16:08	sit down in front of beehives	16:08:00	14.75270	-44.97920	3010
01.02.2009 16:09	sample 290-4; since 15:30: BG- measurement	16:09:00	14.75280	-44.97902	3010
01.02.2009 16:11	drop first colonization tray below beehives	16:11:00	14.75283	-44.97902	3010
01.02.2009 16:13	status report BG: high levels of H2 and CH4 all over the place	16:13:00	14.75283	-44.97903	3010
01.02.2009 16:14	2nd colonization tray deposited	16:14:00	14.75283	-44.97912	3009
01.02.2009 16:15	HD cam on deposited colonization tray #2 swarming with shrimp	16:15:00	14.75277	-44.97912	3010
01.02.2009 16:18	sym catch 3 deposited next to other two	16:18:00	14.75277	-44.97900	3010
01.02.2009 16:23	lift up	16:23:00	14.75278	-44.97912	3008

290 ROV-
4

01.02.2009 16:26	left turn around Irina II corner		16:26:00	14.75280	-44.97914	3010
01.02.2009 16:26	sit down in front of Irina II sulfide mound		16:26:00	14.75280	-44.97914	3010
01.02.2009 16:27	fish takes turkish bath in warm mussel cushion		16:27:00	14.75290	-44.97912	3010
01.02.2009 16:29	relocate little bit to left because Orion too close to beehive smokers		16:29:00	14.75273	-44.97915	3009
01.02.2009 16:30	sit down again		16:30:00	14.75278	-44.97907	3011
01.02.2009 16:35	search for position for GB nozzle in mussel carpet		16:35:00	14.75288	-44.97898	3011
01.02.2009 16:37	placed nozzle in the mussels		16:37:00	14.75278	-44.97915	3009
01.02.2009 16:42	less H2 and all other gases than before => inlet may be clogged		16:42:00	14.75282	-44.97917	3009
01.02.2009 16:44	take nozzle out, brush it against rock		16:44:00	14.75277	-44.97915	3009
01.02.2009 16:48	wait for gas readings, look much better now		16:48:00	14.75280	-44.97907	3010
01.02.2009 16:48	nozzle apparently free again, start next try		16:48:00	14.75280	-44.97907	3010
01.02.2009 16:50	next spot: top of a mussel clump , wait a few minutes for gas readings		16:50:00	14.75280	-44.97917	3010
01.02.2009 16:52	HD cam on spot with adult together juvenile mussels		16:52:00	14.75282	-44.97907	3011
01.02.2009 16:54	HD on new polynoid species Thermiphone crassousi		16:54:00	14.75280	-44.97908	3011
01.02.2009 16:55	GB measurement done (sample 5)	290 ROV-5	16:55:00	14.75277	-44.97914	3010
01.02.2009 17:04	prepare sample 7: mussel scoop of the clump that was measured by GB		17:04:00	14.75282	-44.97908	3010
01.02.2009 17:04	dropped mussel net, try another net		17:04:00	14.75282	-44.97908	3010
01.02.2009 17:29	net #3 empty back in draw		17:29:00	14.75287	-44.97915	3011
01.02.2009 17:35	sample 7: bunches of mussels grabed with claw from bottom	290 ROV-6	17:35:00	14.75282	-44.97914	3010
01.02.2009 17:47	ROV team changes to Phillip and Fritz		17:47:00	14.75273	-44.97915	3009
01.02.2009 17:55	recovered fallen mussel net #2		17:55:00	14.75280	-44.97910	3010
01.02.2009 17:55	off bottom heading towards Irina II microsmoker		17:55:00	14.75280	-44.97910	3010
01.02.2009 17:57	HD on approaching microsmoker		17:57:00	14.75280	-44.97907	3011
01.02.2009 17:59	HD off		17:59:00	14.75273	-44.97900	3011
01.02.2009 18:00	HD on		18:00:00	14.75278	-44.97910	3009
01.02.2009 18:01	HD off		18:01:00	14.75275	-44.97902	3010
01.02.2009 18:08	taking nozzle with ORION		18:08:00	14.75275	-44.97908	3010
01.02.2009 18:14	GB measurement with shrimp on outer chimney wall	290 ROV-8	18:14:00	14.75273	-44.97907	3009
01.02.2009 18:15	HD on		18:15:00	14.75278	-44.97910	3010
01.02.2009 18:19	HD off, flushing KIPS		18:19:00	14.75277	-44.97905	3010
01.02.2009 18:25	filling bottle A2, T = 130-160,	290 ROV-9	18:25:00	14.75282	-44.97905	3011
01.02.2009 18:30	filling bottle A3, 215 °C	290 ROV-10	18:30:00	14.75277	-44.97902	3010
01.02.2009 18:35	HD on, 2 minutes		18:35:00	14.75277	-44.97905	3010

01.02.2009 18:42	filling bottle B4, 352 °C	290 ROV-11	18:42:00	14.75277	-44.97910	3009
01.02.2009 18:46	filling bottle B5, 320-330 °C, clear fluid leaving outlet	290 ROV-12	18:46:00	14.75617	-44.98582	2879
01.02.2009 18:52	filling bottle C9, 320 °C, only little throughflow, dosage 1min ZnAc	290 ROV-13	18:52:00	14.75282	-44.97908	3010
01.02.2009 18:58	stowing nozzle; begin w/ recovery of SMoni data logger		18:58:00	14.75277	-44.97910	3010
01.02.2009 19:02	got SMoni, sulfide crystallized around sensor tip	290 ROV-14	19:02:00	14.75277	-44.97900	3010
01.02.2009 19:35	Smoni stowed		19:35:00	14.75277	-44.97905	3011
01.02.2009 19:38	Taking OBP		19:38:00	14.75268	-44.97908	3011
01.02.2009 19:45	OBP stowed		19:45:00	14.75273	-44.97912	3011
01.02.2009 19:46	off bottom, end of Dive#		19:46:00	14.75272	-44.97907	3011

300 ROV (Kiel 6000 dive #44)

Cruise Number MSM10/3
Station Number 300
Dive Number 44
Location Logatchev I
Coordinates 14°45,135' N 44°58,728' W
Water Depth 3000 m
Vessel Merian

Metadata	Observation	Actions	Posidonia data			
			Time	Lat	Lon	Depth
04.02.2009 12:33	near bottom, homer beacon #14 is working	allowed	12:33:04	14.75257	44.97797	2937
04.02.2009 12:36	bottom in sight, white mat visible, 10 - 15 m away from correct position		12:36:00	14.75258	44.97797	2971
04.02.2009 12:38	empty mussel shells around mat		12:38:00	14.75258	44.97797	2988
04.02.2009 12:41	live mussels and possibly clams?! In mat, marker 26		12:41:00	14.75223	-44.97890	2989
04.02.2009 12:45	determination of mat size, 1,93 m wide in diameter, mat spreads in horizontal direction at about 2 m width and at least 10 times the length, then stretches in thin strip in vertical direction		12:45:04	14.75257	44.97795	2988
04.02.2009 12:51	ROV hits sediment, turbidity in water		12:51:04	14.75258	44.97797	2990
04.02.2009 12:54	zoom in on empty mussel shells		12:54:00	14.75260	44.97795	2992
04.02.2009 12:56	Sample 1: GB (mass spec) running since beginning of dive, too much background noise		12:56:00	14.75257	44.97798	2990
04.02.2009 12:58	HD camera on, horizontal length of mat: 8,5 m + 5 m in horizontal direction		12:58:00	14.75258	44.97797	2989
04.02.2009 13:04	juvenile mussels, snails, crabs, limpets on mat and on rocks in mat		13:04:00	14.75257	44.97797	2990
04.02.2009 13:05	HD camera on, dimension of mat in vertical direction: 15,6 m		13:05:04	14.75258	44.97797	2990
04.02.2009 13:16	directions taken for mat, 30° looking down, 185° looking up at marker 26 (see drawing)		13:06:00	14.75255	44.97800	2990
04.02.2009 13:20	looking for sampling site		13:20:00	14.75257	44.97800	2988
04.02.2009 13:30	chose sampling site on long thin vertical strip on top of hill, in front of mussel patch, heading: 55°, marker 26 visible down hill to left of ROV porch		13:30:00	14.75257	44.97798	2990
04.02.2009 13:36	preparing for GB measurement		13:36:00	14.75258	44.97797	2989
04.02.2009 13:50	slight disturbance of mat surface with KIPS nozzle		13:50:00	14.75227	-44.97887	2989
04.02.2009 13:51	Sample 2: GB measurement about 1 cm above mat, temp: 3,45°C	300 ROV 1	13:51:04	14.75257	44.97795	2989

04.02.2009 13:55	no obvious increase in H2 or CH4 over background		13:55:04	14.75258	44.97797	2989
04.02.2009 13:56	end of GB measurement		13:56:00	14.75260	44.97795	2989
04.02.2009 13:59	KIPS back in holder		13:59:04	14.75257	44.97795	2990
04.02.2009 14:01	shimmering water visible above mussel patch		14:01:04	14.75258	44.97798	2990
04.02.2009 14:03	handover for lunch		14:03:04	14.75258	44.97797	2990
04.02.2009 14:06	will start to collect push core	300 ROV 2	14:06:00	14.75258	44.97800	2990
04.02.2009 14:09	orion grabs pushcore number 22 (see also time 14:52)		14:09:04	14.75257	44.97810	2989
04.02.2009 14:12	positioning push core 22 directly next to a mussel spot (heading 54°)		14:12:00	14.75257	44.97812	2991
04.02.2009 14:13	shimmering water visible above mussel patch		14:13:04	14.75257	44.97810	2988
04.02.2009 14:14	pushcore in sediment and we will leave it there until all pushcores are positioned in sediment		14:14:00	14.75257	44.97810	2990
04.02.2009 14:15	grabbing pushcore number 27		14:15:04	14.75257	44.97808	2989
04.02.2009 14:18	pushcore is grabbed		14:18:00	14.75257	44.97810	2991
04.02.2009 14:21	pushcore 27 is positioned to the left of pushcore number 22 (heading 55°)	300 ROV 3	14:21:04	14.75255	44.97813	2990
04.02.2009 14:23	attempting to grab pushcore number 25		14:23:05	14.75257	44.97812	2991
04.02.2009 14:26	pushcore positioning to the right of pushcore number 22		14:26:00	14.75257	44.97808	2991
04.02.2009 14:27	we have three pushcores in a sediment with a microbial mat next to the mussel spot with diffuse fluids (from left to right 27, 22, 25) LOST TELEMTRY		14:27:04	14.75257	44.97808	2988
04.02.2009 14:29	removing pushcore number 25 first with sediments	300 ROV 4	14:29:04	14.75257	44.97812	2989
04.02.2009 14:30	putting pushcore number 25 back into roV rack		14:30:01	14.75257	44.97812	2989
04.02.2009 14:32	positioned in pushcore holder		14:32:00	14.75258	44.97810	2991
04.02.2009 14:32	going for pushcore number 27		14:32:32	14.75258	44.97812	2989
04.02.2009 14:35	grabbed pushcore number 27 ready to retrieve from sediment and put into the schubblade of the ROV		14:35:04	14.75258	44.97812	2990
04.02.2009 14:36	pulling out of sediment		14:36:01	14.75257	44.97810	2990
04.02.2009 14:38	trying to put pushcore into holder		14:38:00	14.75257	44.97812	2991
04.02.2009 14:39	losing some of the core while putting into holder; telemetry lost to number 1 again.		14:39:04	14.75260	44.97813	2989
04.02.2009 14:51	had lost telemetry		14:51:01	14.75258	44.97810	2991
04.02.2009 14:52	collecting third pushcore number 22 (see sample number 290 ROV 2)	300 ROV 2 (bc lost samples)	14:52:04	14.75257	44.97813	2989

04.02.2009 14:53	lost sample are now recollecting the pushcore a bit to the right of where number 25 was positioned before;		14:53:01	14.75258	44.97812	2990
04.02.2009 14:54	in the sediment taking this core number 25, pulling it back out again and repositioning it in the holder		14:54:04	14.75258	44.97812	2989
04.02.2009 15:01	going to OBT site now		15:01:00	14.75257	44.97813	2989
04.02.2009 15:05	passing over sediment on our way to OBT		15:05:01	14.75267	44.97822	2995
04.02.2009 15:06	still passing sediments on our way to OBT		15:06:04	14.75275	44.97823	2998
04.02.2009 15:11	passing Anyas garden		15:11:00	14.75295	44.97842	3023
04.02.2009 15:13	Sediments		15:13:01	14.75300	44.97848	2949
04.02.2009 15:16	white mussel shels		15:16:05	14.75317	44.97860	3024
04.02.2009 15:19	looking for OBT		15:19:01	14.75328	44.97873	3026
04.02.2009 15:20	found OBT		15:20:05	14.75333	44.97878	3023
04.02.2009 15:21	Positioning ROV for OBT uptake		15:21:01	14.75335	44.97880	3024
04.02.2009 15:25	we are positioned for OBT collection (HD-camera on)		15:25:01	14.75347	44.97898	3027
04.02.2009 15:26	we are collecting OBT and Hd-camera off	300 ROV 5	15:26:04	14.75350	44.97903	3026
04.02.2009 15:29	lifted OBT from ground		15:29:01	14.75355	44.97922	3028
04.02.2009 15:35	OBT on porch		15:35:01	14.75358	44.97918	3027
04.02.2009 15:36	going to Irina II		15:36:05	14.75357	44.97918	3027
04.02.2009 15:40	transit to Irina II		15:40:05	14.75343	44.97898	3020
04.02.2009 15:44	found Irina II		15:44:05	14.75318	44.97855	3014
04.02.2009 15:45	finding spot for OBT deplyment		15:45:01	14.75322	44.97852	3013
04.02.2009 15:56	OBT on ground		15:56:05	14.75305	44.97838	3011
04.02.2009 15:58	HD camera on, flying up hill filming 6 temperature loggers		15:58:04	14.75303	44.97838	3013
04.02.2009 16:05	HD camera off		16:05:01	14.75305	44.97852	3010
04.02.2009 16:06	landing at Logger 6 for collection		16:06:04	14.75305	44.97852	3012
04.02.2009 16:07	lots of empty shells and snails		16:07:01	14.75305	44.97853	3012
04.02.2009 16:12	Sample 6: GB measurement at base of Logger 6, HD camera on		16:12:05	14.75303	44.97853	3013
04.02.2009 16:13	of the 7-8 mussels visible, 3 - 4 are alive, rest dead		16:13:00	14.75302	44.97857	3012
04.02.2009 16:18	slightly elevated H2 and CH4, Mirocaris shrimp		16:18:05	14.75303	44.97853	3012
04.02.2009 16:19	end of GB measurement		16:19:01	14.75305	44.97857	2890
04.02.2009 16:25	pulled out Logger 6 (about 2 minutes earlier), Sample 7, logger was completely vertical in sediment		16:25:01	14.75303	44.97855	3012
04.02.2009 16:29	flying to next logger (Logger 8), 1 up from the base Logger 6		16:29:01	14.75303	44.97855	3012
04.02.2009 16:31	landing at Logger 8 for collection		16:31:01	14.75303	44.97855	3011
04.02.2009 16:36	Sample 8: GB measurement at Logger 8, the logger is horizontal to surface (must have fallen over at some point), nozzle at bottom end of logger, somewhat high H2 and CH4 than at Logger 6		16:36:05	14.75305	44.97855	3012

04.02.2009 16:40	end of GB measurement		16:40:05	14.75303	44.97853	3012
04.02.2009 16:43	Sample 9: collection of Logger 8, both live and dead mussels around logger, lots of snails		16:43:01	14.75305	44.97855	3013
04.02.2009 16:52	Flying to next logger up mound, Logger 2. Mussel bed looks thicker here (several mussels deep, more live mussels than at previous 2 loggers)		16:52:05	14.75303	44.97853	3012
04.02.2009 16:58	Sample 10: GB measurement at Logger 2		16:58:05	14.75303	44.97853	3013
04.02.2009 17:00	HD camera on and off		17:00:05	14.75303	44.97855	3012
04.02.2009 17:04	GB: no signal, moved nozzle a bit		17:04:05	14.75303	44.97855	3012
04.02.2009 17:06	GB: still not signal, end of measurment		17:05:57	14.75303	44.97855	3012
04.02.2009 17:12	Team Wechsel von bislang Claus und Phillip zu Hannes und Martin		17:12:05	14.75305	44.97855	3012
04.02.2009 17:13	Logger 2 is vertically in mussel bed, pulled out		17:13:01	14.75303	44.97857	3012
04.02.2009 17:16	Sample 11: collection of Logger 2		17:16:05	14.75303	44.97853	3012
04.02.2009 17:20	Flying to Logger 1		17:20:05	14.75303	44.97855	3013
04.02.2009 17:39	Sample 12: GB measurement at Logger 1		17:39:01	14.75303	44.97855	3011
04.02.2009 17:40	moved nozzle about 1 cm deeper into mussel bed		17:40:05	14.75302	44.97852	3011
04.02.2009 17:43	end of GB measurement, some H ₂ , maybe sulfide?		17:43:01	14.75303	44.97855	3011
04.02.2009 17:51	Sample 13: collection of Logger 1		17:51:01	14.75302	44.97853	3013
04.02.2009 17:51	Objective: collect mussel net at site with healthy mussels up on Irina II chimney		17:51:01	14.75302	44.97853	3013
04.02.2009 17:55	Loggers 0 and 4 were not collected		17:55:01	14.75303	44.97853	3011
04.02.2009 17:58	Selected little mussel patch for sampling, shimmering water visible, mussels closest to surface have blackened shells		17:58:05	14.75303	44.97855	3011
04.02.2009 18:05	Sample 14: GB measurement in hole around blackened mussels, shimmering water clearly visible, HD camera on		18:05:01	14.75303	44.97853	3012
04.02.2009 18:07	Temp. 5 – 6°C		18:07:01	14.75303	44.97855	3012
04.02.2009 18:07	GB: methane and hydrogen		18:07:01	14.75303	44.97855	3012
04.02.2009 18:16	pump on KIPS A1 (mit ZnAc), t=7.8°C	300 ROV 15	18:16:05	14.75303	44.97852	3011
04.02.2009 18:19	pump off		18:19:01	14.75305	44.97855	3010
04.02.2009 18:19	pump on KIPS A2	300 ROV 16	18:19:01	14.75305	44.97855	3010
04.02.2009 18:20	dosierpumpe an for KIPS A1		18:20:05	14.75303	44.97853	3010
04.02.2009 18:21	dosierpumpe aus		18:21:01	14.75303	44.97852	3010
04.02.2009 18:22	t=6.6		18:22:05	14.75303	44.97853	3011
04.02.2009 18:23	pump off		18:23:01	14.75302	44.97857	3011
04.02.2009 18:24	pump on for KIPS A3	300 ROV 17	18:24:05	14.75303	44.97857	3011
04.02.2009 18:25	alvinocaris in HD picture		18:25:01	14.75303	44.97852	3010

04.02.2009 18:26	male alvinocaris		18:26:05	14.75303	44.97853	3011
04.02.2009 18:27	t=6.5		18:27:01	14.75303	44.97855	3011
04.02.2009 18:28	pump off		18:28:05	14.75303	44.97853	3010
04.02.2009 18:28	pump on KIPS B4	300 ROV 18	18:28:05	14.75303	44.97853	3010
04.02.2009 18:30	t=6.6		18:30:05	14.75303	44.97855	3009
04.02.2009 18:32	pump off		18:32:05	14.75302	44.97855	3011
04.02.2009 18:32	pump on KIPS B5	300 ROV 19	18:32:05	14.75302	44.97855	3011
04.02.2009 18:33	t=10.2°C		18:33:01	14.75303	44.97855	3010
04.02.2009 18:36	pump off		18:36:05	14.75303	44.97855	3011
04.02.2009 18:37	pump on KIPS B6 t=7.0°C	300 ROV 20	18:37:01	14.75303	44.97855	3011
04.02.2009 18:40	t=11.3°C		18:40:05	14.75303	44.97855	3010
04.02.2009 18:41	pump off		18:41:01	14.75302	44.97853	3011
04.02.2009 18:42	pump on KIPS C7	300 ROV 21	18:42:05	14.75303	44.97853	3011
04.02.2009 18:46	7°C		18:46:05	14.75303	44.97855	3011
04.02.2009 18:46	pump off		18:46:05	14.75303	44.97855	3011
04.02.2009 18:48	choosing next fluid sampling spot to investiagte snmall scale heterogenetiy in microbial community;		18:48:05	14.75303	44.97853	3011
04.02.2009 18:56	found our sampling spot waiting for mass spec 26°C		18:56:05	14.75303	44.97853	3010
04.02.2009 19:01	pump on KIPS C8 T= 22.2°C; HD on	300 ROV 22	19:01:01	14.75302	44.97857	3010
04.02.2009 19:06	ump off		19:06:06	14.75305	44.97853	3011
04.02.2009 19:06	pump on KIPS C9 T=5°C	300 ROV 23	19:06:06	14.75305	44.97853	3011
04.02.2009 19:07	pump off		19:07:01	14.75303	44.97853	3010
04.02.2009 19:07	T = 17°C		19:07:01	14.75303	44.97853	3010
04.02.2009 19:07	pump on continue pumping		19:07:01	14.75303	44.97853	3010
04.02.2009 19:08	pump off		19:08:06	14.75302	44.97855	3010
04.02.2009 19:09	pump on continue pumping		19:09:01	14.75302	44.97855	3010
04.02.2009 19:09	T= 9°C		19:09:01	14.75302	44.97855	3010
04.02.2009 19:13	T=10°C		19:13:01	14.75303	44.97857	3011
04.02.2009 19:15	pump off		19:15:01	14.75303	44.97855	3011
04.02.2009 19:20	loosening the mussels with the orion		19:20:06	14.75303	44.97858	3010
04.02.2009 19:25	grabbed mussel net		19:25:01	14.75302	44.97853	3011
04.02.2009 19:29	collecting mussel net	300 ROV 24	19:29:01	14.75303	44.97858	3009
04.02.2009 19:32	putting mussel net into draw of ROV		19:32:05	14.75302	44.97852	3010
04.02.2009 19:36	finished and going to collect OBT		19:36:06	14.75307	44.97855	3010
04.02.2009 19:38	collecting OBT		19:38:06	14.75303	44.97852	3010
04.02.2009 19:40	Positioning OBT on poech of ROV		19:40:05	14.75305	44.97853	3011
04.02.2009 19:44	stabilizing OBT on the porch		19:44:06	14.75303	44.97853	3012
04.02.2009 19:45	string securing OBT on porch		19:45:09	14.75302	44.97855	3010
04.02.2009 19:51	Ascending		19:50:06	14.75303	44.97857	3012

313 ROV (Kiel 6000 dive #45)

Cruise Number MSM10/3
Station Number 313
Dive Number 45
Location LH1, Quest
Coordinates 14°45.175 N 44°58.836 W
Water Depth 3026
Vessel

Metadata	Observation	Actions	Posidonia data		
			Lat	Lon	Depth
08.02.2009 15:35	Bottom visible		14.75275	-44.98083	3003
08.02.2009 15:37	GB (in situ mass spec) running well since beginning of dive		14.75275	-44.98090	3004
08.02.2009 15:44	smokers, strong current based on plume		14.75293	-44.98052	3015
08.02.2009 15:45	Marker 27, white mesh box, with netted bags in box, experiment of Christian		14.75303	-44.98048	3017
08.02.2009 15:47	old piece of rope close to smoker, old Marker 26		14.75295	-44.98055	3014
08.02.2009 15:49	second white mesh box next to Marker 27		14.75300	-44.98050	3015
08.02.2009 16:01	considering location, trying to find Marker 20, short landing in front of mussel patch		14.75300	-44.98053	3016
08.02.2009 16:02	single patches of mussels, lots of dead mussels, NOT T-logger mussel patch		14.75303	-44.98050	3017
08.02.2009 16:03	now trying to find T-logger mussel patch at Marker 20		14.75303	-44.98052	3016
08.02.2009 16:05	2 markers visible, brown sediment patch where push cores were taken previously		14.75312	-44.98057	3018
08.02.2009 16:06	Marker 20 and 32 visible, large bacterial mat visible		14.75313	-44.98053	3018
08.02.2009 16:08	only a single large mussel patch visible, otherwise almost no mussels, clear decrease in mussels over previous years		14.75305	-44.98050	3018
08.02.2009 16:11	on rim of crates, two very small smokers on rim of larger smoker inside crater		14.75302	-44.98052	3017
08.02.2009 16:12	a few large mussel mounds, crab coming out of one mound a few minutes earlier		14.75297	-44.98052	3015
08.02.2009 16:14	chose mussel mound for sampling, shimmering water above mound		14.75313	-44.98055	3017
08.02.2009 16:15	overall at Quest only very few mussels left, the few that are left are heaped in mounds around diffuse outlets, no juvenile mussels visible		14.75300	-44.98050	3017

08.02.2009 16:16	Sample 1: beginning GB measurements at mussel mound, removing nozzle from sleeve		14.75297	-44.98052	3016
08.02.2009 16:18	Sample 1: GB measurement in middle of mussel mound	313 ROV 1	14.75303	-44.98050	3016
08.02.2009 16:20	crab grabbing KIPS nozzle		14.75302	-44.98047	3017
08.02.2009 16:22	Temperature: 13°C		14.75302	-44.98055	3016
08.02.2009 16:24	nozzle clogged up 1-2 minutes ago, pump off and on		14.75302	-44.98053	3017
08.02.2009 16:26	nozzle still clogged, crab crawled out of mound		14.75298	-44.98048	3015
08.02.2009 16:28	cleared nozzle after tapping on porch		14.75300	-44.98067	3016
08.02.2009 16:30	nozzle not completely clear, turning pump on and off again in attempt to clear		14.75298	-44.98048	3016
08.02.2009 16:31	remeasuring in hole with partly clogged nozzle		14.75300	-44.98048	3016
08.02.2009 16:37	nozzle too clogged, withdrew nozzle from mound		14.75302	-44.98058	3017
08.02.2009 16:38	nozzle unclogged, holding nozzle above mound in shimmering water		14.75298	-44.98053	3016
08.02.2009 16:39	Temp: 5.6°C		14.75302	-44.98060	3016
08.02.2009 16:41	Temp: 8°C		14.75297	-44.98053	3016
08.02.2009 16:42	putting nozzle back in mussel mound		14.75302	-44.98050	3017
08.02.2009 16:43	lots of brittle stars between and on mussels		14.75305	-44.98052	3017
08.02.2009 16:45	Temp: 12°C in mussel mound		14.75300	-44.98052	3016
08.02.2009 16:47	Temp: 15°C		14.75310	-44.98063	3016
08.02.2009 17:00	Sample 2: mussel net 4	313 ROV 2	14.75303	-44.98067	3015
08.02.2009 17:09	putting net in draw		14.75303	-44.98057	3016
08.02.2009 17:12	Team change from Klaus and Phillip to Inken and Martin		14.75300	-44.98065	3016
08.02.2009 17:15	heading to wood site		14.75300	-44.98052	3017
08.02.2009 17:27	nothing exciting to be seen, sediment, a few lava outcroppings or rubble		14.75305	-44.97897	3017
08.02.2009 17:29	anemone, white		14.75307	-44.97877	3003
08.02.2009 17:35	at site, looking for wood		14.75257	-44.97827	2987
08.02.2009 17:35	found wood		14.75257	-44.97827	2987
08.02.2009 17:40	HD camera for the last few minutes		14.75260	-44.97825	2989
08.02.2009 17:40	wood split into 2 piles, sediment blackened on valley side of wood, wood on slight hill, upward side of wood lighter than downward side		14.75260	-44.97825	2989
08.02.2009 17:42	wood looks well colonized		14.75260	-44.97823	2990
08.02.2009 17:43	Munidopsis crabs on wood		14.75255	-44.97830	2991
08.02.2009 17:49	polynoid scale worm		14.75255	-44.97830	2991
08.02.2009 17:50	white deposits in sediment: shells from bore mussels?		14.75248	-44.97828	2990

08.02.2009 17:57	some pieces of wood almost completely eaten, split in pieces, a few pieces still whole		14.75260	-44.97827	2992
08.02.2009 18:01	another polynoid scale worm on wood visible		14.75255	-44.97827	2991
08.02.2009 18:11	Sample 3: GB measurement at black sediment spot below wood	313 ROV 3	14.75252	-44.97823	2991
08.02.2009 18:11	Temp: 3.2°C		14.75252	-44.97823	2991
08.02.2009 18:13	2 polychaete tubes, ampharitids?, lots of white shells on sediment, little black spots around shells - bore mussel detritus?		14.75252	-44.97822	2991
08.02.2009 18:15	end of GB measurment, no obvious methane, sulfide or hydrogen		14.75255	-44.97827	2990
08.02.2009 18:18	attempting to sample wood, rope can't be pulled off with Orion claw		14.75252	-44.97830	2990
08.02.2009 18:22	opening biobox		14.75253	-44.97823	2990
08.02.2009 18:27	Sample 4: grabbed piece of eaten up wood (one of small wood logs on side of big wood log) in biobox # 3	313 ROV 4	14.75255	-44.97825	2991
08.02.2009 18:30	Sample 5: little piece from big wood log in middle in biobox # 1	313 ROV 5	14.75247	-44.97828	2989
08.02.2009 18:41	Sample 6: half a log, no 3. from other side of big log, bio box 2	313 ROV 6	14.75253	-44.97822	2991
08.02.2009 18:43	sample 7: piece of log no 2, same side,also bio box 2	313 ROV 7	14.75250	-44.97833	2990
08.02.2009 18:47	sample 8: piece from log no 2, same side: bio box 2	313 ROV 8	14.75253	-44.97827	2990
08.02.2009 18:49	HD camera since begin of sampling this side		14.75252	-44.97820	2991
08.02.2009 18:49	zoom in HD into wood log		14.75252	-44.97820	2991
08.02.2009 18:50	several Alvinocaris in close in up on wood		14.75243	-44.97837	2990
08.02.2009 18:51	Stephane thinks that one is eating wood		14.75248	-44.97830	2991
08.02.2009 18:53	Large Alvinocaris tears a polychaete out of a wood borrow and disappears with it under the large wood log		14.75248	-44.97823	2990
08.02.2009 18:58	start transit to Site B		14.75255	-44.97817	2988
08.02.2009 19:00	flyover sediment, headin 240		14.75232	-44.97785	2976
08.02.2009 19:05	ROV footprint on sediment		14.75193	-44.97790	2963
08.02.2009 19:06	rock outcropp between wood and site B, perhaps identical with mound on map		14.75183	-44.97797	2962
08.02.2009 19:08	cable on the seafloor		14.75180	-44.97782	2957
08.02.2009 19:11	trying to find Site B		14.75162	-44.97798	2948
08.02.2009 19:12	found marker 24		14.75162	-44.97808	2952
08.02.2009 19:13	at Site B smoker B1		14.75167	-44.97808	2955
08.02.2009 19:15	smoni found at chimney B4		14.75173	-44.97805	2955
08.02.2009 19:17	Positioning to collect smoni		14.75172	-44.97802	2953
08.02.2009 19:21	trying to sample a piece of smoker		14.75178	-44.97805	2955
08.02.2009 19:21	broke of a piece		14.75178	-44.97805	2955

08.02.2009 19:22	opening anaerobe barrel		14.75172	-44.97802	2956
08.02.2009 19:22	anaerobe tonne open		14.75172	-44.97802	2956
08.02.2009 19:24	broken off top		14.75177	-44.97800	2956
08.02.2009 19:24	collecting a broken off piece (pyrite kupferkies)	313 ROV 9	14.75177	-44.97800	2956
08.02.2009 19:28	closed lid of anaerobe box		14.75168	-44.97802	2954
08.02.2009 19:29	KIPS nozzle being moved to front of porch		14.75170	-44.97802	2955
08.02.2009 19:30	grabbing KIPS handle		14.75172	-44.97802	2955
08.02.2009 19:33	positioned in chimney; t=352°C		14.75172	-44.97802	2956
08.02.2009 19:35	pump on sampling A1 with ZnAc	313 ROV 10	14.75177	-44.97803	2955
08.02.2009 19:36	pump off		14.75177	-44.97805	2955
08.02.2009 19:36	pump on sampling A2	313 ROV 11	14.75177	-44.97805	2955
08.02.2009 19:38	steady sampling the hot hydrothermal fluids; T=352		14.75170	-44.97805	2956
08.02.2009 19:39	pump off		14.75175	-44.97807	2956
08.02.2009 19:40	pump on A3	313 ROV 12	14.75172	-44.97802	2955
08.02.2009 19:40	temperature constatnt at 350°C		14.75172	-44.97802	2955
08.02.2009 19:42	tüdelüof/Durchflussmesser the KIPS has melted		14.75168	-44.97807	2954
08.02.2009 19:44	pump off t=330°C		14.75170	-44.97803	2954
08.02.2009 19:44	pump on B4	313 ROV 13	14.75170	-44.97803	2954
08.02.2009 19:48	pump off		14.75172	-44.97808	2954
08.02.2009 19:48	pump on B5	313 ROV 14	14.75172	-44.97808	2954
08.02.2009 19:52	pump off; we are moving		14.75175	-44.97808	2955
08.02.2009 19:56	moving away; KIPS nozzle positioned back in porch		14.75173	-44.97798	2956
08.02.2009 19:56	collecting Smoni		14.75173	-44.97798	2956
08.02.2009 19:57	Smino in draw	313 ROV 15	14.75172	-44.97802	2955
08.02.2009 19:59	rock under smoni in box next to anaerobe box	313 ROV 16	14.75175	-44.97802	2955
08.02.2009 20:05	Ascending		14.75170	-44.97800	2955

315 ROV (Kiel 6000 dive #46)

Cruise Number MSM10/3
Station Number 315
Dive Number 46
Location Irina II
Coordinates 14°45.167 N 44°58.752 W
Water Depth 3000 m
Vessel MS Merian

Metadata	Observation	Actions	Posidonia data		
			Lat	Lon	Depth
09.02.2009 12:01	Bottom visible	allowed	14.75258	-44.97927	3009
09.02.2009 12:06	2 remaining temp. Loggers in view (# 0 and 4) on Irina II smoker		14.75288	-44.97915	3010
09.02.2009 12:10	Sample 1: beginning GB measurement at Logger 0, removing KIPS from sleeve	315 ROV 1	14.75288	-44.97915	3010
09.02.2009 12:17	Sample 1: beginning GB measurement at Logger 0, nozzle in mussel bed, mixture of live and dead mussels, lots of brittle stars		14.75283	-44.97923	3010
09.02.2009 12:21	Sample 1: low amounts of methane, hydrogen and sulfide		14.74677	-44.98303	2884
09.02.2009 12:22	Sample 1: end of measurement, returning KIPS to sleeve		14.75282	-44.97910	3010
09.02.2009 12:24	Sample 2: beginning collection of Logger 0	315 ROV 2	14.75303	-44.97927	3011
09.02.2009 12:25	Logger fairly vertical in mussel bed, pulling out		14.75273	-44.97885	3012
09.02.2009 12:28	Sample 2: Logger 0 in draw		14.75292	-44.97912	3011
09.02.2009 12:28	moving to Logger 4		14.75292	-44.97912	3011
09.02.2009 12:34	problems finding a good landing place because of steepness of slope		14.75288	-44.97907	3011
09.02.2009 12:37	Sample 3: beginning GB measurement at Logger 4, removing KIPS from sleeve	315 ROV 3	14.75667	-44.98570	2873
09.02.2009 12:41	Sample 3: beginning GB measurement at Logger 4, nozzle in mussel bed, temp: 3,2°C		14.75287	-44.97918	3010
09.02.2009 12:43	mussel bed thickly layered around Logger 4, all mussels appear to be alive		14.75275	-44.97910	3011
09.02.2009 12:46	Sample 3: end of GB measurement, no differences over background in methane, hydrogen, or sulfide (unlikely however, given good state of mussels!)		14.75288	-44.97914	3011
09.02.2009 12:49	Sample 4: collection of Logger 4, horizontal to ground, may have been covered by mussels rolling down from slope above	315 ROV 4	14.75280	-44.97910	3011
09.02.2009 12:53	moving Logger 4 to draw		14.75288	-44.97925	3010
09.02.2009 13:05	flew to site further up Irina II structure, beehive structure with lots of shimmering water, mussels		14.75288	-44.97920	3010

	surrounding crack, in crack lots of shrimp				
09.02.2009 13:10	Sample 5: beginning GB measurement in mussels, moving KIPS from sleeve, already increase in hydrogen and methane	315 ROV 5	14.75288	-44.97922	3010
09.02.2009 13:12	Sample 5: nozzle in mussels, temp: 7.8 - 8.1°C		14.75290	-44.97923	3010
09.02.2009 13:17	Sample 6: GB measurement in same beehive structure, but deeper in black crack where shrimp are	315 ROV 6	14.75292	-44.97915	3010
09.02.2009 13:19	Sample 6: Temp: 21°C, lots of Rimicaris and Chorocaris		14.75290	-44.97917	3009
09.02.2009 13:23	Sample 7: moving nozzle to outlet source of hot fluids	315 ROV 7	14.75273	-44.97915	3010
09.02.2009 13:26	Temp jumps alot between 17 and 40°C		14.75292	-44.97923	3010
09.02.2009 13:29	disturbance of fluid flow by nozzle, black smoke		14.75283	-44.97920	3009
09.02.2009 13:29	Hesiolyra polychaete visible		14.75283	-44.97920	3009
09.02.2009 13:30	Temp up to 80°C		14.75285	-44.97918	3010
09.02.2009 13:32	Temp 110°C!		14.75288	-44.97914	3010
09.02.2009 13:35	Temp still at 105°C		14.75280	-44.97914	3009
09.02.2009 13:36	moving nozzle back to sleeve		14.75283	-44.97903	3010
09.02.2009 13:41	Sample 8: beginning collection of mussels, getting net from draw	315 ROV 8	14.75297	-44.97910	3011
09.02.2009 13:51	net completely full with mussels around black hole of beehive		14.75297	-44.97915	3010
09.02.2009 13:53	Sample 8 in draw		14.75287	-44.97912	3009
09.02.2009 13:56	collect snail with orion		14.75283	-44.97912	3010
09.02.2009 13:59	changing shifts		14.75287	-44.97917	3010
09.02.2009 14:04	spotted colonization traps		14.75280	-44.97914	3008
09.02.2009 14:06	positioning ROV for collection of traps		14.75680	-44.98538	2876
09.02.2009 14:07	lots of smoke in picture		14.75273	-44.97912	3007
09.02.2009 14:09	bare ground		14.75270	-44.97917	3009
09.02.2009 14:11	back at Irina II		14.75272	-44.97908	3009
09.02.2009 14:13	positioning ROV for collection of traps		14.75273	-44.97910	3008
09.02.2009 14:14	positioned		14.75280	-44.97903	3008
09.02.2009 14:16	opening anaerobe tonne		14.75280	-44.97907	3010
09.02.2009 14:18	first colonization device put into anaerobe tonne (symcatcher 2)	315 ROV 9	14.75280	-44.97908	3009
09.02.2009 14:20	trying to get colonization trap into tonne		14.75283	-44.97908	3009
09.02.2009 14:21	in tonne		14.75282	-44.97908	3009
09.02.2009 14:22	collecting second colonization device (symcatch 3)	315 ROV 10	14.75287	-44.97912	3008
09.02.2009 14:26	opening biobox to put symcatch 3 in (section number 1 of biobox); doesnt fit into anaerobe tonne		14.75280	-44.97908	3009
09.02.2009 14:29	symcatch 1 collected and deposited draw	315 ROV 11	14.75283	-44.97914	3008
09.02.2009 14:36	transit to wood site		14.75287	-44.97908	3009
09.02.2009 14:38	10 m gehievt		14.75275	-44.97910	3003
09.02.2009 14:38	again 10 m up; losing bottom site		14.75275	-44.97910	3003

09.02.2009 14:39	now transit to wood location		14.75268	-44.97917	3001
09.02.2009 14:41	sleeping fish		14.75267	-44.97880	2998
09.02.2009 14:44	found wood site		14.75252	-44.97832	2988
09.02.2009 14:51	opening biobox for wood samples		14.75253	-44.97827	2990
09.02.2009 14:53	trying to get chunks of wood out of log with Orion claw without success		14.75262	-44.97828	2989
09.02.2009 14:55	getting ROV knife		14.75250	-44.97823	2988
09.02.2009 15:13	cable problems for last 10 minutes, thrusters whipped up sediment, lost wood site		14.74277	-44.97558	2775
09.02.2009 15:14	cable or mooring visible, 25 m temp. mooring, floaters gone, not possible to recover with ROV		14.74243	-44.97565	2763
09.02.2009 15:20	back to wood site		14.75258	-44.97840	2988
09.02.2009 15:29	trying to bore out piece of wood with knife, using it as a drill		14.75250	-44.97832	2989
09.02.2009 15:31	big wood log also appears to be fully eaten up by bore worms		14.75255	-44.97833	2991
09.02.2009 15:31	returning knife to holder		14.75255	-44.97833	2991
09.02.2009 15:38	piece of wood from big log in Biobox # 3	315 ROV 12	14.75250	-44.97827	2989
09.02.2009 15:41	another piece of wood (with rope) in Biobox # 3	315 ROV 12	14.75252	-44.97832	2988
09.02.2009 15:49	another piece of wood (with Munidopsis crab and polynoid worm) in Biobox #3	315 ROV 12	14.75253	-44.97833	2990
09.02.2009 16:04	Transit to Anna Louise		14.75235	-44.97825	2976
09.02.2009 16:06	seafloor with gravel, rock outcrops, eventually orange colored, oxidised sediment around rocks		14.75200	-44.97800	2967
09.02.2009 16:08	rock cliff, steep slopes with blocky talus,		14.75185	-44.97777	2961
09.02.2009 16:10	higher peneplain, cable with dredging marks, sediment with gravel		14.75157	-44.97753	2944
09.02.2009 16:12	slope upwards, another dredging mark, gravelly sediment, no animals		14.75150	-44.97750	2935
09.02.2009 16:15	following a valley upwardsthrough coarse rock talus fields		14.75127	-44.97747	2919
09.02.2009 16:21	climbing up a steep slope with talus fragments		14.75085	-44.97748	2921
09.02.2009 16:24	Marker #30 and burnt plastic lid marker		14.75087	-44.97742	2914
09.02.2009 16:29	sitting down looking to NE, in front of chimney at M #30		14.75098	-44.97740	2912
9.2.09 16:44	GB measurement parallel to KIPS sampling	315 ROV 13	14.75095	-44.97742	2915
9.2.09 16:44	KIPS insitu fixation A1, HD on for some time	315 ROV 14	14.75095	-44.97742	2915
9.2.09 16:57	bottle A2	315 ROV 15	14.75093	-44.97742	2915
9.2.09 17:02	bottle A3	315 ROV 16	14.75092	-44.97743	2915
9.2.09 17:06	bottle B4	315 ROV 17	14.75095	-44.97745	2916
9.2.09 17:11	bottle B5	315 ROV	14.75097	-44.97740	2916

9.2.09 17:15	bottle B6	18 315 ROV 19	14.75095	-44.97742	2915
09.02.2009 17:21	finished KIPS sampling		14.75105	-44.97745	2916
09.02.2009 17:26	bringing ROV closer for He tube sampling		14.75098	-44.97738	2915
09.02.2009 17:37	try the next chimney adjacent to M30		14.75105	-44.97738	2914
09.02.2009 17:42	begin handling He tube		14.75097	-44.97740	2914
09.02.2009 18:27	sampling point approx 20 cm above ground, rigmaster too short to come closer	315 ROV 20	14.75102	-44.97738	2916
09.02.2009 18:59	He tube stowed, rock sample from crater rim	315 ROV 21	14.75098	-44.97743	2915
09.02.2009 19:05	HD on, shimmering water everywhere on crater rim, off bottom, heading E-SE, HD off		14.75100	-44.97738	2915
09.02.2009 19:07	heading towards Site "A" Barad Dur		14.75098	-44.97737	2915
09.02.2009 19:09	sediment with dark gravel, elongate tectonized boulders		14.75083	-44.97693	2905
09.02.2009 19:11	arrived site A, new chimney, height is now 4.4 m from top of mound!		14.75085	-44.97683	2905
09.02.2009 19:18	HD video taping for 3D modelling		14.75085	-44.97683	2905
09.02.2009 19:43	finished video taping, end of dive, ascending to surface		14.75077	-44.97682	2903