

Appendix 4: ROV station protocols

The following abbreviations are used:

ER: Erio Rahders

JS: Jan Scholten

KL: Klas Lackschewitz

LF: Leander Franz

SP: Sven Petersen

TK: Thomas Kuhn

Subsamples are taken by these persons according to the protocol.

Station No. 23 ROV/Dive 7 Date (UTC): 22.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Mapping of Logatchev 1 hydrothermal field and relocate structures and markers.

Station Begin

Time (UTC): 13:15 Lat.(Ship): 14°45.35 Long.(Ship): 44°59.06

Depth (HS): 3048 m

Bottom Contact

Time (UTC): 18:45 Lat.(ROV): 14°45.30 Long.(Ship): 44°58.84

Depth (HS): 3055 m Cable out:

For further details of this dive see ROV-Protocol !!

Off Bottom

Time (UTC): 22:32 Lat.(ROV): 14°45.20 Long.(ROV): 44°58.84

Depth (HS): 3027 m Cable out:

Station End

Time (UTC): 00:55 Lat.(Ship): 14°45.21 Long.(Ship): 44°58.61

Depth (HS): 2930 m

Summary: No remarks

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 22.01.04

Stations-#: 23 ROV/Dive 7

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-10		25x20x10	Large, irregular MS crust with broken surface consists of silicified sph. (grey). Outer coating brown to dark grey to black. Abundant Py. Heavily silicified and contains fragments of white angular clasts	10A: Archive 10B: SP 10C: KL 10D: JS E. Archive
-12		16x21x17	Piece of inactive HT-chimney, centre consists of 10 cm cpy with outer rim (1-7 cm). Zn-rich. Inner conduit 1cm in diameter. Fe & Mn-oxide crusts. Am. Silica throughout.	12A: Archive 12B: JS 12C: SP 12D: KL 12E: Archive
-13		23x30x28	Large, irregular, multispired chimney. Curved outline with Sph & Py at outer rim and mm-thin cpy. Interior with black sphalerite and amorphous silica. Some parts are layered.	13A: JS 13B: KL 13C: SP 13D: SP, TK 13E & F: Archive
-14		Two pieces 9x5x2	Light-brown Fe-oxides. Outside with black Mn-Oxide stain. Heterogenous with thin (1 mm) crusts. Coatings on former shell fragment with small (>0.5 mm) holes.	14A: Archive 14B: JS 14C: KL
-15		10x5x4	Irregular dark brown to red with black Mn-oxide crusts. Some cavities with atacamite. Inner part dark grey to black secondary Cu-sulfides, cc-bn	15A: SP 15B: KL & JS 15C: SP 15D: Archive

Station No. 29 ROV/Dive 8 Date (UTC): 24.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Continue mapping of Logatchev 1. Start at IRINA-2 and heading to east.

Station Begin

Time (UTC): 12:36 Lat.(Ship): 14°45.00 Long.(Ship): 44°59.06

Depth (HS): 3007 m

Bottom Contact

Time (UTC): 15:18 Lat.(ROV): 14°45.25 Long.(Ship): 44°58.80

Depth (HS): 3042 m Cable out:

For further details see ROV-Protocol

Off Bottom

Time (UTC): 19:03 Lat.(ROV): 14°45.08 Long.(ROV): 44°58.74

Depth (HS): 3022 m Cable out:

Station End

Time (UTC): 21:07 Lat.(Ship): 14°44.10 Long.(Ship): 44°58.10

Depth (HS): 2831 m

Summary: No geological samples. Niskin bottles 3 and 1 leaked. Located active venting at IRINA-2 (weak and clear vent fluids) with abundant mussel beds. Located VERY intense blacksmoker activity at IRINA-1; all fluids are buoyant. Located several (2, possibly 3) russian TV-Grab stations.

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 24.01.04

Stations-#: 29 ROV/Dive 8

No samples recovered from this dive !

Station No. 38 ROV Date (UTC): 26.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Biology-dive:sampling, deploying benthos traps, environmental measurments.Macro- and Microbiology

Station Begin

Time (UTC): 12:25 Lat.(Ship): Long.(Ship):
Depth (HS):

Bottom Contact

Time (UTC): 14:12 Lat.(Ship): 14°45.222 Long.(Ship): 44°58.771
Depth (HS): 3046 m Cable out:

Time: Lat.: Long.: Comment:

Siehe handgeschriebenes Protokoll ROV 38

Off Bottom

Time (UTC): 20:51 Lat.(ROV): 14°45.174 Long.(ROV): 44°58.780
Depth (HS): 3038 m Cable out:

Station End

Time (UTC): Lat.(Ship): Long.(Ship):
Depth (HS):

Summary:

Gesteinsprobennahme-Protokoll M60/3

Es wurden keine Geo-Proben auf diesem Tauchgang genommen !

Station No. 56 ROV Date (UTC): 31.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Biology-dive: Sampling hydrothermal bacteria and macroorganisms at Irina-2 and Anjas Garden

Station Begin

Time (UTC): 12:20 Lat.(Ship): 14°45.13 Long.(Ship): 44°58.91

Depth (HS): 2983 m

Bottom Contact

Time (UTC): 14:52 Lat.(Ship): Long.(Ship):

Depth (HS): Cable out:

Time:	Lat.:	Long.:	Comment:
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Siehe detailliertes Protokoll ROV 56

Off Bottom

Time (UTC): 22:22 Lat.(ROV): 14°45.19 Long.(ROV): 44°58.73

Depth (HS): 3038 m Cable out:

Station End

Time (UTC): Lat.(Ship): Long.(Ship):

Depth (HS):

Summary:

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 31.01.04

Stations-#: 56 ROV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1		3x3x0,5	Piece of thin sulfide crust on chimney. Consists of Cpy, po ? and bacterial (?) crust of marcasite	Piece to SP

Station No. 64 ROV Date (UTC): 02.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Finding Anna Luise in Logatchev 1

Station Begin

Time (UTC): Lat.(Ship): Long.(Ship):

Depth (HS):

Bottom Contact

Time (UTC): 16:06 Lat.(Ship): 14°45.15 Long.(Ship): 44°58.81

Depth (HS): 3046 m Cable out:

Time: Lat.: Long.: Comment:

See detailed ROV 64 protocol

Off Bottom

Time (UTC): 18:57 Lat.(ROV): 14°45.07 Long.(ROV): 44°58.69

Depth (HS): 2945 m Cable out:

Station End

Time (UTC): 21:23 Lat.(Ship): 14°45.19 Long.(Ship): 44°59.13

Depth (HS): 3043

Summary: Found Anna Louise and took rock and fluid samples

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 02.02.04

Stations-#: 64 ROV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
64ROV-1 (talus from base of Candelaber mound)	14°45.0655N 44°58.6909W 17:24 2949 m	20x10x5 cm	Massive, porous cpy chimney Only very small conduits. Center is slightly recrystallized, outer few mm are dark brown. Fe- Oxide/hydroxide coating.	1B: SP, TK 1B: JS
64ROV-2 (base of Candelaber chimney)	14°45.0650N 44°58.6889W 17:40 2948 m	10x10x3 cm	Chimney; wall o massive chalcopyrite. Multiple layers, inner part bulbous to kidney-like and showing a brown Fe-Oxide (?) coating. Wall is 1-3 cm thick. Atacamite on fracctures. Inactive chimney wall	2:SP, TK 2: JS
64ROV-10 Slurpgun	14°45.0674N 44°58.6868 18:38 2948 m	cm-sized pieces	A:red, oxidized sulfides with secondary Cu-sulfides B: small pieces of cpy C: chips of sphalerite- anhydrite	10A, 10C: KL 10A, 10C: SP, TK 10C: TE
64ROV-11 (inactive chimney west of Candelaber)	14°45.0649N 44°58.6922W 18:55 2948 m	40x25x20 cm	Large irregular chalcopyrite chimney. Rim partly replaced by bornite, outer coating with Fe-oxyhydroxides.	11D: SP

Station No. 73 ROV Date (UTC): 05.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Explore vicinity of Logatchev 1 and sample fluids at BS south of Irina

Station Begin

Time (UTC): Lat.(Ship): Long.(Ship):
Depth (HS):

Bottom Contact

Time (UTC): 15:04 Lat.(Ship): Long.(Ship):
Depth (HS): Cable out:

Time: Lat.: Long.: Comment:

See detailed ROV 73 protocol

Off Bottom

Time (UTC): 20:36 Lat.(ROV): 14°45.185 Long.(ROV): 44°58.759
Depth (HS): 3031 m Cable out:

Station End

Time (UTC): Lat.(Ship): Long.(Ship):
Depth (HS):

Summary:

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 05.02.04

Stations-#: 73 ROV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
73ROV-1A	14°45.192N 44°58.774W 18.25 ? m	cm-Bereich	Peridotit mit extrem starker hydrothermalen Alterierung zu einer hellbraun-rötlichen Masse. Im Randbereich eine körnige, sandige Konsistenz	1A1½: KL
73ROV-1B	14°45.1972N 44°58.7735W 18:37 3050 m	dm-Bereich	B1: Peridotit mit starker Serpentinisierung, Umwandlung von OL und partielle Erhaltung von opx. Im Randbereich 1 cm mächtige, dichter rötliche Umwandlungsschicht durch hydrothermale Prozesse B2: Penetrativ hydrothermal alterierter Peridotit mit weicher, rötlich-brauner GM und einigen Qz-Gängen im mm-Bereich	1B1, 1B2 ½: KL 1B1: LF
73ROV-2	14°45.1925N 44°58.7598 3030 m 19:20		Several pieces of porous po-si-cpy-rich massive sulfide from small inactive spire from Irina 2. Thin Fe-oxide coating on outside.	½ SP, TK ½ JS

Appendix 5: Fluid sampling protocol during ROV stations

Fluid sampling protocol for ROV deployments, cruise M60/3

Date: 22.01.04

Time (UTC) start: 16:34

Time (UTC) end:

Station no.: 23 ROV

Latitude: 14° 45,196 N

Longitude: 44° 58,787 W

Location: Orientation dive, sampling at Irina 2

Water depth (m): 3010

General comments on fluid sampling system:

- Bottle 6+7 have thicker material gas-sample bags

- Pt-100-element is 400 mm long

Jörg`s filter: 0,2 µm Porengröße, Polycarbonat, Durchmesser: 142 mm

all sample bottles were filled with MQ- water in the lab and the handles were opened just before the dive started

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1		-	0,8L Adtech				
2		-	0,8L Adtech				
3	23ROV5	-	0,8L Adtech	3044	14°45,19 N	44°58,78 W	20:42 20:46
4	23ROV1	-	0,8L Adtech				20:27 20:31
5	23ROV2	-	3L Teflon				20:31 20:35
6		-	0,8L Adtech				
7	23ROV6	-	0,8L Adtech				20:48 20:53
8	23ROV3	Jörg`s	-				20:37 20:41
Niskin 1	23ROV4				14°45,2198 N	44°58,8165 W	20:40
Niskin 2	23ROV8				14°45,2187 N	44°58,8165 W	21:11
Niskin 3	23ROV9				14°45,2187 N	44°58,8165 W	21:11

Bottle no.	Sample T (°C) lance	PROFILUR sensor probe data:			
		T (°C)	pH	Cond.	Sulfide
1	-	the profilur system was not installed during this dive			
2	-				
3	-				
4	-				
5	-				
6	-				
7	-				
8	-				

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
all	Diffuse low-temperature vent site with shimmering water, thick mussel beds with crabs, shrimps and brittle stars, bacteria mats. Every few minutes hot water jets from the bed, fluid sampling above fauna. All samples taken at the same site	Temp. sensor was out of function during the whole dive, showed $-7,9\text{ }^{\circ}\text{C}$ No gas in the bags after the dive
8		Handle 8 was a little bit deformed by the manipulator

Handles 2-8 were closed at 3020 m water depth after reaching the ground and moving the ROV some meters up again. Time: 18:51 UTC

No samples were taken for fluid geochemistry from the Niskin bottles.

Fluid sampling protocol for ROV deployments, cruise M60/3

Date:24.01.04

Time (UTC) start:

Time (UTC) end:

Station no.:29ROV

Latitude:14° 45,1 N

Longitude: 44° 58,7 W

Location: Orientation dive, sampling at Irina 1

Water depth (m): 2976

General comments on fluid sampling system:

- Dive-Number:8
- Pt-100-element is 100 mm long
- Temp-Sensor failed below ca 2200 m during the whole dive
- the sample bottles were **not** filled with MQ-water in the lab. The handles were opened just before the dive
- Handle 8 was repaired before the dive by Greg

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1		-	0,8L Adtech				
2	29ROV2	-	0,8L Adtech	2976	14° 45,111 N	44° 58,710 W	18:04:18 18:07:14
3		-	0,8L Adtech				
4		-	3L Teflon				
5		-	3L Teflon				
6		-	0,8L Adtech				
7	29ROV3	-	0,8L Adtech	2976	14° 45,111 N	44° 58,710 W	18:15:15 18:18:53
8	29ROV8	Jörg's	-	2976	14° 45,111 N	44° 58,710 W	18:33:50 18:44:00
Niskin 1	29ROV7				14°45,1084	44°58,7133	18:43
Niskin 2	29ROV6				14°45,1097	44°58,7114	18:38
Niskin 3	29ROV5				14°45,1098	44°58,7114	18:37

Bottle no.	Sample T (°C) lance	T (°C)	PROFILUR sensor probe data:			
			pH	Cond.	Sulfide	Oxygen
1	-		For first Temp-data see below			
2	-					
3	-					
4	-					
5	-					
6	-					
7	-					
8	-					

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
2	Extreme black smoke	
7	Extreme black smoke	
8	Sample taken in surrounding and within the black smoke	
Niskins	Same position as bottles	Niskins 1 and 3 leaked after recovery

Valves 2-8 were closed at 3020 m water depth (25 m meters above the ground) in the following order: 5, 6, 7, 8, 2, 3, 4,

After that we started the pump for 3 minutes, shutt off then an valve 1 was closed.

The pump showed a current-flux on the controll screen during pumping and in the zoom of the pump-exit-tube we were able to see water coming out.

After the dive gas sample bag 2 was filled completely with gas, but Seifert/Ertl measures lots of air and only a small amount of methane.

Result: For the next dive, we will fill the sample bottles with MQ-water in the lab again to avoid to much air in the system when the system is diving.

The probe lance was deformed from one black smoker rock but we can use it like it is now for the next dive.

Temperatures from the Profilur-system were max.8 ° C and mostly 3-5 °C during the sampling period

From the Niskin bottles, only from Niskin1 samples were taken for trace element analyses.

Fluid sampling protocol for ROV deployments, cruise M60/3

Date: 26.01.04

Time (UTC) start:

Time (UTC) end:

Station no.: 38ROV

Latitude: 14° 45,18 N

Longitude: 44° 58,75 W

Location: Biology station at Irina 2

Water depth (m): 3033

General comments on fluid sampling system:

All bottles filled with MQ-water in lab

Pt-100 (100mm) was repaired before this dive to make it pressure-stable below 2200 m

All valves were opened on board before the dive.

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1	38ROV9	-	0,8L Adtech	3031	14° 45,175 N	44° 58,777 W	17:47:22 17:51:25
2	38ROV 11	-	0,8L Adtech	3031	14° 45,186	44° 58,796	19:19:26 19:22:29
3	38ROV2	-	0,8L Adtech	3034	14° 45,185	44° 58,748	15:49:30 15:52:48
4	38ROV7	-	0,8L Adtech	3031	14° 45,183	44° 58,744	17:31:37 17:41:50
5	38ROV8	-	3L Teflon	3031	14° 45,160	44° 58,77	17:38:52 17:41:50
6	38ROV3	-	0,8L Adtech	3034	14° 45,185	44° 58,748	15:55:00 15:58:00
7	38RO 12	-	0,8L Adtech	3031	14° 45,169	44° 58,771	19:30:15 19:33:37
8	38ROV 10	Jörg's	-	3031	14° 45,185	44° 58,7445	17:58:54 18:57:10
Niskin 1	38ROV1				14° 45,184	44° 58,748	15:47:25
Niskin 2	?				14° 45,188	44° 58,747	16:48:07
Niskin 3	?				14° 45,184	44° 58,745	19:51:27

Bottle no.	Sample T (°C) lance	T (°C)	<u>PROFILUR</u> pH	<u>Sensor</u> Cond.	<u>Probe</u> Sulfide	<u>Data</u> Oxygen
1	See below	2,6				
2		2,7				
3	-	2,9	-	-	ca 0	ca. 80 % satur.
4	-	?	-	-	Slightly increased	-
5	-	5,5	-	-	-	-
6	-	2,9	-	-	see 3	see 3
7	-	2,7	-	-	-	-
8	-	3-3,5	-	-	-	-

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
1	Samples taken on main structure, small black smoker	more black partikels than in the other bottles
2	Samples taken on top of main structure, in grey smoke	
3	Mussel bed, diffuse venting	
4	see Bottle 1	
5	see Bottle 1	
6	Sample taken directly above mussels	
7	see Bottle 2	
8	see Bottle 1	
Niskin 1	See samples 3 and 6	
Niskin 2	Sample taken at main structure	
Niskin 3	Sample taken in rising black smoke above top of the structure	

The lance temp.sensor failed during the whole dive

All valves were closed 13 meters above the ground and the system was purged throw valve 7 for 3 miunutes

No gas in sample bags after the dive

After filtration in lab the membran filter from bottle 1 and 2 were given to Andrea
The filter from bottle 3 and 4 were given to Jörg

Fluid sampling protocol for ROV deployments, cruise M60/3

Date: 30.01.04

Time (UTC) start:

Time (UTC) end:

Station no.: 53ROV

Latitude: 14° 45, 084 N

Longitude: 44° 58, 709W

Location: Geology, fluid sampling at Irina-1

Water depth (m): 2959

General comments on fluid sampling system:

Pt-100 element worked on bord, Epoxidlayer around the element tip

All bottles filled with MQ-water in the lab

All handle opened on bord

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1	53ROV9	-	0,8L Adtech	2959	14° 45,084 N	44° 58,709 W	20:13:46 20:16:18
2	53ROV4	-	0,8L Adtech	2957	14° 45,083	44° 58,707	19:15:20 19:18:23
3	53ROV5	-	0,8L Adtech	2959	14° 45,083	44° 58,703	19:40:00 19:43:03
4	53ROV7	-	0,8L Adtech	2959	14° 45,084	44° 58,709	20:00:03 20:03:08
5	53ROV8	-	3L Teflon	2959	14° 45,082	44° 58,709	20:06:47 20:09:49
6	53ROV6	-	0,8L Adtech	2959	14° 45,082	44° 58,706	19:52:42 19:55:45
7	53ROV3	-	0,8L Adtech	2958	14° 45,083	44° 58,706	19:23:50 19:28:11
8		Jörg's	-	-	-	-	-
Niskin 1	53ROV 12			2958	14° 45,083	44° 58,706	20:30:57
Niskin 2	53ROV 11			2958	14° 45,083	44° 58,706	20:28:40
Niskin 3	53ROV 10			2958	14° 45,083	44° 58,706	20:26:50

Bottle no.	Sample T (°C) lance	T (°C)	<u>PROFILUR</u> pH	<u>Sensor</u> Cond.	<u>Probe</u> Sulfide	<u>Data</u> Oxygen
1	See below					
2						
3	-					
4	-					
5	-					
6	-					
7	-					
8	-					

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
1	Samples taken as close as possible to smoker outflow	lots of black particles in the fluid
2	See 1	lots of black particles in the fluid
3	See 1	lots of black particles in the fluid
4	See 1	lots of black particles in the fluid
5	See 1	-
6	See 1	lots of black particles in the fluid
7	See 1	lots of black particles in the fluid
Niskins	See 1	-

The lance temp.sensor failed during the whole dive

All valves were closed 20 meters above the ground and the system was purged throw valve 7 for 3 miunutes

No gas in sample bags after the dive

After filtration in lab the membran filter from bottle 3 was given to Andrea
The filter from bottle 2 and 4 were given to Jörg

Filter from the Niskin bottle 1 and 3: Andrea

Fluid sampling protocol for ROV deployments, cruise M60/3

Date: 31.01.04

Time (UTC) start: 12:20

Time (UTC) end: 22:25

Station no.: 56ROV

Latitude: 14° 45, 13 N

Longitude: 44° 58, 91 W

Location: Biology, fluid sampling surrounding of Irina-2

Water depth (m): 3049

General comments on fluid sampling system:

No temp. sensor during this dive

All bottles filled with MQ-water in the lab

All handle opened on bord

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1		-	0,8L Adtech				
2	56ROV2	-	0,8L Adtech	3041	14°45,217	44°58,814	18:22:00 18:25:04
3		-	0,8L Adtech				
4		-	0,8L Adtech				
5		-	3L Teflon				
6		-	0,8L Adtech				
7	56ROV3	-	0,8L Adtech	3041	14°45,217	44°58,814	18:36 18:35:11
8	56ROV4	Jörg`s	-	3041	14°45,202	44°58,772	18:49:34 19:19:35
Niskin 1	56ROV8			Irina-2			22:17
Niskin 2	56ROV9			Irina-2			22:18
Niskin 3	56ROV7			Irina-2			22:19

Bottle no.	Sample T (°C) lance	T (°C)	<u>PROFILUR</u> pH	<u>Sensor</u> Cond.	<u>Probe</u> Sulfide	<u>Data</u> Oxygen
1	See below					
2		2,66				
3	-					
4	-					
5	-					
6	-					
7	-	2,72				
8	-	2,70 and 2,85				

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
1		
2	Diffuse Fluid above bacteria mats in area IRINA-2	
7	Diffuse Fluid above bacteria mats in area IRINA-2	
8	Diffuse Fluid above bacteria mats in area IRINA-2	-
Niskin 1	Irina-2, 2.5 m above mussel bed	-
Niskin 2	Same as Niskin 1	
Niskin 3	Same as Niskin 1	

The lance temp.sensor was not installed during this dive

All valves were closed 20 meters above the ground and the system was purged throw valve 7 for 5 miunutes

No gas in sample bags after the dive

Filter (Jörg): all

Filter (Andrea): none

Fluid sampling protocol for ROV deployments, cruise M60/3

Date:02.02.04

Time (UTC) start:

Time (UTC) end

Station no.: 64ROV

Latitude:14° 45, 07 N

Longitude: 44° 58, 69 W

Location: Geology dive at Anna-Louise

Water depth (m): 3048

General comments on fluid sampling system:

Temp.sensor: Thermoelement (first dive with this element)

All bottles filled with MQ-water in the lab

All handle opened on bord

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1		-	0,8L Adtech				
2	64ROV6	-	0,8L Adtech	2948	14°45,07	44°58,69	18:01:00 18:03
3	64ROV8	-	0,8L Adtech	2948	14°45,07	44°58,69	18:10:50 18:12:05
4		-	0,8L Adtech				
5		-	0,8L Adtech				
6	64ROV9	-	0,8L Adtech	2948	14°45,07	44°58,69	18:13:35 18:15:30
7	64ROV7	-	0,8L Adtech	2948	14°45,07	44°58,69	18:04:57 18:07:11
8		Jörg`s	-	-	-	-	-
Niskin 1	64ROV3			2948	14°45,07	44°58,69	17:56
Niskin 2	64ROV4			2948	14°45,07	44°58,69	17:56
Niskin 3	64ROV5			2948	14°45,07	44°58,69	17:55

Bottle no.	Sample T (°C) lance	T (°C)	<u>PROFILUR</u> pH	<u>Sensor</u> Cond.	<u>Probe</u> Sulfide	<u>Data</u> Oxygen
1	See below					
2						
3	-					
4	-					
5	-					
6	-					
7	-					
8	-					

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
2	Area Anna-Louise, strong black smoke, little fauna; sampling of discrete smoker in a smoker field at the crater rim	Some gas in bags
3	see 2	
6	see 2	
7	see 2	-
Niskin 1	see 2	
Niskin 2	see 2	
Niskin 3	see 2	-

The lance temp.sensor failed during the first meters (150°C were shown) of the dive and was shut off then

All valves were closed 10 meters above the ground and the system was purged through valve 7 for 3 minutes

Filter (Jörg): Bottle 3

Filter (Andrea): Bottle 2

and Niskin 2 + 3 (all on one filter)

Koordinates of the Reference station:

44 °58,740 W

14°45,207 N

Fluid sampling protocol for ROV deployments, cruise M60/3

Date:03.02.04

Time (UTC) start:

Time (UTC) end

Station no.: 66ROV

Latitude:14° 45, 082 N

Longitude: 44° 58, 69 W

Location: Biology (IRINA-1 und IRINA-2)

Water depth (m): 2960

General comments on fluid sampling system:

Temp.sensor: Thermoelement

All bottles filled with MQ-water in the lab

All handle opened on bord

Gas sample bags are smaller then the dives before

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1	66ROV5	0,2 µm Poly-carbonat	0,4L Adtech	2960	14°45,082	44°58,69	16:10 16:15
2	66ROV6	-	0,4L Adtech	2960	14°45,082	44°58,69	16:19 16:20
3	66ROV 10	-	0,4L Adtech	2959	14°45,083	44°58,696	17:10 17:13
4		-	0,4L Adtech				
5		-	0,4L Adtech				
6	66ROV 11	-	0,4L Adtech	2959	14°45,083	44°58,696	17:34 17:35
7		-	0,4L Adtech				
8		Jörg`s	-	-	-	-	-
Niskin 1	66ROV8			2959	14°45,083	44°58,696	16:53:35
Niskin 2	66ROV9			2959	14°45,083	44°58,696	16:55:03
Niskin 3	-			-	-	-	-

Bottle no.	Sample T (°C) lance	T (°C)	PROFILUR pH	Sensor Cond.	Probe Sulfide	Data Oxygen
1	See below					
2						
3	-	max. 24,7			Increase	
4	-					
5	-					
6	-					
7	-					
8	-					

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
1	Samples taken directly at bacteria covered rock close to IRINA-1	Chloride contents of sample (345 mM) indicates that bottle volume was not completely exchanged during pumping
2	Samples taken directly at bacteria covered rock close to IRINA-1	
3	Samples taken in Black smoke of a single smoker at the border of the field	
4		
5		
6	as 3, partly out of smoke during pumping	
7		
8		
Niskin 1	taken close to Black smoke Different smoker than 3 and 6	
Niskin 2		
Niskin 3		

The lance temp.sensor failed on deck (3,5 °C) and during the dive (3,5 °C and 400°C)

All valves were closed 30 meters above the ground and the system was purged through valve 7 for 3 minutes

Filter (Jörg): In-situ-Bottle 1, Bottle 1 and Niskin 3

Filter (Andrea): Bottle 3

Fluid sampling protocol for ROV deployments, cruise M60/3

Date:05.02.04

Time (UTC) start:

Time (UTC) end

Station no.: 73ROV

Latitude:14° 45,206 N

Longitude: 44° 58,741 W

Location: Geology (Overview, Sampling at IRINA-2)

Water depth (m): 3033

General comments on fluid sampling system:

No Temp. Sensor during this dive

All bottles filled with MQ-water in the lab

All handle opened on bord

Gas sample bags are small

Bottle no.	Sample no.	Filters used	Gas bags (vol., type)	Water depth (m)	Lat.	Long.	Time (UTC) start - end
1	73ROV5	-	0,4L Adtech	3033	14°45,206	44°58,741	20:12 20:13
2	73ROV3	-	0,4L Adtech	3033	14°45,206	44°58,741	19:59 20:02
3	73ROV6	-	0,4L Adtech	3033	14°45,206	44°58,741	20:16 20:17
4	73ROV8	-	0,4L Adtech	3033	14°45,206	44°58,741	20:24 20:35
5	73ROV9	-	0,4L Adtech	3033	14°45,206	44°58,741	20:27 20:28
6	73ROV7	-	0,4L Adtech	3033	14°45,206	44°58,741	20:19 20:21
7	73ROV4	-	0,4L Adtech	3033	14°45,206	44°58,741	20:04 20:07
8		Jörg`s	-	-	-	-	-
Niskin 1	73ROV 12			3033	14°45,1855	44°58,7589	20:34:19
Niskin 2	73ROV 11			3033	14°45,1854	44°58,7589	20:34:45
Niskin 3	73ROV 10			3033	14°45,1855	44°58,7589	20:34:19

Bottle no.	Sample T (°C) lance	T (°C)	PROFILUR pH	Sensor Cond.	Probe Sulfide	Data Oxygen
1	-					
2	-					
3	-					
4	-					
5	-					
6	-					
7	-					
8	-					

Bottle no.	Sample site description (fauna, mineral formations, smoke, ...)	Observations after system recovery (system failures, degassing, ...)
1	small smoker close to marker, all samples taken at same position, also Niskins	
2	See 1	
3	See 1	
4	See 1	
5	See 1	
6	See 1	
7	See 1	
8	See 1	
Niskin 1	See bottle 1; taken 1 m above N2 and 3	
Niskin 2	See bottle 1	
Niskin 3	See bottle 1	

All valves were closed 20 meters above the ground and the system was purged through valve 7 for 3 minutes

Filter (Jörg): Bottle 2, 4 and Niskin 1,2 and 3

Filter (Andrea): Bottle 1 and 3

Appendix 6: GTV station protocols

The following abbreviations are used:

ER: Erio Rahders

JS: Jan Scholten

KL: Klas Lackschewitz

LF: Leander Franz

SP: Sven Petersen

TK: Thomas Kuhn

Subsamples are taken by these persons according to the protocol.

Station No. 20 GTV Date (UTC): 21.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Samples host rocks on small dome structure at 14°45.00/44°58.00

Station Begin

Time (UTC): 17:50 Lat.(Ship): 14°44.90 Long.(Ship): 44°58.00

Depth (HS): 2680 m

Bottom Contact

Time (UTC): 22:41 Lat.(Ship): 14°45.19 Long.(Ship): 44°58.75

Depth (HS): 3019 m Cable out: 3114 m

Time:	Lat.:	Long.:	Comment:
17:56			TV-Grab to water
18:00			Telemetry breakdown ?
18:07			TV-Grab back on board

Off Bottom

Time (UTC): Lat.(Ship): Long.(Ship):

Depth (HS): Cable out:

Station End

Time (UTC): 18:07 Lat.(Ship): Long.(Ship):

Depth (HS):

Summary:

Station was interrupted

Station No. 26 GTV Date (UTC): 23.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sample sulfides in LF-1 at 14°45.24 N/44°58.82 W at 3038 m water depth

Station Begin

Time (UTC): 11:00 Lat.(Ship): 14°45.17 Long.(Ship): 44°58.81

Depth (HS): 3024 m

Bottom Contact

Time (UTC): 12:19 Lat.(Ship): 14°45.26 Long.(Ship): 44°58.85

Depth (HS): 3024 m Cable out: 3087 m

Time:	Lat.:	Long.:	Comment:
13:13	14°45.20	44°58.78	try to grab sample at 3133 m water depth

Off Bottom

Time (UTC): 13:20 Lat.(Ship): 14°45.20 Long.(Ship): 44°58.78

Depth (HS): 3035 m Cable out: 3087 m

Station End

Time (UTC): 14:27 Lat.(Ship): 14°45.18 Long.(Ship): 44°58.84

Depth (HS): 3020 m

Summary: Grab was not working properly. Jaws stayed opened. Some samples were recovered.

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 23.01.04

Stations-#: 26 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1		7x5x4	Harzburgit, richtungslos, mittel- bis grobkörnig, OL fast vollständig serpentiniert, Opx als cm-große, kurzprismatische Kristalle, schwarze Verwitterungshülle	½: KL LF
-2		5x4x3	Harzburgit, mittel- bis grobkörnig, richtungslos, OL größtenteils serpentiniert, Opx kurzprismatisch und stark alteriert, rötlichbraune Verwitterungskruste	½: KL LF
-3		5x4x3	Harzburgit, richtungslos, mittelkörnig, OL fast vollständig erhalten, z. T. intensiv mit Opx verwachsen, OL xenomorph, Opx xeno- bis hypidiomorph. Schwarz bis rötliche Verwitterungshülle.	½: KL LF
-4		3x4x3	Opx-Websterit, richtungslos, grobkörnig, dominiert von großen xeno- und hypidiomorphen relativ frischen Opx und untergeordnet OL, schwarz-braune Verwitterungshülle.	½: KL LF
-5			Alterierter Harzburgitgravel mit grobkörnigem Opx-Fragmenten.	

Station No. 32 GTV Date (UTC): 25.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sampling Main Mound

Station Begin

Time (UTC): 11:27 Lat.(Ship): 14°45.17 Long.(Ship): 44°58.73
Depth (HS): 3012 m

Bottom Contact

Time (UTC): 12:35 Lat.(Ship): 14°45.114 Long.(Ship): 44°58.71
Depth (HS): 2998 m Cable out: 3073 m

Time:	Lat.:	Long.:	Comment:
11:28			GTV in water
11:32			Test ok, continue with 1.0 m/s to 2500 m
12:04	14°45.13	44°58.72	1800 m cable out, depth 2990 m
12:17	14°45.12	44°58.72	winchdriver changes to lab to 2900 m with 1.0 m/s
12:26			videotape on
12:46	14°45.12	44°58.71	grab closed, 3082 m rope, 2982 m water depth
12:51			alert signals on
12:59			videotape off
13:00			winch driver changing

Off Bottom

Time (UTC): 12:47 Lat.(Ship): 14°45.12 Long.(Ship): 44°58.71
Depth (HS): 2982 m Cable out: 3071 m

Station End

Time (UTC): _____ Lat.(Ship): _____ Long.(Ship): _____
Depth (HS): _____

Summary: _____

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 25.01.04

Stations-#: 32 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1 Krusten (A-Q)	14°45.12 N 44°58.71 W	Bis x dm	Hydrothermale Kruste; verwitterter Harzburgit mit großen Opx-Kristallen in feiner GM aus Schichtsilikaten mit größeren lagenförmigen Abscheidungen von Limonit, z. T. Kluffüllungen aus Qz	1B, D TK 1H, 1I, 1J, 1K, 1L: KL 1P, 1Q: JS
-2 Quarze (A-J) Kuhn (K-N) KL (O&P) JS	„	Bis zu 5 x 7 cm	Gebänderte, z. T. Massive Qz-Präzipitate mit teilweise panideomorphen Kristallen auf Klüften; oft intensiv mit Pyrit o. ä. verwachsen	2I: TK 2K, 2L, 2M, 2N: KL
-3A Serpentinite	„	4x5x3	Serpentinit; dunkelgraugrünes, dichtes, stark frakturiertes Gestein mit weißen Asbestverfüllten Frakturen, limonitische Verwitterungskrusten	½: KL LF
-3B Serpentinite	„	6x7x5	Fein bis mittelkörniger Websterit mit richtungslos körniger Textur und bis über 3 mm großen Opx-Prismen und kleineren xenomorphen OL. Deutliche Frakturierung & limonitische Verwitterungskruste	½: KL LF
-3C Serpentinite	„	3x5x3	Stark umgewandelter Websterit, grobkörnig, richtungslos, stark fragmentiert mit deutlicher sulfidischer Imprägnation	½: KL LF
-3D Serpentinite	„	3x5x3	Extrem stark verquarzter Ultramafit mit wenigen Relikten von Opx und grünem Serpentinbelag. Partiell ist Sulfidisierung ausgeprägt-	½: KL LF

-3E Massivsulfide	”	3x4x2	Massivsulfidprobe aus feinkörnigem Pyrit	
-3F Serpentine	”	15x15x10	Harzburgit in einer dichten, stark serpentinisierten GM liegen bis cm-große, relativ gut erhaltene Opx. Die Probe ist am Rand deutlich frakturiert und dort auch stark alteriert.	½: KL TK
-4 Schlamm				KL
-5 sulfidreicher Schlamm				SP

Station No. 33 GTV Date (UTC): 25.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sampling Main Mound

Station Begin

Time (UTC): 16:03 Lat.(Ship): 14°45.08 Long.(Ship): 44°58.70

Depth (HS): 2960 m

Bottom Contact

Time (UTC): 17:15 Lat.(Ship): 14°45.11 Long.(Ship): 44°58.69

Depth (HS): 2985 m Cable out: 3038 m

Time:	Lat.:	Long.:	Comment:
16:05			GTV in water
16:09			Closed jaws for a test-successfully passed
16:55	14°45.08	44°58.67	wich driver changes to lab, continue with 1.0 m/s
17:01			2860 m, videotape on, continue with 0.5 m/s
17:27	14°45.06	44°58.65	3047 m rope length, 2923 water depth
17:30			video tape off, grab closed
17:43			2700 m water depth, winch driver changed

Off Bottom

Time (UTC): 17:30 Lat.(Ship): 14°45.05 Long.(Ship): 44°58.65

Depth (HS): 2921 m Cable out: 3046 m

Station End

Time (UTC): _____ Lat.(Ship): _____ Long.(Ship): _____

Depth (HS): _____

Summary: _____

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 25.01.04

Stations-#: 33 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1		10x10x15	Norit (?), holokristallin, hypidiomorph, richtungslos, mittelkörnig mit Kurzprismen. Opx, xeno-hypidiomorphe Plg und einer Opakphase. Gestein ist relativ frisch.	LF, TK
-2		8x5x3	Harzburgit, richtungslos, mittelkörniges Gefüge, gekennzeichnet durch kurzprism. Opx und leicht alterierten OL. Erhaltungszustand rel. frisch.	LF
-3		8x7x5	Siehe # 2, allerdings mit Pyrlisit auf Oberfläche	½: KL LF
-4		17x11x10	Grobkörniger Peridotit mit cm großen Opx, kleineren OL und z. T. pegmatitischen Partien mit Opx > 10 cm. Gestein ist relativ frisch.	½: KL LF, TK
-5		10x14x6	Mittel- bis grobkörniger Harzburgit mit teils fließenden, teils abrupten Übergang im Korngrößenspektrum. Randlich deutlich sichtbare Verwitterung der Opx & OL.	½: KL LF
-6		9x7x5	Weitestgehend wie # 5 mit gleichartiger Verwitterung	½: KL LF
-7		10x5x6	Grobkörniger Opx-Websterit mit richtungslos körnigem Gefüge, > 3 cm großen prismatischen Opx und kleinen OL, Frakturierung auf Korngrenzen vorhanden. Randlich zu Serpentin/Limonit verwittert.	½: KL LF

-8		12x4x4	Grob- bis Riesenkörniger Opx-Websterit mit lang-prismatischen Opx sowie untergeordnet kleineren OL auf Intergranularpositionen. Starke Frakturierung auf Spaltrissen und zwischen den Körnern.	½: KL LF
-9		17x12x8	Grob- bis Riesenkörniger Harzburgit mit rel. hohem Opx-Anteil. Neben meist xenomorphen kleinen OL existieren bis 7 cm lange Opx-Prismen.	½: KL LF, TK
-10		22x18x12	Grobkörniger Harzburgit bis Websterit mit richtungslos gleichkörniger Mineralanordnung und deutlicher Verwitterung (Serpentinisierung, Limonitierung im Randbereich).	½: KL LF, TK
-11		6x5x4	Peridotitmylonit, deutlich geregeltes mylonitisches Gefüge mit Olivinporphyroklasten in einer dichten Serpentinmatrix (?). Adularverfüllte bis 5 mm breite Klüfte senkrecht zur Foliation. Neusprossung von bis zu 5 cm langen Hornblenden.	½: KL LF, TK
-12		20x10x8	Deutlich serpentinisierter Harzburgit mit prismatischem Opx in einer dunkelgrünen Matrix. Im Außenbereich starke Limonitierung.	½: KL LF, TK
-13		11x6x7	stark serpentinisierter Harzburgit mit deutlich umgewandelten OL und Opx, jetzt fast vollständig zu sehr weichen Serpentin umgewandelt.	½: KL LF
-14		9x6x5	Weitestgehend wie # 13, der Erhaltungszustand der Opx ist in Bereichen etwas besser. Gestein ist mit dem Fingernagel ritzbar.	½: KL LF
-15		7x6x3	Siehe # 14	½: KL

-16		70x50x25	Stark umgewandelter, deutlich frakturiertes, grob- bis riesenkörniger Opx-Websterit mit durchgreifender Serpentinisierung im gesamten Probenbereich.	LF, TK
-17		Rest	Mehr oder weniger stark alterierte Ultramafite.	17A, 17B, 17C, 17D: KL
-18 -19 -20			Atacamite Mn-Krusten Schlamm	18, 20: KL 18 SP 19: TK

Station No. 35 GTV Date (UTC): 25.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Station Begin

Time (UTC): 21:31 Lat.(Ship): 14°45.20 Long.(Ship): 44°58.78

Depth (HS): 3034 m

Bottom Contact

Time (UTC): 22:41 Lat.(Ship): 14°45.19 Long.(Ship): 44°58.75

Depth (HS): 3019 m Cable out: 3114 m

Time:	Lat.:	Long.:	Comment:
22:13	14°46.19	44°58.75	passed 2000 m (Depth 3016 m)
22:33			tape on at rope length 2900 m
23:32	14°45.19	44°58.74	grab closed at 3017 m
23:58			video stopped

Off Bottom

Time (UTC): 23:38 Lat.(Ship): 14°45.19 Long.(Ship): 44°58.75

Depth (HS): 3019 m Cable out: 3125 m

Station End

Time (UTC): 01:03 Lat.(Ship): 14°45.12 Long.(Ship): 44°58.75

Depth (HS): 2992

Summary:

TV-Grab full of mussels in grey, altered sediment with a temperature between 96-106 °C. Typical hydrothermal fauna with crabs, mussels, snails, ophiurids

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 25.01.04

Stations-#: 35 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1		dm	Crust on top of grab, silicified fragments of rocks, cpy. Some samples show breaching of the crust mainly py with minor cpy, abundant anhydrite in places	1A3, 1F, 1H: KL 1A4, 1B3, 1C2, 1D, 1E: SP 1D, 1F: JS
-2			Massive, dense to porous chalcopyrite with local replacement to bornite and chalcocile. Infiltration by pyrite. Some samples contain clay-altered wallrock.	2A4, 2B3, 2E2: JS 2H: KL 2A3, 2B2, 2D3, 2G2, 2H, 2I: SP, TK 2A4, 2B3, 2E2: JS
-3			Porous pyrrhotite-anhydrite. Several small pieces with hex.-pyrrhotite crystals overgrowing anhydrite and early chalcopyrite.	all SP
-4			Clay-altered rock fragments sometimes in porous sulfides, 4A is rounded fragment with resampled containing several bags of light grey (4E) and dark grey (4G)...sampled	4A, 4B: KL 4E2, 4G2: SP
-5		14x10x6	Harzburgit, in einer dtl. Serpentinisierten GM. Fragmentierte OL & bis 2 cm große lamellierte Opx erkennbar, Gestein zeigt zahlreiche Pyritverfüllte Klüfte und ist randlich deutlich limonitisiert, stark frakturiert.	½: KL LF, TK
-6		12x8x5	Serpentinit mit dichter GM mit wenigen größeren Pseudomorphosen nach ?Opx. Gestein ist stark geklüftet, auf den Klüften wahrscheinlich Serpentin und Pyrit, massive Ummantelung durch lagenförmige Sulfidschichten.	½: KL LF

-7			Various pieces of anhydrite-rich material with some pieces containing crystals up to 1,5 cm. Matrix is commonly cpy. Anhydrite shows white rims.	TK
-8			Small pieces enriched in bornite and/or chalcocite otherwise similar to group 2.	½: SP
-9		25x20x11	Stark serpentinisierter Peridotit mit mehreren mm-großen, stark korrodierten OL-Körnern, dunkelbraunen Spl und geringen Anteilen kleiner Opx. Vom Rand ausgehend deutliche Imprägnation von Sulfid. Randlich von cm-dicken Sulfidsaum umgeben	½: KL LF, TK
-10			Fe-Oxide crusts, alternating reddish to dark brown layers on top, sometimes fine pyrite and blueish altered material. One idiomorph quartz crystal.	10: JS
-11			Sulfide mud	11A, 11B, 11C: KL

Station No. 49 GTV Date (UTC): 29.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sample Ultramafics

Station Begin

Time (UTC): 15:05 Lat.(Ship): 14°55.54 Long.(Ship): 44°53.84

Depth (HS): 2985 m

Bottom Contact

Time (UTC): 16:21 Lat.(Ship): 14°55.48 Long.(Ship): 44°54.29

Depth (HS): 3293 m Cable out: 3268 m

Time:	Lat.:	Long.:	Comment:
16:26	14°55.48	44°54.35	3314 m Kabellänge, 3347 m Tiefe

Off Bottom

Time (UTC): see 1 Lat.(Ship): Long.(Ship):

Depth (HS): Cable out:

Station End

Time (UTC): 17:37 Lat.(Ship): 14°55.84 Long.(Ship): 44°55.06

Depth (HS): 3946

Summary:

Ca. 20 Stücke serpentinisierter Ultramafit und pelagischen Sedimenten.

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 29.01.04

Stations-#: 49 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1 (A-F)		25x20x10	Serpentinit mit mehreren dicken Serpentin- & Carbonatadern. OL völlig serpentinisiert. Reste von bis cm-großen Opx, Magnetitadern, starke Serpentinharnischbildung im Außenbereich	1A3: KL 1B-F: TE LF
-2		25x30x25	Dunit, richtungslos körnig, xenomorph mit deutlich frakturierten und serpentinisierten OL mit geringem Anteil Opx, orthogonal orientierte Serpentinverfüllte Gänge	½: KL LF, TK
-3 (A-P)		cm-dm	Relativ wenig serpentinisierter Peridotit mit deutlichem Anteil primärer OL und unterschiedlichen Gefügen (z. B. mylonitisch, hypidioblastisch grob, xenomorph feinkörnig.	3A-P ½: KL LF, TK
-4 (A-H)		cm-dm	Relativ frische, wenig serpentinisierte Peridotite mit leukograden Fsp-reichen Partien intrudierter Schmelze, z. T lagenförmig, Eine Probe zeigt starke Silifizierung.	A-H ½: KL LF, TK
-5 (A-P)		cm-dm	Deutlich serpentinisierte, meist Peridotite mit dichter GM und Porphyroklasten (meist Opx, seltener OL), oftmals Frakturierung und Serpentinabscheidung auf Frakturen. Deutliche Limonitisierung im Außenbereich.	A-P ½: KL LF, TK
-6 (A-K)		cm-dm	Penetrativ serpentinisierter Peridotit, oftmals mit Il-Textur, wobei in einer feinkörnigen bis dichten GM z. T. noch opx-Porphyroklasten erkennbar sind. Auch hier Serpentin verfüllte Adern.	A-K ½: KL LF, TK

-7		4x4x3	Dichter, porphyrischer Basalt mit zahlreichen Vakuolen im sub-mm-Bereich; mm-große Einsprenglinge von Plg-Phänokristallen, relativ frisch, schwache Limonitisierung im Außenbereich	½: KL LF
-8		4x4x3	Serpentinit in Kontakt mit extrem feinkörniger ? basaltischer Partie; Erhaltungsgrad des Serp. Entspricht etwas Gruppe 5; feinkörniges Gestein nicht weiter auflösbar	½: KL LF, TK
-9		4x4x3	Feinkörniger Micrgabbro mit zuckerkörnigem Gefüge und cm-mächtiger dunkler Lage. Mineralbestand aufgrund der sekundären Umwandlungen problematisch bestimmbar.	½: KL LF
-10			Sedimentprobe	KL

Station No. 54 GTV Date (UTC): 31.01.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sample Sulfides at smoking crater

Station Begin

Time (UTC): 00:20 Lat.(Ship): 14°45.17 Long.(Ship): 44°58.59

Depth (HS): 2983 m

Bottom Contact

Time (UTC): 01:26 Lat.(Ship): 14°45.17 Long.(Ship): 44°58.75

Depth (HS): 2949 m Cable out: 3099 m

Time:	Lat.:	Long.:	Comment:
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Siehe GTV-54.xls

Off Bottom

Time (UTC): 02:40 Lat.(Ship): 14°45.17 Long.(Ship): 44°58.63

Depth (HS): 2940 m Cable out: 3015 m

Station End

Time (UTC): 03:49 Lat.(Ship): 14°44.87 Long.(Ship): 44°58.54

Depth (HS): 2838 m

Summary:

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 29.01.04

Stations-#: 54 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1			Fine grained black sulfides, partially compacted. Composed of chalcocite with minor chalcopyrite. Grainsize < 1 mm.	1A, 1B: SP, TK 1: JS
-2 (A-H)			Dark to grey breccias with green atacamite, abundant carbonate. Native copper as grains in Fe-Oxide/Hydroxide matrix and in qtz veins.	2A4, 2B4, 2C4, 2F2: KL 2A2, 2C2, 2E2, 2G3: SP, TK 2B1, 2E2, 2G: JS 2A4, 2B2, 2D4, 2E4, 2H3: TE
-3			Porous massive sulfide enriched in chalcopyrite. Otherwise similar than 54-1.	½ SP ½ JS
-4			Very porous, bright red Fe-oxides with abundant secondary Cu-sulfides. Cavities are lined with < 1 mm Atacamite.	4A4, 4A5, 4B2: SP 4B3: JS
-5 (A-C)			Red jasper breccias, partly silicified. Late veining. Collomorphic banding. Largest piece 50x40x30 cm.	5B2: KL 5B3, 5C2: SP 5A3, 5C4: JS 5B3, 5C2: DB
-6			Pieces of similar material than 3 and 4, but enriched in Atacamite, dark green to bluegreen in colour.	
-7			Dark, red Fe-oxide	½: KL ½: SP

-8			Sediment	KL
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Station No. 57 GTV Date (UTC): 01.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sampling Ultramafic rocks

Station Begin

Time (UTC): 02:00 Lat.(Ship): 14°23.35 Long.(Ship): 44°54.01

Depth (HS): 1700 m

Bottom Contact

Time (UTC): 03:06 Lat.(Ship): 14°42.30 Long.(Ship): 44°53.87

Depth (HS): Cable out:

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-57.xls

Off Bottom

Time (UTC): 03:13 Lat.(Ship): Long.(Ship):

Depth (HS): 1608 m Cable out: 1683 m

Station End

Time (UTC): 04:06 Lat.(Ship): 14°42.24 Long.(Ship): 44°54.09

Depth (HS): 1737 m

Summary: ca. 10 rock pieces

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 01.02.04

Stations-#: 57 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1A		5 Proben 3-16 cm Durchmesser	Peridotite, partiell serpentiniert mit deutlich frakturierten OL-Kristallen mit großen um mm-cm Bereich und untergeordnet Opx mit richtungslosem Gefüge, starke Frakturierung mit Serpentinbildung, Proben: 5 Stück	1A1, 1A2: KL, 1A1 – 1A5: LF, TK
-1B		2 Proben 3-5 cm Durchmesser	Brekziöse Peridotite mit starker Zertrümmerung des Kornbestandes, ungleichmäßige Korngröße (cm-sub mm Bereich). Vorwiegend aus OL-Porphroklasten und untergeordnet Opx aufgebaut.	2B1: KL, 1B1, 1B2: LF
-1C		3x2x3	Stark frakturierter Serpentin-Mylonit mit undeutlichem II-Gefüge und eingeregeltten OL-Aggregaten, untergeordnet Opx, deutliche Frakturierung mit Serpentinbildung	½: KL, LF
-2		7x7x6	Amphibolit; feinkörniges, deutlich II-texturiertes grünweißes Gestein mit eingeregeltten Hbl, kataklastischen OL und Fsp. Deutliche Limonitisierung im Außenbereich	LF, TK
-3		cm-dm	Basalte, verikulare Gesteine ohne II-Textur meist mit dichter GM und wenigen Einsprenglingen von OL. Blasen Hohlräume meist im sub-mm Bereich. Deutlich unterschiedlicher Erhaltungszustand, d. h. neben grau-schwarzen, relativ frischen Basalten liegen hellgrau-gelbliche, deutlich sekundär alterierte Basalte.	A-C: LF A: TK

Station No. 62 GTV Date (UTC): 02.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Hydrothermal Crustsin Logatchev 1

Station Begin

Time (UTC): 00:15 Lat.(Ship): 14°25.27 Long.(Ship): 44°58.57

Depth (HS): 2940 m

Bottom Contact

Time (UTC): 01:13 Lat.(Ship): 14°45.23 Long.(Ship): 44°58.83

Depth (HS): 3020 m Cable out: 3104 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-62.xls

Off Bottom

Time (UTC): 02:07 Lat.(Ship): 14°45.20 Long.(Ship): 44°58.83

Depth (HS): 3037 m Cable out: 3119 m

Station End

Time (UTC): 03:25 Lat.(Ship): 14°45.10 Long.(Ship): 44°59.85

Depth (HS): 1737 m

Summary:

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 02.02.04

Stations-#: 62 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1 A, B		dm-Bereich	Stark serpentinisierte und pyritisierte Websterite-Harzburgite mit richtungslos, mittel- bis grobkörnigem Gefüge und auf meist II-Klüften (bis 3 mm). Serpentinabscheidungen. OL fehlt vollkommen, Opx ist kurzprismatisch, hypidiomorph goldbraunschimmernde Körner, z. T. bis cm-mächtige Sulfidschicht	1B: KL 1A: LF, TK
-2 A-C		cm-Bereich	Harzburgite mit starker Serpentinisierung. Wobei in einer dichten, graugrünen Serp.-GM bis cm-große kurzprismatische Opx liegen. Die Proben sind stark sulfidisiert, wobei der Pyrrothin z. T. idiomorph auf Klüften, z. T. in der Serpentinmatrix und z.T. um die Opx herum agglomeriert sind.	2C: KL 2A: LF
-3 A, B		cm-dm-Bereich	Vollständig sekundär umgewandelte Dunite mit geringem Opx-Anteil. Während OL vollständig serpentinisiert ist liegen Opx als schwarz-braune, ebenfalls stark umgewandelte Körner vor. Die GM ist stark sulfidisiert (Pyrrothin) während im Randbereich eine mm-dünne Sulfidkruste gebildet ist.	3B: KL 3A: LF, TK
-4 A-C		cm-Bereich	Orthopyroxenit mit richtungslos-körnigem, hypidiomorphem Gefüge. Kurzprismatische Opx mit Größen über 5 mm sind sekundär stark alteriert, auf Frakturen und im Korngrenzbereich deutlich sulfidisiert. Material ist stark brüchig.	4A1, 4B1, 4C1: KL 4A: LF

-5		100 Kg	Scoraceous black breccia containing wallrock fragments and Opx crystalpieces. Silicified and sulfidized. Sulfides are predominantly pyrrothites with minor pyrite, chalcopyrite=crust on top of seafloor	5A, 5C2: KL
-6		1 kg	Few pieces of pyrrothite-rich material containing abundant barite and fragments of opx. Minor chalcopyrite.	6/2: TK
-7		dm	Lagige Qz-Kluffüllungen mit partiell silifizierten Nbenngestein	6/7: TK
-8			Silizifizierter Ton, graugrün Globigerinenschlamm	8A, 8B, 8C, 8D: KL
-9			Brown clay, darkbrown to reddish globigerina clay	KL

Station No. 67 GTV Date (UTC): 04.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sampling of dead mussel field east of LF-2

Station Begin

Time (UTC): 00:08 Lat.(Ship): 14°42.43 Long.(Ship): 44°54.47

Depth (HS): 1994 m

Bottom Contact

Time (UTC): 01:10 Lat.(Ship): 14°42.40 Long.(Ship): 44°54.45

Depth (HS): 1938 m Cable out: 2021 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-67.xls

2 Versuche zum Greifen , allerings war erst der zweite erfolgreich. Koordinaten siehe Off bottom

Off Bottom

Time (UTC): 01:50 Lat.(Ship): 14°42.39 Long.(Ship): 44°54.51

Depth (HS): 1967 m Cable out: 2125 m

Station End

Time (UTC): 02:58 Lat.(Ship): 14°42.44 Long.(Ship): 44°54.94

Depth (HS): 2263 m

Summary: Some rock pieces and one Calyptogena shell

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 04.02.04

Stations-#: 67 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1 2 Proben		cm-dm	Grob- bis riesenkörnige Orthopyroxenite mit richtungslos körnigem Gefüge, bis mehrere cm-große Opx; untergeordnet OL, eine Probe zeigt eine OL-reichere Partei, z. T. sind Serpentin-Adern vorhanden	A: LF, TK
-2 11 Proben		cm-dm	Peridotite mit deutlich bis sehr starker Serpentinisierung, wobei in einer meist netzartigen Matrix Relikte von meist cm-großen Opx auftreten. Neben feinen Serpentinadern beobachtet man cm-breite Qz & Talkverfüllte Adern im Randbereich mehrere mm mächtige Karbonatkrusten auftreten.	A-E ½: KL A ½: TE A-C: LF A, B: TK
-3 3 Proben			Metabasalte mit deutl. Vergrünung und dichterem Randpartie (? Chilled Margin). Eine Probe zeigt eine deutl. Silifizierung und Kontakt zu einem grobkörnigerem Ultramafit (? Gangintrusion des Basalts). In Randbereichen treten Psilomelan und Pyrolositkrusten auf.	A ½: KL A: LF, TK

Station No. 74 GTV Date (UTC): 05.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sedimented area close to the Logatchev-1 mound

Station Begin

Time (UTC): 23:51 Lat.(Ship): 14°45.06 Long.(Ship): 44°58.63

Depth (HS): 3058 m

Bottom Contact

Time (UTC): 01:28 Lat.(Ship): 14°45.09 Long.(Ship): 44°58.59

Depth (HS): 2882 m Cable out: 3001 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-74.xls

Off Bottom

Time (UTC): 01:29 Lat.(Ship): 14°45.09 Long.(Ship): 44°58.59

Depth (HS): 2882 m Cable out: 3010 m

Station End

Time (UTC): 02:40 Lat.(Ship): 14°45.06 Long.(Ship): 44°58.60

Depth (HS): 2866 m

Summary:

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 06.02.04

Stations-#: 74 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1 17 Proben		cm-dm	z.T. stark frakturierte und verwitterte Websterite-Orthopyroxenite mit Korngrößen von mm-cm-Bereich. Richtungslos, Opx kurzprismatisch, OL vollständig serpentinisiert, an der Oberfläche z. T. mm mächtige Mn-Krusten	A-F, H: LF A-C: TK
-2 10 Proben		cm-dm	Stark bis extrem serpentinisierte Peridotite. OL vollständig serpentinisiert, Opx noch teilweise erhalten (dann kurzprismatisch, im mm-cm-bereich). Einige Proben zeigen starke Frakturierung mit Serpentinbildung und eine netzartige Serpentinisierung in der GM. Eine Probe zeigt eine sehr helle Serpentin-?Sepiolitmatrix	2B, 2C, 2D ½: KL
-3			Sediment, braun-gelb bis rotbraunes Sediment mit grünlichen Partien (Atakamit). In den oberen (hellen) Lagen sind Globigerinen häufig.	3A, 3B, 3C, 3D: KL 3E: SP
-4			Pelagisches Sediment (Oberfläche)	KL
-5			Pelagisches Sediment. Fe-Oxide unter der Oberfläche	KL

Station No. 77 GTV Date (UTC): 06.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sample ultramafics west of Irina 2

Station Begin

Time (UTC): 13:04 Lat.(Ship): 14°45.19 Long.(Ship): 44°58.83

Depth (HS): 3016 m

Bottom Contact

Time (UTC): 14:11 Lat.(Ship): 14°45.20 Long.(Ship): 44°58.80

Depth (HS): 3015 m Cable out: 3119 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-77.xls

Off Bottom

Time (UTC): 14:29 Lat.(Ship): see bottom Long.(Ship):

Depth (HS): Cable out:

Station End

Time (UTC): 16:06 Lat.(Ship): Long.(Ship):

Depth (HS):

Summary:

TV-Grab is empty, only some mud in the hydraulic system

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 06.02.04

Stations-#: 77 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1			Pelagisches Sediment mit hellbrauner oberer Schicht, darunter liegender rötlicher Schicht mit einem ca. 3 cm breiten orange-gelben Streifen.	KL, LF, TK
-2			Pelagisches Sediment mit hellbrauner oberer Schicht und grünlicher Schicht darunter.	KL

Station No. 78 GTV Date (UTC): 06.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sample ultramafics west of LF-1

Station Begin

Time (UTC): 16:01 Lat.(Ship): 14°45.19 Long.(Ship): 44°58.88

Depth (HS): 3006 m

Bottom Contact

Time (UTC): 17:11 Lat.(Ship): 14°45.14 Long.(Ship): 44°58.84

Depth (HS): 3012 m Cable out: 3101 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-78.xls

Off Bottom

Time (UTC): 17:50 Lat.(Ship): 14°45.20 Long.(Ship): 44°58.88

Depth (HS): 3005 m Cable out: 3102 m

Station End

Time (UTC): 19:05 Lat.(Ship): 14°45.18 Long.(Ship): 44°58.78

Depth (HS): 3014 m

Summary:

Sediment with some Mn-crusts and ultramafic rocks.

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 06.02.04

Stations-#: 78 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1		dm-cm-Bereich	Mn-crusts (ca. 30 mm thick) consisting of 3 layers: upper: porous (velvet-like) layer (plume fallout), consisting of different sublayers, some needles; lower layer, also consisting of sublayers, shiny black, dense, characteristic jointing (from rising diffuse hydrothermal fluids) to dull black. Some Mn crusts have a Fe-oxide layer inbetween the upper and lower Mn-oxide layers at base of lower layer: Manganomelane	1: JS, TK
-2		dm-cm-Bereich	Peridotite (Dunite) mit partieller Serpentinisierung; richtungslos bis schwach ausgelängte Textur; Porphyroklasten von olivin, untergeordnet Spinell; randlich leicht von Mn-Kruste umgeben. 2 Proben 2A, 2B (groß)	2B: KL A, B: LF 2B: TK
-3		dm-cm-Bereich	Websterite, richtungslos-grobkörnig mit prismatischen Orthopyroxenen (Größe im cm-Bereich). Olivin partiell noch erhalten in Intergranularposition. Außen von mehreren cm-m ächtigen Mangankrusten umgeben. 2 Proben: 3A, 3B (groß)	3A ½: KL A, B: LF B: TK
-4		dm-cm-Bereich	Orthopyroxenite mit richtungslos-grobkörnigem Gefüge. Fast monomineralisch aus hypidiomorphen Orthopyroxenen bestehend, auch hier wieder mächtige Mn-Krusten am Rand. 2 Proben 4A (klein, etwas verwittert), 4B (groß)	4A, 4B ½: KL A, B: LF B: TK
-5		3-8 cm	Extrem stark alterierte Peridotite mit mm- bis cm-mächtiger Mn-Kruste	5A, 5B: AK

Station No. 79 GTV Date (UTC): 06.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sampling of hydrothermal crusts east of Logatchev field 1

Station Begin

Time (UTC): 19:32 Lat.(Ship): 14°45.17 Long.(Ship): 44°58.71

Depth (HS): 2972 m

Bottom Contact

Time (UTC): 20:42 Lat.(Ship): 14°45.20 Long.(Ship): 44°58.71

Depth (HS): 3009 m Cable out:

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-79.xls

Off Bottom

Time (UTC): 20:47 Lat.(Ship): 14°45.18 Long.(Ship): 44°58.69

Depth (HS): 3005 m Cable out: 3102 m

Station End

Time (UTC): 22:12 Lat.(Ship): 14°44.97 Long.(Ship): 44°58.68

Depth (HS): 2934 m

Summary:

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 06.02.04

Stations-#: 79 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
1A-G			Fe-Mn oxyhydroxides	1A, 1C, 1F, 1G: KL 1E:SP 1D: TK

Station No. 82 GTV Date (UTC): 07.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Find location of OFOS track 22 where we found a field of crust and a temperature anomaly

Station Begin

Time (UTC): 12:15 Lat.(Ship): 14°45.35 Long.(Ship): 44°58.91

Depth (HS): 2991 m

Bottom Contact

Time (UTC): 13:36 Lat.(Ship): 14°45.34 Long.(Ship): 44°58.88

Depth (HS): 3058 m Cable out: 3139 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-82.xls

Off Bottom

Time (UTC): 13:37 Lat.(Ship): 14°45.34 Long.(Ship): 44°58.88

Depth (HS): 3058 m Cable out: 3129 m

Station End

Time (UTC): Lat.(Ship): Long.(Ship):

Depth (HS):

Summary: Fe- and Mn-oxyhydroxides and small (cm) rounded serpentinites.

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 07.02.04

Stations-#: 82 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1 #1-8		up to 16x11x2,5 cm	Mn-Fe crusts with irregular shape	1/5 JS 1/8 JS 1/4 AK
-2A #1-4		up to 15x12x6 cm	Crusts of brownish material with intercalated Mn-Fe layers and crusts.	2A3: JS 2A4: KL 2A4: SP
-2B #1-4		up to 17x17x10	Same as 2A, but with intercalated reddish material. 2B1 and 2B2 have a red crust on top.	2B2: KL 2B4: TK
-3		up to 5x5x4 cm	Fragments of serpentinites with talc	2 pieces KL
-4 A-D			Sediment redish to brown, brown-green	KL 4B2: TK

Station No. 83 GTV Date (UTC): 07.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sample mussel bed near Irina-2

Station Begin

Time (UTC): 15:47 Lat.(Ship): 14°45.19 Long.(Ship): 44°58.73

Depth (HS): 3015 m

Bottom Contact

Time (UTC): 16:54 Lat.(Ship): 14°45.18 Long.(Ship): 44°58.75

Depth (HS): 3020 m Cable out: 3082 m

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-83.xls

Off Bottom

Time (UTC): 17:16 Lat.(Ship): 14°45.21 Long.(Ship): 44°58.78

Depth (HS): 2994 m Cable out: 3123 m

Station End

Time (UTC): 19:00 Lat.(Ship): 14°43.36 Long.(Ship): 44°58.55

Depth (HS): 3242 m

Summary: Sulfide samples, some few dead mussels

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 07.02.04

Stations-#: 83 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
-1	14°45.21'N / 44°58.78'W		Fe-oxide crusts with atacamite some contain relict sulfides	1D: JS 1B, 1E: SP 1C: KL
-2	14°45.21'N / 44°58.78'W	cm-dm	Clay altered rock fragments cemented by sulfide, top is oxidised. Rock fragments may represent fine talus	2B: KL
-3	14°45.21'N / 44°58.78'W		Porous, pyrite/marcasite crusts	3B: KL 3C2, 3E3: JS 3C3, 3E4: SP 3F3: SP/ER
-4	14°45.21'N / 44°58.78'W		Massive, friable secondary Cu-sulfides, black	4B : KL 4B2: SP/ER/TK 4E3: SP 4B3, 4E2: JS
-5	14°45.21'N / 44°58.78'W		Very old sulfide chimney with sulfide core rimmed by several cm of Fe- oxides. Outer rim consists of lithified sediment with shell fragments and Mn	KL, 5A2: SP, JS
-6	14°45.21'N / 44°58.78'W		Piece of massive chalcopyrite cementing white, clay altered rock fragments.	6A2:JS, SP
-7	14°45.21'N / 44°58.78'W		Serpentinite with strong alteration, dissolution of primary minerals and late limonite on fractures.	7A: KL

-8 A-C	14°45.21'N / 44°58.78'W		Light grey to mud (altered wallrock) at base of TV-grab.	KL
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Station No. 87 GTV Date (UTC): 08.02.04

ROV OFOS GTV Dredge CTD-R MUC

Objectives:

Sampling below a scarp near LF-1

Station Begin

Time (UTC): 12:08 Lat.(Ship): 14°43.96 Long.(Ship): 44°58.28

Depth (HS): 3127 m

Bottom Contact

Time (UTC): 13:16 Lat.(Ship): 14°44.01 Long.(Ship): 44°58.25

Depth (HS): 2950 m Cable out:

Time:	Lat.:	Long.:	Comment:
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Detailliertes Protokoll siehe GTV-87.xls

Off Bottom

Time (UTC): 13:19 Lat.(Ship): 14°44.01 Long.(Ship): 44°58.28

Depth (HS): 2967 m Cable out: 3135 m

Station End

Time (UTC): 14:46 Lat.(Ship): 14°44.02 Long.(Ship): 44°58.18

Depth (HS): 2942 m

Summary: only one dm-sized ultramafite and a few pebbles in the grab !

Gesteinsprobennahme-Protokoll M60/3

Datum (UTC): 08.02.04

Stations-#: 87 GTV

Proben-Nr.	Latitude/ Longitude	Größe (cmxcmxcm)	Beschreibung	Proben genommen
1		23x18x8	Peridotit/Meta-Norit mit dichter, nicht auflösbarer Grundmasse und cm-großen Orthopyroxeneinsprenglingen . Im Zentrum der Probe liegt ein rundlich-lobater Bereich (ca. 4 cm Durchmesser) vor, bei dem es sich um einen Xenolith oder um eine deutlich weniger alterierte Partie handeln könnte.	LF, TK
2		3x4x3	Gabbronorit mit fein- bis mittelkörnigem Gefüge. Dunkle Labradorite, goldfarbene Orthopyroxene und wahrscheinlich Klinopyroxene zeigen ein hypidiomorphes Gefüge.	
3		cm-Bereich	Kleine Peridotitproben als teil des Talus, meist extrem stark serpentiniert. Kornposition reicht von Websterit bis Dunit.	