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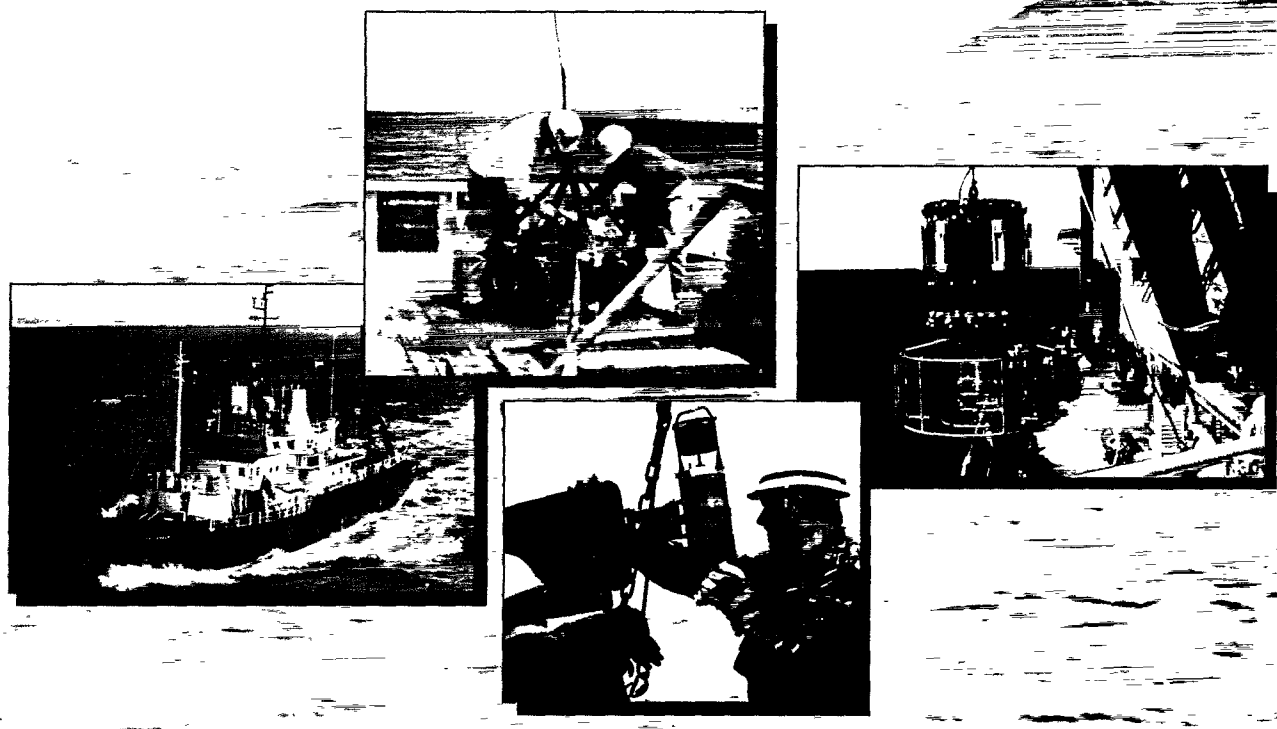
Cruise Report



Natural
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SOUTHAMPTON OCEANOGRAPHY CENTRE

CRUISE REPORT No. 20

FS *POSEIDON* CRUISE 240
19 JUN - 10 JUL 1998

The Fluxes at AMAR Experiment:
FLAME 2

Principal Scientist
C R German

1998

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ABSTRACT

The principal objective of the cruise was to recover a series of 11 long-term (12 month) current meter and sediment trap moorings deployed in Summer 1997 to monitor the neutrally-buoyant hydrothermal plume overlying the Rainbow hydrothermal field on the Mid-Atlantic Ridge, near 36°15'N. Secondary objectives were to continue CTD investigations of the physical and geochemical evolution of the plume and to attempt box-coring in sedimented areas identified from TOBI sidescan sonar records beneath the dispersing neutrally buoyant plume. Mooring recovery was completely successful for all three of the sediment trap moorings with the exception that one 2-week sample was lost from one of the 5 multi-collector sediment traps deployed. Seven of the eight current meter moorings deployed were also recovered, with 100% data-recovery from the 21 current meters recovered inboard. A total of 35 CTD-nephelometer profile stations were occupied to the North and South of the Rainbow hydrothermal field, together with one background station , east of the MAR. In situ CTD and nephel data were complemented by water sampling for He-3 and CH4 and shipboard analysis of rosette samples for salinity and TDMn. A total of 4 box-cores were attempted at depths of 2400-2600m beneath the neutrally buoyant plume. All four cores were successful yielding core lengths of 43, 30, 18 and 18cm at distances of 2, 5, 12 and 29km downstream from the known hydrothermal vent-field, respectively.

KEYWORDS

ACRONYM, AMAR, AZORES TRIPLE JUNCTION, CRUISE 240 1998, CTD OBSERVATIONS, FLAME 2, HYDROTHERMAL ACTIVITY, MID ATLANTIC RIDGE, NEPHELOMETER, PLUME DYNAMICS, *POSEIDON*, RAINBOW HYDROTHERMAL FIELD, SEDIMENT

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GRUND, H.	2nd Engineer
KONRATH, R.	Electrician
ROSEMEYER, R.	Fitter
ZEITZ, H.	Motorman
TEICHERT, K.	Motorman
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CWIENK, A.	2nd Cook
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ITINERARY

Departed:	SOC, UK	19 June 1998
Port-call:	Ponta Delgada, Azores	24 June 1998
Port-call:	Ponta Delgada, Azores	04 July 1998
Arrived:	SOC, UK	10 July 1998

OBJECTIVES

The objectives of the cruise were three-fold:

(1) To recover a series of eleven long-term (≤12 month) current meter and sediment trap moorings which had been deployed around the Rainbow hydrothermal vent-site near 36°N on the Mid-Atlantic Ridge.

(2) To continue studies of the dipsersal of the Rainbow hydrothermal plume using CTD-nephelometry coupled with shipboard and shorebased analyses of TDMn, ^{3}He, CH_4 and salinity.

(3) To raise sediment cores from different locations along and beneath the predicted path of the neutrally-buoyant hydrothermal plume using box-core stations targetted using co-registered swath bathymetry and TOBI sidescan sonar.

NARRATIVE

The majority of the scientific party embarked upon the RV *Poseidon* at SOC on Thursday 18 June and the ship sailed from harbour at SOC at 0700z on Friday 19 June. Passage was made to Ponta Delgada, Azores, arriving at 1500z on Wednesday 24 June to effect boat transfer of the remaining 4 scientific personnel. Boat transfer was completed by 16.30 and passage commenced toward the study work area in the vicinity of the Rainbow hydrothermal field at 36°14'N 33°54'W on the Mid-Atlantic Ridge.

The ship arrived on station at the first mooring recovery site in the AMAR segment (36°26'N, 33°59'W) at 0710z on Friday 26 June 1998 where a CTD profile (CTD01) was completed (0906z) followed by release of the first mooring (Mooring F) at 0934z. The mooring was succesfully recovered inboard at 10:52z after which the ship made passage to the next mooring (Mooring G) at 36°14'N 33°54'W. Mooring G was released at 12:48z and recovered inboard at 13:37z. Adjacent mooring "IFREMER 2" was released at 13:42z and recovered in-board at 15:33z. During the ascent of this mooring, adjacent "IFREMER Mooring 3" was released (14:50z) and that mooring was recovered in-board at 16:35z. Again, during ascent of "IFREMER Mooring 3", the release of "IFREMER Mooring 1" was effected at 15:59z and this mooring was recovered in-board at 17:16z. Following the successful recovery of these first four moorings a night-programme was commenced of CTD profile stations which allowed re-occupation of current meter mooring locations at 36°14'N 33°54'W (CTD02, 17:59-19:54z), 36°12'N 33°49'W (CTD03, 20:54-22:56z), 36°14'N 33°50'W (CTD 04, 23:43-01:42z, Saturday 27 June) and at 36°17'N 33°52'W (CTD 05, 02:27-04:31z).

Mooring "B" was released from 36°16'N 33°53'W at 08:09z and recovered inboard at 09:15z. Following this the first box-coring station was attempted. Deployment of the

grosserkastengreiffer box-corer was first commenced (BXC01) at 10:23z but the deployment was aborted at 10:40z due to excessive ship's drift and the corer recovered in-board at 10:59z. After repositioning the ship accordingly, deployment BXC02 was commenced at 11:15z with successful bottom contact (BOKO 1) achieved in 2322m of water depth at 36°15.6'N 33°52.9'W at 12:29z. A succesful recovery of this sediment core was completed, inboard, at 13:42z. Following this first box-core, Mooring "D" was released from 36°17'N 33°54'W at 14:40z and recovered in-board at 15:43z followed by Mooring "E" which was released from 36°18'N 33° 51'W at 16:35z and recovered inboard at 17:12z. A second evening of CTD stations was then commenced, albeit with continuing CTD system problems, at stations CTD 06 (18:07-19:50z), 07 (20:50-22:49z) and 08 (04:22-06:15z, Sunday 28 June) all of which were occupied in the "Eastern Basin" to the NE of the Rainbow hydrothermal field and east of "Rainbow Sill".

At 08:16z Mooring "H" was released from 36°12'N 33°48'W and successfuly recovered inboard at 09:17z followed by Mooring "C" which was released from 36°13'N 33°51'W at 09:45z and recovered inboard at 10:37z. First attempts to range on and communicate with Mooring "A" at 36°17'N 33°54'W were made at 11:09z. Repositioning and attempted ranging continued, without success, until 12:52z when the release command was sent from directly above the "drop" position for this mooring. Continuing release commands were transmitted until 14:10z, without success, and the station was discontinued at 14:25z. Following this single unsuccesful recovery, boxcorer deployment BXC03 was commenced at 15:06z. This deployment resulted in a second succesful bottom contact (BOKO 2) at 36°12.8'N 33° 50.6'W, in 2363m of water, at 16:39z - the corer being recovered inboard at 17:32z. Following the CTD difficulties of the following evening a long transect was now completed to the northern end of the AMAR segment to effect necessary installation of the spare CTD unit followed by the succesful occupation of three CTD stations: CTD09 (36°40'N 33°39'W; 21:30-23:30z), CTD 10 (36°36'N 33°31'W; 01:07-02:19z, Monday 29 June) and CTD 11 (36°34'N 33°36'W; 03:16-05:24z).

Following these northern AMAR stations, the ship sailed south to commence box-core deployment BXC04 at 08:06z. Bottom contact (BOKO 3) was succesfully achieved in 2519m water depth at 36°17.6'N 33°42.2'W at 08:53z with the corer recovered in-board at 09:41z. Following this third successful box-core, a series of CTDs was commenced running south from the Rainbow hydrothermal field through the South AMAR segment: CTD 12 (36°12'N 33° 57'W; 11:28-13:51z), CTD 13 (36°09'N 34°03'W; 14:43-16:29z), CTD 14 (36°06'N 34°03'W; 17:02-18:50z), CTD 15 (35°59'N 34°07'W; 19:50-21:09z), CTD 16 (35°58'N 34°10'W; 21:40-23:21z), CTD 17 (35°54'N 34°13'W; 00:15-01:02z, Tuesday 30 June), CTDs 18 & 19 (35°51'N 34°10'W; 02:58-03:25z & 04:42z-06:35z), CTD 20 (35°47'N 34°15'W; 07:23-09:14z) and CTD 21 (35°43'N 34°13'W; 09:58-11:46z).

At the end of this southward section of CTD profiles a tow-yo (CTDs 22-26) was conducted across the southern sill into the South AMAR segment from the E.Atlantic between 35°33'N 34°13'W and 35°36'N 34°15'W (13:48-18:10z). Following this survey, two further stations were occupied, the first to the south of the sill (CTD 27 at 35°32'N 34°12'W; 19:01-21:45z) and the other at the easternmost extent of the Oceanographer Fracture Zone as it intersects the SW extent of the South AMAR segment (CTD 28 at 35°40'N 34°21'W; 21:45z-00:24z, Wednesday 1 July). Following these stations, passage was made back toward the Rainbow hydrothermal field followed by reoccupation of a strong plume-signal station to the west of Rainbow, CTD 29, at 36°13'N 33°57'W (05:11-06:50z). Following this profile a final boxcore station was commenced (BXC05) at 07:58z. A fourth succesful bottom contact (BOKO 4) was achieved at 36°14.8'N 33°54.3'W in 2450m water depth at 08:48z and the corer was recovered inboard for the last time at 09:38z.

Following the box-core, a CTD station (CTD 30) was occupied close to the western rift-valley wall at 36°20'N 33°50'W immediately to the north and east of Rainbow sill (10:21-12:21z). Passage was then made back to the centre of the AMAR segment where a series of four CTD profiles were occupied, completing a section that also included CTD 01, close to Mooring "F": CTD 31 (36°26'N 33°42'W; 13:22-15:10z), CTD 32 (36°26'N 33°41'W; 15:41-17:40z), CTD 33 (36°26'N 33°40'W; 18:08-20:06z) and CTD 34 (36°25'N 33°37'W; 20:38-22:16z). Upon completion of this survey one final CTD station was occupied, CTD 35, close to - but to the west of - the Rainbow hydrothermal field (36°13'N 33°56'W; 00:22-03:09z Thursday 2 July). The ship then sailed east to re-occupy an off-ridge background station from the original FLAME cruise, CTD 36 (36°00'N, 33°00'W; 08:00-09:52z). This was the final scientific operation of the cruise, after which the RV *Poseidon* set sail back to Ponta Delgada.

The ship arrived at Ponta Delgada at 09:00z on Saturday 4 July to effect the disembarkation of 4 of the scientific party. Upon completion of this boat transfer, passage was recommenced to SOC where the ship docked for the end of a highly successful and rewarding voyage at 08:00z on Thursday 9 July.

(C.German)

SCIENTIFIC REPORTS

1. Current Meter Mooring Recovery.

During the FLAME 1 cruise, 8 current meter moorings were deployed (labelled A-H). The position of each mooring is given in Table 1. Each mooring had Aanderaa current meters at a nominal 2300, 2100 and 1800m water depth, being below, at and above the expected plume height, respectively. Each current meter had temperature and pressure sensors. A SeaTech LSS light-scattering sensor was fitted to the 2100m current meter on each mooring and mooring A had a fourth current meter at 1000m water depth to monitor the flow above the median valley. Each mooring was fitted with an Oceano acoustic release transponder positioned 100m above the bottom.

The moorings were recovered over a period of 3 days. For moorings B-H good acoustic communication was made with the transponder, the release effected and the buoyancy sighted soon after reaching the surface. Recovery was made using a midship winch and the whole operation was completed in an effective and efficient manner. Each current meter came back in good order. A preliminary examination showed that, in each case, the data record is seesntially complete for the period of deployment.

No acoustic communication was made with mooring A. After several attempts, from various ranges and from a quiet ship, the recovery was abandoned. There were no capabilities on the ship to attempt dragging for the mooring but there is a possibility that such an attempt may be made from the R/V Atalante in the near future.

(P.Taylor, K. Richards)

Mooring	Latitude	Longitude	Water Depth
A	36 ° 17.20' N	33 ° 53.96' W	2440
B	36 ° 16.27' N	33 ° 52.98' W	2450
C	36 ° 13.60' N	33 ° 50.68' W	2400
D	36 ° 16.57' N	33 ° 54.14' W	2520
E	36 ° 17.30' N	33 ° 51.09' W	2890
F	36 ° 25.41' N	33 °°38.68' W	2650
G	36 ° 14.66' N	33 ° 54.02' W	2410
H	36 ° 11.83' N	33 ° 47.98' W	2450

Table 1. Mooring positions and water depth

2. Sediment trap mooring recovery.

Three moorings were deployed during the Marvel cruise in August 1997. The aim of the Flame 2 cruise was to recover these moorings: IFREMER Moorings 1-3.

Mooring 1 was deployed away from the hydrothermal vents to collect a pelagic reference sample of the "background" biogenic particle flux. The sediment trap was 200 meters above the bottom and 10 meters above the trap there was a current meter.

The position was : 36° 13.356' N, 33° 52.810' W.

FOR ALL THE TRAPS, THE PARTICLE SAMPLING PERIOD WAS 14 DAYS FOR EACH SAMPLE AND THE BEGINNING OF THE EXPERIMENT WAS THE 27 AUGUST 97.

ALL 3 MOORINGS WERE RECOVERED ON THE AFTERNOON OF 26 JUNE 98.

Mooring 2 was similar to mooring 3. The trap near the bottom was 150 meters a.b., and 10 meters above this there was a currentmeter. 40 meters above that current meter there was a thermistor chain of 100 meters length, then 10 meters of wire and then the upper sediment trap with another current meter a further 10 meters above that.

Mooring number 2 was deployed about 500 meters North of the hydrothermal site; its position was 36° 14.184' N, 33° 53.658' W.

The mooring number 3 was about one kilometer in the North of the hydrothermal site, his position was 36° 14.013' N, 33° 54.031' W.

22 samples were collected from each trap, but the 22nd sample represents collection over only 9 days because the programmed end of that collecting period was the 1st July 1998. All current meters and thermistor chains appeared to have worked well. Those results will be exploited by Annick Vangriesheim (IFREMER DRO/EP).

Analytical methods: The composition of each sample is examined under a dissecting microscope in order to search for the presence of hydrothermal vent organism larvae. Particles are examined using a Philips XL30 Scanning Electron Microscope. Samples

from traps are then rinsed with Milli-Q purified freshwater (pH ~7), freeze-dried and weighed. Total carbon and nitrogen contents are measured with a Carlo-Erba NA 1500 auto-analyser. Organic carbon content is measured with a Leco WR12 elemental analyser after removing carbonates with a 2N HCl solution. Total sulfur is determined with a Leco CS-125 auto-analyser. Major elements are undertaken by EDAX I DX-4i X-ray spectrometry.

P. Crassous, A.Khripounoff (IFREMER-DRO/EP)

3. CTD Operations

The CTD system for this cruise consisted of an EG&G 1401 deck unit and a Neil Brown Mk IIIb CTD underwater unit fitted with auxilliary channels for up to 8 additional instruments. Of these 8 channels, 4 were used - these were for:

1. Fluorometer
2. Transmissometer
3. Altimeter
4. SeaTech light-scattering sensor (LSS)

Another channel was used to monitor the input voltage to the CTD itself. The data was logged on a PC using EG&G software.

Water sampling was done using a General Oceanics 1015 rosette tone-fire system with 12 2.5l Niskin water bottles. Two electronic reversing thermometers were fitted to bottle number one.

In total 36 CTD casts were made. At the end of the downcast on cast 06 the conductivity, temperature and pressure values started to show errors and continued to do so for much of the up-cast. Believing the problem to have been due to an excessive load on the power supply, the fluorometer was removed for the next cast. This did not solve the problem so the CTD was swapped for the spare unit (s/n DEEP02) on cast 08. The C, T and D data were now back to normal but there was a problem with the transmissometer data. Typically the signal voltage would be too high and noisy until approx. 2000m depth and then start to show the expected behaviour for the rest of the cast.

On cast 17 the LSS signal became temporarily very noisy and got noiser on cast 18 where the CTD was stopped at 580m and brought to the surface. The transmissometer was removed and the LSS moved to a different auxilliary channel of the CTD (from AD4 to AD1). This rectified the fault. The casts were then completed, including a yo-yo sequence from cast 24 to 27, without further problems.

Throughout the cruise the rosette system functioned well, with only 2 mis-fires from over 400 bottles fired.

P.Howarth, P.Taylor (SOC-RVS)

4. Coring operations

The purpose of the coring carried out during cruise RV *Poseidon* 240 to the Rainbow area of the MAR in June/July 1998 was to acquire a series of boxcores from sedimented areas around the Rainbow site for geochemical studies of sedimentation beneath the neutrally buoyant plume.

Due to the lack of direct input from continental shelves, sediments which accumulate in the middle of ocean basins tend to be made up almost entirely of biological remains, although sometimes having a loess component, e.g. Saharan dust. Accordingly, hydrothermal plume particulates, being derived from a reasonably long-term (tens to thousands of years) source, may account for a significant fraction of the sediment over quite large areas around sites of active seafloor venting.

The boxcoring sites were planned so that sediment would be recovered from beneath the path of the spreading, non-buoyant hydrothermal plume at varying distances from the Rainbow hydrothermal vent site. An approximate trajectory of the plume had been previously determined from a combination of water column transmissometer and nephelometer anomalies measured during both CTD casts and BRIDGET tows, together with lowered ADCP data for the area (German et al, 1998). The plume appears to achieve neutral buoyancy at between 2000 and 2200m water depth, and follows the ~2300m contour around the northern end of the Rainbow Ridge, then south and east still following this contour into the bottom of the S. Amar segment. A number of SAP stations had acquired plume particulate material on the FLAME 1 cruise and, accordingly, some of the coring sites were chosen as close to the SAP station coordinates as sedimentary cover permitted, so that comparative studies could be carried out between plume particulate material in the water column, and sediment accumulating below the plume.

Boxcoring

In order to retrieve sediment cores from beneath the neutrally buoyant plume where possible, boxcoring stations were selected using a combination of processed TOBI sidescan sonar imagery, co-registered with Simrad bathymetry, to identify areas of sediment, and CTD and BRIDGET nephelometer (optical backscatter) data from previous cruises indicating the path of the plume. CTD stations carried out at the beginning of the cruise confirmed the continuing presence of the plume in this area. For each boxcore, the bridge was given a 'footprint' of 500m to 1000m square, within which TOBI data indicated sufficient sediment cover for coring to be feasible. Boxcoring was carried out using a 50cm x 50cm x 60cm (height) boxcorer provided courtesy of Prof. Peter Stoffers, Kiel University, Germany.

Station No. 315 - BXC-01 27/6/98

This station was aborted due to the ship having drifted too close to the edge of the designated coring area, where the risk of damaging the box corer on an unsedimented part of the seabed was too great to proceed.

Station No. 316 - BXC-02 27/6/98

The ship approached station from a mile to the south, the previous attempt having shown that net drift would be northward. Ship reached start of station at 11:17 hours and boxcorer was deployed, descending at approx. 20m/min. Due to use of 15mm

cable on 16mm drum, cable had to be stopped at intervals for realignment before lowering could continue. Ship drifted northward towards the coring area as predicted. Wire out was stopped at 2000m as ship had not yet reached the coring site and water depth was just over 2100m. Once ship had crossed the 2200m contour, wire out recommenced to 2100m and stopped again. Wire out was recommenced at 12:18 hours and corer touched bottom at 12:29 hours, at 36°15.558'N, 33°52.893'W, in 2322m of water. Wire in recommenced once corer had closed and corer was on board again at 13:41 hours, with stops for winch cable alignment. The bungy cords holding the top doors of the boxcorer closed had slipped, and the doors were open at recovery. However, the core top was undisturbed, as surface fauna, and faunal tracks on the sediment, were clearly visible. 30cm of sediment was recovered, although the boxcore was sloped at an angle with 25cm on one side and 35cm on the other.

Three subcores were taken across the diagonal of the boxcore, capped and refrigerated at 4°C for chemical and sedimentary work at SOC. A further 10cm subcore ('D') was taken, and subsamples of the top and bottom extracted and preserved for biological work at UCG. These were: 1ml sediment in 10ml 2% formalin, refrigerated at 4°C, 1ml sediment in 1ml 50% ethanol, refrigerated at 4°C, and 5ml sediment in whirlpak bag, preserved at -20°C. The samples were taken using a 5ml cut-tip syringe.

Porewater samples were taken at 3cm, 7cm, 10cm and 14cm. The 7cm sample only extracted 4.5mL of porewaters, but the others managed 8-10mL. Sampling took 10-15 minutes. Samples were taken using Rhizon soil-moisture sampling kits (SMS) with a 10cm long proboscis inserted into the sediment. A vacuum was created by opening the syringe attached to it, and keeping it open by means of a wooden spacer. The proboscis comprises a hydrophilic porous polymer tube connected to a PVC tube. The latter is strengthened by a stainless steel wire, enabling it to be inserted into the sediment without buckling. The PVC tube is attached by means of a Luer-Lock connector to a 10ml syringe. The kit operates in a pH range of 3-12, has a low dead volume, and no ion-exchange properties.

3 mini subcores were taken by V. Magalhaes for sedimentary study at the Departamento de Geologia Marinha, Instituto Geologico e Mineiro, Portugal. These were also refrigerated.

Before the remainder of the boxcore sediment was disposed of, a number of small pots were filled, sealed and refrigerated. These are to be presented to the crew, as the first boxcore sediment taken from the median valley of the Mid-Atlantic Ridge in this area.

Core description:

Surface:
Faunal tracks and burrows clearly in evidence. many small shell fragments. Also many mm size black grains, probably rock fragments. Sediment yellowish brown in colour.

Core:
Top 2cm of core fairly coarse material, many foraminifera, shell fragments and rock fragments - sandy mud texture.
2- 10cm finer muddy material, occasional large foraminifera (mm size), one small mollusc shell.
10-12cm sandier layer, made more visible by many uniformly sized rock fragments, unlike the layer above, where rock fragments came in random sizes. This indicates that this layer may relate to an increase in bottom current strength rather than a slope failure deposit. More consolidated than layers above.
12-25cm finer muddy material
25-30cm - Very coarse sandy layer. Some large rock chips. Grey-brown in colour

While extracting the subcores from the boxcore, 2 basalt pieces were recovered, 1 rounded, ~1cm in diameter, and 1 dumb-bell shaped, about 3 cm long. Both had knobbly surfaces, reminiscent of 2nd world war mines that get washed up on beaches. These may be ejecta from local eruptions, as all the other pieces recovered are angular, indicating that they have been broken off the parent rock by weathering.

Station No. 325 - BXC-03 (28/6/98)

The ship approached station from approx. 1 mile to the south, after having done a drift test. As before, net drift was almost due north. Ship reached start of station at 15:06 hours and boxcorer was deployed, descending at approx. 40m/min. Wire out was stopped at 2000m as ship had not yet reached the coring site. Wire out recommenced at 16:22 hours and stopped at 2200m. Wire out was restarted at 16:34 hours and corer touched bottom at 16:39 hours, at 36°12.811N, 33°50.602W, in 2363m of water. Wire in recommenced once corer had closed, and corer was on board again at 17:32 hours. The top doors were correctly closed on this occasion. 18cm of core was recovered, again with an undisturbed surface. Subcores were taken as for BXC-02. Porewater samples were taken at 5.5cm, 10.5cm and 14.5cm.

Core Description

Surface: The core surface appeared undisturbed except for slight slumping against one wall of the corer. One 3cm polyp of living cold water coral was present on the surface, with its holdfast buried in the sediment but not apparently attached to anything. Species identified as *Caryophyliia sp*. Surface contained many living and dead pteropods, and some dendritic flora (fauna?). One 2cm rock fragment was also lying on the surface, but no other pieces were visible, in contrast to BXC-02 from the northern end of Rainbow Ridge, whose surface was sprinkled with rock fragments. The sediment colour was yellowish brown, muddy with a scattering of sand.

Core: Very homogenous yellow brown mud all the way down core, soft for the first 10cm, then well compacted below that to the bottom. Very few faunal remains in the sediment. However, the upper part of the compacted sediments contained large numbers of greenish spots and streaks, probably anoxic burrow infill, and the lower part contained white spots and streaks, apparently calcified burrows. One of these contained a partly intact white 'worm', resembling a serpulid. No rock fragments were found within the sediments, or at the base. Very few visible fauna.

Station No. 329 - BXC-04 29/6/98

Ship approached coring site from south, drifting northward as before. Core was deployed at 08:06 hours and reached 2000m at 08:40. Wire out continued to 2400m once we had crossed the 2500 depth contour, and winch stopped at 08:47. Winch started again at 08:49 and bottom contact was made at 08:53 hours. Successful pullout was achieved and corer was winched up and inboard at 09:41 hours. Shovel had not swung all the way across (although bottom of box was fully covered) due to a small stone. Attempts to remove the corer from its frame resulted in water pouring out the bottom so this was stopped and the water siphoned off to preserve the core top. Some slumping occurred against the removable side, however, by the time the shovel was moved properly into place. 18cm was recovered. Subcores were taken across the centre rather than diagonally, except 'D' which was taken from the front corner. Otherwise as for boxcore-02. Porewater samples were taken from 5cm and 10cm depth, but on slumped side, so depths are a bit arbitrary.

Core description

Surface: Numerous whole and half pteropods, some spines, 2 half bivalve shells (about 3mm across) present on surface. Also one large very curved piece of blue shell - about 2cm.- which may be from some large planktonic mollus (*Janthia sp?).* Some small basalt or other rock fragments. Yellowish brown very fine sediment - no sand.

Core: Very uniform, sticky yellowish brown mud all the way to the bottom. Greenish burrows in one corner of the bottom half of the core, and one live burrow-maker at 12cm - bright green when in the sediment - an Echiuran. The green colour may result from either reduced iron or copper, as echiurans accumulate both. Specimen had sac of faecal pellets. Also found a pale coloured very long thin worm - several cm long - about 8cm down. Pteropod remains scattered throughout the core, as well as pieces of basalt glass, and other rock chips - possibly ultramafic from local outcrop. No sign of anything like a downslope deposit - no apparent change in grain size anywhere in the matrix. May be slightly more rock chips around 10cm depth. Occasional large white foraminifera downcore. At bottom, some burrows just a little lighter in colour than surrounding sediment, also one or two completely white burrows.

Station 343 - BXC-05 1/7/98

Ship approached coring site from the south, PSO having asked *NADIR* to move out of the way during the test drift. Drift start point was moved a little west to enable coring closer to the centre of the box, and station began at 07:58 hours. As water depth was sufficient, wire out was made to 2400m before stopping. Once inside the box, ship was allowed to drift a few tens of metres northward, before recommencing wire out at 08:44 in 2471m of water. Bottom contact was made at 08:48, at 2540m water depth, at 36°14.804'N, 33°54.303'W. Successful pullout was achieved, and boxcorer was on deck again at 09:38 hours. 43cm of sediment was recovered, and core top was undisturbed. 6 pushcores were taken, in addition to the 10cm biology subcore, as this was the core closest to the vent site, as well as having the best recovery. Porewater samples were taken at 5cm, 10cm, 15cm, 20cm and 25cm downcore, with the 25cm sample being ca. 5cm above the bottom of the core on that side. The top part of the sediment had slumped by several cm in comparison to the height of the core tops visible in the sub cores, so the top 3 sample depths are somewhat arbitrary. The top 2 syringes filled within 10 minutes, the bottom 3 within 15 minutes. One syringe (20cm depth) failed to extract any pore water, so a second was put in at the same depth but a little further over, and filled successfully.

Core Description

Surface: yellowish-brown, smooth muddy surface, with scattering of sandy material. A few pteropods, some spicules, a few tiny rock chips, and one or two dendritic fauna were visible as well as one small broken mollusc(?) shell.

Core: Very cohesive yellowish-brown mud forming the upper half of the ca. 43cm core. On the LHS of the box, the bottom few cm were chalk-white sediments, with all yellowish-brown mud above, while to the right, the lower half (20cm) of the sediments appeared to be heavily bioturbated light brown sediment, possibly as a result of mixing up of chalk from below. The white chalky sediment contained large amounts of rotted serpentinite, and was overlain by mud containing numerous very large (up to 6cm diameter) serpentinite pieces. Large pieces were also present at the same depth (c. 34cm) across the core in the light brown muds. The upper sediment in this core was much more cohesive than in previous cores, although some slumping took place when the side of the corer was removed.

(R.R.Cave)

5.Water Column Sampling

5.a) Helium isotopes.

Helium (^3He) is a key dissolved tracer used extensively in hydrothermal plume studies. It is enriched in hydrothermal fluids and inert, so that it can be utilized as a passive tracer of dilution and dispersion. For practical reasons, helium analyses cannot be performed on board. Instead, they will be performed on shore by mass spectrometry at the Commissariat à l'Energie Atomique (CEA Saclay, Orme des Merisiers, Gif-sur-Yvette) under the responsibility of P. Jean-Baptiste.

Sea water destined for ^3He analyses is sampled in copper tubes fixed to aluminum rails and sealed with metal clamps. In total, 240 samples have been taken from the CTD (Conductivity-Temperature-Depth)-rosette for Helium analyses. Samples were taken at the Rainbow, AMAR and South AMAR sites.

(A.Dapoigny)

5.b) Methane.

For CH_4 measurements, 193 deep seawater samples were collected from the 2.5L Niskin bottles of the CTD rosette. Samples were rapidly drawn by gravity into 125 mL glass bulbs fitted with teflon stopcocks at either end. The bulbs were filled from below and allowed to overflow vertically to about one third of their volume in order to avoid trapping air bubbles. Collected samples were then stored for CH_4 analysis by Dr.J-L.Charlou at the laboratory in IFREMER.

(J.Knöery)

5.c) Manganese.

During the cruise a total of 260 manganese samples were collected in 125 and 250mL HDPE bottles. Unacidified samples were analyzed shipboard (see below) and later acidified with 1mL concentrated HCl/L of sample. Typically, only water samples collected deeper than 1000m were stored and analyzed, although 7 complete depth profiles were acquired. Selected sample bottles had to be "recycled" after analysis to be able to collect new samples.

The collected manganese samples were analyzed shipboard using the direct injection method described in Resing and Mottl (1992). This method was optimized to reach a detection limit of 0.1nM and a precision of 0.2nM or 5%, whichever is greater. The analytical apparatus consists of a peristaltic pump, a column heater, an injection valve, a spectrophometric detector, and a chart recorder. An all-Teflon manifold allows the mixing of reagents and sample before reaching the detector. Due to the low reagent consumption (6mL/sample), only two batches of reagents were used during the cruise. The daily calibrations showed sensitivity to be uniform : 0.00194+/-0.00003 (n=5) AU/nM. Repeated analyses of the same samples yielded identical results, suggesting that the method employed is reliable. Preliminary results indicate a good correlation between LSS response and the measured concentrations of manganese. Results of the shipboard (unacidified samples) analyses will be confirmed by additional post-acidification analyses back at the shore laboratory.

(J.Knöery)

5.d) Salinity.

To calibrate the two Neil-Brown Mk.IIIb CTDs a total of 247 200mL seawater samples were collected from all CTD stations. About a quarter of the samples were taken in the depth range of observed LSS anomalies (near 2000m). The remainder were spread out over the entire salinity range between the surface and the sea bed.

All samples were analysed using a Guildline AUTOSAL (Model 8400A) salinometer in a lab where the temperature was maintained at 22°C+/-1.5°C (+/-0.5°C during individual measuring runs). The bath temperature was set to 24°C and the salinometer re-standardised at least once for every crate of 24 samples. The maximum allowed standard deviation for 3 consecutive salinity measurements was set to 0.0005psu but standard deviations of most measurements lay between 0.00005psu and 0.00025psu.

Due to problems with bottle leakage, non-constant lab temperature, broken sample bottles, and erroneous bottle files 55 samples were discarded leaving a total of 34 samples to calibrate the first instrument (WOCE) and 158 for the second one (SPARE).

(A.Thürnherr)

5.e) Temperature

To calibrate the CTD instruments, the first sampling bottle of the CTD rosette was fitted with two digital reversing thermometers which had been pre-cruise calibrated to an accuracy of +/-0.002°C. Near-bottom temperatures were logged for 23 of the 35 CTD stations. For calibration the mean of the two thermometer readings was used.

(A.Thürnherr)

6. Shipboard CTD Data Processing

6.a) Temperature Calibration

The temperature sensors of both CTDs were calibrated using the offsets calculated from the reversing thermometers. The 10 logged values for the WOCE instrument indicate an offset of -0.0018°C with an associated RMS of error of 0.0012°C. The 36 logged values for the SPARE instrument indicate an offset of -0.0038°C with an RMS of error of 0.0015°C. Corrected temperatures were used for calculating salinities, potential temperatures, and potential densities.

6.b) Salinity Calibration

Corrections were applied directly to the calculated salinity values (as opposed to correcting conductivity). Due to the limited number of casts done with the WOCE instrument no attempt to correct for sensor drift was made (AUTOSAL measurements were only available for casts 03-05). A linear regression was calculated between (temperature corrected) bottle file salinities and AUTOSAL measurements leading to a calibration with an RMS of error of 0.0018psu.

The SPARE CTD showed a (temperature corrected) salinity shift of approximately -0.0023psu per day throughout the sampling period. After de-trending the data, the linear regression calculated from the (temperature corrected) bottle file salinities and AUTOSAL measurements led to a calibration with an RMS error of approximately 0.0033psu. The fact that this is almost twice the value of the WOCE instrument is due to the non-linear sensor shift with time.

6.c) Data Processing

Time lags for the individual sensors were applied during data acquisition using the values supplied by the manufacturer. The T/S diagrams for up- and down-casts show no indications of hysteresis.

In a first processing step the raw files (.asc) were converted into full size processed files (.ctd) by the following sequence of operations:

- scans with anomalous conductivity/temperature/pressure sensor behaviour (e.g. before deployment, after turnaround, after recovery, during sensor problems) were removed manually;
- altimeter values greater than 200m were set to `NaN';
- conductivity, temperature, (uncorrected) pressure, LSS, and altimeter values were copied to the processed file;
- depth, salinity, potential temperature referenced to 200bar, and potential density referenced to 200bar were calculated using a re-implementation of the respective "Pstar" routines;
- the buoyancy frequency was calculated using 30m centred intervals.

In a second step, 2db pressure binned files (.2db) were generated. As the temperature gradients in the main region of interest (below 1500m) are small no attempt was made to remove salinity spikes.

As an experimental step a median filter spanning 15 2-dbar bins was used to de-spike the LSS profiles for some of the data files (.filt). A first analysis indicates that the filter performs well, except for the narrow spikes sometimes seen in near-source profiles.

(A.Thürnherr)

SUMMARY

The FLAME 2 Cruise was an enjoyable success with all objectives met satisfactorily. Ten of the eleven current meter moorings deployed in 1997 were successfully recovered including all three sediment trap moorings. For the sediment trap moorings, only one 2-week sample was lost from one of the 5 multi-collector sediment traps deployed. For the current meter moorings, 100% data-recovery from 21 current meters was achieved. This success rate ensures that the participating scientists will be provided with data sufficient to address all the scientific questions around which the mooring programme was designed.

The night-time water-column programme was also very successful. A total of 35 CTD-nephelometer profile stations were occupied to the North and South of the Rainbow hydrothermal field, together with one background station, east of the MAR. *In situ* CTD & nephel data were complemented by water sampling for ^3He and CH_4 and shipboard analysis of rosette samples for salinity and TDMn.

A particular success of the cruise was the box-coring programme. Combining our previous experience in plume-dipsersion studies with careful analysis and interpretation of the TOBI sidescan sonar data we were able to successfully collect four box-cores of sediment from the rift-valley floor near the Rainbow vent-site at distances ranging from 2km to 30km downstream beneath the neutrally-buoyant plume. These samples will provide us with new insights into the time-integrated discharge from the Rainbow hydrothermal field over 100-1000 year timescales.

ACKNOWLEDGEMENTS

It is my great pleasure as PSO to offer my warmest thanks to Capt. Matthias Gross and the officers and crew of FS *Poseidon*/Reise 240 for their excellent, professional and cheerful support throughout the cruise. Capt. Gross's experience and helpful advice, both for mooring recoveries and "Boko!" were particularly appreciated. Living and working conditions were excellent upon such an immaculately maintained ship and credit for this goes not just to Capt. Gross but to the efforts and high standards of the entire ship's company. I will look forward to sailing with all aboard in the future. Finally, I thank my colleagues in the scientific party for a stimulating and interesting cruise - even if I never did get the chance to *really* win at Monopoly.

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(C.German)

REFERENCES

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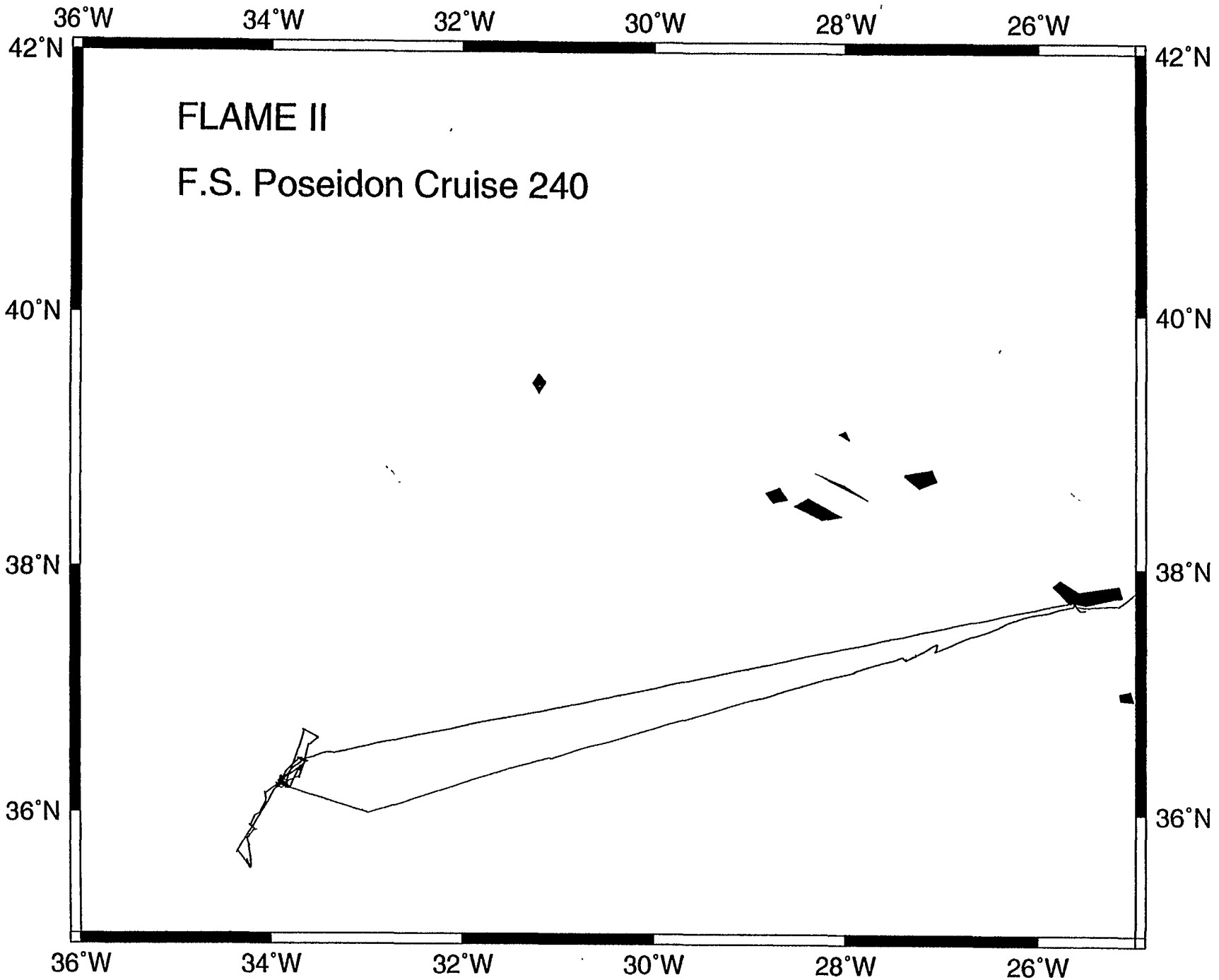
FIGURE CAPTION

Figure 1: Cruise track for FS *Poseidon* Cruise 240 (FLAME II), Azores-Azores, 24 June - 4 July 1998. Not shown are transit legs: SOC-Azores, 19-24 June 1998, and Azores-SOC, 4-10 July 1998.


36°W
34°W
32°W
30°W
28°W
26°W
42°N
40°N
38°N
36°N
FLAME II
F.S. Poseidon Cruise 240

	A	B	C	D	E	F	G	H	I	J	K	L
1	Time (z)	Date	Ship	Lat.	Ship	Long	Water	Station	Opern.	Wire	Instr.	Comments
2			Deg.	Min.	Deg.	Min.	Depth			Out	Depth	
3												
4	07:13	26/6/98	36	26.206	33	38.593	2565	304	**CTD01**			CTD in water. 1.8km Nth of Mng "F"
5	08:10	26/6/98	36	26.208	33	38.919	2644	304	**CTD01**	2600	2604	CTD @ 40m off bottom
6	09:06	26/6/98	36	25.949	33	39.416		304	**CTD01**			CTD on deck
7												
8	09:20	26/6/98	36	25.364	33	39.486	2556	305	**MNG01**			On station for recovery of mooring "F"
9	09:34	26/6/98						305	**MNG01**			Mooring released
10	10:05	26/6/98						305	**MNG01**			Mooring sighted on surface
11	10:25	26/6/98						305	**MNG01**			Buoyancy grappled, recovery started
12	10:28	26/6/98						305	**MNG01**			Buoyancy inboard
13	10:30	26/6/98						305	**MNG01**			1st CM inboard: 6275
14	10:39	26/6/98						305	**MNG01**			2nd CM inboard: 11050 (LSS 342)
15	10:46	26/6/98						305	**MNG01**			3rd CM inboard: 11571
16	10:52	26/6/98						305	**MNG01**			Release inboard, recovery completed
17												
18	12:35	26/6/98	36	14.136	33	54.363	2493	306	**MNG02**			On station for recovery of mooring "G"
19	12:48	26/6/98						306	**MNG02**			Mooring released
20	13:06	26/6/98	36	13.946	33	54.662		306	**MNG02**			Mooring sighted on surface
21	13:20	26/6/98	36	14.776	33	54.175		306	**MNG02**			Buoyancy grappled, recovery started
22	13:21	26/6/98	36	14.776	33	54.175		306	**MNG02**			Buoyancy inboard
23	13:23	26/6/98						306	**MNG02**			1st CM inboard: 11673
24	13:31	26/6/98						306	**MNG02**			2nd CM inboard: 9069
25	13:36	26/6/98						306	**MNG02**			3rd CM inboard: 11572
26		26/6/98						306	**MNG02**			Release inboard, recovery completed
27												
28												
29	13:37	26/6/98	36	14.836	33	54.334	2475	307	**MNG03**			On station for IFREMER mooring "2"
30	13:42	26/6/98	36	14.852	33	54.353		307	**MNG03**			Mooring released
31	14:30	26/6/98	36	14.986	33	54.386		307	**MNG03**			Mooring sighted on surface

	A	B	C	D	E	F	G	H	I	J	K	L
32	14:47	26/6/98	36	14.162	33	53.625		307	MNG03			Buoyancy grappled, recovery started
33	14:50	26/6/98	36	14.161	33	53.664	2151	307	MNG03			Buoyancy inboard
34	14:54	26/6/98						307	MNG03			1st CM inboard: 12200
35	14:56	26/6/98						307	MNG03			1st Sed. Trap 041 (Crunched!!!)
36	15:10	26/6/98						307	MNG03			Thermistor Chain inboard
37	15:20	26/6/98						307	MNG03			Secondary buoyancy inboard
38	15:22	26/6/98						307	MNG03			2nd CM inboard: 3485
39	15:25	26/6/98						307	MNG03			2nd Sed Trap 042 inboard
40	15:32	26/6/98						307	MNG03			Release inboard (end of 307-MNG03)
41												
42												
43	14:50	26/6/98	36	14.161	33	53.687		308	MNG04			IFREMER Mooring 3 released
44	15:37	26/6/98	36	14.204	33	53.687		308	MNG04			Mooring sighted on surface
45	15:55	26/6/98	36	13.918	33	54.157		308	MNG04			Buoyancy grappled, recovery started
46	16:01	26/6/98						308	MNG04			Buoyancy inboard
47	16:05	26/6/98						308	MNG04			1st CM inboard: 12201
48	16:08	26/6/98						308	MNG04			1st Sed. Trap 039
49	16:18	26/6/98						308	MNG04			Thermistor Chain inboard
50	16:24	26/6/98						308	MNG04			Secondary buoyancy inboard
51	16:29	26/6/98						308	MNG04			2nd CM inboard:3486
52	16:32	26/6/98						308	MNG04			2nd Sed Trap 042 inboard
53	16:35	26/6/98						308	MNG04			Release inboard (end of 308-MNG04)
54												
55												
56	15:59	26/6/98	36	13.932	33	54.217		309	MNG05			IFREMER Mooring 1 released
57	16:40	26/6/98	36	13.880	33	54.179		309	MNG05			Mooring sighted on surface
58	17:00	26/6/98	36	13.336	33	52.809	1942	309	MNG05			Buoyancy grappled, recovery started
59	17:03	26/6/98						309	MNG05			Buoyancy inboard
60	17:08	26/6/98						309	MNG05			1st CM inboard: 12288
61	17:11	26/6/98						309	MNG05			Sed. Trap in-board

	A	B	C	D	E	F	G	H	I	J	K	L
62	17:16	26/6/98						309	MNG05			Release inboard (end of 309-MNG05)
63												
64												
65	17:59	26/6/98	36	14.580	33	54.050		310	CTD02			Hove to on station
66	18:03	26/6/98						310	CTD02			CTD in water
67	18:52	26/6/98					2432	310	CTD02	2410	2417	At bottom, 15m off, firing bottle #1
68	19:54	26/6/98	36	14.970	33	54.020		310	CTD02			CTD on deck
69	19:58	26/6/98						310	CTD02			G&Ts in celebration of Henry Charnock
70								310	CTD02			Memorial Concert in Southampton.
71												
72												
73	20:54	26/6/98	36	11.870	33	49.080	2460	311	CTD03			On station
74	21:59	26/6/98	36	12.390	33	48.960	2545	311	CTD03		2525	At bottom, 20m off
75	22:56	26/6/98	36	12.640	33	48.560		311	CTD03			CTD inboard
76	23:01	26/6/98						311	CTD03			End of station
77												
78												
79	23:30	26/6/98						312	CTD04			On station
80	23:43	26/6/98	36	14.460	33	50.390	2460	312	CTD04			In water
81	00:37	27/6/98	36	14.820	33	50.110	2515	312	CTD04	2524	2520	At bottom, 100m off, firing bottle #1
82	01:39	27/6/98	36	15.240	33	49.920		312	CTD04			CTD inboard
83	01:42	27/6/98						312	CTD04			End of station
84												
85												
86	02:15	27/6/98						313	CTD05			On station
87	02:27	27/6/98	36	16.900	33	52.310	2580	313	CTD05			In water
88	03:25	27/6/98	36	16.940	33	52.340	2641	313	CTD05	2601	2608	At bottom, 40m off, firing bottle #1
89	04:31	27/6/98	36	16.870	33	52.220	2603	313	CTD05			CTD inboard
90								313	CTD05			End of station
91												
92												

	A	B	C	D	E	F	G	H	I	J	K	L
93	07:59	27/6/98	36	15.892	33	53.354	2404	314	MNG06			On station for recovery of mooring "B"
94	08:09	27/6/98						314	MNG06			mooring released
95	08:27	27/6/98						314	MNG06			on surface
96	08:55	27/6/98						314	MNG06			grappled
97	08:59	27/6/98						314	MNG06			RCM 11675 on board
98	09:07	27/6/98						314	MNG06			RCM 11821, LSS 336
99	09:14	27/6/98						314	MNG06			RCM 7452 and release
100	09:15	27/6/98						314	MNG06			end of station
101												
102												
103	10:23	27/6/98	36	15.662	33	52.938	2361	315	BXC01			On station; box core in water
104	10:40	27/6/98	36	15.897	33	52.921	2376	315	BXC01	800		Station aborted - out of target area.
105	10:59	27/6/98	36	15.213	33	52.974	2422	315	BXC01			Corer inboard; end
106												
107												
108	11:15	27/6/98	36	14.523	33	52.921	2044	316	BXC02			2nd attempt to core @ "B"; on station
109	11:17	27/6/98						316	BXC02			In water down @ 20m/s
110	11:52	27/6/98	36	14.955	33	52.928	2190	316	BXC02	2000		Winch stopped @ 2000m
111	12:04	27/6/98	36	15.225	33	52.892	2224	316	BXC02	2000		Down to 2100
112	12:06	27/6/98						316	BXC02	2100		Winch stopped
113	12:18	27/6/98	36	15.514	33	52.955	2300	316	BXC02			Start down to core (2200m)
114	12:23	27/6/98						316	BXC02			Going in
115	12:29	27/6/98	36	15.558	33	52.893	2322	316	BXC02			BOKO! (Deutsche bottom contact).
116	12:31	27/6/98						316	BXC02			Good pull-out tension, hauling
117	13:42	27/6/98						316	BXC02			Core on deck; full with good core-top
118												
119												
120	14:40	27/6/98	36	16.975	33	54.033	2414	317	MNG07			On station;recovery of morring "D"
121	14:50	27/6/98	36	16.975	33	54.050	2402	317	MNG07			released
122	15:12	27/6/98						317	MNG07			on surface
123	15:22	27/6/98						317	MNG07			Alongside; start recovery

	A	B	C	D	E	F	G	H	I	J	K	L
124	15:24	27/6/98						317	MNG07			buoyancy on deck
125	15:28	27/6/98						317	MNG07			RCM 11682 on board
126	15:35	27/6/98						317	MNG07			RCM 11813; LSS 539
127	15:40	27/6/98						317	MNG07			RCM 8248
128	15:43	27/6/98						317	MNG07			Release on board; end
129												
130												
131	16:00	27/6/98	36	17.806	33	51.099		318	MNG08			On station; recovery of mooring "E"
132	16:14	27/6/98						318	MNG08			release
133	16:35	27/6/98						318	MNG08			sighted
134	16:45	27/6/98						318	MNG08			alongside
135	16:50	27/6/98						318	MNG08			RCM 11674 on board
136	16:57	27/6/98						318	MNG08			RCM 11054
137	17:03	27/6/98						318	MNG08			RCM 11569
138	17:12	27/6/98						318	MNG08			release on board; end
139												
140												
141	18:07	27/6/98	36	16.222	33	53.053		319	CTD06			CTD in water
142	18:56	27/6/98	36	16.304	33	53.213		319	CTD06	2405	????	At bottom, 10m off, P-sensor futo.
143	19:50	27/6/98						319	CTD06			CTD on-deck
144												
145												
146	20:50	27/6/98	36	17.298	33	50.912	2862	320	CTD07			Test dip at "E": in water
147	21:15	27/6/98						320	CTD07		1500	Sudden salinity "jump" ~(-0.2psu)
148	21:47	27/6/98	36	17.270	33	51.130	2879	320	CTD07	2856	2860	On bottom, 30m off, Sal. = jumped back
149	22:00	27/6/98						320	CTD07	2250		Pressure lost, firing bottle
150	22:49	27/6/98						320	CTD07			CTD inboard, end of station.
151												
152												
153	00:25	28/6/98	36	22.000	33	40.840	2707	321	CTD08			On station
154	04:22	28/6/98	36	22.300	33	40.640	2677	321	CTD08			On station again, spare CTD fitted.

	A	B	C	D	E	F	G	H	I	J	K	L
155	04:28	28/6/98						321	CTD08			CTD in water
156	05:16	28/6/98	36	22.560	33	41.080	2653	321	CTD08		2500	Near bottom, firing bottle #1
157	05:40	28/6/98						321	CTD08		1475	Power supply swapped (test), lost data.
158	06:15	28/6/98	36	22.830	33	41.590	2587	321	CTD08			On deck, bottles 1-7 fired
159												
160												
161	07:59	28/6/98	36	12.236	33	47.999	2585	322	MNG09			On station to recover mooring H
162	08:16	28/6/98						322	MNG09			Mooring released
163	08:34	28/6/98						322	MNG09			On surface
164	08:47	28/6/98						322	MNG09			Sighted
165	08:58	28/6/98						322	MNG09			Grappled mooring
166	09:01	28/6/98						322	MNG09			Buoyancy inboard
167	09:03	28/6/98						322	MNG09			RCM1 (11656) on deck
168	09:11	28/6/98						322	MNG09			RCM2 (6152) on deck
169	09:16	28/6/98						322	MNG09			RCM3 (9415) + release on deck
170	09:17	28/6/98						322	MNG09			End of station
171												
172												
173	09:39	28/6/98	36	13.459	33	50.667		323	MNG10			On station to recover mooring C
174	09:45	28/6/98						323	MNG10			Mooring released
175	10:06	28/6/98						323	MNG10			On surface & sighted
176	10:20	28/6/98						323	MNG10			Grappled mooring
177	10:22	28/6/98						323	MNG10			Buoyancy inboard
178	10:24	28/6/98						323	MNG10			RCM1 (11657) on deck
179	10:31	28/6/98						323	MNG10			RCM2 (11047) on deck
180	10:37	28/6/98						323	MNG10			RCM3 (11570) + release on deck
181												
182												
183	11:09	28/6/98	36	17.220	33	53.890		324	MNG11			On station for "A" @ drop position
184	11:26	28/6/98						324	MNG11			No contact - move to new NE position
185	11:40	28/6/98	36	17.665	33	53.234		324	MNG11			At position 2

	A	B	C	D	E	F	G	H	I	J	K	L
186	11:45	28/6/98						324	MNG11			No contact return to last "fix" position
187	12:32	28/6/98	36	17.311	33	53.432		324	MNG11			At last "fix"position
188	12:40	28/6/98						324	MNG11			No joy: move back to drop position
189	12:50	28/6/98	36	17.260	33	53.989		324	MNG11			On drop position
190	12:52	28/6/98						324	MNG11			Release command: start sending
191	14:10	28/6/98						324	MNG11			Last release command sent
192	14:25	28/6/98						324	MNG11			Moving off: "A" abandoned (for now)
193												
194												
195	15:06	28/6/98	36	11.937	33	50.972	2342	325	BXC03			On station, ~1mi. Sth of box "2"
196	15:10	28/6/98						325	BXC03			In water
197	15:35	28/6/98	36	11.987	33	50.603	2296	325	BXC03	1380		
198	15:46	28/6/98	36	12.060	33	50.720	2294	325	BXC03	2000		Wire stoppped
199	16:14	28/6/98	36	12.505	33	50.655	2349	325	BXC03	2000		
200	16:22	28/6/98	36	12.644	33	50.647	2352	325	BXC03			Going down again
201	16:27	28/6/98	36	12.695	33	50.675	2349	325	BXC03	2200		Wire stopped
202	16:34	28/6/98	36	12.842	33	50.621	2357	325	BXC03			Going in @ 1m/sec
203	16:36	28/6/98						325	BXC03	2300		
204	16:39	28/6/98	36	12.811	33	50.602	2363	325	BXC03	2500		BOKO!!
205	16:42	28/6/98	36	12.849	33	50.653	2361	325	BXC03	2434		Coming up => Pull out OK? (20cm)
206	17:32	28/6/98						325	BXC03			Grosserkastengreiffer an Deck
207												
208												
209	21:30	28/6/98	36	40.320	33	38.720	2536	326	CTD09			On station
210	21:42	28/6/98						326	CTD09			In water (Spare CTD)
211	22:39	28/6/98		40.380		39.220		326	CTD09	2600	2598	On bottom, 19m off, firing bottle #1
212	23:30	28/6/98		40.460		39.720		326	CTD09			On deck
213												
214												
215	01:07	29/6/98	36	36.500	33	30.110	2168	327	CTD10			On station
216	01:30	29/6/98					2173	327	CTD10	2176	2162	On bottom, 23m off, firing bottle #1

	A	B	C	D	E	F	G	H	I	J	K	L
217	02:19	29/6/98	36	36.020	33	31.090		327	CTD10			On surface
218												
219												
220	03:16	29/6/98	36	33.320	33	35.270	2924	328	CTD11			On station
221	03:20	29/6/98					2998	328	CTD11			In water
222	04:20	29/6/98	36	33.560	33	35.760	2931	328	CTD11	2956	2955	On bottom, 42m off, bottle #1
223	05:24	29/6/98	36	33.270	33	36.240		328	CTD11			On surface
224												
225												
226	08:06	29/6/98	36	16.941	33	42.233	2448	329	BXC04			Corer in water
227	08:15	29/6/98	36	17.082	33	42.211	2418	329	BXC04	500		
228	08:23	29/6/98	36	17.229	33	42.215	2350	329	BXC04	1000		
229	08:33	29/6/98	36	17.397	33	42.248	2373	329	BXC04	1600		
230	08:40	29/6/98	36	17.507	33	42.213	2548	329	BXC04	2000		
231	08:47	29/6/98	36	17.588	33	42.218	2554	329	BXC04	2400		Winch stopped
232	08:49	29/6/98						329	BXC04			Going in @ 1m/sec
233	08:53	29/6/98	36	17.576	33	42.207	2519	329	BXC04	2646		BOKO!!!
234	08:55	29/6/98	36	17.590	33	42.213	2524	329	BXC04	2610		Off bottom, good pull-out, up @ 1m/s
235	09:41	29/6/98						329	BXC04			Corer on deck
236												
237												
238	11:28	29/6/98						330	CTD12			On station
239	11:31	29/6/98	36	12.426	33	56.651	3298	330	CTD12			In water
240	12:38	29/6/98	36	12.594	33	56.949	3301	330	CTD12	3288	3289	CTD stopped, 20m off, firing bottle #1
241	13:51	29/6/98	36	12.631	33	57.490	3153	330	CTD12			CTD on deck
242												
243												
244	14:43	29/6/98						331	CTD13			On station
245	14:49	29/6/98	36	9.397	34	02.955	2123	331	CTD13			In water
246	15:32	29/6/98	36	9.575	34	03.260	2107	331	CTD13	2130	2132	On bottom, 26m off, firing bottle #1
247	16:29	29/6/98	36	9.815	34	03.632	2133	331	CTD13			On deck

	A	B	C	D	E	F	G	H	I	J	K	L
248												
249												
250	17:02	29/6/98	36	5.568	34	02.840	2652	332	CTD14			On station
251	17:08	29/6/98	36	5.541	34	02.860	2654	332	CTD14			In water
252	18:03	29/6/98	36	5.614	34	02.947	2695	332	CTD14	2675		At bottom, 20m off, firing bottle #1
253	18:50	29/6/98	36	5.652	34	02.962	2641	332	CTD14			On deck.
254												
255												
256	19:50	29/6/98	35	59.500	34	07.036	2016	333	CTD15			On station
257	19:52	29/6/98	35	59.466	34	07.062	2081	333	CTD15			In water
258	20:34	29/6/98	35	59.432	34	07.050	2087	333	CTD15		2060	at bottom, 8m off, bottle #1 fired
259	21:09	29/6/98	35	59.410	34	07.060						CTD on deck
260												
261	21:40	29/6/98	35	58.030	34	09.990	2342	334	CTD16			On station
262	21:50	29/6/98						334	CTD16			CTD in water
263	22:37	29/6/98	35	58.010	34	10.110	2382	334	CTD16		2425	on bottom, 80m off, bottle #1 fired
264	23:21		35	58.030	34	10.060			CTD16			CTD on deck
265												
266												
267	00:15	30/6/98	35	53.670	34	12.410	2204	335	CTD17			On station
268	00:17	30/6/98						335	CTD17			in water
269	01:02	30/6/98	35	53.570	34	12.800	2038	335	CTD17	2196	2190	on bottom, 10m off, bottle #1 fired
270	01:25	30/6/98						335	CTD17		Weird plume @1600m, up to 1500m, down again.	
271		30/6/98						335	CTD17			nothing seen down to 1700m, up again
272	02:17	30/6/98	35	53.680	34	13.420		335	CTD17			CTD on deck
273												
274												
275	02:58	30/6/98	35	51.060	34	09.990	2362	336	CTD18			On station
276	03:01	30/6/98						336	CTD18			CTD in water
277	03:10	30/6/98						336	CTD18		590	LSS bad data, power cycling
278	03:15	30/6/98						336	CTD18			aborted

	A	B	C	D	E	F	G	H	I	J	K	L
279	03:25	30/6/98						336	CTD18			On deck, Tx taken off, LSS
280												
281												switched to different channel
282	04:42	30/6/98	35	51.000	34	09.950		336	CTD19			On station again
283	05:40	30/6/98	35	51.010	34	10.530	2450	336	CTD19	2500	2478	on bottom, 20m off, bottle #1 fired
284	06:35	30/6/98	35	50.940	34	10.910		336	CTD19			on deck
285												
286												
287	07:23	30/6/98	35	46.710	34	14.700	2688	337	CTD20			On station
288	08:22	30/6/98	35	46.575	34	14.954		337	CTD20	2707	2708	at bottom, 20m off, bottle #1 fired
289	09:14	30/6/98	35	46.459	34	15.228	2559	337	CTD20			CTD on deck
290												
291												
292	09:58	30/6/98	35	43.381	34	13.302	2478	338	CTD21			On station
293	10:06	30/6/98	35	43.311	34	13.327	2482	338	CTD21			In water
294	10:58	30/6/98	35	43.065	34	13.539		338	CTD21			At bottom, 20m off, firing bottle#1
295	11:46	30/6/98	35	43.174	34	13.763		338	CTD21			CTD on deck
296												
297												
298	13:48	30/6/98	35	33.345	34	12.755	2261	339	CTD22			On station CTD22; yo-yo
299	14:38	30/6/98	35	33.946	34	13.356	2228	339	CTD22		2152	Bottom of 1st yo
300	14:49	30/6/98	35	34.038	34	13.442	2253	339	CTD22		1604	Top of 1st yo
301	14:51	30/6/98	35	34.038	34	13.442	2253	339	CTD23		1604	Start 2nd yo, hove-to at sill
302	15:07	30/6/98	35	34.246	34	13.565	2310	339	CTD23	2384	2284	Bottom of 2nd yo, starting drift again
303	15:22	30/6/98	35	34.430	34	13.810	2395	339	CTD23		1580	Top of 2nd yo
304	15:23	30/6/98	35	34.430	34	13.810	2395	339	CTD24		1580	Start of 3rd yo
305	15:44	30/6/98	35	34.693	34	14.031	2540	339	CTD24	2540	2366	Bottom of 3rd yo, 20m off
306	15:57	30/6/98	35	34.896	34	14.196	2565	339	CTD24	1858	1596	Top of 3rd yo
307	15:58	30/6/98	35	34.896	34	14.196	2565	339	CTD25	1858	1596	Start of 4th yo
308	16:19	30/6/98	35	35.122	34	14.435	2589	339	CTD25	2792	2494	Bottom of 4th yo, 20m off
309	16:39	30/6/98	35	35.370	34	14.690	2624	339	CTD25	1850	1614	Top of 4th yo

	A	B	C	D	E	F	G	H	I	J	K	L
310	16:42	30/6/98	35	35.409	34	14.705	2635	339	**CTD26**	1850	1614	Start of 5th yo
311	17:04	30/6/98	35	35.609	34	14.888	2662	339	**CTD26**	2837	2580	Bottom of 5, 20m off, firing bottle #1
312	18:10	30/6/98	35	36.350	34	14.960		339	**CTD26**			Out of water and on deck.
313												
314												
315	19:01	30/6/98	35	32.648	34	12.511	2449	340	**CTD27**			On station & in water.
316	19:52	30/6/98	35	32.414	34	12.480	2452	340	**CTD27**	2437	2437	20m off, on bottom, firing bottle #1
317	20:36	30/6/98	35	32.100		12.710	2439	340	**CTD27**			On deck
318												
319												
320	21:45	30/6/98	35	40.33		20..58	3243	341	**CTD28**			On station
321	21:51	30/6/98	35				3220	341	**CTD28**			In water
322	22:35	30/6/98	35					341	**CTD28**			Power cycle:LSS; noise probs, >1700m
323	23:05	30/6/98	35	40.04		21.150		341	**CTD28**	3233	3238	10m off bottom, firing bottle #1
324	00:24	1/7/98	35	39.72		21.730		341	**CTD28**			On deck
325												
326												
327	05:11	1/7/98	36	12.790	33	56.570	3293	342	**CTD29**			On station & in water
328	06:03	1/7/98	36	12.640	33	57.060		342	**CTD29**	2404	2400	On bottom, firing bottle #1
329	06:50	1/7/98	36	12.800	33	57.400		342	**CTD29**			On deck
330												
331												
332	07:58	1/7/98	36	14.242	33	54.282	2403	343	**BXC05**			On station
333	08:00	1/7/98	36	14.249	33	54.327		343	**BXC05**			In water
334	08:13	1/7/98	36	14.453	33	54.368	2496	343	**BXC05**	800		Going down @ 1m/sec
335	08:19	1/7/98	36	14.516	33	54.368	2468	343	**BXC05**	1200		Going down @ 1m/sec
336	08:29	1/7/98	36	14.591	33	54.345	2470	343	**BXC05**	1800		Going down @ 1m/sec
337	08:39	1/7/98	36	14.715	33	54.355	2480	343	**BXC05**	2400		Wire stopped
338	08:44	1/7/98	36	14.755	33	54.339	2471	343	**BXC05**	2400		Going in @ 1m/sec
339	08:48	1/7/98	36	14.804	33	54.303	2450	343	**BXC05**	2642		BOKO!!!!
340	08:50	1/7/98	36	14.817	33	54.305	2453	343	**BXC05**	2629		Clear of bottom, good pull-out

	A	B	C	D	E	F	G	H	I	J	K	L
341	09:38	1/7/98	36	15.469	33	54.511		343	**BXC05**	0		Corer on deck
342												
343												
344	10:21	1/7/98	36	19.733	33	49.860	2478	344	**CTD30**			On station
345	10:25	1/7/98	36	19.718	33	49.917	2510	344	**CTD30**			In water
346	11:20	1/7/98						344	**CTD30**			At bottom, 20m off, firing bottle #1
347	12:21	1/7/98	36	19.515	33	51.243	2245	344	**CTD30**			CTD on deck
348												
349												
350	13:22	1/7/98						345	**CTD31**			On station
351	13:24	1/7/98	36	25.934	33	42.278	2362	345	**CTD31**			In water
352	14:10	1/7/98	36	26.333	33	42.645	2212	345	**CTD31**	2346	2316	At bottom, 20m off, firing bottle #1
353	15:10	1/7/98	36	27.015	33	42.760	2196	345	**CTD31**		0	CTD in-board
354												
355												
356	15:41	1/7/98	36	25.659	33	41.324		346	**CTD32**			On station, CTD in water
357	16:34	1/7/98	36	26.078	33	41.367	2602	346	**CTD32**	2654	2641	At bottom, 20m off, firing bottle #1
358	17:40	1/7/98	36	26.712	33	41.504	2460	346	**CTD32**			On deck
359												
360												.
361	18:08	1/7/98	36	25.644	33	39.982	2562	347	**CTD33**			On station
362	18:20	1/7/98	36	25.662	33	40.160	2550	347	**CTD33**			In water
363	19:12	1/7/98	36	26.137	33	40.406	2389	347	**CTD33**	2542	2501	On bottom, 20m off, firing bottle #1
364	20:06	1/7/98	36	26.539	33	40.582		347	**CTD33**			CTD on deck
365												
366												
367	20:38	1/7/98	36	24.980	33	36.880	2340	348	**CTD34**			On station
368	20:44	1/7/98						348	**CTD34**			In water
369	21:28	1/7/98	36	25.000	33	37.050	2543	348	**CTD34**	2340	2347	On bottom, 48m off, bottle 1 @2300m
370	22:16	1/7/98	36	25.000	33	37.320		348	**CTD34**			On deck
371												

	A	B	C	D	E	F	G	H	I	J	K	L
372												
373	00:22	2/7/98	36	13.050	33	55.580	2797	349	**CTD35**			On station
374	01:34	2/7/98	36	13.680	33	56.100		349	**CTD35**	3087	3041	7m off-bottom
375	02:04	2/7/98	36					349	**CTD35**	1975		Winch stopped in peak
376	02:15	2/7/98	36					349	**CTD35**			Haul continued
377	03:09	2/7/98	36	14.600	33	56.750		349	**CTD35**			On deck
378												
379												
380	08:00	2/7/98						350	**CTD36**			On station
381	08:00	2/7/98	35	59.940	33	00.085	2625	350	**CTD36**			In water
382	08:56	2/7/98	35	59.611	32	59.967	2470	350	**CTD36**	2627	2619	On bottom, 20m off, firing bottle #1
383	09:52	2/7/98	35	59.558	32	59.653	2363	350	**CTD36**			On deck
384												
385												
386					**END OF SCIENCE**							
387												
388												
389												
390	09:00	4/7/98										Commence Boat Transfer (Azores)
391	10:00	4/7/98										Transfer Complete, Set Sail for SOC
392												
393	08:00	10/7/98										All fast alongside, SOC

Cast: 1
Water Depth: 2565m

Bottle	Depth
1	2604
2	2453
3	2353
4	2254
5	2185
6	2125
7	2056
8	1957
9	1509
10	807
11	410
12	208

Cast: 2
Water Depth: 2425m

Bottle	Depth
1	2417
2	2123
3	2041
4	2033
5	2022
6	2009
7	1950
8	1650
9	1210
10	1009
11	812
12	415

Cast: 3
Water Depth: 2460m

Bottle	Depth
1	2525
2	2275
3	2200
4	2097
5	2028
6	1950
7	1880
8	1810
9	1400
10	800
11	402
12	202

Cast: 4
Water Depth: 2460m

Bottle	Depth
1	2520
2	2403
3	2275
4	2150
5	2025
6	1900
7	1775
8	1403
9	1000
10	700
11	300
12	101

Cast: 5
Water Depth: 2587m

Bottle	Depth
1	2608
2	2500
3	2350
4	2199
5	2050
6	1898
7	1751
8	1550
9	997
10	602
11	398
12	200

Cast: 6
Water Depth: 2403m

Bottle	Depth
1	*2405
2	*2295
3	*2260
4	*2201
5	*2160
6	*2100
7	*2050
8	*1206
9	*1173
10	*1140
11	*1090
12	*1080

*Wire out - no CTD data

Cast:	7	Cast:	8	Cast:	9
Water Depth: 2881m		Water Depth: 2690m		Water Depth: 2537m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2860	1	2503	1	2598
2	2650	2	2299	2	2448
3	2425	3	2200	3	2297
4	2250	4	2100	4	2200
5	1962*	5	1999	5	2099
6	1850*	6	1899	6	1950
7	1650*	7	1799	7	1800
8		8	approx800	8	1400
9		9		9	1199
10		10		10	1000
11		11		11	600
12		12		12	300

Cast:	10	Cast:	11	Cast:	12
Water Depth: 2170m		Water Depth: 2950m		Water Depth: 3262m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2162	1	2955	1	3289
2	2100	2	2600	2	2799
3	2001	3	2200	3	2499
4	1950	4	2127	4	2198
5	1850	5	2050	5	2105
6	1750	6	1975	6	2011
7	1601	7	1901	7	1982
8	1301	8	1801	8	1889
9	999	9	1400	9	1882
10	700	10	798	10	1700
11	399	11	400	11	999
12	100	12	200	12	399

Cast:	13	Cast:	14	Cast:	15
Water Depth: 2136m		Water Depth: 2660m		Water Depth: 2015m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2132	1	2675	1	2060
2	2100	2	2399	2	2018
3	2075	3	2198	3	2000
4	2049	4	2098	4	1948
5	1898	5	2000	5	1798
6	1799	6	1899	6	1600
7	1602	7	1899	7	1399
8	1300	8	1800	8	1199
9	999	9	1599	9	1001
10	700	10	1200	10	400
11	299	11	597	11	200
12	50	12	197	12	103

Cast:	16	Cast:	17	Cast:	18
Water Depth: 2366m		Water Depth: 2278m		Water Depth: 2362m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2425	1	2190	1	Cancelled
2	2299	2	2125	2	Cancelled
3	2200	3	2075	3	Cancelled
4	2099	4	2001	4	Cancelled
5	2002	5	1950	5	Cancelled
6	1900	6	1874	6	Cancelled
7	1748	7	1751	7	Cancelled
8	1400	8	1613	8	Cancelled
9	1190	9	1300	9	Cancelled
10	596	10	500	10	Cancelled
11	394	11	300	11	Cancelled
12	197	12	100	12	Cancelled

Cast:	19	Cast:	20	Cast:	21
Water Depth:	2362m	Water Depth:	2688m	Water Depth:	2478m
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2478	1	2708	1	2522
2	2200	2	2176	2	2500
3	2050	3	2099	3	2048
4	2000	4	2024	4	2023
5	1900	5	1949	5	2000
6	1800	6	1874	6	1975
7	1700	7	1800	7	1949
8	1601	8	1499	8	1700
9	1200	9	1200	9	1200
10	501	10	500	10	997
11	399	11	299	11	298
12	200	12	100	12	98

Cast:	22	Cast:	23	Cast:	24
Water Depth:		Water Depth:		Water Depth:	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	
6		6		6	
7		7		7	
8		8		8	
9		9		9	
10		10		10	
11		11		11	
12		12		12	

Cast:	25	Cast:	26 (YY5)	Cast:	27
Water Depth:		Water Depth: 2629m		Water Depth: 2449m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1		1	2580	1	2437
2		2	2500	2	2347
3		3	2301	3	2217
4		4	2200	4	2019
5		5	2100	5	1999
6		6	1999	6	1800
7		7	1800	7	1602
8		8	1500	8	1299
9		9	1200	9	1050
10		10	900	10	800
11		11	700	11	500
12		12	330	12	100

Cast:	28	Cast:	29	Cast:	30
Water Depth: 3220m		Water Depth: 3220m		Water Depth: 2478m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	3230	1	2400	1	2448
2	3000	2	2000	2	2300
3	2799	3	1400	3	2199
4	2600	4	1000	4	2100
5	2500	5	399	5	1999
6	2400	6	198	6	1900
7	2300	7		7	1799
8	1800	8		8	1500
9	1500	9		9	1300
10	1000	10		10	880
11	600	11		11	698
12	200	12		12	249

Cast:	31	Cast:	32	Cast:	33
Water Depth: 2349m		Water Depth: 2488m		Water Depth: 2532m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2314	1	2461	1	2501
2	2195	2	2300	2	2300
3	2100	3	2201	3	2200
4	2050	4	2100	4	2100
5	2000	5	2050	5	2049
6	1899	6	1999	6	2000
7	1800	7	1900	7	1900
8	1450	8	1602	8	1499
9	1150	9	1125	9	1299
10	925	10	850	10	800
11	300	11	550	11	600
12	100	12	100	12	199

Cast:	34	Cast:	35	Cast:	36
Water Depth: 2400m		Water Depth: 2800m		Water Depth: 2625m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2298	1	3041	1	2619
2	2200	2	1200	2	2400
3	2100	3	1200	3	2200
4	2049	4	600	4	2000
5	2000	5	399	5	1700
6	1950	6	200	6	1400
7	1900	7	100	7	1068
8	1600	8		8	961
9	1200	9		9	891
10	599	10		10	700
11	400	11		11	299
12	200	12		12	99

Cast:	31	Cast:	32	Cast:	33
Water Depth: 2349m		Water Depth: 2488m		Water Depth: 2532m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2314	1	2461	1	2501
2	2195	2	2300	2	2300
3	2100	3	2201	3	2200
4	2050	4	2100	4	2100
5	2000	5	2050	5	2049
6	1899	6	1999	6	2000
7	1800	7	1900	7	1900
8	1450	8	1602	8	1499
9	1150	9	1125	9	1299
10	925	10	850	10	800
11	300	11	550	11	600
12	100	12	100	12	199

Cast:	34	Cast:	35	Cast:	36
Water Depth: 2400m		Water Depth: 2800m		Water Depth: 2625m	
Bottle	Depth	Bottle	Depth	Bottle	Depth
1	2298	1	3041	1	2619
2	2200	2	1200	2	2400
3	2100	3	1200	3	2200
4	2049	4	600	4	2000
5	2000	5	399	5	1700
6	1950	6	200	6	1400
7	1900	7	100	7	1068
8	1600	8		8	961
9	1200	9		9	891
10	599	10		10	700
11	400	11		11	299
12	200	12		12	99

Appendix C: Box Core Samples Taken

Station	Boxcore	Subcores	Porewater	Biological samples	Other	Owner
316	BXC-02	BXC-02A	3cm	1ml top- 2% formalin	3 x 5cm subsamples	VM
		BXC-02B	7cm	1ml top - 50% ethanol	Basalt 'bullets'	PRC
		BXC-02C	10cm	5ml top - whirlpak, -20°C	Basalt chips - top	PRC
			14cm	1ml 10cm- 2% formalin	Basalt chips - in sediment	PRC
				1ml 10cm - 50% ethanol	Surface faunal remains	PRC
				5ml 10cm - whirlpak, -20°C	Downcore faunal remains	PRC
325	BXC-03	BXC-03A	5.5cm	1ml top- 2% formalin	3 x 5cm subsamples	VM
		BXC-03B	10.5cm	1ml top - 50% ethanol	Top 5 cm	AK
		BXC-03C	14.5cm	5ml top - whirlpak, -20°C	Live coral polyp	PRC
				1ml 10cm- 2% formalin	2 x white carbonate burrows	PRC
				1ml 10cm - 50% ethanol	1 x green anoxic burrow	PRC
				5ml 10cm - whirlpak, -20°C	Surface faunal remains	PRC
					Downcore faunal remains	PRC
329	BXC-04	BXC-04A	5cm	1ml top- 2% formalin	3 x 5cm subsamples	VM
		BXC-04B	10cm	1ml top - 50% ethanol	Top 5 cm	AK
		BXC-04C		5ml top - whirlpak, -20°C	Live green burrowing worm	PRC
				1ml 10cm- 2% formalin	Live long thin worm	PRC
				1ml 10cm - 50% ethanol	Live small animal	PRC
				5ml 10cm - whirlpak, -20°C	Surface faunal remains	PRC
					Downcore faunal remains	PRC
343	BXC-05	BXC-05A	5cm	1ml top- 2% formalin	6 x 5cm subsamples	VM
		BXC-05B	10cm	1ml top - 50% ethanol	Top 5 cm	AK
		BXC-05C	15cm	5ml top - whirlpak, -20°C	surface basalt chips	PRC
		BXC-05E	20cm	1ml 10cm- 2% formalin	downcore large basalt pieces	PRC
		BXC-05F	25cm	1ml 10cm - 50% ethanol	bottom chalky sediment sample	PRC
		BXC-05G		5ml 10cm - whirlpak, -20°C	chalk 'hardground' sample	PRC
					chalk with serpentinised? basalt	PRC
					Surface faunal remains	PRC
					Downcore faunal remains	PRC

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