

## Fahrtberichte - Hinweise für Autoren

Die Fahrtberichte erscheinen zeitnah nach Beendigung einer Fahrt und dienen als Arbeitsunterlage für den mit der betreffenden Fahrt befassten Personenkreis und interessierte Wissenschaftler, sowie als Berichte für die fördernden Institutionen. Verantwortlich für die Erstellung der Berichte ist die Fahrtleitung.

Die Fahrtleitung reicht **spätestens 2 Monate nach Abschluss einer Fahrt** das vollständige Manuskript als PDF-Datei bei der GPF-Geschäftsstelle unter der E-Mail Adresse [gpf@dfg.de](mailto:gpf@dfg.de) ein oder informiert die GPF-Geschäftsstelle, dass der Fahrtbericht unter einem entsprechenden Link heruntergeladen werden kann. Um eine einheitliche Form der Berichte zu gewährleisten, werden die Autoren gebeten, die im Folgenden zusammengestellten Hinweise beim Erstellen des Berichts zu beachten. Beispiele können unter <https://www.pangaea.de/expeditions/> eingesehen werden.

### ALLGEMEINE HINWEISE

Die FAHRTBERICHTE sind in **englischer Sprache** zu erstellen.

**Der Gesamtumfang der Kapitel 3 bis 6 sollte maximal 40 Seiten umfassen.**

**Seitenformat:** DIN A4

**Seitenränder:** Innen: 25 mm, Außen: 20 mm, Kopf: 25 mm, Fuß: 20 mm.

**Text:** TIMES NEW ROMAN, 12 pt., Zeilenabstand 16 pt., Blocksatz, Absätze links 0,5 cm einrücken (ab dem zweiten Absatz nach einer Überschrift)

**Kopfzeile:** TIMES NEW ROMAN, *italics* 10 pt., Seitenzahlen außenständig, im Wechsel rechts/links.

**Beispiel:**

*Meteor-Berichte, Cruise MXX, Leg Y, May 13 – June 06, 2012, St. John's-Bergen* 2

**Überschriften:** TIMES NEW ROMAN, 12 pt., fett, Wortanfänge mit Großbuchstaben (Ausnahmen: Worte mit weniger als drei Buchstaben), Tabulator für Textanfang nach Kapitelnummer auf 20 mm setzen. Autoren eingeklammert unter die Überschrift, TIMES NEW ROMAN, 12 pt., 20 mm eingerückt. Überschrift und Autorenzeile jeweils mit 6 pt. Abstand nach der Zeile.

**Beispiel:**

#### **4.4.6.3 Particle Flux Measurements with Moored Particle Traps**

(A. Schmidt, B. Meyer, C. Neumann, D. Scholz)

Particle flux measurements at the ESTOC (European Station for Time-series in the Ocean, Canary Islands) carried out since fall 1991 show ...

**Abbildungen:** Abbildungen sollten in den einzelnen Kapiteln durchnummeriert werden. Ähnlich der Vorgehensweise bei der Seitennummerierung sollte jeweils die Nummer des Kapitels vorangestellt werden, also z.B. Fig. 2.3 für die dritte Abbildung im zweiten Kapitel. Bei den Abbildungen ist auf Leserlichkeit im Schwarzweiß-Ausdruck zu achten.

**Tabellen:** Wie Abbildungen sollten auch Tabellen in den einzelnen Kapiteln durchnummeriert werden, also z.B. Tab. 3.5 für die fünfte Tabelle im dritten Kapitel.

**Abbildungsunter- und Tabellenüberschriften:** TIMES NEW ROMAN, 10 pt., Zeilenabstand 14 pt., Blocksatz, Tabulator für Textanfang nach Kapitelnummer und Einzug für folgende Zeilen auf 20 mm setzen.

**Beispiel:**

**Fig. 3.1** Track chart of RV SONNE Cruise SO262. Bathymetry from Smith (2014). Six main working areas (Pacific Ocean and Working Areas A-E).

**Schiffsnamen** bitte in Großbuchstaben setzen (RV SONNE), ebenso registrierte Namen von Messinstrumenten (z.B. PARASOUND).

**Längen- und Breitengrade, pH-Werte, Gewichts- und Längeneinheiten** etc. in englischer Dezimalschreibweise darstellen.

## **GLIEDERUNG:**

**Deckblatt** enthält (in Arial 14, alles zentriert):

- SONNE or METEOR or MARIA S.MERIAN or POSEIDON or ALKOR or ELISABETH MANN BORGESSE or HEINCKE-Berichte
- Title (in englischer Sprache in Fettdruck, kursiv)
- Cruise No. (Cruise No. M, MSM, SO, POS, EMB, AL bzw. HEXX/Leg)
- vier Leerzeilen
- Auslauf- und Einlaufdatum, Auslauf- und Einlaufhafen (untereinander)
- ACRONYM (Kürzel laut Antrag)

**Beispiel:**

June 09 – June 22, 2012

Reykjavik (Iceland) – Bremerhaven (Germany)

ICEAGE

- Logo (in englischer Sprache)
- Autoren (z.B. M. Mustermann), Fettdruck
- Chief Scientist
- Institution
- Erscheinungsjahr

## **Table of Contents**

### **1 Summary**

Englische und deutsche Zusammenfassung der Fahrt (Gesamtumfang: maximal eine Seite).

### **2 Participants**

2.1 Liste der „**Principal Investigators**“ mit akademischem Titel und Kurzbezeichnung der Herkunftseinrichtung. 2.2 Liste der „**Cruise Participants**“ mit Namen und akademischen Titel, Spezialgebiet sowie Kurzbezeichnung der Herkunftseinrichtung. 2.3 Liste der „**Participating Institutions**“. 2.4 Liste der „**Crew**“ mit Nennung des Rangs (Rank).

### **3 Research Program**

Ausgangsfragen und Zielsetzung der Fahrt. Diese sind für AL-, POS-, HE und EMB-Berichte in der Komplexität nicht zwingend vorgesehen.

3.1 Description of the Work Area

3.2 Aims of the Cruise

3.3 Agenda of the Cruise

- Detaillierte Stationskarte, die die Hauptarbeitsgebiete und den Fahrtverlauf darstellt
- Entwicklung der durchgeführten Arbeiten einschließlich Abweichungen vom ursprünglichen Arbeitsplan, Probleme in der technischen Durchführung, ggf. wissenschaftliche oder technische Fehlschläge
- Erläutern Sie, welche Maßnahmen im Hinblick auf eine verantwortungsvolle Meeresforschung und falls zutreffend Mitigationsmaßnahmen ergriffen wurden

#### 4 Narrative of the Cruise

Hier wird der taggenaue Ablauf der Fahrt geschildert. Der Abschnitt soll als Fließtext verfasst sein (Beispiele befinden sich im **Anhang 1**).

#### 5 Preliminary Results

In diesem Teil werden kurz die während der Fahrt an Bord gewonnenen Proben und Daten, erste wissenschaftliche Ergebnisse aller Arbeitsgruppen sowie die geplante weitere Datenauswertung dargestellt. Es sollte soweit möglich ein kurzer Ausblick auf den erwarteten Erkenntnisgewinn (**expected results**) nach Verarbeitung der Daten und Proben gegeben werden. Die Anzahl der Abbildungen sollte begrenzt sein, detaillierte Kernbeschreibungen aller gewonnenen Sedimentkerne und die Protokolle von ROV-Tauchgängen sollen in einem Anhang zusammengefasst werden.

#### 6 Ship's Meteorological Station

Bericht der Bordwetterwarte über die meteorologischen Bedingungen während der Fahrt, insofern eine Bordwetterwarte auf dem Schiff vorhanden ist.

#### 7 Station List

Zulässige **Syntax** in Anlehnung an das DShip:

|       |  |
|-------|--|
| X...X | Schiffsnamenkürzel   |
| n...n | Fahrtnummer  |
| /     | Trennstrich zwischen Fahrtnummer und Fahrtabschnitt (alternativ ist ein Punkt erlaubt, da in Unix-Datensystemen der / nicht möglich ist) |
| m...m | Fahrtabschnittsnummer  |
| _     | Trennzeichen zwischen Fahrt, Fahrtabschnitt und Station bzw. Aktion  |
| s...s | Stationsnummer   |
| -     | Trennzeichen   |
| r...r | Geräteinsatznummer   |

Beispiele: SO266/1\_101-1 oder SO266\_101-1

Bitte die korrekten **Abkürzungen** beachten:

SONNE = SO

METEOR = M

MARIA S. MERIAN = MSM

POSEIDON = POS

ELISABETH MANN BORGESSE = EMB

ALKOR = AL

HEINCKE = HE

**Stationsliste:** Es muss die offizielle Schiffsstationsnummerierung verwendet werden. Dies kann neben einer möglichen eigenen institutsbezogenen Stationsnummerierung (z.B. GeoB-Nummern)

erfolgen. Andere Listen je nach Bedarf mit Verzeichnissen zu den verwendeten Abkürzungen können angehängt werden. Die Längen- und Breitengrade sind in englischer Dezimalschreibweise darzustellen.

**Beispiel:**

| Station    | Institute Description | Device/ Gear | Date     | Time  | Latitude    | Longitude  | max. p [db] | Comment/ measurements |
|------------|-----------------------|--------------|----------|-------|-------------|------------|-------------|-----------------------|
| SONNE      |                       |              |          |       |             |            |             |                       |
| SO266/15-1 | GeoB 13501-1          | 001          | 25.10.18 | 22:02 | 17° 04.17'N | 24°51.16'W |             | CTD test station      |

**Oder**

| Station | Institute Description | Device/ Gear | Date     | Time  | Latitude    | Longitude  | max. p [db] | Comment/ measurements |
|---------|-----------------------|--------------|----------|-------|-------------|------------|-------------|-----------------------|
| SO266   |                       |              |          |       |             |            |             |                       |
| 15-1    | GeoB 13501-1          | 001          | 25.10.18 | 22:02 | 17° 04.17'N | 24°51.16'W |             | CTD test station      |

**8 Data and Sample Storage and Availability**

Hier müssen detaillierte Angaben über die Erstbearbeitung der Daten und Proben sowie den langfristigen Verbleib der Daten und Proben gemacht werden (siehe auch **Anhang 2**). Bitte nennen Sie den Ort der Speicherung und langfristigen Datenlagerung, den voraussichtlichen Zeitpunkt des offenen Zugangs für andere Wissenschaftler, sowie die Ansprechpartner.

**Beispiel 1:**

**Biochemistry** – samples and data are held at the Association for Marine Science in...

(responsible Dr..... ) and at the University .... (responsible Dr. ). Samples are being analyzed by a postgraduate student under supervision of Dr.....

**Beispiel 2:**

**Table 8.1** Overview of data availability

| Data Type             | Database | Available | Open Access | Contact Person: Name, Inst. Email |
|-----------------------|----------|-----------|-------------|-----------------------------------|
| hydrography           |          | Date      | Date        | E-Mail                            |
| raw data<br>CTD, ADCP | PANGAEA  | Jan. 2013 | Jun. 2014   |                                   |

**9 Acknowledgements**

Dank, Hinweis auf Förderinstitutionen und Fördernummer usw.

## 10 References

**Literaturverzeichnis:** Die Formatierung des Literaturverzeichnisses soll in Anlehnung an das Format von „Deep-Sea Research“ erfolgen. Absatzformatierung: hängender Einzug (0,5 cm), keine Leerzeile zwischen den Literaturangaben.

### **Beispiele:**

Journal:

Smith, K.L., Ruhl, H.A., Kaufmann, R.S., Kahru, M., 2008. Tracing abyssal food supply back to upper-ocean processes over a 17-year time series in the northeast Pacific. *Limnology and Oceanography* 53, 2655-2667.

Buch:

Sargent, J.R., 1976. The structure, metabolism and function of lipids in marine organisms. In: Malins, D.C., Sargent, J.R. (Eds.), *Biochemical and Biophysical Perspectives in Marine Biology*. Academic Press, London, pp. 149-212.

# ANHANG

## Anhang 1

### Beispiele für "Narrative of the Cruise"

#### Beispiel 1 (M80/3 Thor Hansteen):

The final preparations for cruise M80/3 were carried out onboard the RV METEOR in the harbour of Dakar (Senegal). Ten scientists boarded the ship on 25 December and began the mobilisation of the remotely operated vehicle (ROV) KIEL 6000. A reception and ship's tour were held for the German ambassador in Senegal and other members of the embassy on 27 December. On 28 December the remaining scientists boarded the ship and started preparations in the laboratories on the following day.

The RV METEOR departed from Dakar on the evening of 29 December and began her transit to the first working area at Senghor Seamount in the northeast of the Cape Verde Archipelago. The scientists used the transit time to finish lab preparations and set up equipment. Scientific work began on 31 December with the recovery of two gravity cores to the northeast and northwest of Senghor Seamount. During the following hydroacoustic mapping in the night to 1 January, the ship's crew arranged an appropriate New Year celebration. The 2010 year began with another three gravity cores and two dredge hauls at Senghor Seamount followed by PARASOUND mapping to reveal the nature of its summit plateau.

The ROV KIEL 6000 was deployed on 2 January for the first time during the cruise to explore an area of Senghor's southwestern flank. The deployment, including coordination, operation and recovery, worked well; the dive was successful but had to be shortened for technical reasons. As the local weather conditions were rapidly getting worse, it was decided not to spend any more time at Senghor Seamount but to proceed to Cabo Verde Seamount 200 km further south. The next day the ROV dived for 9 hours within a collapse scar and crater-like depression to investigate the interior of this seamount, which is thought to be very old. The dive was very successful and the recovery of samples, even large samples, at any place exceeded the expectations. During the following 1 ½ days Cabo Verde Seamount was further sampled by three dredge hauls, three gravity cores were recovered in its vicinity, and bathymetric data were completed, before the RV METEOR headed for Maio Seamount.

The work at Maio Seamount began on 5 January with detailed hydroacoustic mapping of this hitherto unmapped and unsampled edifice. Immediately after mapping, a detailed digital map could be produced and three dredge localities were selected. The dredge hauls yielded many corals but no rocks, suggesting that Maio Seamount is a relatively old edifice. Similar work was carried out at the nearby Maio Ridge to the west, a subsided island for which bathymetric data and samples were lacking until now. After successful mapping and three dredge hauls the RV METEOR headed further west on 7 January. Three gravity cores were taken south of Santiago and Fogo islands, and Cadamosto Seamount southwest of the Fogo-Brava platform was mapped.

The next two ROV dives were carried out at Cadamosto Seamount on 8 and 9 January. Because of favourable weather conditions with the RV METEOR operating on the lee side of Fogo and Brava, the sea was relatively calm. The very successful dives lasted for 11 hours each and yielded a number of rock and coral samples from the summit region of Cadamosto. The ROV explored a number of apparently young lava flows, three steep crater rims, the bottom of one of these craters, and a recent volcanic vent. The work at Cadamosto was concluded with two dredge hauls at two volcanic cones on its northeastern flank that yielded some fresh volcanic rocks. During the next four days a total of 12 gravity cores were recovered around Brava and progressively farther north towards the central area of the archipelago. PARASOUND profiles in the southern parts of the archipelago revealed young faults with vertical displacements of up to 80 m, showing the importance of recent vertical tectonics for the regional geological evolution. On 14 January the RV METEOR reached the Charles Darwin volcano field southwest of Santo Antão. The first ROV dive to about 3400 m depth revealed some technical problems, which were fixed during the following day. The work programme was accordingly changed in order to recover two gravity cores west of the volcano field followed by multibeam mapping. During the next five days, four successful ROV dives were carried out at the volcano field at depths up to 3800 m, yielding a large number of samples and spectacular imagery of volcanic structures and colonization of deep seamounts by corals and sponges. The work was supplemented by six dredge hauls, multibeam mapping and some PARASOUND profiles in this area. On 16 January, Nola Seamount northwest of Santo Antão featuring two shallow plateaus was mapped in detail, and in the evening the "Bergfest" (mid-cruise celebration) was held during hydroacoustic mapping.

On the evening of 19 January, RV METEOR headed towards Sodade Seamount west of Santo Antão, which had been discovered some days earlier through hydroacoustic surveys. After carrying out more detailed mapping, the seamount was successfully sampled by four dredge hauls and explored by a long ROV dive during the following day. Two gravity cores were recovered west of Santo Antão on 21 January, and the volcanic area around Sodade Seamount was mapped before the ship went on to Nola Seamount. In spite of temporary winch problems, two dredge hauls at Nola were recovered in the night of 22 January, followed by completion of the local bathymetric mapping. The next day began with a ROV dive at Nola, which was interrupted soon after deployment by a complete power failure of the ROV. Whilst the vehicle was drifting upward by its own buoyancy, the skilled ROV team assisted by the ship's WTD team managed to repair the high-voltage power supply. The dive could be continued and yielded excellent imagery and samples from a part of Nola Seamount. In the evening two successful dredge hauls were carried out, before the RV METEOR headed for the next gravity-core station.

Between 23 and 25 January, seven gravity cores were recovered north of the Northern Cape Verde chain and close to Santo Antão. Because of successful and time-efficient coring, time was available for two more ROV dives at the Charles Darwin volcano field and at Nola Seamount on 25 and 26 January, respectively. The night between the two dives was used for three dredge hauls at Nola Seamount. On the morning of 26 January the RV METEOR began

her transit to Las Palmas de Gran Canaria, briefly interrupted on 28 January in order to carry out a deep-sea diving test of the ROV to about 5200 m water depth.

The RV METEOR arrived at the port of Las Palmas on the morning of 1 February, having successfully completed cruise M80/3.

## **Beispiel 2 (M84/2 Bohrmann):**

On Saturday 26 February 2011 at 1 p.m. local time, RV METEOR left her location situated on Ahirkapi roads south of the Golden Horn of Istanbul and reached the Black Sea after crossing the Bosphorus. During the night we also reached the first working area at Eregli, and we started to record the data from the multi-beam EM122 and the Parasound systems. Thanks to scientific information from previous cruises we were able to find acoustic anomalies in the water column very fast with the Parasound, which showed us strong emissions of free gas into the water column. During the second week of our cruise, we first of all investigated methane emissions in the western working area of the Turkish sector. If free methane escapes from the seafloor deeper than 750 m water depth, the emission of gas is always associated with the occurrence of methane hydrate in the sediments.

The 750 m water depth at 9°C marks the upper stability boundary for methane hydrate of structure I within the Black Sea. Earlier samplings proved methane hydrates down in the sediment to about 3-4 m below seafloor, and with the portable drilling system MeBo we can penetrate the sediments even deeper in order to understand the methane hydrate distribution there also. The acoustic systems of RV METEOR, the multibeam echo sounders EM122 and EM710 and the Parasound system were the most important tools we deployed during our search for occurrences of methane hydrate. Drilling with MeBo at Eregli Seep showed only a drilling result of a few meters, but at least it sampled young sediments of the classic Black Sea sequence which we could not have sampled with the gravity corer in this area with considerably higher sedimentation rates. We saved further drillings in this area for our way back to Istanbul.

The further course of the expedition followed the Turkish Black Sea coast to the east into the next working area near the city of Samsun. The side trip was only short, and our course led us to the Georgian continental margin – our main work area. The third working week was entirely dedicated to the investigation of gas hydrates off Georgia, and we wanted to investigate the seepage areas of Batumi seep and Pechori Mound, previously the subject of thorough preliminary investigations, in depth by means of MeBo drillings. On Saturday evening we started the drilling at Pechori Mound. Pechori Mound is an active, seep structure of relatively large dimensions overtopping the seafloor by several tens of meters. We were able to core a sediment sequence of about 20 m, predominantly yielding massive gas hydrates. The thickness of the gas hydrate layers in particular was surprising. During the following nights we mainly performed profiles with the ship's own acoustic systems where we repeatedly measured the gas seeps that were already known to us in order to understand the time variability of the gas emissions. On the Monday night we investigated a previously unknown area at Kulevi Ridge, and there we also detected massive gas flares in the water column whose emissions almost reached the water surface. On this occasion we learned to combine the single beams of the echo sounder EM122, which are shown very frequently due to the narrow overlapping of the water column, and to assemble them into a 3-D-illustration to a very realistic image of the single gas plumes in the water column. Much to our surprise we could now see that the upper ends of the gas plumes are clearly influenced by the flow conditions in the water. This might explain why in the 2-D profiles view the gas plumes are

normally cut off at the upper end. The finding that this is not true, but that the gas definitely migrates towards the water surface, is significant.

On Thursday 3 March we started MeBo drillings at Batumi Seep, our most important seep area. During a 20-hour deployment we could only proceed very slowly as the soft sediments of the Black Sea resulted in MeBo sinking in considerably, and therefore the motors of the drill rig constantly had to be cooled before continuing the drilling. Up to a drill depth of 10 m we were able to drill plenty of gas hydrates, which are very valuable for our scientific examination in Bremen. Unfortunately, due to damage at the drill rig we had to cease our drilling activities for this cruise.

The start of the fourth week of the cruise was concerned with an intensive sampling programme at the different seep locations in Georgia. On this occasion the dynamic autoclave piston corer (DAPC) could be deployed for the first time during the cruise to sample the upper 250 cm of the sediments. Besides the sediments, gases and gas hydrates were also sampled under in-situ pressure of the seafloor in the pressure-tight autoclave. While the gas fractions get lost in large part during the normal sampling using the gravity corer and the gas hydrates decompose because of the pressure reduction during heaving, the gases and gas hydrates in the autoclave survive and allow a quantitative determination.

We had discovered these new seeps by their oil slicks shown in satellite imaging. The hydro-acoustic measurements of these oil seeps showed that they are connected to gas emissions, and the sampling proved that gas hydrates can be encountered near the seafloor. After this intensive deployment of our devices we left the working area in Georgia on Tuesday and arrived at the Samsun working area in Turkey after a 7-hour transit. Several areas with a higher backscatter signal on the seafloor at 1,200-1,400 m water depth were known from former expeditions here also, and we had the suspicion that these were also gas emissions on the seafloor. Here again we used the EM122 and tried to compare the backscatter pattern measured with the deep-towed Sidescan Sonar with the backscatter images of the EM122 mapping. We were surprised to find identical figures of structures in the areas of the overlapping measurements, which caused us to map the entire ridge during the first night. We found that we were able to trace 22 areas with higher backscatter signals along the approx. 25 km ridge, half of the patches showing active gas emissions to the water column.

A sampling programme with the gravity corer on five of these patches with higher backscatter proved that gas hydrate was abundant everywhere so that we could clearly document the rise of gas from the underground. The gas emissions seem to follow a tectonic line. As the ridge was unnamed to date, and we intend to publish our investigations, we agreed with our Turkish colleagues on board to name this ridge "Ordu Ridge". The ridge can be clearly separated morphologically and is situated in a south/north prolongation of the provincial town Ordu, so that we think we have found a suitable name for the subject matter of our investigation.

On Thursday 17 March 17, RV METEOR entered the port of Trabzon in order to embark part of the scientific crew and also the expedition equipment on Thursday and Friday. On Saturday we moved back to the Samsun working area where we will carry out our final

investigations. During week 5 of our cruise we completed the work in the Turkish working area of Samsun. The transit to Ukraine working area was exhausting as the METEOR could proceed only very slowly with strong winds of around Beaufort 8. In the Ukraine our first destination was a strong gas emission site in a water depth of 900 m which is well-known by the name Kerch Flare. This time the sampling of a sediment core rich in gas hydrate succeeded at once, as we could locate the emissions more exactly. An extensive sampling programme was carried out by Thursday evening. We used the night as well as the whole of Friday for mapping on the continental slopes of Kerch deep sea fan, development of the mountains as well as the Crimean Peninsula. These showed how, depending on the landward side, the continental ridge shows completely different morphologies.

On Sunday we had already visited the two mud volcanoes Dvurechenskii MV and Helgoland MV and had recorded gas activity by acoustic analyses as well as sampling sediments of the mud volcanoes. We wanted to continue this work the next day. But meanwhile our little post-processing group on board had completely processed the multibeam echo sounder data measured along the Ukrainian continental slope thus far, and we took time to admire the amazing maps. Unfortunately, though, there were several blanks in the data due to lack of time which we would rather have liked to fill in by reproduced measurements.

Furthermore, we found a couple of gaps in the backscatter intensity maps which we wanted to fill with further measurements. We therefore quickly decided to plan a further measuring day in the area of Kerch Fan in order to substantiate the pressing questions with further data. So far, we had left out an area in the North on the Ukrainian Shelf, which had been restricted for us because of military exercises for several days from 7:30 a.m. until 11:30 p.m. We had hoped now to have another chance to measure those parts of the shelf during this new measurement. But on Monday morning the vessel received another message which prevented us from doing so. We had to divert once again. But in the end we were able to fill in the gaps during the measurements on the upper continental slope, and so we could achieve a complete detailed image from this extremely interesting slope morphology giving us an important insight into the geological processes. We were astonished at the highly detailed structures which are characterised by down-slope transport. The overlaying areas with high backscatter intensity turned out to be areas with stronger gas emissions which strengthen our work hypothesis of quantifying these emissions.

On our route back to the west to the two mud volcanoes, we crossed numerous mud volcanoes among which the Tbilisi MV, the Odessa MV, Vodianskii MV as well as the NIOZ mud volcano clearly showed activities in the form of flares. The Dvurechenskii mud volcano now also showed a definite gas flare in its centre. The mud volcanoes of the Sorokin Trough in general are related to the zone of diapirs formed by the Maikop Formation in the underground. In the cap area of the mud diapirs, usually due to the higher gas pressure, break-throughs of relatively liquid and gas-bearing mud appear, channelling upwards along discontinuities and developing cone-like structures where they escape the seafloor, which we consider to be actual mud volcanoes. The Sogokin Trough itself is characterised by crustal compression which supports the diapir-like uplifting of the mud formation and which had been shaped in the course of the Caucasus Mountain's development.

Back to the two mud volcanoes, the Dvurechenskii and the Helgoland MV, it turned out that both were active whereas two days previous the Dvurechenskii had seemed to be in a dormant phase. However, a precise analysis of echo sounder data taken two days previously showed that the Dvurechenskii MV had already been active, but that we could not see this in the proximate profile the vessel. An 18-hour long sampling programme followed, mainly at Helgoland mud volcano, and we were able to take extremely interesting sediment cores. One gravity core was very near the conduit of the mud volcano where we measured temperatures of about 20°C and we could directly sample fluids rising from a great depth. The extremely high ammonium concentrations of the pore waters are an indication of special diagenesis conditions occurring at greater depth. Ten meters beneath, we were able to sample gas hydrates with a gravity corer, i.e. the temperature there is already lower than 16°C. Still a little deeper, in the area of the edge of the inner volcano structure we even measured 9°C corresponding to the normal bottom water temperature in the deep Black Sea. After further measurements at Ukraine and in Turkey we finished our station and profile work of this cruise on Friday, 1 April at 10:37 a.m.

The cruise finished on Saturday 2 April, when RV METEOR completed her passage through the Bosphorus and berthed at Haydarpasa (berth 13) at 7.12 p.m. This was around one day later than planned, because of the thick fog in the channel which severely restricted passage. Like many other ships, RV METEOR was forced to wait at the entrance to the channel.

## Anhang 2

### **Richtlinien für die Weitergabe und Aufbewahrung des auf Fahrten von FS *METEOR* / FS *MARIA S. MERIAN* gesammelten zoologischen Materials**

Die Wissenschaftler an Bord des FS *METEOR* und FS *MARIA S. MERIAN* sammeln das zoologische Material mit Unterstützung der Deutschen Forschungsgemeinschaft und anderer öffentlicher Geldgeber. Angesichts der hohen Kosten, welche die Materialsammlung auf Forschungsschiffen verursacht und des Wertes der Fundstücke für die Wissenschaft muss gewährleistet sein, dass das Material allgemein zugänglich bleibt. Dies ist auf Dauer nur in Forschungsmuseen möglich. Daher wird es vom Sammler (der gleichzeitig auch Bearbeiter der Objekte sein kann) nur treuhänderisch verwahrt. Das Deutsche Zentrum für Marine Biodiversitätsforschung (DZMB) wurde gemäß der Empfehlung des Wissenschaftsrates als Abteilung des Forschungsinstituts Senckenberg zur Stärkung der taxonomischen und systematischen Erforschung mariner Organismen in Deutschland gegründet. Es ist eine Aufgabe des DZMB, die Dokumentation, Archivierung und den Verbleib der auf Fahrten deutscher Forschungsschiffe genommenen Proben zu regeln.

Die folgenden Richtlinien sollen sowohl den Belangen der Bearbeiter als auch der musealen Erhaltung des Materials dienen.

#### **I. Das Materialarchiv**

Das DZMB übernimmt als Service-Einrichtung der deutschen Meeresforschung die Leitung des Materialarchivs und bildet den Knoten zwischen dem Sammler, taxonomischen Bearbeiter und Endaufbewahrer. Dafür führt das DZMB eine entsprechende Datenbank. Koordinatoren, Fahrtleiter und andere betroffene Wissenschaftler von Fahrten, während denen zoologisches Material gesammelt wird, sind verpflichtet, mit dem Materialarchiv zusammenzuarbeiten.

1. Nach jeder Fahrt, während der zoologisches Material gesammelt wurde, erhält das Archiv eine Nachricht über die Art der genommenen Proben und die verantwortlichen Wissenschaftler. Die jeweiligen Fahrtleiter sind für diesen Informationsfluss durch Übermittlung des Fahrtprogramms und des Fahrtberichtes verantwortlich.
2. Das Archiv holt auf einem Fragebogen spezifische Informationen über das Material ein (z.B. Umfang, Konservierung, Erstbearbeiter, Art der Erstbearbeitung, spezielle Wünsche des Erstbearbeiters). Es archiviert diese Information und stellt sie Interessenten zur Verfügung.
3. Das Materialarchiv gibt zu diesem Zwecke ein Informationsblatt heraus und leitet die Wünsche von Zweitbearbeitern an Sammler und Erstbearbeiter weiter. Es nimmt Materialwünsche bezüglich künftiger Fahrten entgegen und leitet sie weiter.
4. Deutschen Fahrten kann das Materialarchiv bei Bedarf einen Bordbiologen für die Erstbearbeitung und Dokumentation des Materials an Bord zur Verfügung stellen.
5. Das Materialarchiv versucht, in Absprache mit den Endaufbewahrern, zu erreichen, dass das Material - soweit möglich - innerhalb eines vernünftigen Zeitraumes bearbeitet wird. Es wird über Folgebearbeitungen auf dem Laufenden gehalten, deren Ergebnisse dem Sammler, Erstbearbeiter und der Deutschen Forschungsgemeinschaft bekannt gemacht werden. Die Endaufbewahrer sind verpflichtet, in diesem Sinne mit dem Materialarchiv zusammenzuarbeiten.
6. Der Sammler ist verpflichtet, Restproben von wissenschaftlichem Interesse dem

Materialarchiv zu schicken. Dafür stellt das DZMB Lagerräume zur Verfügung.

7. Die Anschrift des Materialarchivs lautet: Deutsches Zentrum für Marine Biodiversitätsforschung, Forschungsinstitut und Naturmuseum Senckenberg, Südstrand 44, D-26382 Wilhelmshaven. Email: pmartinez@senckenberg.de
8. Die Homepage des Materialarchivs lautet: [www.material-archiv.de](http://www.material-archiv.de)

## II. Endaufbewahrer

1. Als Endaufbewahrer kommen nur deutsche Forschungsmuseen in Frage, in denen die Infrastruktur zur Aufbewahrung und Pflege des Materials langfristig gesichert ist.
2. Für die unterschiedlichen Tiergruppen sollen solche Museen bevorzugt werden, die einen Bearbeiter stellen. Diese werden von den Museen verpflichtet, mit dem Materialarchiv zusammenzuarbeiten und es über Ergebnisse zu informieren. Eine aktualisierte Liste der zuständigen Endaufbewahrer befindet sich auf der Homepage des Materialarchivs.
3. Bei Vorliegen wichtiger Gründe kann das Materialarchiv nach Anhörung des betreffenden Endaufbewahrers den Aufbewahrungsort neu festlegen. Dies soll nicht routinemäßig aufgrund kurzlebiger Änderungen erfolgen. Ein wichtiger Grund wäre z.B. die Einrichtung einer Planstelle für einen Wissenschaftler, der eine bis dahin nicht an einem der Museen bearbeitete Tiergruppe übernimmt.

### Liste der für die Endaufbewahrung zuständigen Museen

Sind für eine Tiergruppe zwei Museen angegeben, so bedeutet dies, dass das erstgenannte federführend tätig ist.

|                                  |                        |
|----------------------------------|------------------------|
| Radiolaria                       | Senckenberg            |
| Foraminifera                     | Senckenberg            |
| Tintinnoidea                     | Kiel                   |
| Porifera                         | Senckenberg, Hamburg   |
| Hydrozoa                         | München, Hamburg       |
| Scyphozoa, Actinaria, Zoantharia | Hamburg, Senckenberg   |
| Madreporaria                     | Stralsund, Hamburg     |
| Octocorallia                     | Stralsund, Senckenberg |
| Ctenophora                       | Hamburg                |
| Bryozoa                          | Senckenberg            |
| Brachiopoda, Phoronida           | Berlin                 |
| Chaetognatha                     | Hamburg                |
| Tardigrada                       | Hamburg                |
| Polychaeta                       | Hamburg, Senckenberg   |
| Oligochaeta                      | Hamburg                |
| Nematoda                         | Senckenberg            |
| Kinorhyncha                      | Berlin                 |
| Loricifera                       | Senckenberg, Berlin    |
| Priapulida                       | Senckenberg            |

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| Rotifera                                   | Hamburg                                  |
| Gastrotricha                               | Berlin                                   |
| Plathelminthes, Gnathostomulida            | Hamburg                                  |
| Nemertini                                  | Hamburg                                  |
| Sipunculida, Echiurida                     | Senckenberg, Hamburg                     |
| Aplacophora                                | München, Hamburg                         |
| Polyplacophora                             | München, Senckenberg                     |
| Gastropoda                                 | München, Senckenberg, Hamburg            |
| Bivalvia                                   | Senckenberg, München, Hamburg, Stralsund |
| Scaphopoda                                 | Senckenberg                              |
| Cephalopoda                                | Hamburg                                  |
| Pantopoda                                  | München                                  |
| Acari                                      | Hamburg                                  |
| Tardigrada                                 | Hamburg                                  |
| Harpacticoidea (+ andere benth. Copepoden) | Senckenberg                              |
| Calanoida (+ andere plank. Copepoden)      | Hamburg                                  |
| Siphonostomatoida (+ parasit. Copepoden)   | Senckenberg                              |
| übrige Copepoda                            | Senckenberg                              |
| Ostracoda                                  | Hamburg, Senckenberg                     |
| Cirripedia                                 | Kiel                                     |
| Ascothoracida                              | Kiel                                     |
| Tantulocarida                              | Senckenberg                              |
| Leptostraca                                | Senckenberg                              |
| Mysidacea                                  | Hamburg                                  |
| Euphausiacea                               | Senckenberg, Hamburg                     |
| Decapoda, Stomatopoda                      | Senckenberg, München                     |
| Tanaidacea                                 | Hamburg, Berlin                          |
| Cumacea                                    | Hamburg                                  |
| Isopoda                                    | Hamburg, Senckenberg                     |
| Amphipoda                                  | Hamburg, Berlin                          |
| Insecta                                    | Senckenberg                              |
| Echinodermata                              | München, Hamburg                         |
| Tunicata                                   | Hamburg                                  |
| Pisces: Atlantik                           | Hamburg, Stralsund                       |
| Pisces: Indopazifik und Mittelmeer         | Senckenberg                              |
| Reptilia                                   | Senckenberg                              |
| Mammalia                                   | Stralsund                                |

#### **Anschriften:**

- Forschungsinstitut Senckenberg, Senckenberganlage 25, 60325 Frankfurt a. M.
- Zoologisches Institut und Zoologisches Museum, Martin-Luther-King-Platz 3, 20146 Hamburg
- Zoologisches Museum Kiel, Hegewischstr. 3, 24105 Kiel
- Zoologische Staatssammlung, Münchhausenstr. 21, 81247 München
- Deutsches Meeresmuseum, Katharinenberg 14-20, 18439 Stralsund
- Museum für Naturkunde, Invalidenstrasse 43, 10099 Berlin