

## Short cruise report of R/V Meteor cruise M72/1

**Dates:** February 07.2007 – February 20.2007

**Port calls:** Istanbul – Istanbul (Turkey)

**Chief scientist:** Richard Seifert, Institute of Biogeochemistry and Marine Chemistry,  
University of Hamburg

### List of participants:

Seifert, Richard	Chief scientist	IfBM
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Lendt, Ralf	Gas-chemistry	IfBM
Oppermann, Birte	Biogeochemistry	IfBM
Warmuth, Marco	Gas-chemistry	IfBM
Rathmeyer, Volker	ROV-Team	MARUM
Rehage, Ralf	ROV-Team	MARUM
Reuter, Michael	ROV-Team	MARUM
Buhmann, Sitta	ROV-Team	MARUM
Suck, Inken	ROV-Team	MARUM
Hüttich, Daniel	ROV-Team	MARUM
Mai, Hung Anh	ROV-Team	MARUM
Kasten, Sabine	Geochemistry	AWI
Schlüter, Michael	Geochemistry	AWI
März, Christian	Geochemistry	RCOM
Scholten, Jan	Carbonates	IfM-GEOMAR
Amini, Marghalera	Carbonates	IfM-GEOMAR
Krüger, Martin	Microbiology	BGR
Zoch, Daniela	Microbiology	BGR
Siegert, Michael	Microbiology	BGR
Wenzhöfer, Frank	In Situ Sensors	MPI-Bremen
Stål, Henrik	In Situ Sensors	MBL
Carlsen, Ditte	In Situ Sensors	MBL
Larsen, Morten	In Situ Sensors	MBL
Nikolovska, Aneta	Echo sounding	RCOM
Artemov, Yuriy	Mapping	IBSS
Gulin, Sergej	Mapping	IBSS

IfBM: Institut für Biogeochemie und Meereschemie der Universität Hamburg

MARUM: Zentrum für Marine Umweltwissenschaften, Universität Bremen

AWI: Alfred Wegener Institut für Polar- und Meeresforschung, Bremerhaven

RCOM: DFG-Forschungszentrum Ozeanränder, Universität Bremen

IfM-GEOMAR: Leibniz-Institut für Meereswissenschaften an der Christian-Albrechts-Universität zu Kiel

BGR: Bundesanstalt für Geowissenschaften und Rohstoffe, Geozentrum Hannover

MPI: Max-Planck-Institut für Marine Mikrobiologie in Bremen

MBL: Marine Biological Laboratory, University of Copenhagen

IBSS: A.O. Kovalevsky Institute of Biology of the Southern Seas, Ukrainian Academy of Sciences

## Goals and work plan of the cruise M72/1

The Cruise M72/1 from February 07. to 20.2007 was dedicated to study gas vents and seeps in the northwestern Black Sea focusing on the zone of gas hydrate stability below 700m water depth. Target area is the Dnieper Canyon, featured by the availability of extended information from previous studies, in particular the projects GHOSTDABS (01.04.2001 to 31.03.2004) and BEBOP (cruise POS 317/2 in September 2004), both coordinated by the IfBM. Within a multidisciplinary approach combining excellent expertise from relevant scientific fields - i.e. biogeochemistry, microbiology, organic-geochemistry, marine geology, sedimentology, and geochemistry - main focus was be directed on five central topics:

- localization and investigation of gas escape structures at the seafloor,
- biogeochemical transformation of gases (methane, hydrogen),
- investigation and sampling of microbial mats,
- characterization of the microbial diversity in the vicinity of seeps and vents,
- gas transfer sediment - water column – atmosphere,
- studies on the biogeochemical milieu (sediments, waters and microbial structures).

Methodologies applied to obtain data and samples were:

- a remotely operated vehicle (ROV, QUEST 4000, MARUM, University of Bremen) for ocean floor investigations and sampling of microbial mats and water samples including the application of a profiler to obtaining geochemical profiles of the upper sediment layer *in-situ*;
- gravity corer (GC) and multi corer (MUC) for sediment sampling;
- CTD/Carousel water sampler for profiling and sampling of the water column;
- deep sea *in-situ* pumps (DSP) to gain samples of  $^{222}\text{Rn}$ ,  $^{226}\text{Ra}$  and uranium isotopes of fluids and the water column as well as of suspended matter for biogeochemical studies;
- Parasound and multi beam echo-sounding (EM 120 and EM 710) surveys for flare mapping and bathymetry.

In total, 62 stations were performed within the 11.5 working days including 8 ROV-dives, 23 sediment stations (MUC, GC), 22 water stations (CTD, DSP), and about 220nm of profiling (Parasound and multi beam echo sounding).

## Short narrative of the cruise (times are ship time, UTC + 2hrs.)

Already at the morning of the 05.02. the vanguard of the scientific party boarded R/V METEOR. After the scientific party was completely on board, all containers could be loaded in the course of the early afternoon of 06.02.2007. The rest of day was spent with unloading the containers, the distribution of equipment to the laboratories, and with installations of sampling gear. Istanbul harbour was left February 7<sup>th</sup> at noon and R/V METEOR steamed from the Asian part of Istanbul into the Bosphorus to the working area in the north-western Black Sea. The working area was reached after 22hrs steaming with the help of a fresh breeze from astern. Weather kept being a friendly partner throughout the whole cruise. Work proceeded until the 19.02.2007 within five areas or sites (see below). Station work was abandoned 19.02.2007 at 02:00 and R/V METEOR set forth to Istanbul to moor in the morning of the 20.02.2007 at

Ambarli, a container terminal at the European part of Istanbul. The scientific party debarked R/V METEOR in the evening after having loaded the scientific containers and launched the air freight.

With most of the obtained data and samples already accessible at the home laboratories, detailed work necessary to cover the above mentioned topics is currently in progress.

#### Site Krugly

Active gas seepage in a water depth of 833m has been observed in this area at 44°33.79'N° / 031°43.82'E. Investigation by ROV revealed gas is emanating from holes in the seafloor with no indications of associated fauna. Rising bubbles oscillate and no indications of gas hydrate skins were seen. Push cores were taken directly at the seep location.

#### Anaconda area

The area is located along the shelf edge between 032°45'E and 33°E. It is named after an about 500m wide and 50m deep E to W striking channel at 1700m water depth. Two sites were investigated in this area by ROV dives, site Deep Chimney covering a profile from 44°27.325'N / 032°48.673'E at 1600m to 44°25.325'N / 032°49.373'E at 915m and site High Jump embracing two main points of interest: 44°25.32' N / 032°57.78'E at 1730m and 44°26.20' N / 032°58.50'E at 870m water depth. Both sites were chosen based on information of Ukrainian colleagues reporting findings of authigen-formed carbonates and microbial mats by dredges and observations of chimney like structures during submersible dives. However, none of the three ROV-dives performed during M72/1 revealed indications of active or recent gas seepage. Neither gases emanating from the seafloor nor authigen-formed carbonates or microbial mats were observed. But, the dives yield impressive views on massive slides of sediment packages along the shelf-slope. The frequent occurrence of mass wasting processes might on the one hand transport structures generated at shallower areas to depth, on the other hand it should cover and destroy structures located within their pathways.

#### Site 720m

Evidence for active gas seepage within this area came from distinct flairs rooted at 44°40.624'N, 032°06.759'E at 719m depth, 44°40.734'N, 032°06.658'E at 717m. Investigation at the sea floor showed several ENE – WSW striking chains of active gas seeps. Push cores and water samples were taken directly at the seep location.

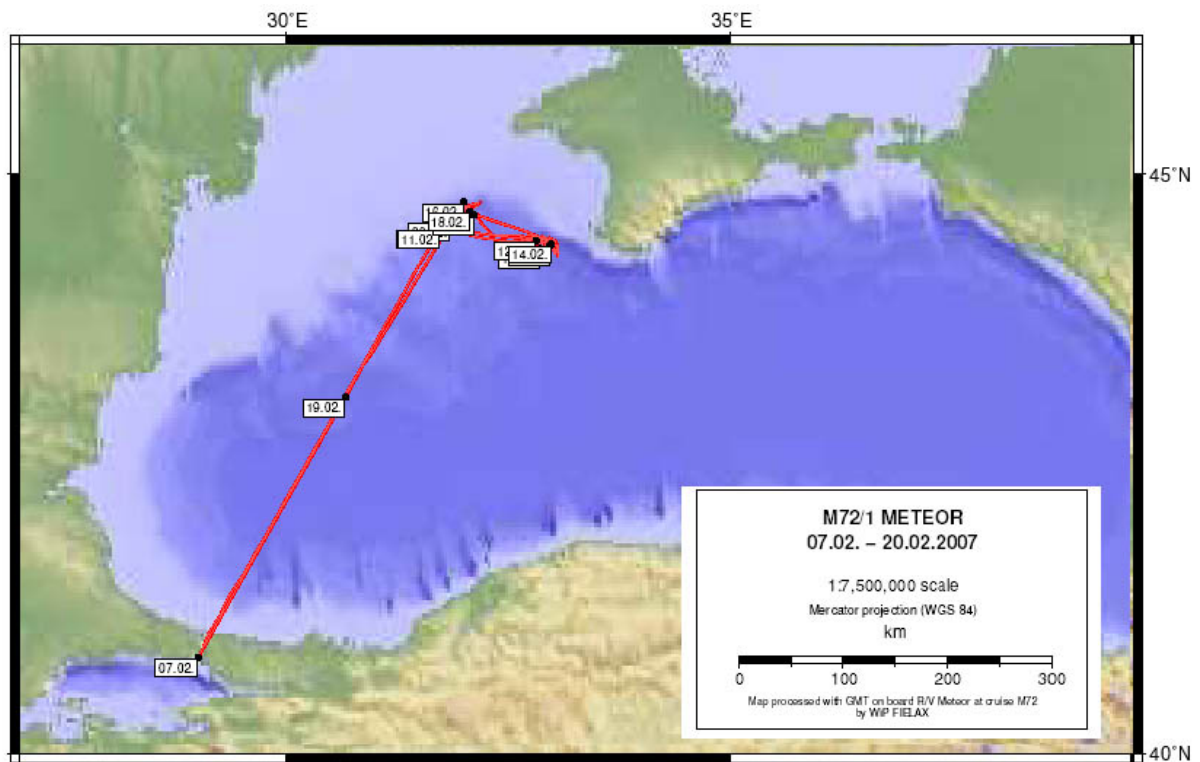
#### GHOSTDABS field

Viewed for the first time in 2001 at 44°46.47'N, 031°59.52'E during a cruise with R/V Professor Logatchev coordinated by the IfBM in Hamburg, the GHOSTDABS field harbours a forest of up to 5m high carbonate structures. These impressive chimneys covering an area of about 25x25m are built by anaerobically methane oxidizing (AOM) microbial communities thriving on vigorous gas seeps at 235m depth. They are still the largest and, most probably, oldest living AOM related microbial reefs so far discovered in the Black Sea. Samples of microbial mats and carbonates as well as of waters and sediments were gained.

#### Site The Trolls

The site at 44°42.084'N, 032°03.916'E was chosen based on reported strong gas seepage at 730m water depth. This seep is the deepest within a chain of seeps lined up along a ridge structure of the shelf slope. Investigation by ROV revealed numerous small fields of holes in

the sediment releasing gas and neighbouring groups of up to 50cm high chimneys. Samples of microbial mats and carbonates as well as of waters and sediments were recovered.



Track of R/V METEOR cruise M72/1