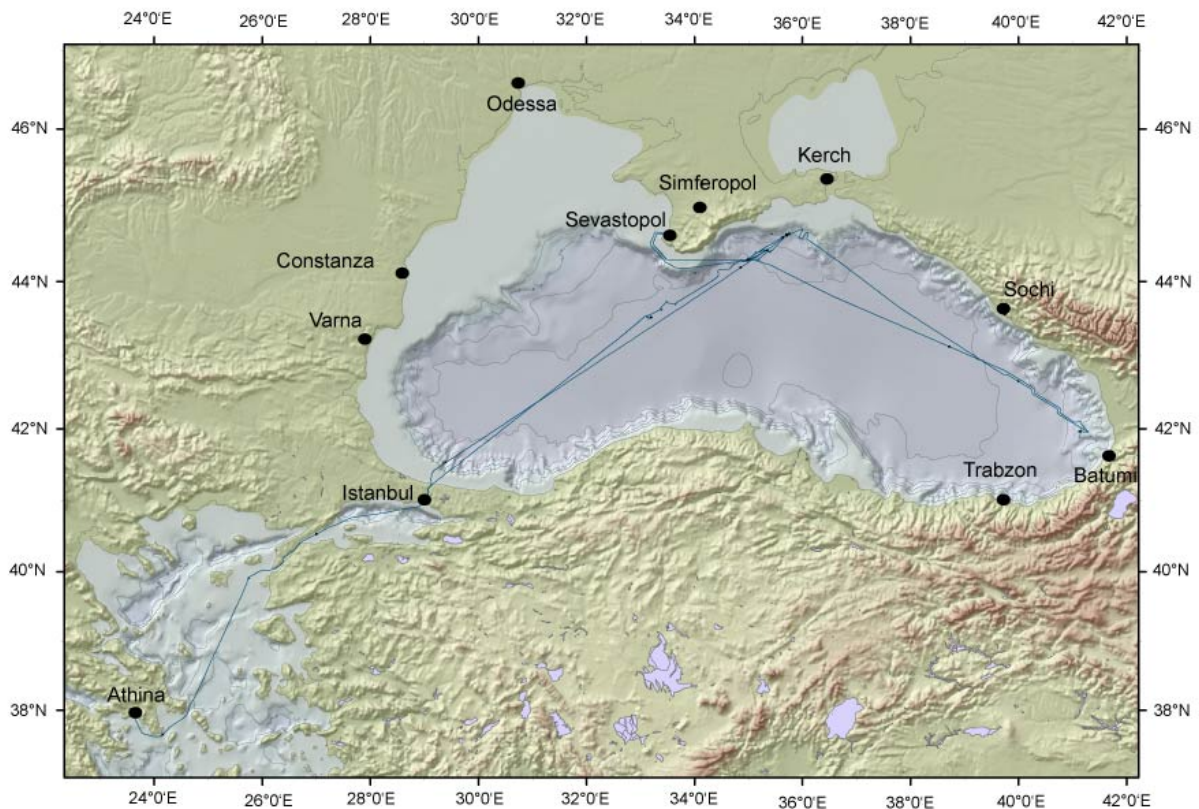


Gerhard Bohrmann  
MARUM - Center for Marine Environmental Sciences  
and Department of Geosciences,  
University of Bremen  
Post Box 330 440  
D-28334 Bremen, Germany

Phone: ++49 (0)421-218-65050  
Fax: ++49 (0)421-218-65099  
Email: [gbohrmann@marum.de](mailto:gbohrmann@marum.de)

**Short Cruise Report  
R/V MARIA S. MERIAN Cruise MSM15/2**

**Istanbul – Sevastopol – Istanbul  
10 May – 3 June 2010  
Chief Scientist: Gerhard Bohrmann  
Captain: Friedhelm von Staa, Ralf Schmidt**



Ship track of R/V MARIA S. MERIAN cruise MSM15/2 .

**Objectives**

Investigations of natural gas emission sites and gas hydrates within sediment deposits were the scientific mission of the cruise. This expedition was based on former results of earlier cruises and on the experiences of our cooperation partners in Russia and Ukraine. Methane emission sites from the seabed are well known from sediments in the Black Sea, and we

intended to define the emission rates of the methane using different methods. Methane emissions in the water column are connected to the presence of near-surface gas hydrate deposits. The quantification and the dynamics of gas hydrates are very important for geoscientists because methane as a greenhouse gas reaching the atmosphere can also be relevant for climate change. From sediments of the Black Sea the first gas hydrates ever had been recovered.

During this second leg of cruise 15, the autonomous underwater vehicle AUV SEAL 5000 and the remotely operating vehicle ROV QUEST 4000 as well as our autoclave piston corer was planned to deploy and were installed on board. The cruise with R/V MARIA S. MERIAN was planned in preparation of a MeBo drilling cruise which is now scheduled for 2011 (26 Feb - 2 April).

### **Cruise Narrative**

On 10 May 2010, R/V MARIA S. MERIAN cast off from the port of Haydapasar (Istanbul), at 8:42 local time, heading for the Black Sea. The pilot left the vessel at 10:05 and we could steam into the Black Sea towards the Crimean Peninsula. After a 12-hour transit through Turkish territory we reached the Ukrainian border where our research could start. We started the recording of Parasound and multibeam echosounder data in the area of the central province of mud volcanoes. By means of Parasound we verified the activities of some mud volcanoes, searching for gas emissions indicated by acoustic anomalies. In the western Sorokin Trough for the first time we found signs of gas emissions on the Dvurechenskii mud volcano (DSV) as well as above some other mud volcanoes in its neighbourhood. During a first dive with ROV QUEST (Dive 263) on Thursday 13 May, we could not find the temperature deployment from 2007. The first interpretation was that a mud eruption has plunged our mooring station to the deep mud. Contrary to the situation three years ago now free gas escapes in small quantities at several places which we interpreted as a last sign of a mud volcano eruption dying away. Further work concentrated mainly on a prominent gas emission in 900m water depth on the slope south of the Kerch Peninsula. There we could for the first time create a complete micro-bathymetric map during a 24-hour measurement with the AUV SEAL 5000. On Monday 17 May, two AUV mapping dives on the Dvurechenskii mud volcano were accomplished during daytime. Subsequently we did an ROV dive at a flare emission at a possible fault zone which had been newly detected by PARASOUND. Tuesday was characterised by recording profiles as well as sampling with the autoclave piston corer and the gravity corer. During the ROV dive in the evening we could retrieve the temperature mooring which we earlier thought had been lost on DSV. The successful recovery of the temperature logger will allow us to analyse the data of the temperature logger about the volcanic activities during the past three years. The AUV measurements done before had enabled us to determine the exact coordinates of the temperature mooring.

On Thursday 20 May, R/V MARIA S. MERIAN punctually passed the port entrance of Sevastopol and berthed on its scheduled place at Nachimow Quay. This quay is situated in the city center and just three walking minutes from the cooperating O.A. Kovalevski Institute (IBSS). The visit of MARIA S. MERIAN in Ukraine was the start of the "German week at the Crimean Peninsula" which had been accomplished by the German Embassy in Kiev. The event started at 11:00 with a press conference accomplished by the German Ambassador Hans-Jürgen Heimsoeth as well as representatives from the German Ministry of Education and Science (BMBF) and from the Ukrainian Academy of Sciences, under attendance of

more than 35 journalists and press representatives. In the afternoon we guided several groups of visitors across the vessel.

For the evening the Captain and the Chief Scientist had invited 120 guests and representatives of the public, including 13 Ambassadors from different EU-countries for a festive reception on board the vessel. The BMBF had also taken the opportunity of MARIA S. MERIAN's visit to invite for the workshop "Germany – Competent Partners in Marine Research" on 21 May. For this event also representatives of the most important German marine research institutions had arrived. On 22 May, R/V MARIA S. MERIAN left Sevastopol and arrived in the afternoon at the working area of the western Sorokin Trough. The last AUV map we had compiled on the „nameless mud volcano“ was the basis for our subsequent ROV dive which during the night became one of our highlights. Contrary to the flat Dvurechenskii mud volcano (Fig. 1) the "nameless mud volcano" is characterised by its detailed morphology. The biggest surprise was found in the mud volcano's center where considerable quantities of free gas bubbled into the water column. There were a big mud pond and several smaller mud pools to be found which were filled with very liquid mud, and where the methane emissions bubbled into the water in a very spectacular manner. A gravity core sampling was accomplished in the outer central area of the volcano, and a further gravity corer fitted with temperature loggers was discharged more than 50m deep into the seafloor of the centre. The existing temperature of 30°C showed the high activity of the mud volcano. Furthermore the Whitsunday was characterised by the transit to Georgia and gave opportunity to everybody for maintenance of our labs and devices as well as for personal matters.

After a 24-hour transit from the first research area at Ukraine through the Russian sector to Georgia, where we now had to accomplish a dive at the Batumi seep area. This is the area in the Black Sea with the strongest gas emission within the gas hydrate stability zone, and we have been prepared for an intense diving program here and at two oil seeps close by. During the first dive we analysed three of the known Batumi flare clusters, and a sonar module (called ASSMO) which would register the gas bubble streams for several days was left at cluster 3. After this first successful dive we accomplished an AUV mapping dive at the Colkhetti oil seep which is about 12km away. While AUV SEAL mapped its programmed track at the ground we could take first oil samples from the water surface in a rubber boat. In the late afternoon we were ordered to cease our work. The reason was that there were still some open questions on our research. As the following day was a Georgian holiday and we could already see the end of our cruise we decided to leave Georgia and to use the remaining time for work in Ukrainian waters. After a short dive to recover the ASSMO we steamed back to the eastern Sorokin Trough in Ukraine where the remaining four days would be used for detailed verification of three gas seeps. Those were the Kerch flare, the Helgoland mud volcano and a gas seep in 1700m water depth connected to a fault. We produced detailed micro-bathymetric maps of all the three locations with the AUV SEAL 5000 giving us high-definition orientation for the accomplished ROV dives, so that our sampling and measuring program was efficient and under complete consideration of the geological structures. The escaping gas could be successfully sampled at all the emission places. The fluxes of numerous bubble streams could successfully be defined, so that considering the exact seafloor mapping we could cover the regional extension of each seep. Due to this we will be able to present a quantification of gas emissions from the deep gas seeps of the Sorokin Trough soon after the analysis of the expedition. We stopped station work on Sunday 30 May

and started transit. On Monday, 31 May we passed the Bosphorus, Marmara Sea and Dardanelles towards the Mediterranean Sea where we berthed in the harbour of Elefsina (Greece) on Wednesday 2 May.

### Acknowledgements

We thank both captains, Friedhelm von Staa and Ralf Schmidt, and also their crew for the outstanding support of our scientific work on board the research vessel. At the same time we thank both teams of ROV and AUV, without their achievements we would not have reached our scientific goals. The ship time of MARIA S. MERIAN was provided by the Deutsche Forschungsgemeinschaft within the core program METEOR/MERIAN.

### Cruise participants

<b>Name</b>	<b>Working group</b>	<b>Affiliation</b>	<b>Participation</b>
Gerhard Bohrmann	Chief Scientist	GeoB	Leg 2a & b
Klaus Dehning	DAPC, Corers	MARUM	Leg 2a & b
Carmen Friese	ROV works	GeoB	Leg 2a & b
Akihiro Hiruta	GIS Mapping	MARUM	Leg 2a
Daniel Hüttich	ROV	MARUM	Leg 2a & b
Stephan A. Klapp	Sediments	GeoB	Leg 2a
Jan-Hendrik Körber	PARASOUND	MARUM	Leg 2a & b
Eberhard Kopiske	AUV	MARUM	Leg 2a & b
Hoang Anh Mai	ROV	MARUM	Leg 2a & b
Yann Marcon	GIS Mapping	MARUM	Leg 2b
Gerrit Meinecke	AUV	MARUM	Leg 2a & b
Thomas Pape	Gas Analyses	GeoB	Leg 2a & b
Volker Ratmeyer	ROV	MARUM	Leg 2a & b
Ralf Rehage	ROV	MARUM	Leg 2a & b
Jens Renken	AUV	MARUM	Leg 2a & b
Christian Reuter	ROV	MARUM	Leg 2a & b
Michael Reuter	ROV	MARUM	Leg 2a & b
Miriam Römer	Gas Quantification	GeoB	Leg 2a & b
Heiko Sahling	ROV Survey.	GeoB	Leg 2a & b
Paul Wintersteller	Karten	MARUM	Leg 2a & b
Marcel Zarrouk	ROV	MARUM	Leg 2a & b
Dmytro Yevtushenko	Observer	IBSS, Sevastopol	Leg 2a
Mikhail Ivanov	Geology	MSU, Moscow	Leg 2a
Tatiana Malakhova	Observer	IBSS, Sevastopol	Leg 2a
Evgeni Sakvarelidze	Observer	TSU, Tbilise	Leg 2b
Valentina Blinova	Geochemistry	MSU, Moscow	Leg 2b
George Komakhidze	Observer	BSMC, Tbilise	Leg 2b

### Participating Institutions

GeoB	Fachbereich Geowissenschaften, University of Bremen, Klagenfurter Str. 28334 Bremen, <b>Germany</b>
IBSS	A. O. Kovalevsky Institute of Biology of the Southern Seas, Ukrainian Academy of Sciences, 2 Nakhimov Av., 99011 Sevastopol, <b>Ukraine</b>
MSU	Geology and geochemistry of fuel minerals, Geological faculty Moscow State University, Leninskie Gory, 119992 Moscow, <b>Russia</b>
MARUM	MARUM Zentrum für marine Umweltwissenschaften, University of Bremen, Leobener Str., 28334 Bremen, <b>Germany</b>

TSU Faculty of Geography, Tbilisi State University, Cholokashvili Ave.,  
Tbilisi 0126, **Georgia**

BSMC National Environmental Agency\_Black Sea Monitoring Center, 51,  
Rustaveli str, 6010, Batumi, **Georgia**

**Scientific work/station work during MSM 15/2:**

AUV SEAL 5000 7 dives  
ROV QUEST 4000 10 dives  
DAPC 7 deployments  
Gravity cores with T-sensors 9 stations  
Gravity cores 6 stations  
Velocity profiles 4 stations  
TV-sled 1 deployment

**Station list**

			Time (UTC)		Begin / on seafloor		
Date	St. No.	Instrument	Begin	End	Latitude N	Longitude E	Water depth (m)
10.05.	544	SVP-1	23:42	00:39	43°17.729	32°41.892	2107
11.05.	545	PE-1	02:58	09:07	43°31.973	33°04.784	2160
11.05.	546	GC-T-1	09:30	11:16	43°32.003	33°06.830	2100
11.05.	547	AUV	12:57	13:33	43°37.020	33°20.740	0
11.05.	548	PE-2	13:52	18:27	43°37.140	33°20.900	2110
12.05.	549	PE-3	21:38	04:10	44°00.360	34°19.090	2138
12.05.	550	AUV-29	06:02	13:44	44°17.010	34°59.679	
12.05.	551	SVP-2	10:27	10:40	44°16.961	35°00.006	
12.05.	552	DAPC-1	14:04	16:01	44°17.280	35°00.040	2086
12.05.	553-1	GC-1	16:48	17:56	44°17.270	35°00.056	2088
12.05.	553-2	GC-2	18:25	19:25	44°17.280	35°00.040	2087
12.05.	554	GC-T-2	20:03	21:11	44°16.990	34°59.110	2059
12.05.	555	GC-T-3	21:38	22:45	44°16.910	34°58.770	2059
12.05.	556	PE-4	22:53	04:53	44°16.920	34°58.780	
13.05.	557	PE-5	06:06	07:07	44°17.340	34°59.910	
13.05.	558	ROV-263	09:20	18:56	44°16.986	34°58.899	2040
13.05.	559	PE-6	19:32	02:14	44°17.330	35°00.170	
14.05.	560	AUV-30	03:40	05:36	44°16.985	34°59.746	
14.05.	561	PE-7	07:30	08:47	44°22.811	34°59.198	1820
14.05.	562	GC-3	09:09	09:54	44°23.003	35°09.275	1813
14.05.	563	DAPC-2	10:25	11:54	44°23.021	35°09.279	1812
14.05.	564	PE-8	14:21	15:38	44°37.180	35°41.900	896
14.05.	565	ROV-264	16:41	03:15	44°37.198	35°42.241	908
15.05.	566	AUV-31	04:59	05:47	44°36.783	35°42.739	908
15.05.	567	ROV-265	18:14	06:10	44°37.198	35°42.332	912
16.05.	568	GC-T-4	06:29	07:11	44°37.215	35°42.286	880
16.05.	569	DAPC-3	07:43	08:38	44°37.218	35°42.284	880
16.05.	570	PE-9	08:52	12:15	44°37.297	35°42.128	904
16.05.	571	PE-10	13:46	02:45	44°24.641	35°25.830	1747
17.05.	572	AUV-32	05:12	15:08	44°16.911	34°59.295	
17.05.	573	SVP-3	06:09	06:44	44°16.775	34°59.316	
17.05.	574	ROV-266	17:53	04:22	44°24.879	35°20.644	1730
18.05.	575	GC-4	05:13	05:55	44°25.302	35°16.080	1698
18.05.	576	GC-5	06:22	07:17	44°25.328	35°15.869	1717

18.05.	577	DAPC-4	08:11	09:28	44°25.310	35°16.075	1679
18.05.	578	PE-11	09:58	10:37	44°23.949	35°12.643	1785
18.05.	579	GC-T-5	11:42	14:04	44°17.040	34°58.880	2057
18.05.	580	GC-T-6	14:30	16:49	44°17.041	34°58.891	2057
18.05.	581	ROV-267	17:33	04:39	44°16.946	34°58.857	2058
19.05.	582	AUV-33	05:45	15:55	44°16.889	34°59.141	2066
22.05.	583	ROV-268	16:41	05:01	44°17.277	35°00.069	2066
23.05.	584	GC-6	05:34	06:28	44°17.347	35°00.164	2101
23.05.	585	GC-T-7	07:22	09:44	44°17.311	35°00.037	2104
23.05.	586	POSI	10:20	13:43	44°18.459	34°59.850	2056
24.05	587	PE-12	14:10	15:53	42°05.828	41°01.298	2072
24.05	588	ROV-269	17:00	03:11	41°57.428	41°17.420	834
25.05.	589	DAPC-5	04:26	05:34	41°58.058	41°06.189	1129
25.05.	590	AUV-34	06:35	15:33	41°57.680	41°07.009	1125
25.05.	591	SVP-4	10:53	11:25	41°57.369	41°06.568	1125
25.05.	592	ROV-270	18:56	21:08	41°57.580	41°17.229	860
26.05.	593	PE-13	21:30	03:01	44°33.948	36°04.778	975
27.05.	594	AUV-35	05:20	10:06	44°36.886	35°42.378	896
27.05.	595	GC-T-8	10:40	11:26	44°37.219	35°42.295	896
27.05.	596	TV-S	12:13	14:39	44°37.216	35°42.282	897
27.05.	597	ROV-271	15:22	02:04	44°37.191	35°42.291	897
28.05.	598	DAPC-6	02:22	03:33	44°37.222	35°42.275	895
28.05.	599	AUV-36	06:35	17:16	44°24.938	35°19.742	1748
28.05.	600	ROV-272	19:17	04:43	44°17.298	35°00.048	2068
29.05.	601	AUV-37	06:52	09:43	44°23.449	35°08.882	
29.05.	602	PE-14	10:32	13:13	44°23.348	35°08.758	1796
29.05.	603	GC-T-9	13:41	14:41	44°24.867	35°20.679	1748
29.05.	603-2	DAPC-7	14:47	16:22	44°24.874	35°20.690	1748
29.05.	603-3	ROV-273	17:00	01:24	44°24.848	35°20.673	1748