Dr. Jens Karstens
GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
Wischhofstr. 1-3
24148 Kiel
Germany

Phone: +49 431 600-2415
Fax: +49 431 600-2922
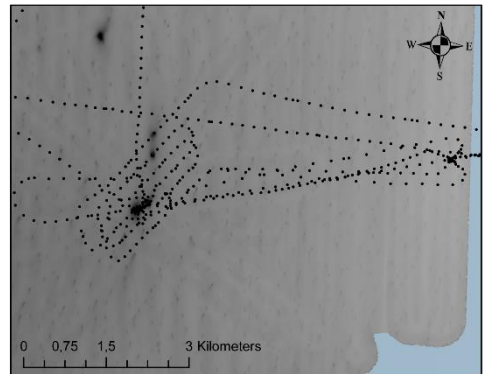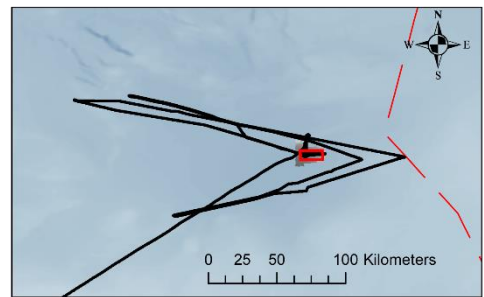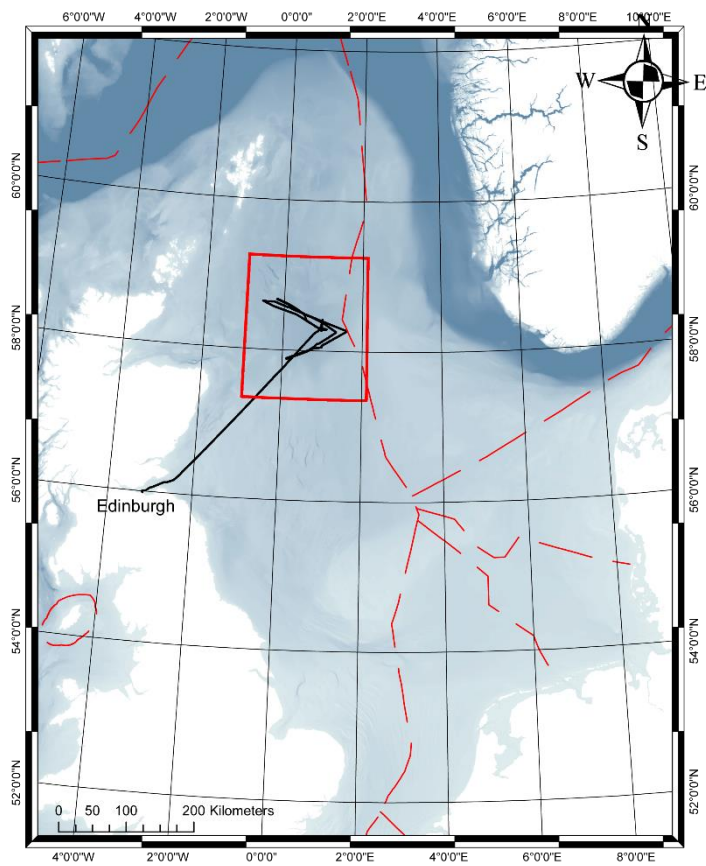Email: jkarstens@geomar.de

Short Cruise Report
Maria S. Merian – MSM78

Edinburgh – Edinburgh
16th October – 25th October, 2018

Chief scientist: Dr. Jens Karstens
Captain: Ralf Schmidt

Cruise track

Objectives

Focused fluid conduits affect the migration of gas in marine sediments and represent potential leakage pathways in the overburden of CO_2 storage formations. The EU funded project "Strategies for Environmental Monitoring of Marine Carbon Capture and Storage" investigates the hydraulic properties of natural and manmade fluid pathways to facilitate a more reliable environmental risk assessment. The key parameters for the assessment are the hydraulic properties of focused fluid conduits and their temporal evolution. These were analyzed with multiple acoustic and electro-magnetic surveys at the Scanner Pockmark in the British sector of the North Sea during the first leg of research cruise MSM63 in May 2017. The second leg could not be completed due to technical problems and the planned seafloor drilling operations were conducted during MSM78. We used the seafloor-drilling device RockDrill2 to obtain four sediment cores at two separate sites (two within the pockmark and two at a reference site). The drilling operation recovered more than 22 m of core material and recorded a gamma-ray log at the pockmark site. In addition, we collected seven gravity cores within the pockmark and at the reference site recovering about 30 m of sediments. The sediment cores will be analyzed geochemically and geophysically during the next months and the results will be combined with the geophysical results of MSM63. Furthermore, we recorded 24 profiles with the Parasound and the EM712 multibeam echosounder systems.

Narrative

After the mobilization of the RockDrill2 we left Edinburgh harbor in the afternoon of the 16th of October and sailed to the study area in the Central North Sea. We reached the area covered by our research permit around 02:00 (UTC) 17th of October and collected a first water sound velocity profile for calibrating the hydroacoustic experiments and started recording Parasound and EM712 data connecting dataset from previous cruises. In the afternoon, we reached the study area around the Scanner Pockmark, collected an additional water sound velocity profile, and surveyed the previously chosen RockDrill2 sites. At 16:00 (UTC), we deployed RockDrill2 at the reference core location. The drilling operation started at 20:40 (UTC). On the 19th of October At 6:52 (UTC), the drilling operation was stopped after reaching a depth of 24 m and the RockDrill2 was recovered. The obtained sediment cores were immediately cut and pore water samples were taken. During the recovery of the samples and re-equipment of the RockDrill2, we collected additional bathymetric data. Around 16:00 (UTC), RockDrill2 was deployed at the main core location within the Scanner Pockmark to conduct a drilling recovery test. Between 16:14 and 18:30 (UTC), RockDrill2 reached a depth of 3.4 m and was recovered to evaluate the used configuration. At 22:30 (UTC), RockDrill2 was deployed again, but had a technical problem and had to be recovered again. After fixing the technical problem, RockDrill2 was deployed again at 02:00 (UTC) of the 20th of October and drilled to a depth of 10.3 m, which was reached at 15:20 (UTC). Afterwards, the borehole was scanned using the OAG logging tool and RockDrill2 was recovered around 18:00 (UTC). The obtained sediment core segments were recovered, cut and sampled. RockDrill2 was re-equipped for a final drilling operation at the reference site and deployed at 21:30. Open-hole drilling to a depth of 31 m began at 22:12 (UTC) and was followed by coring of two sections reaching a maximum depth of 34.3 m. Due to technical problems with the top-drive of RockDrill2, the drilling operation had to be stopped and systems was recovered at 18:45 (UTC) of the 21st of October. In the evening wind speed and wave height increased and it was not possible to conduct additional RockDrill2 operations. At 19:20 (UTC), we started recording additional hydroacoustic profiles. On the 22nd and 23rd of October, the wind reached force 7 to 9 for a period of more than 50 hours and we could only collect hydroacoustic profiles following the main wave direction during this period. On the 24th of October at 7:00 (UTC), we began collecting gravity cores. Five gravity cores were obtained within the Scanner Pockmark at three different sites and two at the reference core site. We recorded a final water sound velocity profile at 12:37 (UTC) and collected a final Parasound profile before sailing back to Edinburgh. We arrived Edinburgh in the afternoon of the 25th of October and started with the demobilization.

Teilnehmerliste

1.	Dr. Jens Karstens	Chief scientist	GEOMAR
2.	Christoph Böttner	Hydroacoustics	GEOMAR
3.	Bettina Schramm	Hydroacoustics	GEOMAR
4.	Rebecca Kühn	Hydroacoustics	GEOMAR
5.	Michael Wilson	RockDrill2	BGS
6.	Will Lewis	RockDrill2	BGS
7.	David Baxter	RockDrill2	BGS
8.	Iain Pheasant	RockDrill2	BGS
9.	Apostolos Tsiligiannis	RockDrill2	BGS
10.	Rodrique Akkari	RockDrill2	BGS
11.	David Bailey	RockDrill2	BGS
12.	Paul Kane	RockDrill2	BGS
13.	Ewan Brown	RockDrill2	BGS
14.	Dr. Anna Lichtschlag	Marine Geochemistry	NOCS
15.	Dr. Anita Flohr	Marine Geochemistry	Soton
16.	Mike Edwards	Coring	NOCS
17.	Dr. Ismael Falcon-Suarez	Marine Geochemistry	NOCS
18.	Ben Roche	Hydroacoustics	NOCS
19.	Prof. Dr. Rachael James	Marine Geochemistry	Soton
20.	Dr. Doris Maicher	Coring	GEOMAR
21.			

Institutes

GEOMAR	GEOMAR Helmholtz Centre for Ocean Research Kiel Marine Geodynamics, Wischhofstr. 1-3, 24148 Kiel, Germany
BGS	British Geological Survey, The Sir George Bruce Building, Research Avenue South, Edinburgh, EH14 4AP, U.K.
NOCS	National Oceanography Centre, European Way, Southampton SO14 3ZH, U.K.
Soton	University of Southampton, European Way, SO14 3ZH, Southampton, U.K.

Station List

Activity - Device Operation	Timestamp	Device	Action	Depth (m)	Speed (kn)	Course	Latitude (deg)	Longitude (deg)
MSM78_0_Underway-3	16.10.2018 17:24	Parasound	profile start	56.4	13	49	56.181.625	-2.462.562
MSM78_0_Underway-4	16.10.2018 19:15	Multibeam Echosounder	profile start	58.9	13	39	56.497.134	-2.027.991
MSM78_1-1	17.10.2018 02:08	Sound Velocity Profiler	in the water	95.3	0	82	57.626.239	-0.438202
MSM78_1-1	17.10.2018 02:13	Sound Velocity Profiler	max depth/on ground	94.9	0	243	57.626.235	-0.438046
MSM78_1-1	17.10.2018 02:19	Sound Velocity Profiler	on deck	95	0	244	57.626.029	-0.438478
MSM78_2-1	17.10.2018 02:54	Parasound	profile start	96.9	0	49	5.762.571	-0.43897
MSM78_2-1	17.10.2018 07:25	Parasound	alter course	121.4	7	65	58.130.522	-0.25958
MSM78_2-1	17.10.2018 11:42	Parasound	alter course	147.1	7	89	58.156.995	0.67561
MSM78_2-1	17.10.2018 13:28	Parasound	profile end	146.3	6	52	58.283.346	0.979136
MSM78_3-1	17.10.2018 13:36	Sound Velocity Profiler	in the water	153.5	0	198	58.284.555	0.982709
MSM78_3-1	17.10.2018 13:42	Sound Velocity Profiler	max depth/on ground	152.8	0	255	58.284.556	0.982684
MSM78_3-1	17.10.2018 13:49	Sound Velocity Profiler	on deck	153.7	0	249	58.284.571	0.98271
MSM78_4-1	17.10.2018 14:18	Parasound	profile start	147.1	2	80	58.280.272	0.954982
MSM78_4-1	17.10.2018 15:07	Parasound	profile end	138.8	5	79	58.292.796	1.082.632
MSM78_5-1	17.10.2018 16:06	MEBO Seafloor Drill	lowering	139.6	0	332	58.291.363	106.687
MSM78_5-1	17.10.2018 16:17	MEBO Seafloor Drill	information	140.5	0	156	58.291.357	1.066.871
MSM78_5-1	17.10.2018 16:39	MEBO Seafloor Drill	information	139.9	0	270	58.291.358	1.066.863
MSM78_5-1	17.10.2018 16:39	MEBO Seafloor Drill	hoisting	140.1	0	74	58.291.357	1.066.868
MSM78_6-1	17.10.2018 19:28	MEBO Seafloor Drill	lowering	148	0	46	58.291.352	1.066.775
MSM78_6-1	17.10.2018 19:28	MEBO Seafloor Drill	information	148.4	0	256	58.291.352	1.066.778
MSM78_6-1	17.10.2018 19:38	MEBO Seafloor Drill	max depth/on ground	148	0	271	58.291.362	1.066.783
MSM78_6-1	17.10.2018 20:39	MEBO Seafloor Drill	Start drilling	148.4	0	119	58.291.373	1.066.785
MSM78_6-1	19.10.2018 06:52	MEBO Seafloor Drill	End of drilling	146.9	0	158	58.290.904	1.067.239

MSM78_6-1	19.10.2018 09:55	MEBO Seafloor Drill	hoisting	139.5	0	169	58.290.932	106.725
MSM78_6-1	19.10.2018 10:07	MEBO Seafloor Drill	information	140.7	0	39	58.290.905	106.721
MSM78_6-1	19.10.2018 10:09	MEBO Seafloor Drill	information	139.6	0	246	58.290.928	1.067.223
MSM78_7-1	19.10.2018 10:31	Multibeam Echosounder	profile start	145	5	223	58.285.697	0.988242
MSM78_7-1	19.10.2018 10:44	Multibeam Echosounder	alter course	145.9	5	230	58.273.373	0.966748
MSM78_7-1	19.10.2018 10:48	Multibeam Echosounder	alter course	146.2	7	348	58.277.856	0.960014
MSM78_7-1	19.10.2018 11:02	Multibeam Echosounder	alter course	144.6	4	89	58.293.006	0.985943
MSM78_7-1	19.10.2018 11:05	Multibeam Echosounder	alter course	145.1	5	207	58.289.528	0.988843
MSM78_7-1	19.10.2018 11:20	Multibeam Echosounder	alter course	146.2	5	325	58.276.076	0.961968
MSM78_7-1	19.10.2018 11:37	Multibeam Echosounder	alter course	145.1	5	81	58.295.479	0.984283
MSM78_7-1	19.10.2018 11:55	Multibeam Echosounder	alter course	144.9	6	222	58.275.938	0.960584
MSM78_7-1	19.10.2018 12:19	Multibeam Echosounder	alter course	121.6	6	44	58.301.386	0.987954
MSM78_7-1	19.10.2018 12:50	Multibeam Echosounder	alter course	138	4	262	58.293.058	109.257
MSM78_7-1	19.10.2018 13:31	Multibeam Echosounder	profile end	145.2	7	262	58.279.228	0.946098
MSM78_8-1	19.10.2018 15:40	MEBO Seafloor Drill	information	159.5	0	291	58.281.471	0.970022
MSM78_8-1	19.10.2018 15:55	MEBO Seafloor Drill	max depth/on ground	160.7	0	6	582.815	0.970011
MSM78_8-1	19.10.2018 16:14	MEBO Seafloor Drill	Start drilling	160	0	16	58.281.468	0.970017
MSM78_8-1	19.10.2018 18:30	MEBO Seafloor Drill	End of drilling	159.2	0	188	58.281.692	0.969916
MSM78_8-1	19.10.2018 18:46	MEBO Seafloor Drill	hoisting	160.7	0	224	58.281.672	0.969884
MSM78_8-1	19.10.2018 18:59	MEBO Seafloor Drill	information	160.3	0	114	58.281.682	0.969887
MSM78_9-1	19.10.2018 22:20	MEBO Seafloor Drill	information	160.7	0	133	5.828.173	0.969866
MSM78_9-1	19.10.2018 22:29	MEBO Seafloor Drill	lowering	160.3	0	6	58.281.728	0.969867
MSM78_9-1	19.10.2018 23:02	MEBO Seafloor Drill	information	160.1	0	39	58.281.727	0.969863
MSM78_10-1	20.10.2018 01:40	MEBO Seafloor Drill	information	159.9	0	299	58.281.616	0.969895

MSM78_10-1	20.10.2018 01:48	MEBO Seafloor Drill	lowering	160.3	0	74	58.281.617	0.969866
MSM78_10-1	20.10.2018 02:17	MEBO Seafloor Drill	max depth/on ground	159.4	0	311	58.281.608	0.969831
MSM78_10-1	20.10.2018 02:51	MEBO Seafloor Drill	Start drilling	159.6	0	99	58.281.603	0.969811
MSM78_10-1	20.10.2018 15:19	MEBO Seafloor Drill	End of drilling	163.8	0	128	58.281.307	0.97027
MSM78_10-1	20.10.2018 17:48	MEBO Seafloor Drill	hoisting	163.4	0	51	58.281.313	0.970252
MSM78_10-1	20.10.2018 18:03	MEBO Seafloor Drill	information	163.4	0	327	58.281.304	0.970243
MSM78_11-1	20.10.2018 21:22	MEBO Seafloor Drill	information	148.2	0	165	58.291.104	1.066.878
MSM78_11-1	20.10.2018 21:25	MEBO Seafloor Drill	lowering	148.4	0	126	58.291.096	10.669
MSM78_11-1	20.10.2018 21:36	MEBO Seafloor Drill	max depth/on ground	148.2	0	330	58.291.098	1.066.898
MSM78_11-1	20.10.2018 22:12	MEBO Seafloor Drill	Start drilling	148	0	99	58.291.098	1.066.899
MSM78_11-1	21.10.2018 11:36	MEBO Seafloor Drill	End of drilling	148.7	0	302	58.291.373	1.066.734
MSM78_11-1	21.10.2018 18:45	MEBO Seafloor Drill	information	148.7	0	102	58.291.348	1.066.719
MSM78_11-1	21.10.2018 18:46	MEBO Seafloor Drill	information	147.1	0	223	58.291.348	10.667
MSM78_12-1	21.10.2018 19:23	Parasound	profile start	144.5	5	272	58.292.074	1.076.954
MSM78_12-1	22.10.2018 00:10	Parasound	alter course	139.2	5	293	58.481.323	0.307104
MSM78_12-1	22.10.2018 03:44	Parasound	alter course	122.6	5	277	58.577.809	-0.275359
MSM78_12-1	22.10.2018 05:19	Parasound	alter course	119.5	6	298	58.641.081	-0.540425
MSM78_12-1	22.10.2018 06:41	Parasound	alter course	122.9	7	94	58.638.833	-0.257553
MSM78_12-1	22.10.2018 15:26	Parasound	profile end	96.4	7	119	58.273.887	1.611.315
MSM78_13-1	22.10.2018 15:34	Parasound	information	97.1	6	244	58.269.366	1.601.802
MSM78_13-1	22.10.2018 20:03	Parasound	alter course	138.2	7	216	58.074.057	0.981763
MSM78_13-1	22.10.2018 20:15	Parasound	alter course	177.8	4	258	58.049.798	0.968915
MSM78_13-1	22.10.2018 21:36	Parasound	alter course	144.5	5	241	58.030.486	0.753408
MSM78_13-1	22.10.2018 22:32	Parasound	alter course	149.3	5	244	57.990.635	0.608497

MSM78_13-1	23.10.2018 01:26	Parasound	alter course	120.2	6	247	57.883.189	0.116865
MSM78_13-1	23.10.2018 04:21	Parasound	alter course	147.3	7	73	58.010.081	0.657872
MSM78_13-1	23.10.2018 05:05	Parasound	alter course	146.3	7	52	58.058.707	0.792717
MSM78_13-1	23.10.2018 05:30	Parasound	alter course	142.7	7	32	58.093.553	0.849508
MSM78_13-1	23.10.2018 05:46	Parasound	alter course	141.6	7	82	58.101.098	0.906688
MSM78_13-1	23.10.2018 06:55	Parasound	alter course	136.7	7	56	58.175.529	1.115.757
MSM78_13-1	23.10.2018 07:05	Parasound	alter course	136.4	6	25	58.184.485	1.143.464
MSM78_13-1	23.10.2018 08:08	Parasound	information	116.8	7	34	58.254.357	1.331.792
MSM78_13-1	24.10.2018 03:49	Parasound	alter course	141.6	7	114	58.491.063	0.509915
MSM78_13-1	24.10.2018 04:45	Parasound	alter course	142.8	6	158	58.399.291	0.577632
MSM78_13-1	24.10.2018 06:46	Parasound	profile end	155.6	7	122	58.281.741	0.969614
MSM78_14-1	24.10.2018 07:11	Gravity corer	in the water	168.2	0	169	58.281.468	0.970919
MSM78_14-1	24.10.2018 07:19	Gravity corer	max depth/on ground	170.4	0	184	58.281.483	0.970913
MSM78_14-1	24.10.2018 07:20	Gravity corer	hoisting	169.8	0	56	58.281.467	0.970932
MSM78_14-1	24.10.2018 07:29	Gravity corer	on deck	168.2	0	114	58.281.486	0.97094
MSM78_15-1	24.10.2018 08:18	Gravity corer	in the water	171.5	0	179	58.281.474	0.970941
MSM78_15-1	24.10.2018 08:24	Gravity corer	max depth/on ground	168	0	303	58.281.461	0.970914
MSM78_15-1	24.10.2018 08:25	Gravity corer	hoisting	167.8	0	8	58.281.468	0.970913
MSM78_15-1	24.10.2018 08:34	Gravity corer	on deck	170.4	0	172	58.281.445	0.970954
MSM78_16-1	24.10.2018 08:55	Gravity corer	in the water	169.1	0	184	58.281.421	0.970666
MSM78_16-1	24.10.2018 09:00	Gravity corer	hoisting	168	0	201	58.281.423	0.970696
MSM78_16-1	24.10.2018 09:00	Gravity corer	max depth/on ground	169.1	0	254	58.281.438	0.970709
MSM78_16-1	24.10.2018 09:08	Gravity corer	on deck	171.1	0	92	58.281.427	0.970711
MSM78_17-1	24.10.2018 09:26	Gravity corer	in the water	163.2	0	352	58.282.396	0.974601

MSM78_17-1	24.10.2018 09:31	Gravity corer	max depth/on ground	165.4	0	198	58.282.406	0.974605
MSM78_17-1	24.10.2018 09:32	Gravity corer	hoisting	166.2	0	164	58.282.408	0.974637
MSM78_17-1	24.10.2018 09:40	Gravity corer	on deck	163.6	0	327	58.282.413	0.974638
MSM78_18-1	24.10.2018 09:58	Gravity corer	in the water	164.5	0	290	58.282.408	0.974658
MSM78_18-1	24.10.2018 10:02	Gravity corer	max depth/on ground	163.8	0	38	58.282.403	0.974632
MSM78_18-1	24.10.2018 10:03	Gravity corer	hoisting	166.2	0	267	58.282.419	0.97468
MSM78_18-1	24.10.2018 10:11	Gravity corer	on deck	164.9	0	48	58.282.394	0.974616
MSM78_19-1	24.10.2018 10:53	Gravity corer	in the water	148.2	0	193	58.291.012	1.068.097
MSM78_19-1	24.10.2018 10:57	Gravity corer	max depth/on ground	147.6	0	285	58.291.052	1.067.992
MSM78_19-1	24.10.2018 10:58	Gravity corer	hoisting	145.6	0	358	58.291.054	1.068.016
MSM78_19-1	24.10.2018 11:06	Gravity corer	on deck	149.5	0	179	58.291.071	106.797
MSM78_20-1	24.10.2018 11:19	Gravity corer	in the water	146.7	0	15	58.291.048	1.067.983
MSM78_20-1	24.10.2018 11:23	Gravity corer	max depth/on ground	148.9	0	143	58.291.083	1.067.842
MSM78_20-1	24.10.2018 11:32	Gravity corer	on deck	148.2	1	65	5.829.106	1.068
MSM78_21-1	24.10.2018 12:37	Sound Velocity Profiler	in the water	161	0	75	58.281.352	0.971049
MSM78_21-1	24.10.2018 12:43	Sound Velocity Profiler	max depth/on ground	162.5	0	21	58.281.346	0.971063
MSM78_22-1	24.10.2018 12:50	Parasound	profile start	161	0	170	58.281.327	0.971076
MSM78_21-1	24.10.2018 12:50	Sound Velocity Profiler	on deck	165.2	0	188	58.281.321	0.971079
MSM78_22-1	24.10.2018 14:24	Parasound	profile end	132.8	7	353	58.411.265	0.97076
MSM78_0_Underway-4	25.10.2018 10:35	Multibeam Echosounder	profile end	56.5	11	221	56.451.121	-2.028.672
MSM78_0_Underway-3	25.10.2018 12:20	Parasound	profile end	56.3	14	241	56.182.083	-2.458.849