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Short Cruise Report

MARIA S. MERIAN cruise MSM98/2 (GPF 20-3_073)

Emden – Emden (Germany)

26.01.2021 – 22.02.2021

Chief Scientist: Jens Schneider von Deimling

Captain: Ralf Schmidt

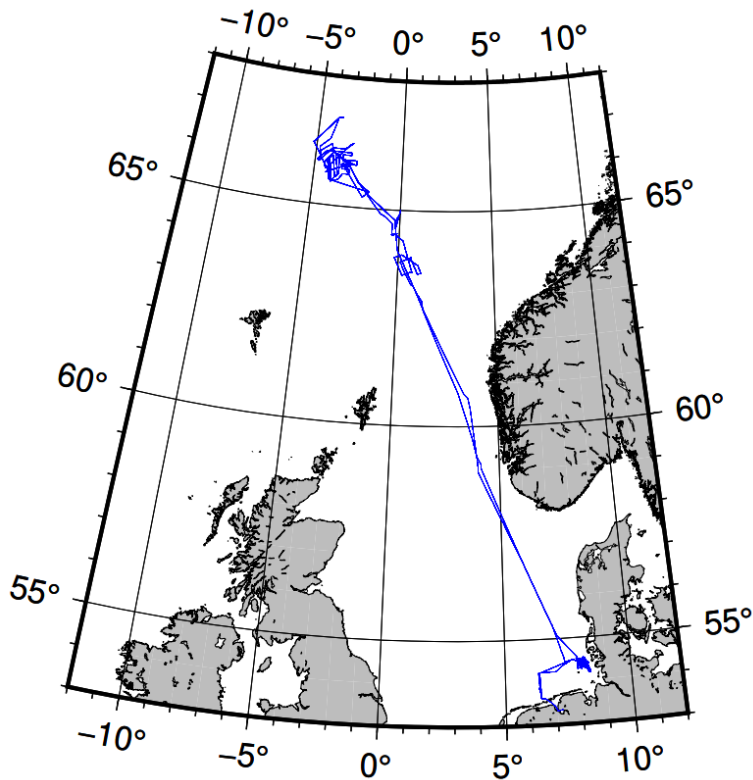


Figure 1: Overview of the MSM98_2 ships track (blue) connecting the two working areas. One is located offshore Norway extending to Aegir ridge, and the other being located in the German Bight between the island of Sylt and Heligoland.

Objectives

This cruise addresses two independent research topics. The first topic aimed to constrain the lateral extent and age of the Tampen Slide offshore Norway in order to assess the frequency of catastrophic landslides and associated hazards. The second objective was to image a glaciotectonic complex north of Heligoland in unprecedented detail in order to reconstruct its formation in relation to ice sheet progression and margins in the German Bight in the North Sea during glacial cycles.

Narrative

We departed port of EMDEN Tuesday, 26.01.2021, as scheduled 08:30 o'clock and ran first tests of hydroacoustic equipment near Heligoland. Afterwards we steamed towards North and entered Norwegian waters Wednesday 27.01 05:40 UTC. After 2.5 days we arrived in the first working area near the Tampen landslide headwall area Thursday 28.01 around 13 o'clock. Here we deployed the streamer seismic and our seismic source. After some technical problems we started with a softstart late afternoon and subsequently started our seismic surveying profile with the aim to connect the Tampen headwall area with Aegir ridge. In the evening of Friday, 29.01, the weather unexpectedly deteriorated with up to 6 m waves and wind gusts of 26 m/s and the streamer and airgun had to be recovered. We therefore abandoned seismic surveying and we subsequently ran both, dedicated subbottom profiler and multibeam echosounder lines on Saturday 30.01 and Sunday 31.01 to identify suitable gravity corer location within the Aegir ridge trough and adjacent areas. During the very limited amount of daylight we gathered 4 gravity cores on Monday 01.02 and Tuesday 02.02 with recoveries up to 5.5 m of fine grained material and refined our subbottom profiling during the nights. With decreasing swells we proceeded with our multichannel airgun seismics to correlate the landward side into the Aegir ridge. We faced major technical problems Wednesday 03.02 morning and abandoned the survey 10:22 UTC. The repair lasted several

hours during which the Danish royal airforce visited us by a helicopter and took some pictures from the vessel. Around 14:00 UTC we re-deployed the repaired streamer but two hours later the wind increased again to 20 m/s and we decided to abandon the survey and adjusted our survey directions to run all lines with the direction of the sea at day and reserved time to look for gravity corer positions during night in opposite direction. The strategy payed off and we found some excellent shallow sediment pinch-out areas being prone for gravity coring. Here, three gravity cores with up to 7.3 m recovery were conducted on Friday 05.02 northwest of the ridge axis in a basin on a morphological high. We found at least two turbidites in one of the cores. On Friday night we continued with our seismic surveying, re-deployed and soft started on Saturday 06.02 17 o'clock UTC and finished our program at Aegir ridge Sunday 07.02 8 o'clock UTC. In the night, we steamed upslope and deployed our streamer again to refine the previously found Tampen slide pinchout area likely caused by a morphological high at depth of unknown origin. We continued seismic surveying here until Wednesday 10.02 05:00 o'clock UTC in the morning under fairly calm weather conditions for the first time during this cruise. After sailing a subsequent roll calibration for the deep water multibeam echosounder in 1500 m water depth we started steaming back up the continental shelf towards our second research area in the German Bight. After steaming two days, were the seismic equipment was heavily tested on deck, we reached the working area being located between the island Sylt and Heligoland on Friday 12.02 and deployed and soft started the streamer seismic at 9:55 UTC together with a Micro GI airgun operated with only 130 bar. The new PARASOUND system on board was fine tuned to optimally image the palaeo landscape in parallel. Given the pleasant weather situation with a blocking high over Denmark and resulting easterly winds and minimum fetch for building waves, the seismo-acoustic survey ran throughout until Monday 12:00 UTC without any technical problems. We only interrupted the survey for airgun maintenance reasons, and continued the survey until it was finished 19.02 09:30 o'clock UTC. Subsequently we installed our NORBIT multibeam echosounder in the moonpool of R/V MERIAN for the first time and ran habitat mapping surveys with our multifrequency prototype system. Thus, first we had to run eights to calibrate our Applanix inertial navigation system at on 10.02 13:30 UTC by sailing 'fast eights' for one hour. Subsequently we ran densely spaced survey lines to cover a part of the previous seismic working area on 20.02 until noon time. Then we took four van-Veen grab samples to groundtruth the habitat mapping survey. We left the working area in the evening and sailed to the site 22 nm northwest of Heligoland to calibrate our own multibeam at the 'wreck' calibration site starting 22 o'clock. Subsequently a survey around the wreck was commenced. On Sunday 21.02 14 o'clock UTC we stopped the multifrequency multibeam echosounder surveying and recovered our device from the moonpool. Parasound and EM712 was continued until 21:00 o'clock, we then stopped the scientific program and started steaming towards Emden. Finally, the scientific/technical party disembarked and left the vessel 14:30 on 22.02 and headed back towards Kiel.

Acknowledgements

We would like to thank Captain Ralf Schmidt and the entire crew of R/V MARIA S. MERIAN for the excellent support during our cruise, for the hospitality and professional support throughout the cruise. We also acknowledge the support from the German Research Fleet Coordination Centre with organization and help during preparation and conduction of the cruise. The ship time was provided by the German Research Foundation (DFG) within the METEOR/MERIAN program.

Cruise participants (scientific crew)

1. Jens Schneider von Deimling	Chief Scientist	CAU
2. Arne Lohrberg	Seismics/Hydroacoustics	CAU
3. Qinqin Tang	Seismics/Hydroacoustics	CAU
4. Henrik Grob	Seismics/Hydroacoustics	CAU
5. Stine Hildebrandt	Seismics/Hydroacoustics	ZBSA
6. Frederik Lenz	Seismics/Hydroacoustics	CAU
7. Heiko Jähmlich	Technician	CAU
8. Sven Heinrich	Technician	CAU
9. Carolin Wallmeier	Hiwi	CAU
10. Anina Hinz	Hiwi	GEOMAR
11. Katharina Gross	Hiwi	CAU
12. Alexander Schmitz	Hiwi	CAU
13. Janne Scheffler	Hiwi	CAU

Institutes

CAU	- Christian-Albrechts-University Kiel
GEOMAR	- Hemholtz Centre for Ocean research Kiel
ZBSA	- Center for Baltic and Scandinavian Archaeology

Stationlist

Station ID	Date / Time	Device	Action	Position	Position	Depth
No.	[UTC]			Lat	Lon	[m]
MSM98/2_1-1	26.01.2021 17:02	EM712 Shallow-water Multibeam Echosounder	profile start	54° 26,017' N	007° 25,558' E	28,8
MSM98/2_2-1	28.01.2021 12:12	Seismic Towed Receiver	Streamer in water	62° 59,923' N	001° 09,827' E	1139
MSM98/2_2-2	28.01.2021 16:52	Seismic Source	profile start	63° 04,699' N	001° 01,597' E	1251,3
MSM98/2_2-3	28.01.2021 16:52	EM122 Deep-Sea Multibeam Echosounder	profile start	63° 04,737' N	001° 01,554' E	1248,7
MSM98/2_2-4	28.01.2021 16:52	Parasound P70	profile start	63° 04,738' N	001° 01,553' E	1248,7
MSM98/2_2-5	28.01.2021 18:55	Expendable Sound Velocimeter	in the water	63° 12,088' N	000° 53,621' E	1422,7
MSM98/2_3-1	30.01.2021 05:59	Seismic Towed Receiver	Streamer in water	64° 35,148' N	000° 13,290' W	2669,2
MSM98/2_3-2	30.01.2021 06:14	Seismic Source	Airgun in water	64° 35,782' N	000° 13,496' W	2675,5
MSM98/2_3-3	30.01.2021 06:45	EM122 Deep-Sea Multibeam Echosounder	profile start	64° 37,405' N	000° 13,987' W	2693,5
MSM98/2_3-4	30.01.2021 06:45	Parasound P70	profile start	64° 37,428' N	000° 13,994' W	2698,3
MSM98/2_4-1	30.01.2021 22:27	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 23,859' N	001° 58,336' W	3174,5
MSM98/2_4-2	30.01.2021 22:27	Parasound P70	profile start	65° 23,859' N	001° 58,336' W	3174,5
MSM98/2_5-1	31.01.2021 05:15	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 35,929' N	004° 05,913' W	2928,1
MSM98/2_5-2	31.01.2021 05:15	Parasound P70	profile start	65° 35,959' N	004° 05,929' W	2927,9
MSM98/2_5-3	31.01.2021 07:21	Expendable Sound Velocimeter	in the water	65° 47,830' N	004° 11,018' W	3736,1
MSM98/2_6-2	01.02.2021 14:31	Sound Velocity Profiler	max depth/on ground	65° 35,029' N	003° 57,179' W	3122,6
MSM98/2_6-1	01.02.2021 14:31	Gravity Corer	max depth/on ground	65° 35,030' N	003° 57,179' W	3117
MSM98/2_7-1	01.02.2021 16:54	Gravity Corer	max depth/on ground	65° 35,152' N	003° 57,234' W	3116,6
MSM98/2_8-1	01.02.2021 17:55	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 35,185' N	003° 57,037' W	3116,6
MSM98/2_8-2	01.02.2021 17:55	Parasound P70	profile start	65° 35,176' N	003° 56,969' W	3117,5
MSM98/2_9-1	02.02.2021 09:06	Gravity Corer	max depth/on ground	65° 58,808' N	002° 40,224' W	3413
MSM98/2_9-2	02.02.2021 09:06	Sound Velocity Profiler	max depth/on ground	65° 58,808' N	002° 40,224' W	3413
MSM98/2_10-1	02.02.2021 11:51	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 57,418' N	003° 28,895' W	3658,9
MSM98/2_10-2	02.02.2021 11:51	Parasound P70	profile start	65° 57,418' N	003° 28,895' W	3658,9
MSM98/2_11-1	02.02.2021 14:23	Gravity Corer	max depth/on ground	65° 58,795' N	003° 25,617' W	3650
MSM98/2_12-1	02.02.2021 19:40	Seismic Towed Receiver	Streamer in water	65° 15,480' N	002° 08,421' W	3149
MSM98/2_12-2	02.02.2021 20:18	Seismic Source	profile start	65° 16,891' N	002° 04,313' W	3159,1

MSM98/2_12-3	02.02.2021 20:18	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 16,891' N	002° 04,311' W	3153,9
MSM98/2_12-4	02.02.2021 20:18	Parasound P70	profile start	65° 16,892' N	002° 04,308' W	3153,9
MSM98/2_13-1	03.02.2021 13:53	Seismic Towed Receiver	Streamer in water	65° 54,658' N	003° 07,821' W	3429,1
MSM98/2_13-2	03.02.2021 14:08	Seismic Source	Airgun in water	65° 55,175' N	003° 06,074' W	3417,8
MSM98/2_13-3	03.02.2021 15:00	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 57,422' N	002° 59,592' W	3465,4
MSM98/2_13-4	03.02.2021 15:01	Parasound P70	profile start	65° 57,464' N	002° 59,642' W	3458,7
MSM98/2_14-1	03.02.2021 17:43	Multibeam	profile start	66° 03,448' N	003° 25,112' W	3577,7
MSM98/2_14-2	03.02.2021 17:43	Parasound P70	profile start	66° 03,472' N	003° 25,169' W	3606,9
MSM98/2_15-1	04.02.2021 11:42	Seismic Towed Receiver	Streamer in water	66° 28,482' N	002° 53,305' W	3633,2
MSM98/2_15-2	04.02.2021 11:54	Seismic Source	Airgun in water	66° 28,056' N	002° 55,171' W	3472
MSM98/2_15-3	04.02.2021 12:31	Parasound P70	profile start	66° 26,605' N	003° 01,463' W	3662,5
MSM98/2_15-4	04.02.2021 15:52	EM122 Deep-Sea Multibeam Echosounder	profile start	66° 14,312' N	003° 28,590' W	3698,2
MSM98/2_16-1	04.02.2021 22:32	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 50,720' N	004° 22,578' W	3723,8
MSM98/2_16-2	04.02.2021 22:32	Parasound P70	profile start	65° 50,759' N	004° 22,619' W	3722,8
MSM98/2_17-1	05.02.2021 07:56	Gravity Corer	max depth/on ground	66° 06,234' N	004° 42,431' W	3524,6
MSM98/2_17-2	05.02.2021 07:56	Sound Velocity Profiler	max depth/on ground	66° 06,234' N	004° 42,430' W	3529,6
MSM98/2_18-1	05.02.2021 10:09	Gravity Corer	max depth/on ground	66° 06,235' N	004° 42,432' W	3529,5
MSM98/2_19-1	05.02.2021 12:22	Gravity Corer	max depth/on ground	66° 04,842' N	004° 45,577' W	3519
MSM98/2_20-1	05.02.2021 14:35	EM122 Deep-Sea Multibeam Echosounder	profile start	66° 19,730' N	004° 48,393' W	3098,5
MSM98/2_20-2	05.02.2021 14:35	Parasound P70	profile start	66° 19,730' N	004° 48,393' W	3098,5
MSM98/2_21-1	05.02.2021 19:32	Seismic Towed Receiver	Streamer in water	67° 03,329' N	003° 40,786' W	3740,8
MSM98/2_21-2	05.02.2021 19:43	Seismic Source	Airgun in water	67° 03,199' N	003° 42,491' W	3765,8
MSM98/2_21-4	05.02.2021 20:07	Parasound P70	profile start	67° 02,885' N	003° 46,705' W	3778
MSM98/2_21-3	05.02.2021 20:07	EM122 Deep-Sea Multibeam Echosounder	profile start	67° 02,885' N	003° 46,705' W	3778
MSM98/2_22-2	07.02.2021 11:13	Parasound P70	profile start	65° 58,654' N	003° 03,532' W	3498,7
MSM98/2_22-1	07.02.2021 11:13	EM122 Deep-Sea Multibeam Echosounder	profile start	65° 58,654' N	003° 03,532' W	3498,7
MSM98/2_23-1	07.02.2021 21:24	Seismic Towed Receiver	Streamer in water	64° 25,703' N	000° 23,558' W	2641,5
MSM98/2_23-2	07.02.2021 21:37	Seismic Source	Airgun in water	64° 25,826' N	000° 21,763' W	2644,1
MSM98/2_24-1	08.02.2021 10:04	Seismic Towed Receiver	Streamer in water	64° 24,652' N	000° 22,694' W	2634,4
MSM98/2_24-2	08.02.2021 10:18	Seismic Source	Airgun in water	64° 25,018' N	000° 20,840' W	2635,7
MSM98/2_24-3	08.02.2021 10:38	EM122 Deep-Sea Multibeam Echosounder	profile start	64° 25,620' N	000° 17,834' W	2645,7
MSM98/2_24-4	08.02.2021 10:38	Parasound P70	profile start	64° 25,629' N	000° 17,793' W	2645,1

MSM98/2_25-1	10.02.2021 08:36	Expendable Sound Velocimeter	in the water	63° 15,114' N	000° 49,657' E	1491,4
MSM98/2_25-1	10.02.2021 08:41	Expendable Sound Velocimeter	station end	63° 14,586' N	000° 50,381' E	1472,1
MSM98/2_26-1	12.02.2021 09:36	Seismic Towed Receiver	Streamer in water	54° 16,872' N	007° 53,682' E	26,7
MSM98/2_26-2	12.02.2021 09:48	Seismic Source	Airgun in water	54° 17,175' N	007° 55,362' E	25,2
MSM98/2_26-3	12.02.2021 10:28	EM712 Shallow-water Multibeam Echosounder	profile start	54° 18,308' N	008° 00,729' E	21,4
MSM98/2_26-4	12.02.2021 10:28	Parasound P70	profile start	54° 18,328' N	008° 00,716' E	21,4
MSM98/2_26-5	12.02.2021 12:41	Expendable Sound Velocimeter	in the water	54° 28,449' N	007° 53,393' E	21,5
MSM98/2_27-1	16.02.2021 12:39	Seismic Towed Receiver	Streamer in water	54° 25,865' N	008° 15,848' E	15,9
MSM98/2_27-2	16.02.2021 12:54	Seismic Source	Airgun in water	54° 24,794' N	008° 16,550' E	17,2
MSM98/2_27-4	16.02.2021 13:28	Parasound P70	profile start	54° 22,413' N	008° 17,205' E	15,5
MSM98/2_27-3	16.02.2021 13:28	EM712 Shallow-water Multibeam Echosounder	profile start	54° 22,413' N	008° 17,205' E	15,5
MSM98/2_27-5	16.02.2021 13:57	Expendable Sound Velocimeter	station end	54° 22,369' N	008° 13,028' E	19,5
MSM98/2_28-1	19.02.2021 10:31	Sound Velocity Profiler	max depth/on ground	54° 24,161' N	008° 15,700' E	15
MSM98/2_29-1	19.02.2021 12:20	Gravity Corer	max depth/on ground	54° 17,694' N	007° 59,214' E	21,8
MSM98/2_29-2	19.02.2021 12:25	Gravity Corer	max depth/on ground	54° 17,694' N	007° 59,215' E	22
MSM98/2_30-1	19.02.2021 13:36	Multibeam	profile start	54° 17,684' N	007° 59,169' E	22,5
MSM98/2_31-2	19.02.2021 15:36	EM712 Shallow-water Multibeam Echosounder	profile start	54° 22,723' N	008° 02,026' E	20,2
MSM98/2_31-1	19.02.2021 15:36	Multibeam	profile start	54° 22,740' N	008° 02,026' E	20,2
MSM98/2_31-2	19.02.2021 17:45	EM712 Shallow-water Multibeam Echosounder	information	54° 22,490' N	008° 02,661' E	19,3
MSM98/2_32-1	19.02.2021 17:49	Sound Velocity Profiler	max depth/on ground	54° 22,490' N	008° 02,664' E	19,6
MSM98/2_31-2	19.02.2021 17:52	EM712 Shallow-water Multibeam Echosounder	information	54° 22,490' N	008° 02,662' E	19,2
MSM98/2_33-1	19.02.2021 21:33	Sound Velocity Profiler	max depth/on ground	54° 22,314' N	008° 02,632' E	18,5
MSM98/2_34-1	20.02.2021 01:40	Sound Velocity Profiler	max depth/on ground	54° 24,918' N	008° 02,723' E	19,2
MSM98/2_31-1	20.02.2021 01:50	Multibeam	information	54° 24,815' N	008° 02,897' E	19,9
MSM98/2_35-1	20.02.2021 04:56	Sound Velocity Profiler	max depth/on ground	54° 22,340' N	008° 03,006' E	19,7
MSM98/2_31-1	20.02.2021 05:00	Multibeam	information	54° 22,340' N	008° 03,006' E	19,6
MSM98/2_36-1	20.02.2021 09:38	Sound Velocity Profiler	max depth/on ground	54° 22,351' N	008° 03,076' E	17,6
MSM98/2_31-1	20.02.2021 09:43	Multibeam	information	54° 22,351' N	008° 03,076' E	17,4
MSM98/2_31-3	20.02.2021 11:28	Multibeam	profile start	54° 24,875' N	008° 02,554' E	17,9
MSM98/2_31-3	20.02.2021 11:44	Multibeam	profile end	54° 24,706' N	008° 02,716' E	18,5
MSM98/2_37-1	20.02.2021 11:59	Grab	max depth/on ground	54° 24,534' N	008° 02,737' E	19,1
MSM98/2_37-2	20.02.2021 12:03	Grab	max depth/on ground	54° 24,534' N	008° 02,736' E	19,2
MSM98/2_38-1	20.02.2021 12:33	Grab	max depth/on ground	54° 24,532' N	008° 02,726' E	19,2

MSM98/2_39-1	20.02.2021 13:04	Grab	max depth/on ground	54° 23,140' N	008° 02,847' E	19,3
MSM98/2_40-1	20.02.2021 13:29	Grab	max depth/on ground	54° 22,563' N	008° 02,953' E	18,4
MSM98/2_41-1	20.02.2021 13:35	Sound Velocity Profiler	max depth/on ground	54° 22,563' N	008° 02,954' E	18,7
MSM98/2_42-1	20.02.2021 15:18	Sound Velocity Profiler	max depth/on ground	54° 22,274' N	008° 02,862' E	20
MSM98/2_31-1	20.02.2021 15:21	Multibeam	information	54° 22,274' N	008° 02,862' E	20
MSM98/2_31-4	20.02.2021 15:22	Parasound P70	profile start	54° 22,274' N	008° 02,862' E	20,1
MSM98/2_31-2	20.02.2021 15:22	EM712 Shallow-water Multibeam Echosounder	information	54° 22,274' N	008° 02,862' E	20,1
MSM98/2_31-1	20.02.2021 17:35	Multibeam	profile end	54° 22,584' N	008° 02,618' E	19,4
MSM98/2_43-1	20.02.2021 17:40	Sound Velocity Profiler	max depth/on ground	54° 22,494' N	008° 02,618' E	19,6
MSM98/2_44-1	20.02.2021 22:40	Sound Velocity Profiler	max depth/on ground	54° 25,976' N	007° 26,371' E	28
MSM98/2_45-1	20.02.2021 22:52	Multibeam	information	54° 25,784' N	007° 25,938' E	28,3
MSM98/2_46-1	21.02.2021 01:22	Sound Velocity Profiler	max depth/on ground	54° 25,590' N	007° 27,178' E	28,6
MSM98/2_45-3	21.02.2021 01:40	EM712 Shallow-water Multibeam Echosounder	profile start	54° 25,617' N	007° 26,275' E	28,9
MSM98/2_47-1	21.02.2021 06:05	Sound Velocity Profiler	max depth/on ground	54° 25,712' N	007° 26,482' E	29
MSM98/2_45-3	21.02.2021 06:08	EM712 Shallow-water Multibeam Echosounder	information	54° 25,708' N	007° 26,483' E	29
MSM98/2_45-2	21.02.2021 06:08	Multibeam	information	54° 25,707' N	007° 26,484' E	29,1
MSM98/2_48-1	21.02.2021 09:11	Grab	max depth/on ground	54° 26,719' N	007° 24,282' E	29,4
MSM98/2_49-1	21.02.2021 09:16	Grab	max depth/on ground	54° 26,719' N	007° 24,281' E	29,2
MSM98/2_50-1	21.02.2021 09:50	Grab	max depth/on ground	54° 25,254' N	007° 25,320' E	28,3
MSM98/2_45-2	21.02.2021 09:54	Multibeam	information	54° 25,254' N	007° 25,319' E	28,5
MSM98/2_45-3	21.02.2021 09:55	EM712 Shallow-water Multibeam Echosounder	information	54° 25,255' N	007° 25,319' E	28,4
MSM98/2_45-2	21.02.2021 13:29	Multibeam	profile end	54° 25,874' N	007° 26,633' E	28
MSM98/2_51-1	21.02.2021 13:38	Sound Velocity Profiler	max depth/on ground	54° 25,726' N	007° 26,843' E	28,3
MSM98/2_52-1	21.02.2021 14:04	Parasound P70	profile start	54° 25,729' N	007° 26,119' E	28,7
MSM98/2_52-2	21.02.2021 14:04	EM712 Shallow-water Multibeam Echosounder	profile start	54° 25,729' N	007° 26,119' E	28,7
MSM98/2_52-2	21.02.2021 20:00	EM712 Shallow-water Multibeam Echosounder	profile end	54° 27,631' N	007° 31,078' E	26,8
MSM98/2_52-1	21.02.2021 22:00	Parasound P70	profile end	54° 26,940' N	007° 26,917' E	28,9