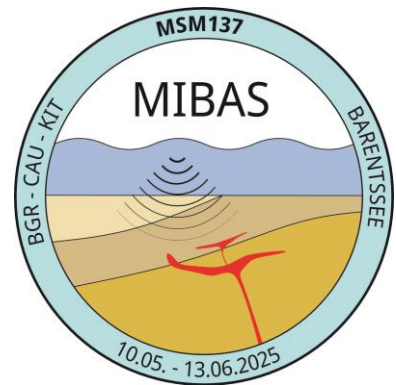


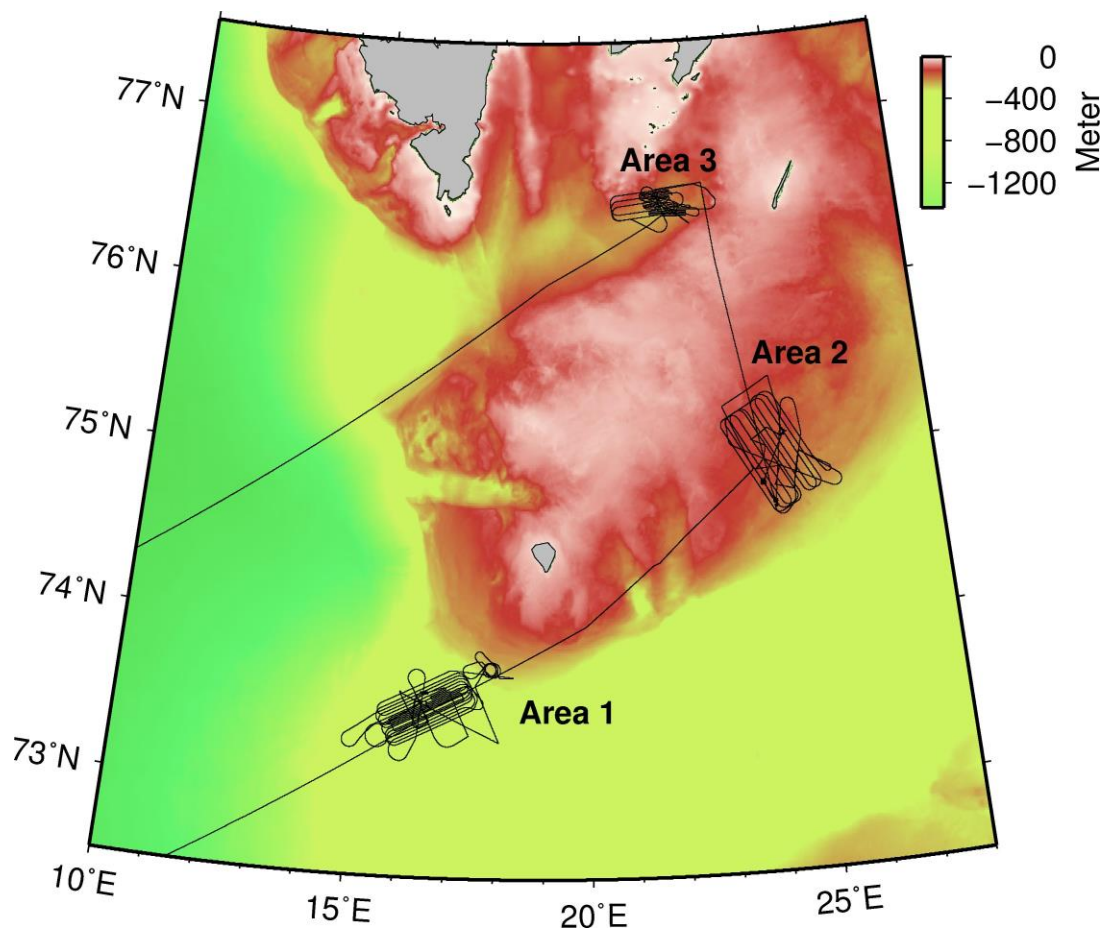
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## Short Cruise Report RV MARIA S. MERIAN MSM137

Reykjavik, Iceland – Reykjavik, Iceland  
10/05/2025 – 13/06/2025  
Chief Scientist: Michael Schnabel  
Captain: Björn Maaß



## Objectives

Magmatic intrusions are widespread all over the globe. Recently, the impact of sills and dikes onto sedimentary basins is discussed intensely, e.g. for contact-metamorphism and venting of methane. Even global climate anomalies were recently linked to regional sill emplacements and associated outbursts of methane into the atmosphere. Anyhow, these discussions often suffer from an appropriate geophysical imaging at depth. As 80 – 90% of emplaced sills are proposed to be in the sub-seismic domain, detailed imaging is necessary for the interpretation of extent, shape and volume of sills.

The conventional seismic method is only partly capable to resolve structures in relation to magmatic intrusions. Therefore, a main objective of cruise MSM137 was to apply enhanced geophysical methods in order to image and identify sills on a detailed scale. We combined the acquisition of seismic data with a towed streamer cable (active length 6,600 m) with registrations on the ocean floor via ocean bottom seismometers. The analysis of this data will result in complementary images. The data will be analysed via full waveform inversion to further enhance the seismic velocity model. Additionally, the data recording from multibeam and sediment echosounder was optimized to constrain the shallow subsurface. Complementary application of magnetics and gravity was done to resolve deep structures in the area below the intrusions.

The geophysical measurements during cruise MSM137 were focused to three selected areas in the north-western Barents Sea – at the Vestbakken Volcanic Province, the Gardarbanken High and the Edgeøya Platform.

## Narrative

The mobilization of cruise MSM137 started on May 7 in Reykjavik with the loading of two streamer winches and four containers to RV. MARIA S. MERIAN. On May 8, 14 scientists and technicians from the BGR started to unload the equipment and the installation of the scientific instruments was started. The next day, the complete scientific crew of cruise MSM137 boarded the vessel and finalized the set-up of the laboratories.

In the morning of May 10, the vessel left the port of Reykjavik and sailed counter clockwise around Iceland with destination to the Norwegian Barents Sea. The northern Barents Sea at this time was still covered by an unusually large ice cover, with very close ice drifts just north-east of Bear Island.

After leaving the Icelandic EEZ in the morning of May 13, we conducted two releaser tests. These tests confirmed that the prepared acoustic releasers for the ocean bottom seismometers (OBS) are working properly. Around noon, the data acquisition was started with the recently installed Deep Sea Multibeam Echosounder EM124. 24 hours later, we switched the data acquisition to the Shallow Water Echosounder EM712, which was used for the rest of the cruise due to the shallow water depths on the Barents Shelf.

As soon as we reached working area 1, we started to deploy 16 OBS at water depths between 400 and 450 m. In addition, we measured a sound velocity profile – this data is needed to process the multibeam echosounder data. In the morning of May 15, we deployed the seismic streamer with a total length of 6,850 m. In the afternoon, we deployed the passive acoustic monitoring (PAM) system, the magnetometer cable as well as both air gun arrays. During final transit to the first line we noticed some technical issues

with the tail buoy which was no longer attached to the end of the streamer cable. Therefore, we had to recover the whole cable and we were able to pick-up the freely floating tail buoy in the morning of May 16. After re-deployment of all our gear we started the production of seismic data at 17:53 UTC on May 16. The following days were characterized by a smooth data acquisition; smaller failures of seismic sources were all repaired during line changes, without loss of time. Until 17:17 UTC on May 23, we sailed a total of 19 seismic lines within working area 1. The recovery of OBS in this working area was slightly delayed by rough weather conditions, but around noon of May 25 all equipment was back on deck.

During the previous days, the ice conditions in the northern Barents Sea had greatly improved. Therefore, we decided to sail to the northern edge of working area 2. After we confirmed that this area was totally free from drifting ice we started the deployment of 12 OBS in working area 2. The seismic cable and sources were also deployed, and at 22:43 UTC on May 26 we started seismic acquisition in working area 2. Here, a significant activity of marine mammals was found. This led to a total of seven shutdowns of seismic work as well as around 5 hours of missing seismic production. Until 13:06 UTC on June 1 we sailed a total of 14 seismic lines within working area 2. Detailed work with the multibeam system was done June 2. This allowed us to identify two active venting systems in this working area.

We conducted the transit to working area 3 in the morning of June 3. Due to the perfect wind conditions of the previous days the ice cover just recently vanished in this area. We deployed the seismic streamer in the afternoon of June 3. During this time, the weather conditions deteriorated. Therefore, we postponed the deployment of seismic sources to the next day. At 14:57 UTC on June 4 we started seismic production in working area 3. In the evening of June 4, the vessel sailed through smaller pieces of ice, but fortunately, the ice had no contact with our towed gear. Consequently, we shortened the following seismic lines. Until 05:29 UTC on June 6 we finished a total of seven lines. On June 7, we completed our bathymetric data set in working area 3. Subsequently, we started our transit back to Reykjavik. There, we arrived as scheduled in the morning of June 13.

## **Acknowledgements**

We like to thank captain Björn Maaß and his crew for their immense support during this cruise. We thank the German Research Fleet Coordination Centre, Bries Research (Klaus Bergmann) and the *Geschäftsstelle des Begutachtungspanels Forschungsschiffe (GPF)* for their support during preparation of the cruise. We acknowledge the financial support from the German Research Foundation (DFG) under grant number GPF 20-1/070.

## Cruise participants

Name	Discipline	Institution
Schnabel, Michael, Dr.	Seismics / Chief Scientist	BGR
Ehrhardt, Axel, Dr.	Seismics / Co-Chief Scientist	BGR
Engels, Martin, Dr.	Seismics	BGR
Schramm, Bettina, Dr.	Seismics	BGR
Schauer, Michael	Seismics	BGR
Steinborn, Peter	Seismics	BGR
Kuckuck, Jan	Seismics	BGR
Demir, Ümit	Seismics	BGR
Behrens, Thomas	Seismics	BGR
Ebert, Timo	Seismics	BGR
Herbst, René	Seismics	BGR
Barckhausen, Udo, Dr.	Magnetics	BGR
Bellenberg, Stephanie	Magnetics	BGR
Heyde, Ingo, Dr.	Gravity	BGR
Straßburger, Chris	Hydroacoustics	CAU
Thamm, Viktoria	Hydroacoustics	CAU
Schwer, Felix	Hydroacoustics	KIT
Belleville, Morgane	Marine Mammal Observer	EPI
Kołodziejka, Lilianna	Marine Mammal Observer	EPI

BGR	Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover
CAU	Christian-Albrechts-Universität zu Kiel
KIT	Karlsruher Institut für Technologie
EPI	EPI Limited, Manchester

## Station List

Station No.		Date	Gear	Time	Latitude	Longitude	Remarks/Recovery
MERIAN	BGR25-	2025		[UTC]	[°N]	[°E]	
MSM137_1		14.5.	EM712 / P70	14:06	73° 12,827'	015° 13,944'	Until 23.05.2025 22:02
MSM137_2		14.5.	SVP	16:13	73° 24,549'	016° 17,093'	448 m depth
MSM137_3	OBS101	14.5.	OBS	16:45	73° 24,551'	016° 17,036'	
MSM137_4	OBS102	14.5.	OBS	17:26	73° 26,934'	016° 16,372'	
MSM137_5	OBS103	14.5.	OBS	17:46	73° 28,789'	016° 17,661'	
MSM137_6	OBS104	14.5.	OBS	18:08	73° 30,985'	016° 17,973'	
MSM137_7	OBS105	14.5.	OBS	18:26	73° 32,671'	016° 18,593'	
MSM137_8	OBS106	14.5.	OBS	18:47	73° 34,584'	016° 20,138'	
MSM137_9	OBS107	14.5.	OBS	19:11	73° 32,973'	016° 25,730'	
MSM137_10	OBS108	14.5.	OBS	19:28	73° 33,059'	016° 31,420'	
MSM137_11	OBS109	14.5.	OBS	19:47	73° 31,680'	016° 34,099'	
MSM137_12	OBS110	14.5.	OBS	20:10	73° 30,359'	016° 39,408'	
MSM137_13	OBS111	14.5.	OBS	20:51	73° 29,055'	016° 30,663'	
MSM137_14	OBS112	14.5.	OBS	21:12	73° 30,202'	016° 26,337'	
MSM137_15	OBS113	14.5.	OBS	21:35	73° 27,961'	016° 24,372'	
MSM137_16	OBS115	14.5.	OBS	22:03	73° 27,178'	016° 33,916'	
MSM137_17	OBS116	14.5.	OBS	22:23	73° 25,542'	016° 36,106'	
MSM137_18	OBS118	14.5.	OBS	23:00	73° 23,413'	016° 22,861'	
MSM137_19		15.5.	SEISSTR	08:10	73° 18,850'	018° 04,435'	Until 23.05.2025 22:01
MSM137_20		17.5.	XSV	09:55	73° 33,084'	016° 59,405'	
MSM137_21		20.5.	XSV	08:25	73° 26,435'	015° 56,643'	
MSM137_22		22.5.	XSV	20:04	73° 29,576'	017° 08,671'	
MSM137_23		23.5.	EM712 / P70	23:50	73° 36,911'	017° 00,751'	Until 24.05.2025 07:47
MSM137_24		24.5.	SVP	08:42	73° 34,180'	016° 19,753'	430 m depth
MSM137_25		24.5.	EM712 / P70	20:41	73° 24,291'	015° 50,064'	Until 25.05.2025 09:17
MSM137_26	OBS119	26.5.	OBS	09:37	75° 14,152'	024° 31,742'	
MSM137_27	OBS120	26.5.	OBS	10:31	75° 05,162'	024° 31,458'	
MSM137_28	OBS121	26.5.	OBS	11:10	75° 08,565'	024° 13,605'	
MSM137_29	OBS122	26.5.	OBS	11:55	75° 04,630'	023° 50,174'	
MSM137_30	OBS123	26.5.	OBS	12:30	75° 02,216'	024° 08,754'	
MSM137_31	OBS124	26.5.	OBS	13:02	74° 57,682'	024° 05,391'	
MSM137_32	OBS125	26.5.	OBS	13:33	74° 54,019'	023° 53,954'	
MSM137_33	OBS126	26.5.	OBS	14:25	74° 54,559'	024° 25,617'	
MSM137_34	OBS127	26.5.	OBS	15:07	74° 47,856'	024° 18,596'	
MSM137_35	OBS128	26.5.	OBS	15:50	74° 46,059'	024° 42,943'	
MSM137_36	OBS129	26.5.	OBS	16:31	74° 52,194'	024° 46,975'	
MSM137_37	OBS130	26.5.	OBS	17:22	74° 59,397'	024° 54,376'	
MSM137_38		26.5.	SVP	17:30	74° 59,423'	024° 54,412'	170 m depth
MSM137_39-1		26.5.	SEISTR	18:00	74° 59,304'	024° 55,209'	Until 01.06.2025 17:08
MSM137_39-4		26.5.	EM712 / P70	18:00	74° 59,304'	024° 55,207'	Until 01.06.2025 17:08
MSM137_40		27.5.	XSV	20:57	75° 09,662'	024° 37,740'	
MSM137_41		28.5.	XSV	11:19	74° 50,157'	025° 09,124'	
MSM137_42		28.5.	XSV	22:33	75° 07,791'	023° 13,360'	
MSM137_43		29.5.	XSV	07:49	74° 39,709'	024° 34,963'	
MSM137_44		29.5.	XSV	11:18	74° 51,352'	024° 36,400'	
MSM137_45		31.5.	XSV	11:22	75° 05,221'	023° 27,771'	
MSM137_46		31.5.	XSV	20:00	74° 46,563'	024° 29,095'	
MSM137_47		1.6.	XSV	10:45	74° 52,773'	024° 41,915'	
MSM137_48		2.6.	EM712 / P70	05:15	75° 08,707'	024° 32,311'	Until 02.06.2025 08:55
MSM137_49		2.6.	SVP	10:58	74° 48,997'	024° 01,293'	155 m depth
MSM137_50		2.6.	EM712 / P70	11:15	74° 49,010'	024° 01,333'	Until 02.06.2025 23:27
MSM137_51		3.6.	SEISTR	12:59	76° 36,305'	021° 54,234'	Until 06.06.2025 11:46
MSM137_52		4.6.	XSV	09:47	76° 28,978'	022° 41,119'	
MSM137_53		6.6.	SVP	16:58	76° 34,953'	022° 15,029'	190 m depth
MSM137_54		6.6.	EM712 / P70	17:34	76° 36,316'	022° 13,570'	Until 07.06.2025 22:00
MSM137_55		7.6.	SVP	08:59	76° 30,457'	021° 35,907'	235 m depth

### Seismic lines for station MSM137\_19 SEISTR (Area 1)

Profile	Start End	Date	Time	Latitude	Longitude	Heading	SP	FFID	Profile length
BGR		2025	UTC	[°N]	[°E]				[km]
BGR25-101A002	Start	16.05.	17:53:26	73°44.135'	17°00.877'	247.4°	2000	341	
	End	16.05.	23:46:26	73°31.588'	15°34.510'		1647	694	50.73
BGR25-110A003	Start	17.05.	01:18:24	73°27.692'	15°44.356'	67.4°	1000	715	
	End	17.05.	06:47:59	73°40.146'	17°10.668'		2020	1735	50.96
BGR25-119A004	Start	17.05.	08:45:39	73°35.470'	17°16.128'	247.4°	2000	1755	
	End	17.05.	14:45:48	73°22.829'	15°48.433'		960	2793	52.01
BGR25-129A005	Start	17.05.	16:48:32	73°18.685'	16°01.314'	67.4°	1005	2816	
	End	17.05.	22:40:50	73°31.214'	17°28.324'		2040	3851	51.76
BGR25-118A006	Start	18.05.	00:54:19	73°35.961'	17°15.219'	247.4°	2000	3872	
	End	18.05.	06:48:48	73°23.320'	15°47.481'		960	4912	52.01
BGR25-108A007	Start	18.05.	08:44:22	73°28.678'	15°42.647'	67.4°	1000	4930	
	End	18.05.	14:57:45	73°41.350'	17°10.735'		2040	5970	52.01
BGR25-121A008	Start	18.05.	17:28:47	73°34.373'	17°17.985'	247.4°	2000	5991	
	End	18.05.	23:12:54	72°21.877'	15°50.120'		960	7031	52.03
BGR25-131A009	Start	19.05.	01:11:02	73°17.674'	16°02.666'	67.4°	1000	7052	
	End	19.05.	07:00:05	73°30.270'	17°29.999'		2040	8092	52.02
BGR25-114A010	Start	19.05.	10:22:17	73°37.950'	17°11.741'	247.4°	2000	8113	
	End	19.05.	16:13:49	73°25.208'	15°44.018'		960	9153	52.03
BGR25-125A011	Start	19.05.	18:38:29	73°20.553'	15°57.461'	67.4°	1000	9174	
	End	20.05.	00:57:30	73°33.157'	17°25.027'		2040	10178	52.04
BGR25-115A012	Start	20.05.	03:22:06	73°37.117'	17°10.645'	247.4°	1976	10223	
	End	20.05.	09:14:51	73°24.756'	15°44.445'		960	11238	50.82
BGR25-104A013	Start	20.05.	11:38:28	73°30.531'	15°39.849'	67.4°	1000	11259	
	End	20.05.	17:44:50	73°43.255'	17°07.375'		2040	12299	52.03
BGR25-116A014	Start	20.05.	20:09:32	73°36.953'	17°13.485'	247.4°	2000	12320	
	End	21.05.	02:13:02	73°24.255'	15°45.769'		960	13360	52.02
BGR25-106A015	Start	21.05.	11:42:20	73°29.560'	15°40.958'	67.4°	1000	13381	
	End	21.05.	17:47:13	73°42.304'	17°09.055'		2040	14421	52.02
BGR25-123A016	Start	21.05.	20:51:37	73°33.525'	17°19.459'	247.4°	2000	14442	
	End	22.05.	03:02:29	73°20.913'	15°51.877'		960	15482	52.01
BGR25-112A017	Start	22.05.	08:15:53	73°26.718'	15°46.202'	67.4°	1000	15503	
	End	22.05.	14:18:59	73°39.402'	17°14.158'		2040	16542	52.01
BGR25-127A018	Start	22.05.	19:02:11	73°31.220'	17°23.220'	247.4°	2000	16563	
	End	23.05.	01:43:12	73°19.025'	15°55.308'		960	17603	52.15
BGR25-134A019	Start	23.05.	06:16:24	73°20.522'	16°21.842'	10.8°	1000	17622	
	End	23.05.	10:34:57	73°40.214'	16°29.577'		1737	18359	36.86
BGR25-133A020	Start	23.05.	13:46:19	73°37.456'	16°15.200'	158.4°	1599	18380	
	End	23.05.	17:17:16	73°22.500'	16°40.879'		980	18999	30.96

### Seismic lines for station MSM137\_39 SEISTR (Area 2)

Profile	Start End	Date	Time	Latitude	Longitude	Heading	SP	FFID	Profile length
BGR		2025	UTC	[°N]	[°E]				[km]
BGR25-186A026	Start	26.05.	22:43:01	74°55.970'	25°15.059'	328.3°	1200	19001	
	End	27.05.	04:45:28	75°19.663'	24°25.786'		2199	20000	49.98
BGR25-172A027	Start	27.05.	07:10:27	75°15.262'	24°04.026'	148.3°	2160	20021	
	End	27.05.	10:55:21	75°00.338'	24°35.221'		1530	20651	31.51
BGR25-172B028	Start	27.05.	12:53:02	74°52.783'	24°50.829'	148.3°	1211	20652	
	End	27.05.	14:22:26	74°46.838'	25°03.030'		960	20903	12.56
BGR25-182A029	Start	27.05.	16:12:30	74°50.256'	25°17.626'	328.3°	1000	20924	
	End	27.05.	23:10:39	75°18.752'	24°18.927'		2200	22124	60.02
BGR25-168A030	Start	28.05.	01:52:42	75°14.294'	23°57.099'	148.3°	2160	22145	
	End	28.05.	03:49:23	75°06.114'	24°14.391'		1814	22491	17.31
BGR25-168B031	Start	28.05.	04:24:47	75°03.700'	24°19.448'	148.3°	1712	22492	
	End	28.05.	05:41:21	74°58.540'	24°30.194'		1494	22710	10.90
BGR25-168C032	Start	28.05.	06:01:25	74°57.290'	24°32.827'	148.3°	1441	22711	
	End	28.05.	08:58:36	74°45.905'	24°56.298'		960	23192	24.06

BGR25-178A033	Start	28.05.	11:07:11	74°49.327'	25°10.833'	328.3°	1000	23206	
	End	28.05.	12:54:36	74°56.612'	24°55.966'		1307	23513	15.36
BGR25-178B034	Start	28.05.	13:07:24	74°57.516'	24°54.129'	328.3°	1345	23514	
	End	28.05.	14:07:23	75°01.735'	24°45.416'		1523	23692	8.90
BGR25-178C035	Start	28.05.	15:29:47	75°07.264'	24°33.986'	328.3°	1756	23693	
	End	28.05.	18:03:53	75°17.791'	24°11.952'		2200	24137	22.21
BGR25-142A036	Start	28.05.	22:30:07	75°07.984'	23°12.900'	148.3°	2160	24158	
	End	29.05.	06:07:43	74°39.769'	24°12.933'		960	25358	60.02
BGR25-164A037	Start	29.05.	09:57:21	74°46.076'	24°47.343'	328.3°	1000	25379	
	End	29.05.	11:28:12	74°52.028'	24°34.995'		1252	25631	12.61
BGR25-164B038	Start	29.05.	11:57:32	74°53.927'	24°31.125'	328.3°	1332	25632	
	End	29.05.	17:12:25	75°14.436'	23°47.914'		2200	26500	43.42
BGR25-150A039	Start	29.05.	19:36:36	75°02.951'	23°26.500'	148.3°	2160	26521	
	End	30.05.	02:37:30	74°42.630'	24°24.360'		1000	27681	58.02
BGR25-187A040	Start	30.05.	04:23:52	74°43.623'	24°44.118'	9.0°	1000	27699	
	End	30.05.	09:28:11	75°05.731'	24°59.752'		1557	28256	41.96
BGR25-188A041	Start	30.05.	13:20:48	75°16.412'	24°35.367'	184.6°	1905	28281	
	End	30.05.	21:47:57	74°38.589'	24°17.279'		960	29226	71.12
BGR25-162A042	Start	31.05.	00:42:50	74°45.607'	24°43.993'	328.3°	1000	128277	
	End	31.05.	07:38:28	75°12.989'	23°46.593'		2061	129338	53.07
BGR25-146A043	Start	31.05.	10:23:10	75°08.959'	23°19.616'	148.3°	2160	29378	
	End	31.05.	17:26:15	74°40.734'	24°19.649'		960	30578	60.03
BGR25-156A044	Start	31.05.	19:24:13	74°44.190'	24°33.930'	328.3°	1000	30599	
	End	01.06.	02:21:08	75°12.511'	23°34.348'		2200	31799	60.03
BGR25-189A045	Start	01.06.	05:43:23	75°02.831'	23°24.308'	113.3°	1822	31818	
	End	01.06.	13:06:34	74°48.018'	25°18.282'		1000	32640	61.68

### Seismic lines for station MSM137\_51 SEISTR (Area 3)

Profile	Start End	Date	Time	Latitude	Longitude	Heading	SP	FFID	Profile length
BGR		2025	UTC	[°N]	[°E]				[km]
BGR25-190A046	Start	04.06.	14:57:20	76°37.789'	22°53.270'	262.9°	2000	32645	
	End	04.06.	21:00:05	76°34.835'	20°53.291'		960	33685	52.04
BGR25-191A047	Start	04.06.	23:27:04	76°28.057'	21°02.338'	82.9°	1000	33706	
	End	05.06.	03:58:23	76°30.519'	22°31.556'		1781	34487	39.13
BGR25-192A048	Start	05.06.	05:16:19	76°35.092'	22 24.198'	262.9°	1741	34498	
	End	05.06.	09:41:02	76°32.851'	20°54.369'		960	35279	39.07
BGR25-193A049	Start	05.06.	12:09:59	76°26.064'	21°03.387'	82.9°	1000	35300	
	End	05.06.	15:55:13	76°28.228'	22°17.392'		1650	35950	32.58
BGR25-194A050	Start	05.06.	17:16:55	76°32.857'	22°11.110'	262.9°	1620	35951	
	End	05.06.	20:59:34	76°30.881'	20°55.428'		960	36611	33.02
BGR25-196A051	Start	05.06.	22:38:48	76°25.949'	20°57.684'	118.3°	1001	36617	
	End	06.06.	01:36:48	76°21.643'	21°51.684'		1984	37600	25.83
BGR25-197A052	Start	06.06.	02:54:53	76°24.426'	22°09.311'	338.9°	1924	37601	
	End	06.06.	05:29:14	76°36.161'	21°50.684'		993	38532	23.29