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Short Cruise Report
MARIA S. MERIAN MSM144

Reykjavik - Reykjavik
21.06.2026 – 25.07.2026
Chief Scientist: Dr. Uwe John
Captain: Marius Kruse

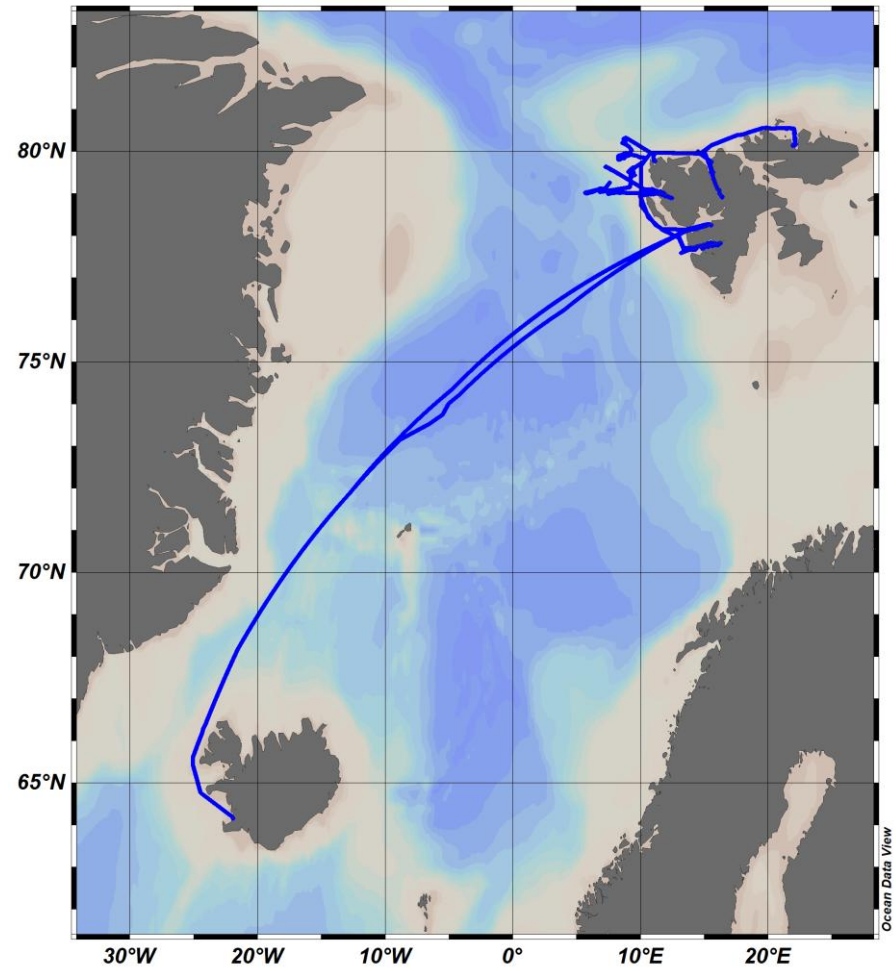

Fig. 1: Cruise ship track map.

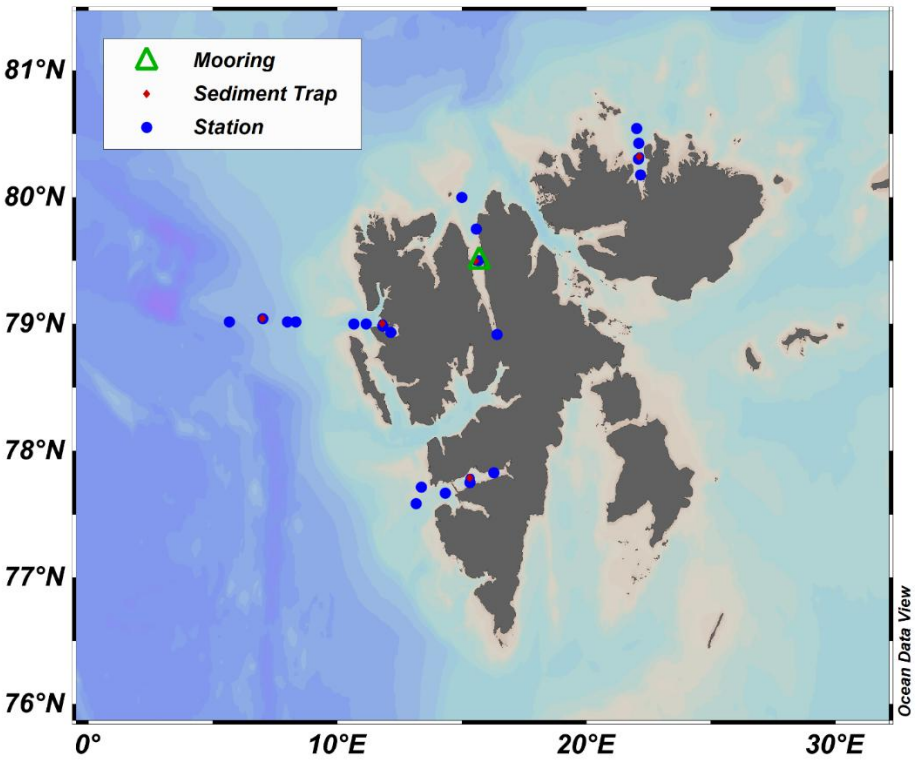

Fig. 2: Cruise map with research stations as blue dots, deployment of sediment traps and the mooring is highlighted in red and green.

Objectives

Global warming is causing fundamental environmental changes in the Arctic. The increased athmospheric and ocean heat transport into the Arctic Ocean has led to accelerated sea ice and glacier melt. The process of Atlantic water inflow in the Arctic and its consequences on the marine ecosystem are known as Atlantification. Atantification is particularly pronounced along the west coast of Svalbard, the largest island of the Svalbard archipelago, and has resulted in accelerated melting of marine-terminating glaciers and increased freshwater runoff, affecting both hydrography and biology in the fjord systems. Wihin the FjordChange project we investigated the impact of Atlantification at the Arctic ecosystem around Svalbard. The FjordChange project is structured into three main research aims and specific research question and to continue taking critical samples for the multi-year dataset including deployment of moorings, taking sediment samples and performing plankton community experiments allowing to evaluate the impact from atlantification across a gradient with strong atlantification in the two southern fjords (Van Mijenfjord and Kongsfjord) and weak atlantification in the two northern fjords (Wijdenfjord and Rijpfjord).

Objective 1) Understanding the impact of atlantification on the physical and chemical oceanography in Arctic fjord ecosystems

Objective 2) Investigating the impact of atlantification on ecosystem structure and function (including assessing the recent and past changes of the eukaryotic and prokaryotic plankton diversity)

Objective 3) Understanding how increased Atlantic Water inflow and glacier melt alter plankton interactions and carbon-cycling processes.

The scientific work is divided into four working groups complementarily addressing past and present plankton communities and their adaptations.

1) Oceanography, water chemistry, primary productivity, ammonium and nitrate uptake: To investigate the abiotic conditions in areas, a comprehensive oceanographic characterization of the sampling area, including high-resolution physico-chemical (CTD - conductivity, temperature and depth profiles) with dissolved nutrients (DOC, PON and POP samples) and optical measurements (vertical abundance and size distribution of particles and aggregates as well as distribution and quality of dissolved organic matter) along several transects from the shelf to the inner fjord systems will be performed. Carbon, nitrate uptake rates and primary production of phytoplankton are measured at three different temperatures with stable isotopes to determine the productivity to assess expected changes in productivity under temperature changes due to global warming.

2) Experimentally investigate plankton community change under warming and impact on melt or river water on natural communities: Changes in phytoplankton community composition will be tested in microcosm experiments under two different temperatures to simulate changes under global warming using different salinity set ups with glacier melt water, river run-off or milliQ water on existing plankton communities.

3) Molecular ecology and plankton diversity: Using microscopic and molecular community analysis, specifically environmental genomic approaches including amplicon sequencing, metatrascriptomics and selected metabolomics. Samples of microscopic plankton communities will be collected from Niskin bottles of the CTD rosette from four depths per station (surface (3m), 10m and 40 m, and chlorophyll maximum) and a phytoplankton net tow. Microscopic samples will be analysed onboard by microscopy, and individual cells sampled for culture cultivation and single cell analysis. Data analyses will involve transcript assembly and taxonomic and functional annotation, and transcript profiles will be related to environmental parameters, oceanography and water chemistry using multivariate statistical

approaches.

4) Past changes of plankton diversity and activities (paleometagenomics): Sediment cores for cyst analyses and paleo-biological metabarcoding will be used to determine a) how long the potentially toxic species have been present; b) if cyst beds are already established; and c) for pre-industrial community dynamics assessment. Sediment cores targeting the last 150-200 yr. (∽0.5m-in length) from the post-industrialisation to contemporary era collected in the different locations selected based on the sediment geology. Plankton samples (both vegetative organisms and resting stages preserved in the sediments) and organic carbon samples are used to calibrate the genetic data.

Narrative of the MSM144 FjordChange Expedition – Svalbard/Spitzbergen, 2026

On 20 June 2026, we boarded the *RV Maria S. Merian*, settled into our cabins, and began unloading the containers and setting up the laboratories. After safety briefings and drills the following morning, we set sail from Reykjavik on 21 June, heading towards the first sampling stations off Greenland's west coast. Before, we had to pick up two colleagues from Longyearbyen. The FjordChange project, involving 20 scientists, investigates the impact of climate change on coastal marine ecosystems of Svalbard. Our focus lies on phytoplankton dynamics, biodiversity, and the potential spread of toxic algae in Greenlandic waters. To achieve this, we collected water column samples, analysed plankton communities, extracted sediment cores, and conducted experiments under varying temperature and nutrient scenarios to assess the resilience of these ecosystems.

We began sampling with a test station on 27 June at 77° 42.771 ′ N, 013° 22.488 ′ E outside the Van Mijenfjorden under good sea conditions, the programme was completed efficiently. A total of 5 stations covered the fjord including land sampling at the tip of the fjord. In the middle a sediment trap was deployed for 24h.

We left the first area and headed for the most northern fjord of the FjordChange investigations, the Rijpfjorden. Here, also 5 stations were conducted with sediment trap deployment for 24h in the middle of the fjord. A land sampling was conducted at the end of the fjord system.

Our third research area covered the Wijdefjorden. Besides a 24h sediment trap deployment in the middle of the fjord and a land sampling at the end of the fjord, we deployed a long-term mooring at 79° 30.321 'N 015° 22.662 'E. This mooring is equipped with sensors for temperature, salinity and currents measurements and stay in the water for about 2 years to investigate long-term changes of the fjord system.

After the Wijdefjorden we headed towards the "Hausgarten" to investigated some long-term stations. A total of four stations were done, including a sediment trap deployment for 24h. These stations were the deepest of the FjordChange programme onboard RV Maria S. Merian.

Our final fjord system was the Kongsfjorden. After our station programme we headed for Ny-Alesund to exchange samples, as -20 °C samples will be shipped from Ny-Alesund while we took 4°C samples from the station to be shipped back via the ship. After that, our two colleagues from Norway were brought back to Longyearbyen, and we headed towards Reykjavik. On the 25th of July we reached Reykjavik in the early morning.

After 30 stations and 4575 nautical miles, the expedition was a success. Across 30 CTD deployments, we, filtered approximately 13,000 litres of seawater, and collected over 100 plankton isolates**,** 31 MUC sediment cores**,** and 12 gravity cores.

These extensive datasets and samples will underpin future analyses, helping us understand ecosystem responses to climate change and potential risks to the sensitive environment of Svalbard**.**

Research area overviews

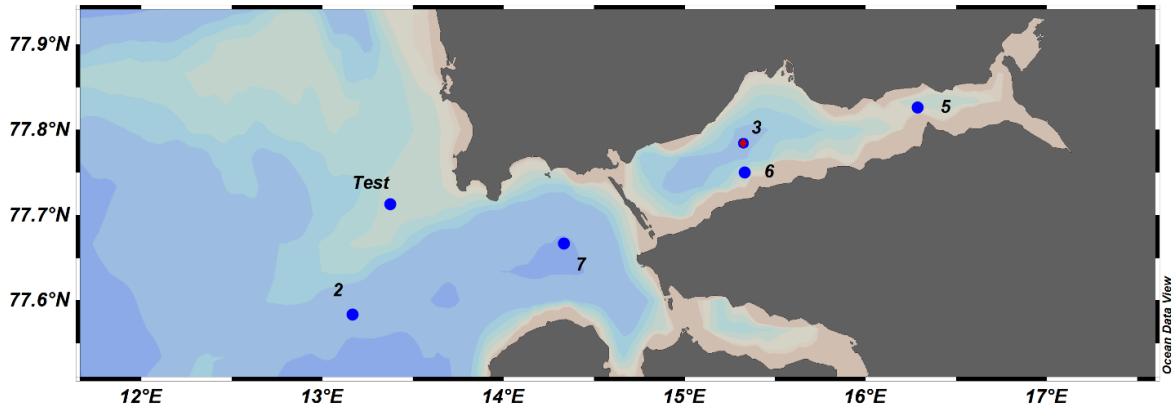

Fig. 3: Overview of the first research area (Van Mijenfjorden, station 2 - 7) including a test station outside the fjord.

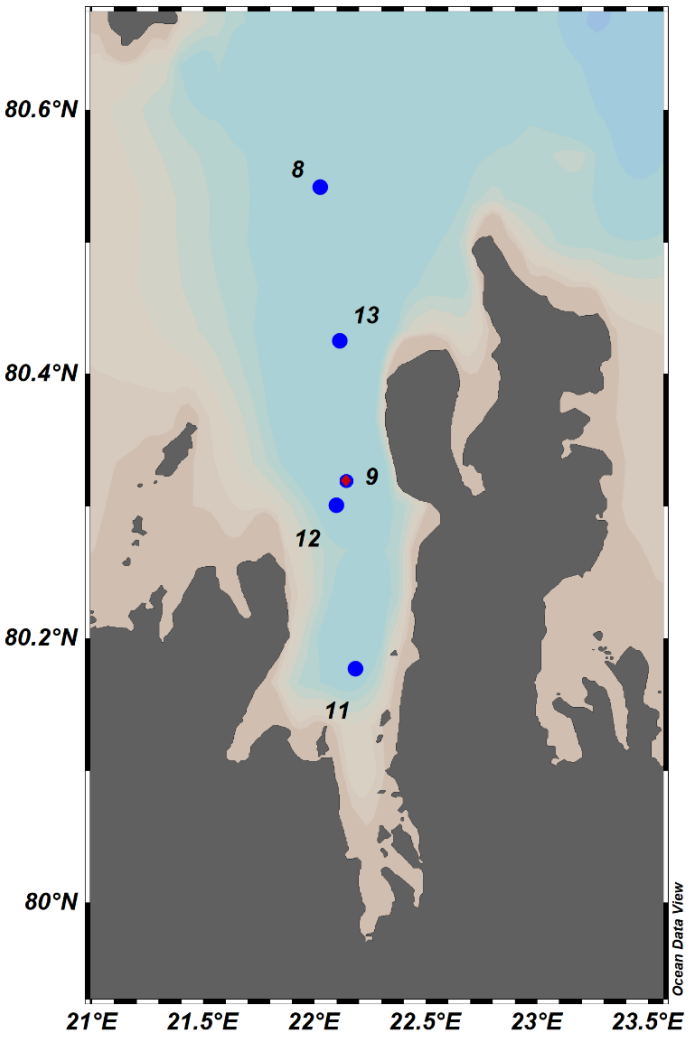

Fig 4: Overview of the second research area, the most northern area (Rijppefjorden, station 8 – 13).

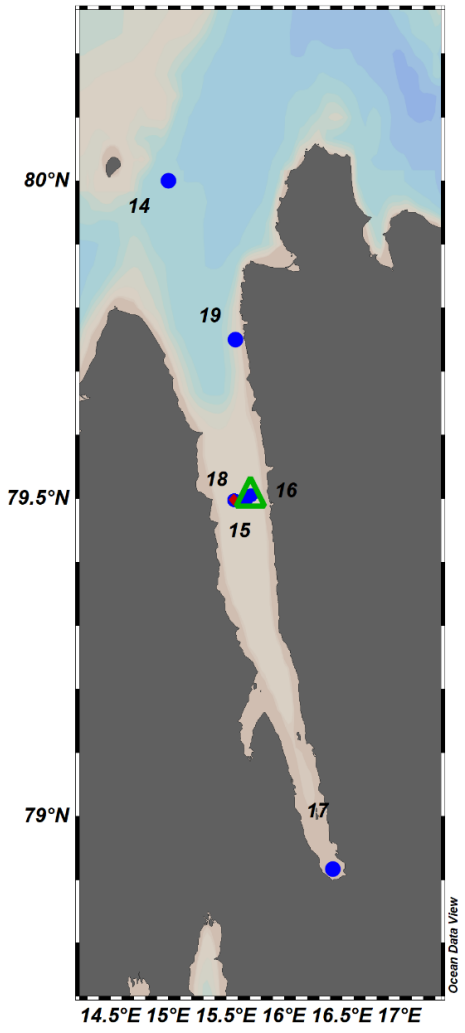

Fig 5: Overview of the third research area (Wijdefjorden, station 14-19). Highlighted in green is the deployment of a mooring.

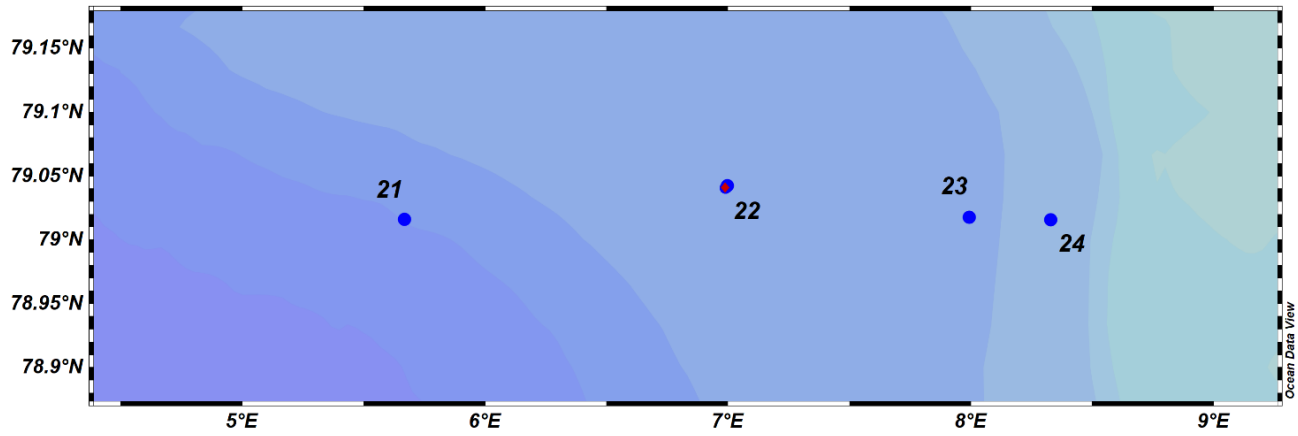

Fig 6: The fourth research area covered the "Hausgarten" (station 21-24).

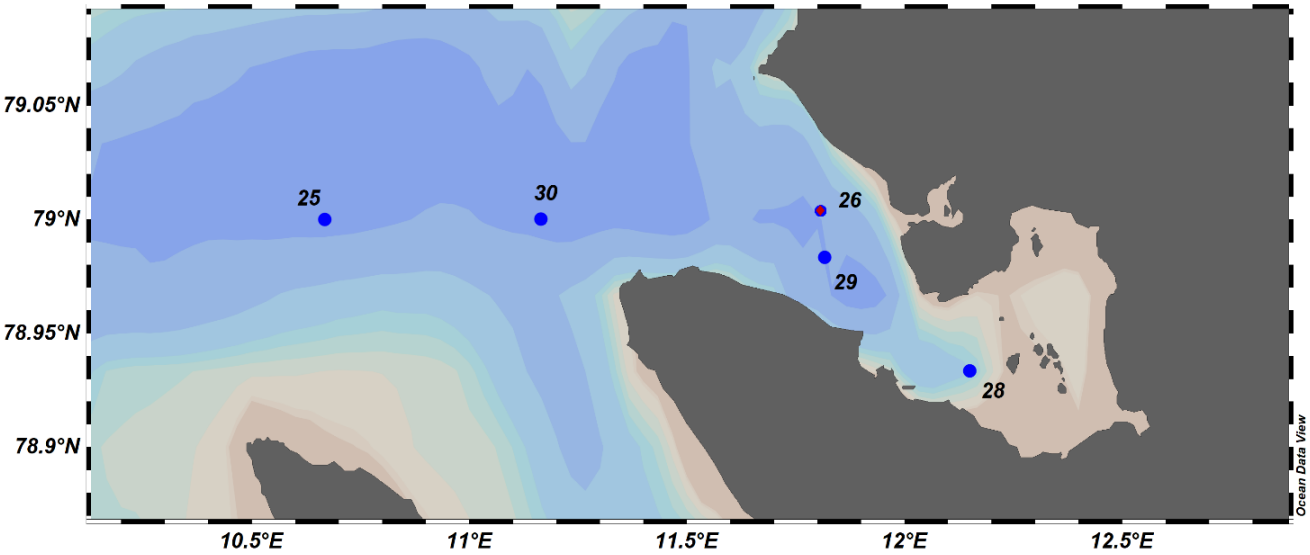

Fig 7: The last research area covered the Kongsfjorden (station 25-30).

Acknowledgements

We would like to express our sincere thanks to Captain Marcus Kruse and his team, who guided us perfectly through the waters of Spitzbergen Fjords during this successful expedition. We would also like to thank boatswain Enno Vredenborg and his entire team for their great support on deck and during sampling, and of course the team of Matthias Brem for the great catering and daily surprise. Thanks also to the AWI port warehouse and logistics team for all their help. Thank you all.

Cruise participant list

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2.	KLARA	STEPHAN	Experiments	UHH
3.	MORTEN	IVERSEN	Carbon Flux	AWI
4.	MAREN	STANIEK	Carbon Flux	AWI
5.	HANNAH REBECCA	SCHÖNING	Carbon Flux	UBremen
6.	ALLAN	CEMBELLA	Molecular ecology	AWI
7.	WENCHE	EIKREM	Taxonomy/Microalgae	UiO
8.	FABIAN	MOYE	Experiments	HIFMB/AWI
9.	ROHAN HEINRICH	HENKEL	CTD/biooptics	ICBM
10.	LEILA FELICE	KOPPLIN	Experiments	AWI
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16.	LORENZ	ECKARDT	Experiments	AWI
17.	DAVID ALEJANDRO	NAVARRETE RODRÍGUEZ	Sediment coring	AWI
18.	DANIELA	VOSS	CTD/biooptics	ICBM
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20.	SOOKYOUNG	KIM	Molecular Ecology	GEOMAR

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Stations list

Station	Station Time	Latitude	Longitude	Depth (m)
MSM144_1-1	27.06.2026 06:05	77° 42,771' N	013° 22,488' E	49
MSM144_2-1	28.06.2026 06:04	77° 35,001' N	013° 09,996' E	134
MSM144_3-1	28.06.2026 14:50	77° 47,053' N	015° 19,446' E	108
MSM144_4-1	28.06.2026 17:40	77° 49,122' N	016° 11,946' E	58
MSM144_5-1	29.06.2026 03:09	77° 49,259' N	016° 14,118' E	55
MSM144_6-1	30.06.2026 06:06	77° 44,990' N	015° 20,001' E	89
MSM144_7-1	30.06.2026 16:02	77° 40,007' N	014° 20,021' E	160
MSM144_8-1	03.07.2026 06:09	80° 32,500' N	022° 01,496' E	143
MSM144_9-1	03.07.2026 14:10	80° 19,171' N	022° 08,561' E	241
MSM144_10-1	03.07.2026 20:41	80° 09,691' N	022° 07,498' E	182
MSM144_11-1	04.07.2026 03:50	80° 07,570' N	021° 56,772' E	74
MSM144_12-1	05.07.2026 06:04	80° 18,054' N	022° 05,844' E	120
MSM144_13-1	05.07.2026 13:59	80° 25,528' N	022° 06,768' E	175
MSM144_14-1	06.07.2026 06:05	79° 59,998' N	014° 59,997' E	139
MSM144_15-1	06.07.2026 14:44	79° 29,844' N	015° 33,861' E	99
MSM144_16-1	06.07.2026 15:34	79° 30,321' N	015° 42,662' E	128
MSM144_17-1	07.07.2026 03:55	78° 54,995' N	016° 25,000' E	73
MSM144_18-1	08.07.2026 06:02	79° 30,004' N	015° 39,962' E	127
MSM144_19-1	08.07.2026 13:57	79° 44,998' N	015° 34,673' E	145
MSM144_20-1	12.07.2026 05:56	79° 02,454' N	006° 59,343' E	1283
MSM144_21-1	12.07.2026 09:15	79° 00,957' N	005° 40,142' E	1978
MSM144_22-1	13.07.2026 07:48	79° 02,542' N	006° 59,874' E	1298
MSM144_23-1	14.07.2026 06:16	79° 01,048' N	007° 59,661' E	1076
MSM144_24-1	14.07.2026 12:28	79° 00,940' N	008° 19,746' E	802
MSM144_25-1	15.07.2026 06:06	79° 00,000' N	010° 40,063' E	305
MSM144_26-1	15.07.2026 16:01	79° 00,233' N	011° 48,425' E	216
MSM144_27-1	15.07.2026 18:51	79° 06,530' N	010° 53,517' E	120
MSM144_28-1	16.07.2026 03:50	78° 53,561' N	012° 24,791' E	84
MSM144_29-1	17.07.2026 06:02	78° 58,997' N	011° 48,972' E	310
MSM144_30-1	17.07.2026 10:58	79° 00,003' N	011° 09,886' E	285