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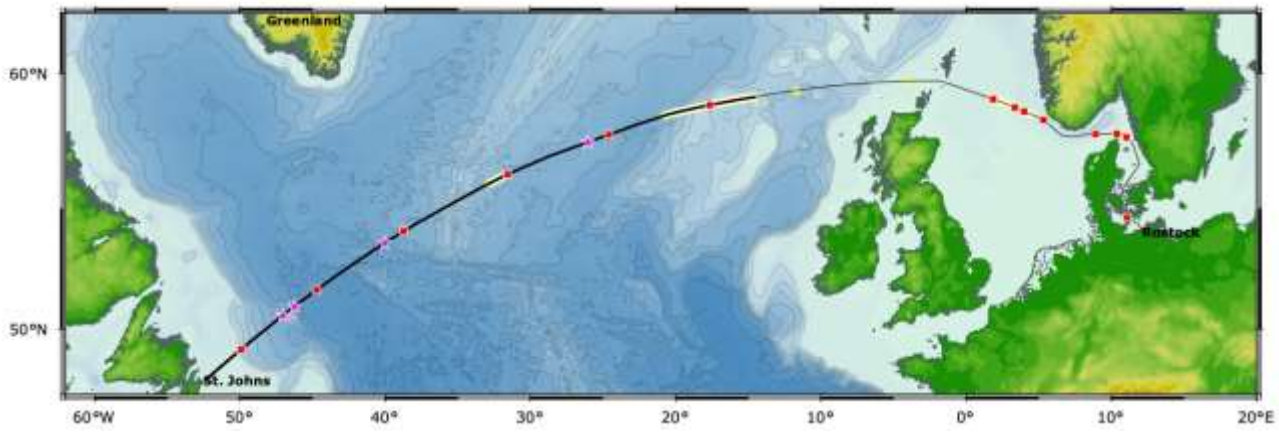
R/V MARIA S. MERIAN
Short Cruise Report
Cruise MSM129/1

Rostock, Germany – St. John's, Canada
May 25 – June 5, 2024

Chief scientist: Johannes Karstensen
Co-Chief scientist: Michael Schlundt
Captain: Sören Janssen



RV Maria S. Merian MSM129/1 cruise track (thin black) and station overview. Thicker black: ADCP/TSG Underway data; yellow dots: Moving Vessel Profiler; magenta stars: CTD stations; red squares: DIC surface sampling.

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Objectives

The scientific program of the RV MARIA S. MERIAN MSM129/1 expedition was dedicated to improvements in data acquisition and data/metadata management aspects of the DAM "Underway Research Data" project. A case study conducted during MSM129/1 addressed the establishment of a workflow in the DAM underway data workflow to favour situation-dependent sampling. Obviously, this needs to be done without additional steaming time. The test case chosen for MSM129/1 was the mapping of 'potential seamounts', but other conceivable cases would be the sampling of mesoscale ocean structures. Upper ocean surveys were done with a profiling underway system (Moving Vessel Profiler, MVP) and for the purpose to estimate how deep the North Atlantic marine heat wave (established in 2023) is traceable. Four CTD's were acquired to calibrate mooring instruments (MSM129/leg 2) but also to estimate for the Orphan Knoll region if west/east differences in the T/S properties at the Deep Western Boundary Current core depth (approx. 2900m; referenced to the 53°N observatory) can be identified. Embedded in the DAM project thermosalinograph (TSG), Fluorometer, Acoustic Doppler Current Profiler (ADCP), FerryBox, and Bathymetry data were acquired. The expedition was a contribution to national (DAM Underway Research Data) and international projects (EU projects EuroGO-SHIP and ObsSea4Clim).

Narrative (all times are Local Time, LT, if not otherwise stated)

The loading of containers for MSM129 (leg 1 and leg 2) was done on 21st May and the 22nd the Moving Vessel Profiler (MVP) was set up in the aft port side. On 22nd and 23rd May many activities were on the program (incl. an open ship) and that prohibited full time working on the redistribution of boxes as well as set up of equipment. However, on 24th May the familiarization for the science crew members took place and on 25th May, at 8:30 the RV MARIA S. MERIAN left Rostock-Warnemünde for the leg 1 of the MSM129. After the pilot left at 08:50 a XBand radar calibration was done (within 3km to the coast and in German EEZ waters). Underway water sampling was started at 09:00. Before entering Danish waters the XBand radar was switched off and likewise all underway throughflow system within 3nm (4nm) of Denmark (Norway). Moreover, all systems were switched off completely in Swedish and United Kingdom waters (no permissions applied for). Further set up of equipment followed during the next days, e.g. for chemical analysis of dissolved oxygen. A first DAM initiated meeting on data flow with all science crew participants was conducted. In the morning of the 26th May, we entered Danish waters outside 3nm and prepared to start the MVP survey. However, the system was not operating as expected and attempts to detect the issues went on the whole day and part of the night incl. the relocation of the whole device on deck. Fortunately, the weather allowed so. The issue was resolved (non-functioning switch) and the survey started 27th May at 8:30am. In parallel the underway systems were operated (TSG, FerryBox). During MSM129/1 many fruitful discussions between the DAM experts and also with the ship crew have been done. Ship also slowed down for engine reasons. In UK waters some testing (but without data archiving) of the parasound and the MVP were done to be well prepared for the international waters survey. D. Damaske (PANGAEA/AWI) prepared a proposal for surveying so far uncharted seamounts and it turned out that for a survey of seven seamounts the course modifications were really minor (less than 5nm for the whole track). In international waters we started with the underway (TSG, Fluorometer, Ferrybox, ADCP, bathymetry) data collection and MVP survey on the 29th May at around 22:00 (LT). The MVP was operated continuously until 30th May 20:30 when it was stopped for regular servicing. On 31st May at 14:30 the first CTD went into the water and limited to 2000m. It included a calibration cast for optode logger (to be deployed on leg 2). The CTD control from the lab was done by using a new interface designed by the IOW in the framework of the DAM Underway Research Data project. All sampling bottles

except one did work well. The groups did Chlorophyll-a filtration in the upper layer (ICBM), and oxygen and salinity sampling (GEOMAR). At 23:00 seamount #3 was crossed and surveyed. On 1st June the MVP had to be stopped after 4 hours because the spool mechanism had a problem and the barrel ran uneven. This problem remained during the rest of the cruise. A deep cast CTD#2 was done after crossing the Reykjanes Ridge. During the whole cruise daily science meetings took place with interesting presentations form the cruise participants, specifically DAM data and metadata flow relevant topics were presented. Likewise, a presentation of the DAM to the ship's officers and the electronics and WTD was done, followed by fruitful discussions. CTD #3 was done on the 4th June around midnight and shortly after the CTD#4 both on opposite sides of the Orphan Knoll region. We finally received the clearance for Canada just in time to enter as planned the EEZ. The RV MARIA S. MERIAN moored on the 5th of June at Pier 12 of St. John's harbour and the leg 1 of MSM129 ended.

Acknowledgement

We thank Captain Sören Janssen, his officers and the crew of RV Maria S. Merian for their support of our observational program and the hospitality and friendliness on board. We also thank the crew on deck, in the engine rooms and the galley for providing and supporting an excellent working environment. The ship time was provided by the German Research Foundation (DFG) within the METEOR/MERIAN core program. We benefited from financial contributions by the research institutions involved.

cruise participants (science crew)

Name	Discipline	Institution
Dr Johannes Karstensen	Fahrtleiter/Chief scientist	GEOMAR
Dr Michael Schlundt	Co-Chief scientist, DAM Lead	GEOMAR
Hannah Olbricht	PO Technik	GEOMAR
Vasile-Sorin Balan	CTD	GeoEcoMar
Dr Gerd Krahmann	Glider, lADCP, CTD	GEOMAR
Dr Abed Hassoun	Oxygen, carbon	GEOMAR
Kim Ripke	CTD, mooring data	CAU Kiel
Yurid Behr	Salinometer, CTD	CAU Kiel
Lasse Glüsen	X-Band, CTD	CAU Kiel
Stefanie Brechtelsbauer	ADCP, CTD	CAU Kiel
Christiane Lösel	Blogs etc. CTD,	CAU Kiel
Grete Boskamp	UVP, CTD	IOW
Dr Marianne Rehage	DAM-Bathymetry	MARUM/PANGAEA
Dr Julia Oelker	DAM Fluorometer	ICBM
Daniel Damaske	DAM-Bathymetrie	MARUM/PANGAEA
Dr Kathrin Riemann-Campe	Data DAM-Oceanography	AWI/PANGAEA
Dr Alexandra Marki	Data DAM-Oceanography	BSH
Norbert Anselm	DAM Dataflow	AWI
Emil Michels	DAM CTD	IOW
Dr Gregor Börner	DAM Sensors	GEOMAR

Institution

GEOMAR: Helmholtz Zentrum für Ozeanforschung Kiel, Kiel, Germany
CAU Kiel: Christian-Albrechts-Universität Kiel, Kiel, Germany
GeoEcoMar: National Institute for Research and Development on Marine Geology and Geo-ecology, Constantza, Romania
AWI/PANGAEA: Helmholtz-Zentrum Hereon, Geesthacht, Germany
ICBM: Institute for Chemistry and Biology of the Marine Environment, Oldenburg, Germany
MARUM/PANGAEA: Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany
BSH: Bundesamt für Seeschifffahrt und Hydrography, Hamburg, Germany

Science crew participants of MARIA S. MERIAN cruise MSM129/1

Station List

Gear coding:
CTD: CTD and rosette sampler;
TSG: Thermosalinograph (and Fluorometer),
ADCP: Acoustic Doppler Current Profiler (always 75kHz & 38kHz)
MVP: Moving vessel profiler
FBOX: FerryBox
RADAR: XBand Radar

Station No.	Gear	Date Time		Latitude	Longitude	Depth (m)	Remarks
MSM129/1_0_ Underway-2	TSG	25.05.24	07:00:00	54° 13.533' N	012° 02.747' E	28	
	TSG	25.05.24	12:12:20	54° 46.878' N	010° 52.652' E	26	Enter EEZ
	TSG	26.05.24	06:30:15	57° 39.375' N	011° 12.130' E	42	Exit EEZ
	TSG	27.05.24	19:59:55	59° 07.965' N	001° 41.392' E	118	Enter EEZ
	TSG	29.05.24	22:00:00	59° 10.463' N	014° 28.488' W	977	Exit EEZ
	TSG	05.06.24	08:54:04	47° 39.691' N	052° 21.496' W	179	
MSM129/1_0_ Underway-3	FBOX	25.05.24	07:00:38	54° 13.627' N	012° 02.649' E	28	
	FBOX	25.05.24	12:12:00	54° 46.822' N	010° 52.658' E	26	Enter EEZ
	FBOX	26.05.24	06:30:31	57° 39.408' N	011° 12.076' E	38	Exit EEZ
	FBOX	27.05.24	19:56:01	59° 07.880' N	001° 41.761' E	118	Enter EEZ
	FBOX	29.05.24	22:01:50	59° 10.413' N	014° 29.007' W	982	Exit EEZ
	FBOX	05.06.24	08:46:19	47° 40.284' N	052° 20.519' W	182	
MSM129/1_0_ Underway-4	RADAR	25.05.24	07:00:48	54° 13.652' N	012° 02.624' E	28	
	RADAR	25.05.24	07:54:14	54° 21.803' N	011° 54.006' E	20	Enter EEZ
	RADAR	29.05.24	22:02:00	59° 10.409' N	014° 29.061' W	981	Exit EEZ
	RADAR	01.06.24	10:39:11	56° 20.605' N	031° 31.831' W	2350	Enter EEZ
	RADAR	01.06.24	10:42:37	56° 20.356' N	031° 32.862' W	2300	Exit EEZ
	RADAR	03.06.24	11:12:21	51° 46.566' N	044° 28.668' W	4177	Enter EEZ
	RADAR	03.06.24	11:16:44	51° 46.044' N	044° 29.824' W	4176	Exit EEZ
	RADAR	04.06.24	03:36:19	50° 30.749' N	047° 08.332' W	2920	
	ADCP	26.05.24	11:25:00	57° 51.568' N	010° 39.350' E	120	
MSM129/1_0_ Underway-5	ADCP	26.05.24	18:22:00	57° 50.872' N	009° 08.739' E	181	Enter EEZ
	ADCP	29.05.24	22:00:00	59° 10.463' N	014° 28.488' W	977	Exit EEZ
	ADCP	05.06.24	08:54:26	47° 39.664' N	052° 21.544' W	180	
MSM129/1_1-1	MVP	27.05.24	09:42:51	58° 31.979' N	004° 36.647' E	276	
MSM129/1_1-1	MVP	27.05.24	19:56:35	59° 07.892' N	001° 41.709' E	118	
MSM129/1_2-1	MVP	29.05.24	22:09:30	59° 10.274' N	014° 30.727' W	1007	
MSM129/1_2-1	MVP	30.05.24	19:34:17	58° 30.222' N	020° 48.617' W	2935	
MSM129/1_3-1	CTD	31.05.24	14:45:48	57° 32.257' N	026° 01.976' W	2775	CTD#1
MSM129/1_4-1	MVP	01.06.24	11:02:53	56° 19.063' N	031° 38.260' W	2355	
MSM129/1_4-1	MVP	01.06.24	15:23:14	55° 58.575' N	032° 51.146' W	2225	
MSM129/1_5-1	MVP	02.06.24	10:31:01	54° 07.231' N	038° 40.008' W	2770	
MSM129/1_5-1	MVP	02.06.24	10:51:38	54° 06.717' N	038° 41.680' W	2838	
MSM129/1_6-1	CTD	02.06.24	15:51:17	53° 37.855' N	039° 59.714' W	3453	CTD#2
MSM129/1_7-1	CTD	03.06.24	18:17:26	50° 58.170' N	046° 12.615' W	2816	CTD#3
MSM129/1_8-1	CTD	04.06.24	01:01:11	50° 34.309' N	047° 01.172' W	2967	CTD#4