

NOTIFICATION OF PROPOSED RESEARCH CRUISE

Part A: GENERAL

1. Name of research ship: **MARIA S. MERIAN** Cruise No. **MSM142**

2. Dates of cruise **from Nuuk, Greenland, 26. March 2026
to Reykjavik, Iceland, 11. May 2026**

3. Operating Authority **Institute of Oceanography / University of Hamburg
Bundesstr. 53, D-20146 Hamburg, Germany
Tel.: +49-40-42838-3640**

4. Owner (if different from para 3) **Federal State Mecklenburg-Vorpommern, Germany**

5. Particulars of ship:

Name	MARIA S. MERIAN
Nationality	German
Overall length	94,8 metres
Maximum draught	6,50 metres
Net tonnage	1.671 NT
Propulsion	Diesel Electric
Call sign	DBBT
IMO No.	9274197

6. Crew

Name of master	Marius Kruse
No. of crew	max. 24

7. Scientific personnel:

Name and address of scientist in charge:	Dr. Fehmi Dilmahamod GEOMAR Helmholtz Centre for Ocean Research Kiel Wischhofstraße 1-3 24146 Kiel, Germany
Phone:	+49 (0) 431 600 4117
Fax:	+49 (0) 431 600 4102
Email:	fdilmahamod@geomar.de
No. of scientists	max. 22

8. Geographical areas in which ship will operate (with reference in latitude and longitude):

Labrador Sea / Irminger Sea 45° – 67° N, 25° – 60° W (See attached map)

9. Brief description of purpose of cruise:

This cruise encompasses three distinct projects: (1) Observations of submesoscale processes within the spring bloom in the Labrador Sea, including biogeochemical observations both underway and in the upper water column during the spring bloom onset, as well as direct flux measurements between the ocean and the atmosphere of CO₂ complemented by observations of ocean's skin temperature and wave properties. (2) Mooring and hydrographic surveys of the Labrador Sea Area in relation to the Atlantic Meridional Overturning Circulation, (3) Mooring deployment in the Denmark Strait Region to monitor submesoscale instabilities and sediment transport.

10. Dates and names of intended ports of call:

**Reykjavik, Iceland: For four days within the time window of 08. to 17.05.2026
⇒ Planned so far from 11.05.2026 to 14.05.2026**

11. Any special logistic requirements at ports of call:

Crew change; unloading/ loading of equipment; logistics; bunkering.

Part B: DETAIL

1. Name of research ship: **MARIA S. MERIAN** Cruise No. **MSM142**
2. Dates of cruise **from Nuuk, Greenland, 26. March 2026**
to Reykjavik, Iceland, 11. May 2026
3. Purpose of research and general operational methods:

One component (SEA-Bloom) of the research cruise is to sample across small-scale oceanic features (fronts, filaments and eddies), to quantify the mixing associated to these features and their impacts on the phytoplankton concentration within the context of Labrador Sea Spring Bloom. The exact location of measurements will be decided in real-time, after analysing real-time satellite data of sea surface temperature, surface chlorophyll-a concentration and sea surface height. The quantification of the air-sea flux of CO₂ and monitoring of the temporal changes in the ocean's inorganic carbon pool will also be undertaken. This component involves sampling with towed instruments, deployment and recovery of underwater ocean gliders as well as BGC Argo floats, and shipboard observations of meteorological and oceanographic parameters in the water column (temperature, salinity, oxygen, carbon parameters and currents). The biogeochemical measurements will focus on carbon dynamics during the onset of the spring bloom including its impact on gas exchange. We will investigate the impact of freshly formed organic matter (e.g., organic acids) inside and outside the bloom to understand their impact on carbon related parameters that will be measured on board. We will continuously measure surface water for its carbon and oxygen content to estimate the CO₂ flux using the so-called bulk method. In addition, we will use the eddy-covariance technique to measure this flux directly. Both measurements together allow a better understanding of the physical processes driving gas exchange under bloom conditions. The second component (ClimObsSPNA) during this cruise aims at quantifying the strength and composition of the Deep Western Boundary Current (DWBC) and the sinking of water in the central Labrador Sea. The work comprises the recovery and re-deployment of moorings that includes instruments measuring temperature, salinity, currents and oxygen, shipboard observations of meteorological and oceanographic parameters in the water column (temperature, salinity, oxygen, currents). CTD (hydrography) and ADCP/X-Band radar (currents) sections will be run across the major current systems and across the basins from the shallow shelves into the deep regions. The Canadian time series "Station 27" will be sampled with CTD. The work is embedded in the Canadian Ocean Frontiers Institute (Mooring operations at K1 site) and in the international (incl. Canada) OSNAP. Oxygen sensors on 7 moorings will be deployed for Dalhousie University, Halifax, Canada (Prof. Doug Wallace). The first two components are partly funded by the European Commission (project: ObsSea4Clim), and by the German Ministry of Education and Science. The third component (MIXSED-1) goal is to assess how

Denmark Strait overflow is subjected to submesoscale instabilities which enhance the lateral mixing and watermass modification of the overflow waters, and how flow-topography interactions lead to sediment transport. The quantification of small-scale currents involves the deployment of a mooring array (6 moorings equipped with CTDs, current meters, temperature loggers) downstream of the Denmark Strait along with two moorings further southwest to quantify sediment transport (current meters, CTDs, turbidity sensors). MIXSED-1 is funded by the State Research Agency of Spain (AEG) and the German Research Foundation (DFG).

4. Attach chart showing (on an appropriate scale) the geographical area of the intended work, positions of intended stations, tracks of survey lines, positions of moored / seabed equipment:

Estimated date of first entry into EEZ of coastal state: **03 May 2026**

Estimated last exit from EEZ of coastal state: **11 May 2026**

Multiple EEZ entries/exits during the research cruise? **YES**

5. Types of samples required (e.g., Geological / Water / Plankton / Fish / Radioactivity / Isotope) and (b) methods by which samples will be obtained (including dredging / coring / drilling/ fishing etc.).

(a) Type of samples	(b) Method
Water	CTD Rosette, Thermosalinograph, ADCP Currents, X-Band Radar, Underwater Glider, underway sampling, Current Meter, Dissolved Oxygen, Temperature loggers
Zooplankton	Photography

6. Details of moored equipment:

Laying	Recovery	Description	Latitude	Longitude
MSM142 March-May 2026	MIXSED-2, August 2026	Mooring dsK1_1_2026	65° 34.004' N	29° 25.878' W
MSM142 March-May 2026	MIXSED-2, August 2026	Mooring dsK3_1_2026	65° 31.889' N	29° 24.762' W
MSM142 March-May 2026	MIXSED-2, August 2026	Mooring dsK2_1_2026	65° 33.411' N	29° 20.960' W
MSM142 March-May 2026	MIXSED-2, August 2026	Mooring dsG1_1_2026	65° 35.679' N	29° 28.008' W
MSM142 March-May 2026	MIXSED-2, August 2026	Mooring dsG2_1_2026	65° 33.965' N	29° 16.644' W
MSM142 March-May 2026	MIXSED-2, August 2026	Mooring dsG3_1_2026	65° 30.098' N	29° 26.058' W

7. Explosives: NO EXPLOSIVES

8. Detail and reference of

(a) Any relevant previous / future cruises:

RRS Charles Darwin cruise 163/164 September 2004
 WNA05 – Thalassa cruise in Summer 2005
 RRS DISCOVERY cruise D311 September/October 2006
 RV M.S. Merian cruise MSM05/2 May / June 2007
 RV M.S. Merian cruise MSM05/4 July 2007
 RV M.S. Merian cruise MSM12/1 May/June 2009
 RV Meteor cruise M82/1 July 2010
 RV Meteor cruise M85/2 August 2011
 RV M.S. Merian cruise MSM21/1 May/June 2012
 RV THALASSA MSM40 August 2014
 RV M.S. Merian cruise MSM54 May/June 2016
 RV M.S. Merian cruise MSM74 June/July 2018
 RV M.S. Merian cruise MSM76 August/September 2018
 RV M.S. Merian cruise MSM94 August/September 2020
 RV Meteor M184 August/September 2022
 RV Sarmiento de Gamboa cruise FARDWO-DS1 July/August 2023
 RV M.S. Merian cruise MSM129 June/July 2024
 RV Sarmiento de Gamboa cruise FARDWO-DS2 September 2024

(b) Any previous published research data relating to the proposed cruise. (Attach separate sheet if necessary.):

Koelling, J., Atamanchuk, D., Karstensen, J., and Wallace, D. W. R.: Decadal variability of oxygen uptake, export, and storage in the Labrador Sea from observations and CMIP6 models. *Frontiers in Marine Sciences*, 10.3389/fmars.2023.1202299, 2023

Fu, Y., et al.: Seasonality of the Meridional Overturning Circulation in the Subpolar North Atlantic, *Nature Communications*, <https://doi.org/10.1038/s43247-023-00848-9>, 2023.

Koelling, J., Atamanchuk, D., Karstensen, J., Handmann, P., and Wallace, D. W.R.: Oxygen export to the deep ocean following Labrador Sea Water formation, *Biogeosciences*, <https://doi.org/10.5194/bg-2021-185>, 2021.

Li, F., Lozier, M.S., Bacon, S. et al. Subpolar North Atlantic western boundary density anomalies and the Meridional Overturning Circulation. *Nat Commun* 12, 3002 (2021). <https://doi.org/10.1038/s41467-021-23350-2>

Fu, Y., F. Li, J. Karstensen, C. Wang, A stable Atlantic Meridional Overturning Circulation in a changing North Atlantic Ocean since the 1990s (2020), *Science Advances*, 6, 48, eabc7836, DOI: 10.1126/sciadv.abc7836

Pacini, A., R.S. Pickart, F. Bahr, D.J. Torres, A. Ramsey, J. Holte, J. Karstensen, M. Oltmanns, F. Straneo, I.A. Le Bras, G.W.K. Moore, and M.F. de Jong, (2020). Mean

- conditions and seasonality of the West Greenland boundary current system
Journal of Physical Oceanography, 50, 2849-2871. 10.1175/JPO-D-20-0086.1.
- Oltmanns, M., J. Karstensen, K. Moore, S. Josey, (2020) Rapid North Atlantic cooling initiated by surface freshwater, Geophysical Research Letters, 10.1029/2020GL08720
- Lozier, M.S., et al. (2019) A Sea Change in Our View of Overturning – First Results from the Overturning in the Subpolar North Atlantic Program, Science, 363, 516–521, February 1, doi: 10.1126/science.aau6592
- Fischer, J., Karstensen, J., Oltmanns, M., and Schmidtke, S. (2018) Mean circulation and EKE distribution in the Labrador Sea Water level of the subpolar North Atlantic, Ocean Sci., 14, 1167-1183, <https://doi.org/10.5194/os-14-1167-2018>
- Zantopp, R., J. Fischer, M. Visbeck, and J. Karstensen (2017) From interannual to decadal: 17 years of boundary current transports at the exit of the Labrador Sea, J. Geophys. Res. Oceans, 122, doi:10.1002/2016JC012271
- Holliday, N. P., Bacon, S., Cunningham, S. A., Gary, S. F., Karstensen, J., King, B. A., Li, F., & McDonagh, E. L., Subpolar North Atlantic Overturning and gyre-scale circulation in the summer 2014 and 2016. (2018) Journal of Geophysical Research: Oceans, 122. <https://doi.org/10.1029/2018JC013>
- Schaffer, J., Kanzow, T., Jochumsen, K., Lackschewitz, K., Tippenhauer, S., Zhurbas, V. M., & Quadfasel, D. (2016). Enhanced turbulence driven by mesoscale motions and flow-topography interaction in the Denmark Strait overflow plume. Journal of Geophysical Research: Oceans, 121(10), 7650-7672.
- Jochumsen, K., Moritz, M., Nunes, N., Quadfasel, D., Larsen, K. M., Hansen, B., ... & Jonsson, S. (2017). Revised transport estimates of the Denmark Strait overflow. Journal of Geophysical Research: Oceans, 122(4), 3434-3450.

9. Names and addresses of scientists of the coastal state in whose waters the proposed cruise takes place with whom previous contact has been made:

Dr. Andreas Macrander
Marine & Freshwater Research Institute
Telefon: +354 57 52 062
E-mail: andreas.macrander@hafogvatn.is

Dr. Angel Angulo Ruíz
University of Iceland
Telefon: +354 52 54 407
E-mail: angel@hi.is

10. State:

- (a) Whether visits to the ship in port by scientists of the coastal state concerned will be acceptable:

Yes, after discussion.

- (b) Whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation/disembarkation:

Yes, after discussion.

Embarkation: Nuuk, Greenland, 25.03.2026

Disembarkation: Reykjavik, Iceland, 11.05.2026

- (c) When research data from intended cruise is likely to be made available to the coastal state and if so by what means:

- **Cruise Report three months after finishing the research cruise.**
- **Scientific publication within the following three years.**

Part C: SCIENTIFIC EQUIPMENT

COASTAL STATE: ICELAND

11. Complete the following table - (indicate 'YES' or 'NO'):

Please add in "b" the equipment you will bring to the vessel and complete the table with yes or no. Note that forgotten equipment can led to restrictions in research.

List of all major marine scientific equipment it is proposed to use.	Fisheries research within fishing limits	Research concerning continental shelf out to State's margin	Waters in which equipment will be deployed			
			within 3 NM	between 3-12 NM	between 12-50 NM	between 50-200 NM
a. vessel mounted systems						
ADCP & XBand radar currents	NO	YES	NO	YES	YES	YES
USBL underwater positioning	NO	NO	NO	NO	NO	NO
Multibeam echosounder	NO	YES	NO	YES	YES	YES
Sub-bottom profiler Parasound P70	NO	YES	NO	YES	YES	YES
Permanent surface water sampling / analysis (incl. Thermosalinograph)	NO	YES	NO	YES	YES	YES
b. mobile equipment						
Sound velocity probe AML SV PlusX	NO	NO	NO	NO	NO	NO
XSV Expendable Sound Velocimeter	NO	NO	NO	NO	NO	NO
Drone	NO	NO	NO	NO	NO	NO
Meteorological Sensors	NO	YES	NO	YES	YES	YES
CTD with lowered ADCP	NO	YES	NO	NO	NO	YES
Current meter and hydrography/biogeochemistry moorings, for positions see table	NO	YES	NO	NO	NO	YES

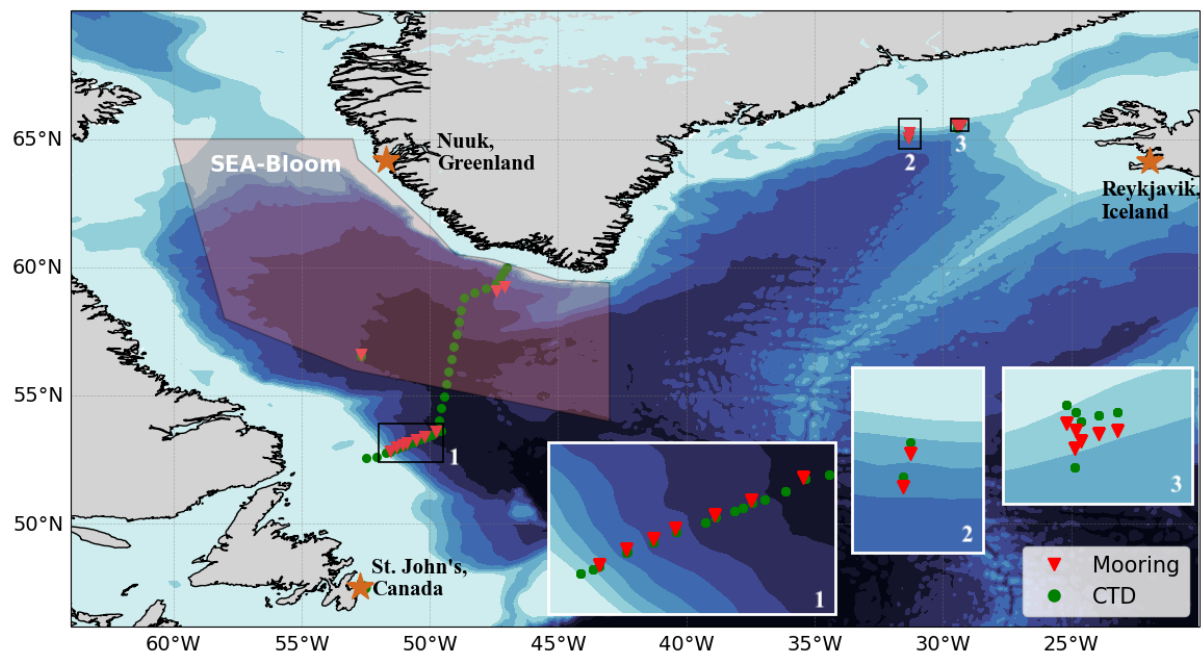
Hamburg, 01.09.2025

Date

Universität Hamburg
 GEH Centrum für Erdsystemforschung und Nachhaltigkeit
 Leitstelle Deutsche Forschungsschiffe
 Bundesstr. 55
 D-20146 Hamburg
 - Germany -

(On behalf of the principal scientist)

NB IF ANY DETAILS ARE MATERIALLY CHANGED REGARDING DATES/AREA OF OPERATION AFTER THIS FORM HAS BEEN SUBMITTED, THE COASTAL STATE AUTHORITIES MUST BE NOTIFIED IMMEDIATELY

Attachment: Map of intended work components

Planned cruise activities. Red triangles mark the mooring locations to be deployed (see table above for mooring locations in Icelandic waters). Green dots indicate hydrographic stations.