

NOTIFICATION OF PROPOSED RESEARCH CRUISE

Page 1

GENERAL

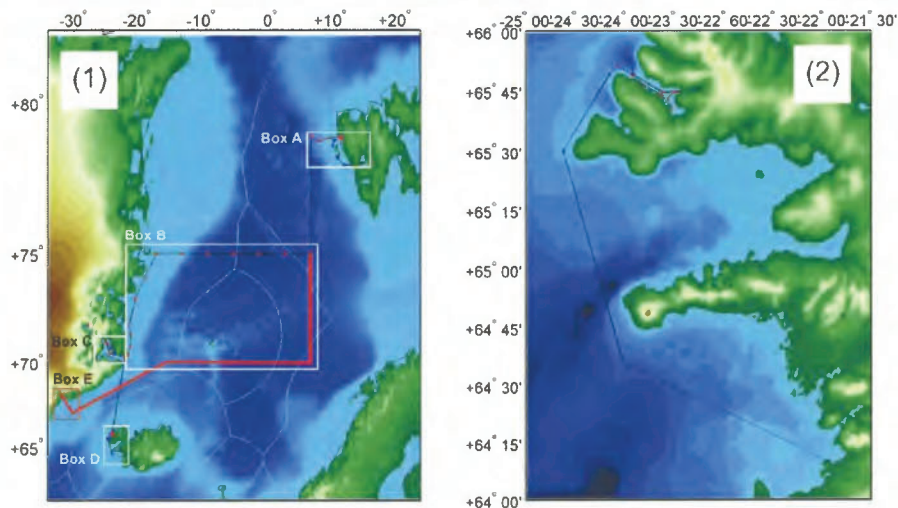
Part A

01. Name of research ship: **MARIA S. MERIAN** Cruise No. **MSM56**
02. Dates of cruise from **July 2nd 2016** (Longyearbyen) to **July 25th 2016**
(Reykjavik)
03. Operating Authority **Institut für Meereskunde / University of Hamburg**
Bundesstr. 53, D-20146 Hamburg, Germany
Tel.: +49-40-42838-3640 - Fax: +49-40-42838-46 44
04. Owner (if different from para 3) **Federal State Mecklenburg-Vorpommern, Germany**
-
05. Particulars of ship:
- | | |
|-----------------|------------------------|
| Name | MARIA S. MERIAN |
| Nationality | German |
| Overall length | 94,8 metres |
| Maximum draught | 6,5 metres |
| Nett tonnage | 1750 NRZ |
| Propulsion | Diesel Electric |
| Call sign | D B B T |
06. Crew
- | | |
|----------------|-----------------------|
| Name of master | Ralf Schmidt |
| No. of crew | <u>max. 23</u> |
-
07. Scientific personnel:
- | | |
|---|--|
| Name and address of scientist in charge | Prof. Dr. Boris Koch
Alfred-Wegener-Institut
Am Handelshafen 12
27570 Bremerhaven |
| Tel./Fax/Telex No. | 0471 4831 1346 |
| No. of scientists | <u>22</u> |
08. Geographical areas in which ship will operate

The overall operations will be within **79.2 N / 12.3 E** and **64.1 N / 33 W**.

Sampling stations will be located within boxes A-D (map 1):

Box A:	79.2 N / 7.1 W	and	78.1 N / 15.7 W
Box B:	75.1 N / 21.5 E	and	69 N / 7 W
Box C:	72.1 N / 28.5 E	and	70 N / 21.5 E
Box D:	66.5 N / 25 E	and	64 N / 22.5 E (map 2)



The locations of the station during the transit between Svalbard and Greenland will depend on ice conditions. The red line represents an alternative route, passing through EEZ Jan Mayen, in case of heavy ice conditions. Box E represents an alternative fjord sampling in Kangerdlugssuaq fjord in case Scoresby Sund is not accessible due to ice conditions.

Box E: 69 N / 33 E and 67.5 N / 31 E

09. Brief description of purpose of cruise

Topic: Molecular ecological chemistry in Arctic fjords at different stages of deglaciation.

Field of research: Ecology, Molecular Biology, Org. Chemistry, Phys. Oceanography

Sampling: Water, sediment and aerosol sampling in three different fjord systems.

10. Dates and names of intended ports of call

Reykjavik, July 22nd to August 02nd 2016 (intended so far July 25th to July 29th)

11. Any special logistic requirements at ports of call

Bunkering, crew change, container handling.

DETAIL

Part B

01. Name of research ship Maria S. Merian Cruise No. **MSM 56**

02. Dates of cruise from July 2nd 2016 (Longyearbyen) to July 25th 2016
(Reykjavik)

03. Purpose of research and general operational methods

Our proposed study thus aims at two topics: (i) changes of the phyto and bacterioplankton diversity along salinity gradients in Arctic fjords and (ii) the impact of such changes on biogeochemical fluxes and chemical modification of organic substrates and metabolites. For this we seek to study the water column in three Fjord systems (Arnarfjörður, Iceland; Scoresby Sund, Greenland and Kongsfjord, Svalbard), which differ in the degree of the available scientific knowledge, their size and extend of freshwater input and their biogeochemical settings. High-end analytical methods will be used to relate biodiversity to chemical signatures in the water column. Apart from the oceanographic parameters, oxygen concentration, alkalinity, particle flux and radiocarbon dates will be measured to provide element fluxes. A 4-day time series station in Scoresby Sund will help to assess diurnal variability. The Scoresby Sund is the world's largest fjord system and scientific studies are relatively scarce. Our results will therefore have a substantial importance for our understanding of the impact of global warming on environmental changes in the Arctic.

04. 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.

See "Attachment 01 maps and stations"

05. Types of samples required, e.g. Geological / Water / Plankton / Fish / Radio-activity / Isotope

Water (dissolved and particulate organic matter, microalgae, bacteria), ice, surface sediment, aerosols.

and methods by which samples will be obtained (including dredging/coring/drilling).

Water measurements: Temperature and salinity at different water depths using a CTD-Sensor, towed optical sensors, pCO₂ sensor

Water: Water rosette (winch), plankton nets (winch), Diaphragma pump system (<30m water depth)
Ship pump system for surface water

Plankton: Plankton net hauls, Bongonet 60cm diameter (< 150 µm mesh-size), flow cytometer

Particles in water: Drifting sediment traps equipped with video system

Surface sediment: van Veen sediment grab (0.1m²)

Ice & glacier runoff: Zodiac; manual collection with sample bottles

Aerosol sampler: Continuous onboard air filtration using an aerosol sampler

06. Details of moored equipment:

There will be no deployment of moored equipment.

07. Explosives: ***no explosives***
08. Detail and reference of
- (a) Any relevant previous / future cruises
Merian MSM21/3 (West Greenland and Iceland)
- (b) Any previous published research data relating to the proposed cruise.
(Attach separate sheet if necessary.)
See "Attachment 02 publications".
09. 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. René Groben
Matis ohf. / Icelandic Food and Biotech R&D
Vínlandsleið 12
113 Reykjavík
Iceland**
10. State:
- (a) Whether visits to the ship in port by scientists of the coastal state concerned will be acceptable.
- Yes**
- (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.**
- (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**

COASTAL STATE: Iceland

SCIENTIFIC EQUIPMENT

11. Complete the following table - SEPARATE COPY FOR EACH COASTAL STATE

(indicate 'YES' or 'NO')

List of all major Marine Scientific Equipment it is proposed to use and indicate waters in which it will be deployed	Fisheries Research within Fishing Limits	Research concerning Continental Shelf out to Coastal State's Margin	Within	Between	Between	Between
			3 NM	3 - 12 NM	12 - 50 NM	50 - 200 NM

a)						
vessel mounted systems:						
hydroacoustic mapping / measuring (incl. ADCP, Parasound and multibeam)	No	Yes	Yes	Yes	Yes	Yes
permanent surface water sampling / pumping (incl. Thermosalinograph)	No	No	Yes	Yes	Yes	Yes
b)						
mobile equipment:						
Ship CTD / water rosette	No	No	Yes	Yes	Yes	Yes
Ferry box for continuous monitoring of e.g. fluorescence	No	No	Yes	Yes	Yes	Yes
Towed optical sensors	No	No	Yes	Yes	Yes	Yes
pCO ₂ analyser	No	No	Yes	Yes	Yes	Yes
Diaphragma pump system	No	No	Yes	Yes	Yes	Yes
Plankton nets: Zooplankton, Phytoplankton	No	No	Yes	Yes	Yes	Yes
Drifting sediment trap including optical system	No	No	Yes	Yes	Yes	Yes
Van Veen Grab Corer	No	Yes	Yes	Yes	Yes	Yes
Ships' zodiac	No	No	Yes	Yes	Yes	Yes
Aerosol sampler	No	No	Yes	Yes	Yes	Yes
Flow Cytometer	No	No	Yes	Yes	Yes	Yes
Drone incl. Thermocamera	No	No	Yes	Yes	Yes	Yes

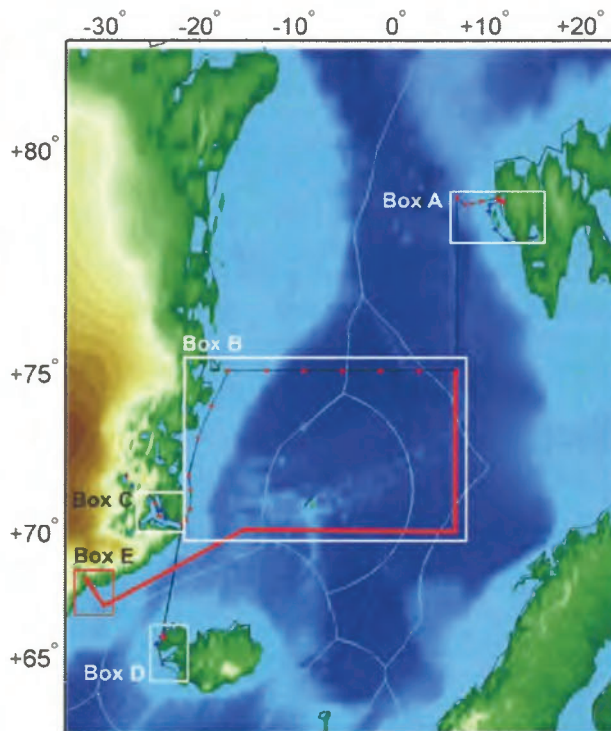
Maria S. Merian cruise MSM56
from July 2rd (Longyearbyen) to July 25th 2016 (Reykjavik)

Attachment 01: Geographical area of the intended work

Overview map

The overall operations will be within **79.2 N / 12.3 E and 64.1 N / 33 W**.

Sampling stations will be located within boxes A-D (see map):



Box A:
79.2 N / 7.1 W and 78.1 N / 15.7 W

Box B:
75.1 N / 21.5 E and 69 N / 7 W

Box C:
72.1 N / 28.5 E and 70 N / 21.5 E

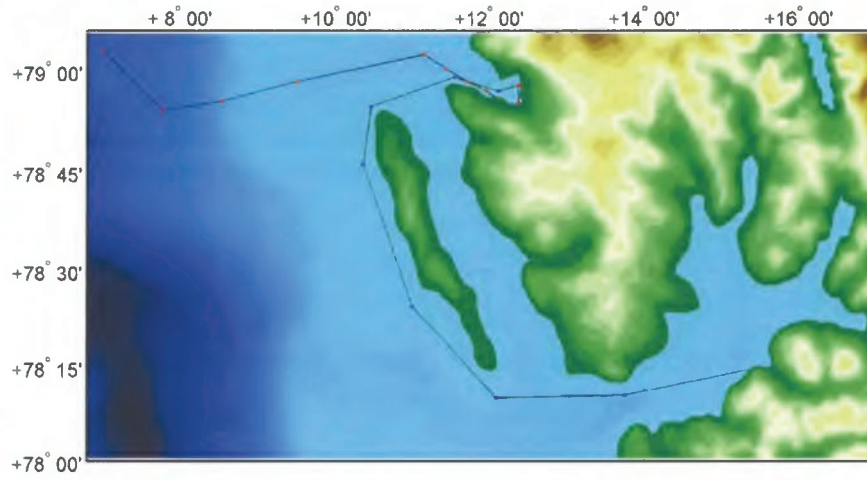
Box D:
66.5 N / 25 E and 64 N / 22.5 E

The locations of the station during the transit between Svalbard and Greenland will depend on ice conditions. The red line represents an alternative route, passing through EEZ Jan Mayen, in case of heavy ice conditions. Box E represents an

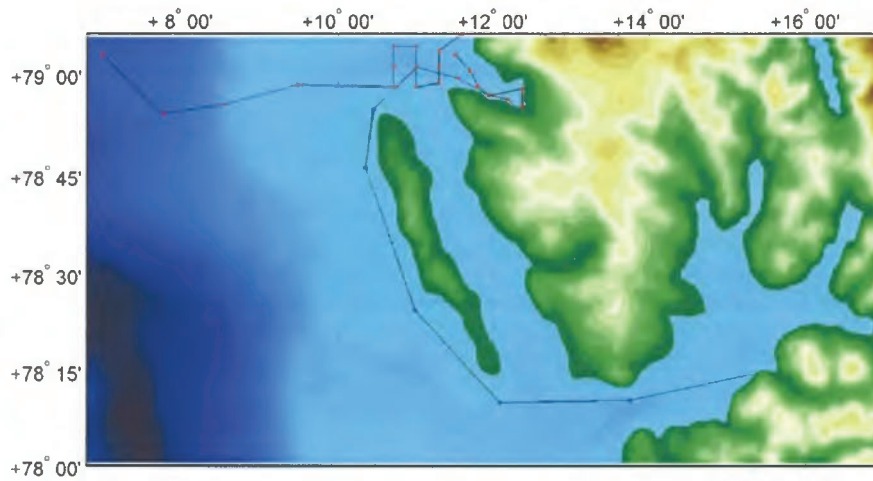
alternative fjord sampling in Kangerdlugssuaq fjord in case Scoresby Sund is not accessible due to ice conditions.

Box E: 69 N / 33 E and 67.5 N / 31 E

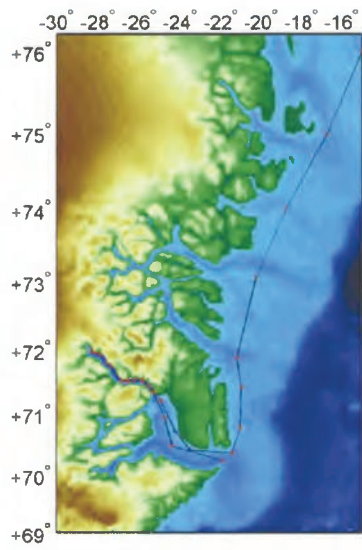
Spitzbergen



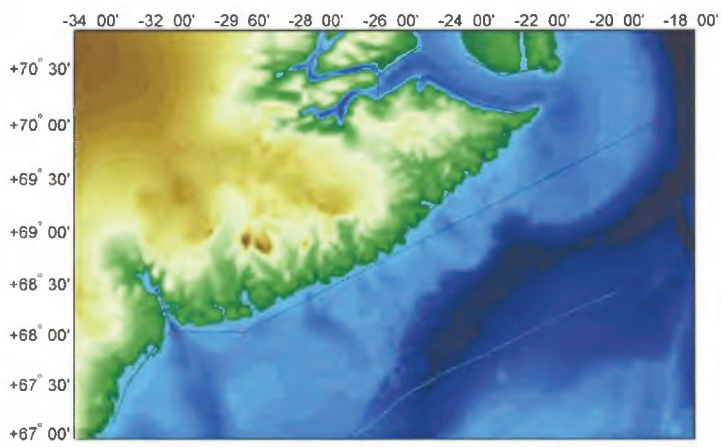
Alternative extended sampling in case of heavy ice conditions in Scoresby Sund (Greenland):



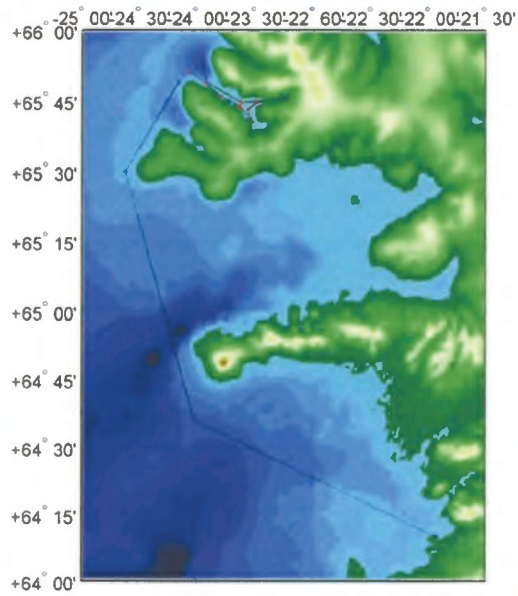
Scoresby Sund (Greenland)



**Alternative extended sampling in case of heavy ice conditions in Scoresby Sund (Greenland):
Kangerdlugssuaq fjord (Greenland)**



Iceland



Overview station activities

Table 1. Instrument overview: Standard stations (n=50) include the first five instruments in the list.

Instrument	No. of casts	Total deployment time [h]
CTD/ROS	50	62.80
Plankton Net	50	25.00
Zooplankton Net	50	25.00
Light sensor	50	15.00
Pump system	50	25.00
Drifting sediment trap	6	6.00
Van Veen Grab	4	1.65
Zodiac	4	8.00

Locations of stations

Table 2. Station overview: station ID, coordinates, water depth at each station (based on GEBCO), and number of casts. TS indicates the time series station (25).

Station	Lat	Lon	Depth	No of casts
Longyearbyen	78.23	15.65		
1	78.97	12.37	2	8
2	78.92	12.38	1	5
3	78.89	12.44	78	5
4	78.95	11.95	76	5
5	78.97	11.73	129	5
6	79.01	11.42	268	5
7	79.04	11.14	227	5
8	78.97	9.49	215	5
9	78.93	8.54	416	5
10	78.90	7.77	1099	5
11	79.05	7.00	1270	5
12	75.00	7.00	2019	5
13	75.00	3.00	2674	5
14	75.00	-1.00	3652	5
15	75.00	-5.00	3607	5
16	75.00	-9.00	3341	5
17	75.00	-13.00	371	5
18	75.00	-17.00	288	5
19	74.01	-18.77	254	5
20	73.06	-20.25	198	5
21	71.87	-21.21	401	5
22	71.41	-20.99	241	5
23	70.76	-21.05	204	5
24	70.37	-21.46	415	5
25	71.21	-24.97	447	5
26	71.45	-25.54	461	5
27	71.53	-25.85	344	1
28	71.54	-26.28	530	8
29	71.51	-26.57	1007	5
30	71.80	-27.55	457	5
31	71.95	-28.11	43	5
32	72.05	-28.36	637	7
33	71.98	-28.30	131	5
34	71.94	-27.90	501	5
35	71.75	-27.34	485	5
36	71.53	-26.85	408	5
37	71.53	-25.85	470	6
38	71.35	-25.32	310	5

Station	Lat	Lon	Depth	No of casts
39	70.95	-24.78	367	5
40	70.48	-24.41	425	5
41	70.24	-21.90	456	5
42	65.73	-23.63	10	2
43	65.77	-23.21	189	6
44	65.75	-23.28	13	5
45	65.75	-23.39	30	5
46	65.74	-23.49	10	5
47	65.72	-23.56	10	5
48	65.67	-23.53	10	5
49	65.73	-23.63	10	6
50	65.77	-23.80	10	5
51	65.81	-23.93	56	5
52	65.85	-24.07	104	5
Reykjavik	64.15	-21.93		

Maria S. Merian cruise MSM56
from July 2rd (Longyearbyen) to July 25th 2016 (Reykjavik)

Attachment 02: Selected previous publications

Alpermann, T.J., Tillmann, U., Beszteri, B., Cembella, A.D. and U. John (2010) Phenotypic variation and genotypic diversity in a planktonic population of the toxigenic marine dinoflagellate *Alexandrium tamarense*. *Journal of Phycology*, 46(1), 18-32., doi:10.1111/j.1529-8817.2009.00767.x.

Dittmar, T., Koch, B.P., Hertkorn, N., Kattner, G. (2008). A simple and efficient method for the solid-phase extraction of dissolved organic matter (SPE-DOM) from seawater. *Limnology and Oceanography: Methods*, 6, 230-235.

Dubinenkov I., Flerus R., Schmitt-Kopplin P., Kattner G., Koch B.P. (2015). Origin-specific molecular signatures of dissolved organic matter in the Lena Delta. *Biogeochemistry*, 123, 1–14.

Flerus R., Lechtenfeld O.J., Koch B.P., McCallister S.L., Schmitt-Kopplin P., Benner R., Kaiser K., Kattner G. (2012). A molecular perspective on the ageing of marine dissolved organic matter. *Biogeosciences*, 9, 1935–1955.

Hansen, M. O., Nielsen, T. G., Stedmon, C. A., and Munk, P.: Oceanographic regime shift during 1997 in Disko Bay, Western Greenland, *Limnology and Oceanography*, 57, 634-644, 10.4319/lo.2012.57.2.0634, 2012.

Heinrich, S. , Valentin, K. U. , Frickenhaus, S. , John, U. and Wiencke, C. (2012). Transcriptomic analysis of acclimation to temperature and light Stress in *Saccharina latissima* (Phaeophyceae), *PLoS ONE*, 7 (8), e44342 doi:10.1371/journal.pone.0044342 , hdl:10013/epic.39902

Hertkorn N., Frommberger M., Witt M., Koch B.P., Schmitt-Kopplin Ph., Perdue E.M. (2008). Natural organic matter and the event horizon of mass spectrometry. *Analytical Chemistry* 80, 8908–8919.

Hertkorn N., Harir M., Koch B.P., Michalke B., Grill P., Schmitt-Kopplin P. (2013). High field NMR spectroscopy and FTICR mass spectrometry: powerful discovery tools for the molecular level characterization of marine dissolved organic matter from the South Atlantic Ocean. *Biogeosciences*, 10, 1583-1624.

Hop, H., Falk-Petersen, S., Svendsen, H., Kwasniewski, S., Pavlov, V., Pavlova, O., and Soreide, J. E.: Physical and biological characteristics of the pelagic system across Fram Strait to Kongsfjorden, *Progress in Oceanography*, 71, 182-231, 10.1016/j.pocean.2006.09.007, 2006.

Hop, H., Pearson, T., Hegseth, E. N., Kovacs, K. M., Wiencke, C., Kwasniewski, S., Eiane, K., Mehlum, F., Gulliksen, B., Włodarska-Kowalczyk, M., Lydersen, C., Weslawski, J. M., Cochrane, S., Gabrielsen, G. W., Leakey, R. J. G., Lonne, O. J., Zajaczkowski, M., Falk-Petersen, S., Kendall, M., Wangberg, S. A., Bischof, K., Voronkov, A. Y., Kovaltchouk, N. A., Wiktor, J., Poltermann, M., di Prisco, G., Papucci, C., and Gerland, S.: The marine ecosystem of Kongsfjorden, Svalbard, *Polar Research*, 21, 167-208, 10.1111/j.1751-8369.2002.tb00073.x, 2002.

Huhn, O., Hellmer, H. H., Rhein, M., Rodehacke, C., Roether, W. G., Schodlok, M. P., and Schroder, M.: Evidence of deep- and bottom-water formation in the western Weddell Sea, *Deep-Sea Research Part II-Topical Studies in Oceanography*, 55, 1098-1116, 10.1016/j.dsr2.2007.12.015, 2008.

Iversen, K. R., and Seuthe, L.: Seasonal microbial processes in a high-latitude fjord (Kongsfjorden, Svalbard): I. Heterotrophic bacteria, picoplankton and nanoflagellates, *Polar Biology*, 34, 731-749, 10.1007/s00300-010-0929-2, 2011.

Jacob, T., Wahr, J., Pfeffer, W. T., and Swenson, S.: Recent contributions of glaciers and ice caps to sea level rise, *Nature*, 482, 514-518, 10.1038/nature10847, 2012.

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Wannicke, N., Koch, B.P., Voss, M. (2009). Release of fixed N₂ and C as dissolved compounds by *Trichodesmium erythrum* and *Nodularia spumigena* under the influence of high light and high nutrient (P), *Aquatic microbial ecology*, 57, 175-189.

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Yamashita Y., McCallister S.L., Koch B.P., Gonsior M., Jaffé, R. (2015). Dynamics of dissolved organic matter in fjord ecosystems: Contributions of terrestrial dissolved organic matter in the deep layer. *Estuarine, Coastal and Shelf Science*, 159, 37-49.

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