INSTITUTE OF OCEANOLOGY
POLISH ACADEMY OF SCIENCES

REPORT
FROM THE RESEARCH CRUISE
AREX 2018
R/V OCEANIA
14.06.2018 - 30.08.2018

Coordination

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IO PAS
SOPOT

The IO PAN long-term monitoring program AREX

Scientific background and objectives

Understanding of Arctic climate processes is the main aim of the oceanographic and atmospheric studies carried on in the polar region. The Arctic region is one of the most visible indicators of the on-going changing climate. The recent Arctic sea ice decline is one of the main drivers of the extensive research activities, carried out in high latitudes. The impacts of climate change observed in the Arctic precede those observed at the lower latitudes. The effects of global warming in the Arctic include a steady temperature increase, observed both in the atmosphere and in the ocean. These changes influence both the thickness and extent of the sea ice in the sub-Arctic seas and Arctic Ocean as well as ocean climate and vulnerable Arctic ecosystems.

Large oceanic exchanges between the North Atlantic and the Arctic Ocean result in the strong conversion of water masses when warm and salty Atlantic water (AW), transported through the Nordic Seas into the Arctic Ocean mixes with surrounding local waters and undergoes cooling, freezing and melting. As a result a part of AW is transformed into freshened surface waters over the shallow shelves, sea ice and dense (and highly saline) deep waters. Southward transport of the Arctic origin waters is one of main mechanisms of the global thermohaline circulation (THC). Better understanding of the variability of volume and heat transports between the North Atlantic and Arctic Ocean as well as processes of water mass conversion is necessary for improved qualitative and quantitative estimation of the large-scale meridional overturning circulation and its role in shaping the climate change in the northern hemisphere on inter-annual to decadal time scales.

The long-term AREX program and IO PAN annual cruises, carried by the research vessel Oceania for the last 30 years in the Nordic Seas and the European Arctic, are focused on multidisciplinary observations in areas such as physical oceanography, air—ocean interactions, ocean biogeochemistry and ecology to study the changes of abiotic and biotic Arctic environment. All these studies are carried out under the strategic research initiative addressing the role of the ocean in changing climate, its effects on the European seas and contemporary changes of the coastal ecosystems in the shelf seas. The data collected under the observational program AREX every year, in the same way, provide time series of key ocean variables which allow monitoring changes of the Arctic environment.

Oceanographic measurements and collection of water samples during the AREX 2018 cruise contributed to several IO PAN statutory research areas (I.3, I.4. I.5, I.7, II.2, III.1, III.5) and external research projects (national and international): ARGO-Poland, INTAROS, DWINS, Tax4Fun, Assemble+, KNOW, ABeFun, ABCMP, DIANA1, SEAPOP II, ecoPLAST, DAINA LT-PL ADAMANT, CASUMA and PhD grants. The scientific program AREX was focused on numerous scientific goals, subdivided into detailed tasks. A general overview is provided in the following sections.

Scientific goals and research tasks of the AREX2018 cruise

The AREX cruise of the Institute of Oceanology Polish Academy of Sciences (IO PAS) research vessel Oceania, repeated every summer over the same time period, in 2018 took place from June 14 to August 30. The AREX 2018 cruise lasted 78 days and consisted of five legs, devoted to collection of oceanographic, meteorological, aerosol and ocean ecosystem observations in the open ocean regions, including the eastern Norwegian and Greenland seas, Fram Strait, selected West Spitsbergen fjords and the southern Nansen Basin of the Arctic Ocean. The scientific crew and scientific equipment were exchanged between the individual cruise legs during short stays in Longyearbyen.

The main legs of the AREX 2018 expedition included:

LEG	PERIOD	CRUISE TRACK	CRUISE LEADER
I	14.06-21.06	Gdańsk - Tromsø	Dr Violetta Drozdowska
II	22.06-04.07	Tromsø - Longyearbyen	Dr hab. Waldemar Walczowski
III	05.07-24.07	Longyearbyen - Longyearbyen	Dr Agnieszka Beszczyńska- Möller
IVa	25.07-02.08	Longyearbyen – Longyearbyen	Dr Marta Głuchowska
IVb	03.08-12.08	Longyearbyen – Longyearbyen	Dr Marta Głuchowska
V	13.08-30.08	Longyearbyen – Gdańsk	Dr hab. Marek Zajączkowski

During atmospheric measurements collected on the **Leg I** of the research expedition **AREX2018** the following scientific tasks and questions were addressed:

- Description of the marine aerosols characteristic in the Arctic region: size distribution, concentration, optical properties, chemical composition and proportion of absorbing aerosols in the marine aerosols component;
- Estimation of the impact of marine aerosol on radiation flux in the sea surface;
- Estimation of the vertical CO_2 fluxes in the atmospheric boundary layer;
- Estimation of latent and sensible heat fluxes between ocean and atmosphere;
- Description of the meteorological conditions;
- Description of the CDOM and FDOM properties in surface microlayers: surface-active substances (surfactants);
- Creation the application for preparation of the Cruise Summary Report on the ship's server.

Additionally, the LTE internet and satellite communication system on the ship was optimized and updated during the entire AREX cruise. The standard meteorological observations were carried out according to the SHIP standard.

During the **Legs II** and **III** of the research expedition **AREX2018** measurements were collected to address the following scientific tasks:

- Structure and dynamics of the Norwegian-Atlantic and West Spitsbergen Currents in the eastern part of the Norwegian Sea, the Greenland Sea and entry to the Barents Sea;
- Variability of temperature, salinity and sea currents over the shelf and continental slope in the eastern part of the Norwegian Sea, the Greenland Sea and entry to the Barents Sea.
- Estimation of the volume and heat transport by the Norwegian-Atlantic Current;
- Overflow of dense brine waters in the Storfjordrenna;
- Variability of intermediate and deep water masses in the eastern part of the Norwegian Sea, Greenland Sea and the entrance to the Barents Sea;
- Description of the marine aerosols characteristic in the Arctic region: size distribution, concentration, optical properties, chemical composition and proportion of absorbing aerosols in the marine aerosols component;
- Estimation of the impact of marine aerosol on radiation flux in the sea surface;
- Estimation of the vertical CO_2 fluxes in the atmospheric boundary layer;
- Estimation of latent and sensible heat fluxes between ocean and atmosphere;
- Estimation of the droplet flux from the sea surface and their impact on ocean-atmosphere mass and energy exchanges;
- Description of the meteorological conditions;
- Description of the spatial distributions and quantitative-qualitative composition of zooplankton communities in the epi- and mesopelagic zones in the Norwegian-Atlantic and West Spitsbergen Current;
- Genetic diversity in zooplankton population in the Norwegian-Atlantic region;
- Description of the dependence between protozoa and zooplankton in the Hornsund fjords;
- Collection of zooplankton samples from 14 regular station plankton monitoring from 50m of surface layer with WP2/60um lub Juday/63um;

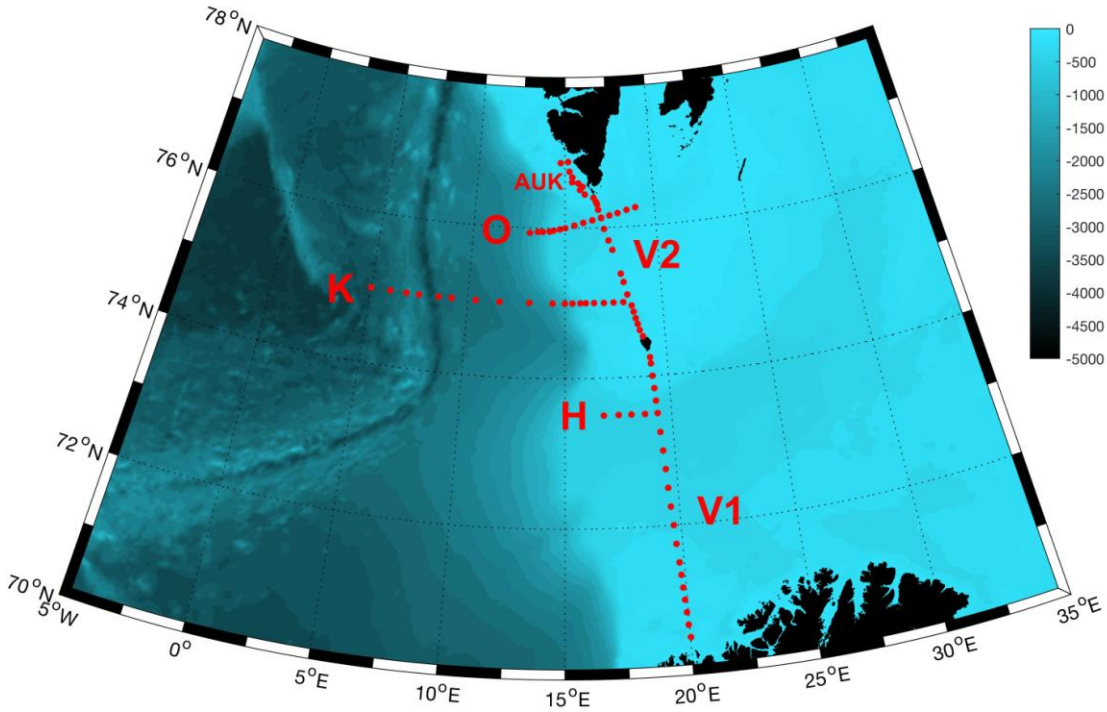
Work at sea

During the **AREX2018** expedition (**Legs II** and **III**) all oceanographic measurements were conducted on the station grid consisting of standard sections repeated annually since 2000, and along new sections located north of Svalbard. Location of oceanographic sections is shown on Fig. 1. During both legs of the cruise 154 full-depth CTD (Seabird 9/11+) stations were measured (83 stations during the leg II and 71 stations during the leg III), providing profiles of temperature, salinity, dissolved oxygen and fluorescence. In addition to CTD casts, the ocean currents were measured with a Lowered Acoustic Doppler Current Profiler (LADCP, Teledyne RDI) at each station and the upper (200m) ocean currents were continuously recorded during the whole survey with a Vessel-Mounted Acoustic Doppler Current Profiler (VM-ADCP). The CTD and LADCP system was mounted on the SeaBird bathymetric rosette equipped with large Nansen bottles. On stations water samples were collected for post-cruise

calibration of conductivity sensors. The detailed list and schedule of CTD casts is given in the station list (Att. 1).

The standard meteorological observations were carried out according to the SHIP standard and wind components, air humidity and CO2 concentration were measured separately. Concentration and distribution of marine aerosols, as well as aerosol optical thickness, were measured at selected stations. On selected stations, plankton samples were collected with various sampling gear (WP2/180, WP2/60, WP2/20 nets, Multiple Plankton Sampler (in four statons)). Total in the leg II and III were collected 67 "stratified" samples of zooplankton (and 11 samples by WP2/60, intended for the study of meroplankton), 24 samples of protozoan plankton and 24 samples of suspension for chlorophyll *a*. During the leg III one Autonomous Underwater Vehicle (glider) type Slocum G1 was launched (78°10.93'N 010°01.09'E) in cooperation with LOCEAN (Laboratoire d'Océanographie et du Climat: Expérimentations et Approches Numériques) University Pierre et Marie Curie.

a)



b)

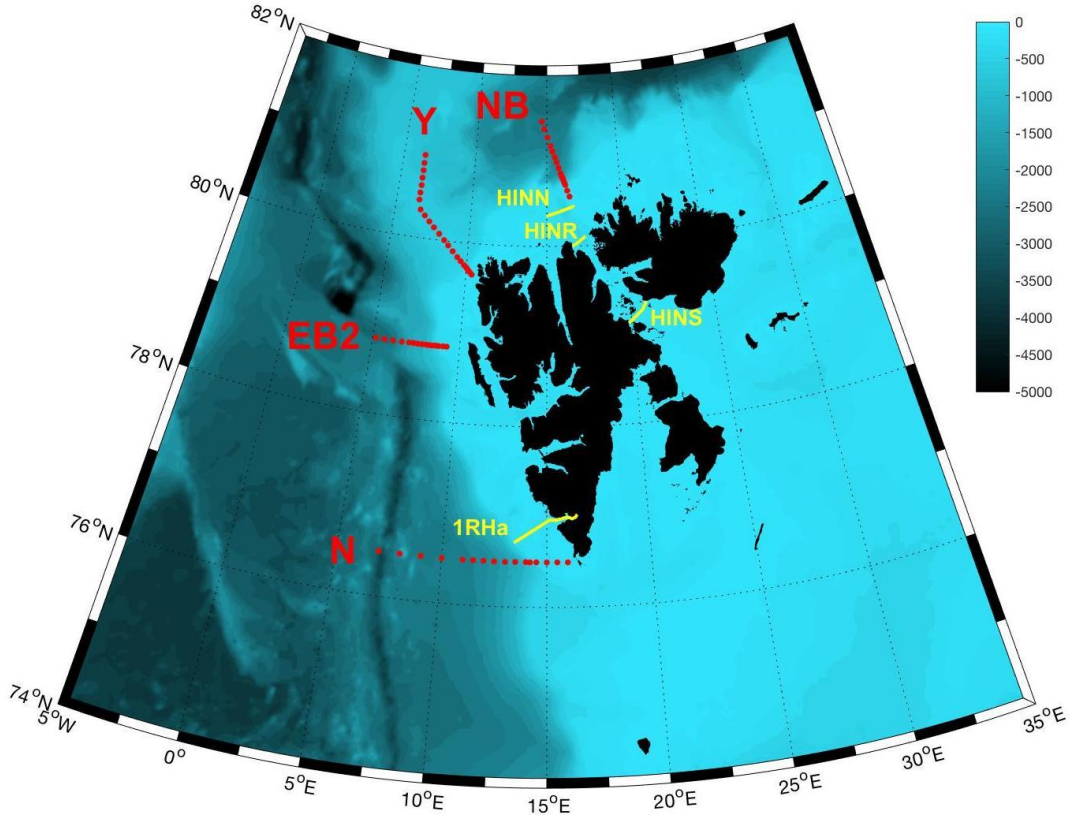


Figure 1 Distribution of CTD stations during the open ocean part legs II (up) and leg III (down) of the AREX 2018 cruise. Red dots mark CTD stations and yellow line shows the high-resolution towed CTD section.

Section time and numer of stations

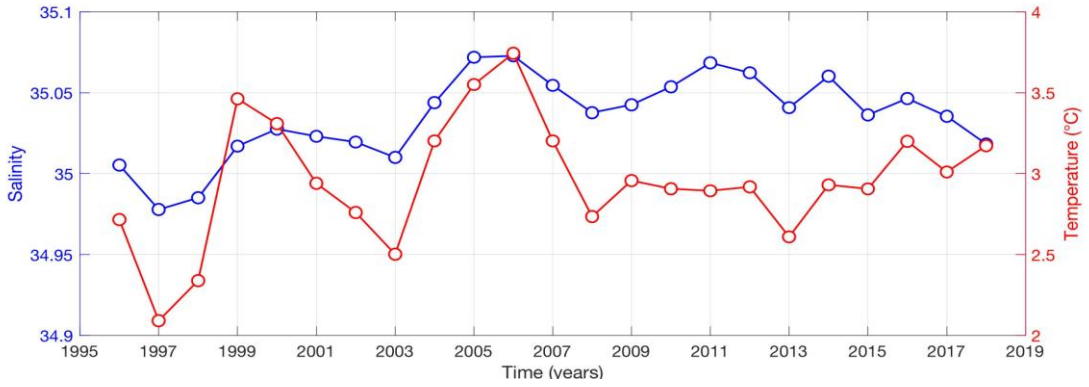
Section	Start (UTC)	End (UTC)	Nb of stations	Time used (h)
V1 (V1 - V20)	22.06, 07:24	24.06, 00:51	20	42
H (H1, H2, H3, H5)	24.06, 06:03	24.06, 11:58	4	6
V2 (V21 - V38)	24.06, 23:32	25.07, 21:36	17	22
K (K-3 - K16)	28.06, 17:08	01.07, 13:29	18	69
O (O8 - O-13)	02.07, 17:48	03.07, 14:57	15	21
NB (NB1 - NB11)	12.07, 16:14	14.07, 15:12	18	47
Y (Y1 - Y10)	17.07, 05:06	18.07, 04:58	22	24
EB2 (EB2-1 - EB2-10)	18.07, 19:22	19.07, 19:05	15	24
N (N-15 - N5)	21.07, 14:53	23.07, 03:08	16	36

Preliminary results of oceanographic measurements

During the AREX2018 cruise hydrographic measurements were performed at the grid of stations, which included 9 standard CTD sections. Collected time series of water properties are used to study long-term changes in the ocean climate in Nordic Seas and Fram Strait. The standard section N, running westward off Sørkapp, represents the longest time series of IOPAN hydrographic observations and provides data for studying the long-term variability of the Atlantic water hydrographic properties.

Oceanographic data from the N cross-section along the 76° 30'N represent the longest time series collected by the Institute of Oceanology Polish Academy of Sciences (Fig. 2). Preliminary analysis showed that in 2018 Atlantic water was slightly warmer and less saline (Fig. 2) than in 2017. For the first time in 15 years, the average salinity of Atlantic waters was below the long-term average (Fig. 3)

a)



b)

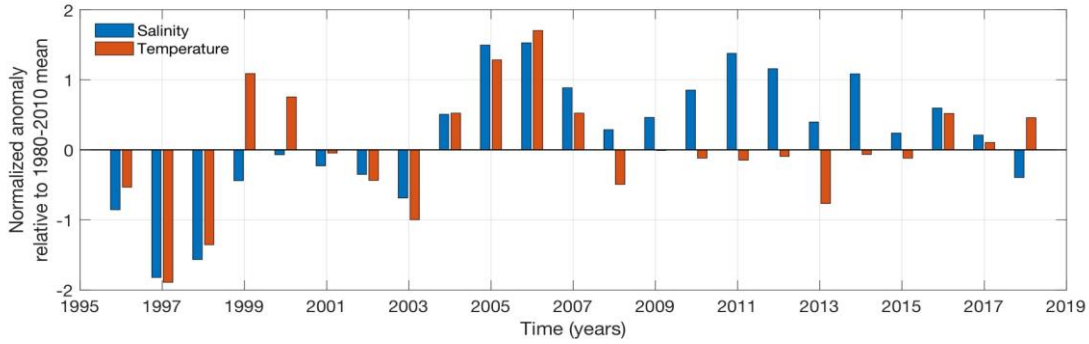


Figure 2 (a) Time series of the vertically averaged temperature and salinity of the Atlantic water (T>0°C S>34.92) at the section N along 76°30'N between 6° and 15°E measured in summers of 1996-2018; (b) normalized anomalies of temperature and salinity of Atlantic waters in relation to average values for 1980-2010.

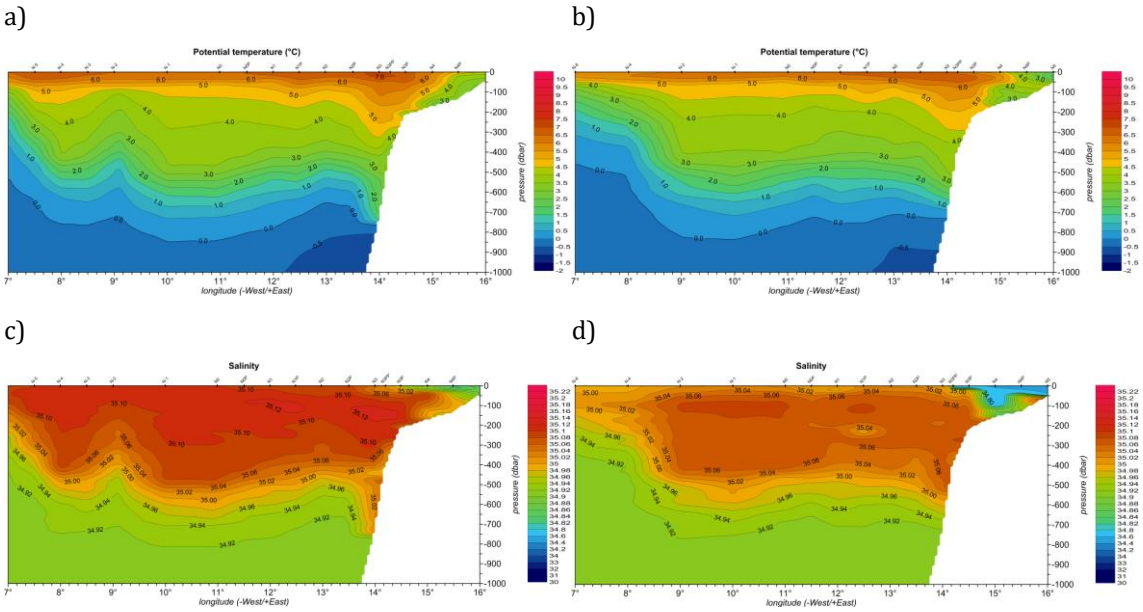


Figure 3 Distributions of temperature (a, b) and salinity (c, d) in the upper layer of 0-1000 m on the N cross-section in July 2017 (a, c) and in July 2018 (b, d).

During **Legs IVa** and **IVb** of the **AREX2018** expedition multidisciplinary observations of marine plankton and benthos, physical (marine optics), hydrographic (CTD profiles and cross-sections), chemical and meteorological (aerosols) in the West Spitsbergen fjords (Fig. 4) were conducted in the main studied areas in Isfjorden, Hornsund, Kongsfjorden, Krossfjorden, Smeerenburgfjorden and Prins Karls Forlandsundet Strait. Collection of samples and in situ hydrographic and biological measurements will contribute to long-term observations of plankton and benthos in the Arctic fjords.

The measurements and samples collection included:

- Collection of plankton (zooplankton) and benthos samples in the studied areas;
- Estimation of taxonomic composition, abundance and biomass of macro- and meiozoobenthos on monitoring stations in the Hornsund, Kongsfjorden fjords and stations located in the Forlandsundet and Krossfjorden fjord;
- Description of the spatial distributions and quantitative-qualitative plankton composition (protozoan plankton and zooplankton) in the Hornsund, Kongsfjorden and Isfjorden fjords;
- Evaluation of genetic and taxonomic diversity of zooplankton organisms in the Atlantic water, Nordic Seas and Isfjorden fjord;
- Determination of the nesting *alle alle* in the Hornsund and Kongsfjord fjords;
- Determining of the ecological plasticity of Calanus in the Atlantic and Arctic waters and inside the Hornsund fjord;
- Determining of the phylogenetic relationships between benthic organisms;
- Estimation the distribution of benthic fauna in disturbed habitats of the glacier;
- Estimation the content of mineral suspensions in glacial bays in the Hornsund fjord the Forlandsundet Strait;

- Measurements of inherent and apparent optical properties in the West Spitsbergen fjords;
- Characterisation of spectral vertical profiles of solar (absorption and attenuation of light) in water column and surface spectral reflectances;
- High-resolution hydrographic section with a towed CTD scanfish system in Hornsund and Kongsfjorden fjords;
- Description of the marine aerosols characteristic in the Arctic region: size distribution, concentration, optical properties, chemical composition and proportion of absorbing aerosols in the marine aerosols component;
- Estimation of the impact of marine aerosol on radiation flux in the sea surface;
- Estimation of the vertical CO_2 fluxes in the atmospheric boundary layer;
- Estimation of latent and sensible heat fluxes between ocean and atmosphere;
- Description of the meteorological conditions;
- Collection of bottom sediment samples and water samples for chemical analysis in the Hornsund and Kongsfiord fjords;
- Recognition the impact of glaciers on the acid-base system;
- Determination the concentrations of persistent organic pollutants in abiotic elements in the Hornsund ecosystem;
- Determination the concentrations of heavy metals in abiotic elements in the Hornsund ecosystem and geochemical research in the Krossfjorden.

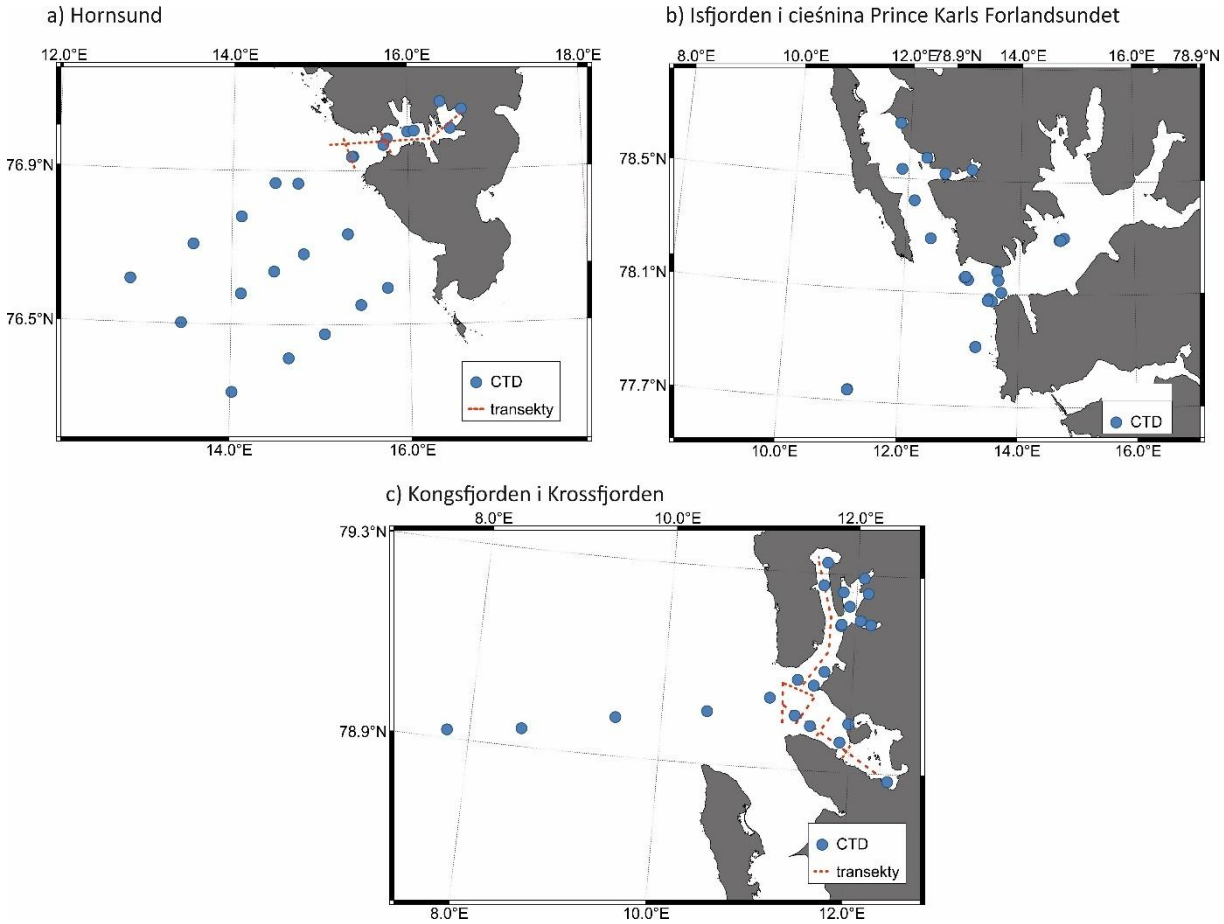


Figure 4 Distribution of CTD stations during the fjord part of the AREX 2018 cruise in the Hornsund, Isfjorden i Kongsfjorden-Krossfjorden fjords.

Paleoceanography measurements carried on under the **Leg V** of the research expedition **AREX2018** were aimed in studying:

- Northward advection of Atlantic water along the western and northern Svalbard shelf using benthic/plankton foraminifera as a main indicator;
- Description of the bottom surface and the structure of surface deposits in places of planned geological-environmental research by acoustic equipment;
- Reconstruction of changes in the surface temperature in water layer based on alkenone analysis;
- Description of the species composition, location and biodiversity contemporary benthic foraminifers and cysts of furrows;
- Description of the species composition and DNA of contemporary foraminifers from the Monothalamea class in the sediments;
- Recognition of the range of municipal pollution in surface sediments in the Adventfjorden – Isfjorden;
- Description of the marine aerosols characteristic in the Arctic region: size distribution, concentration, optical properties, chemical composition and proportion of absorbing aerosols in the marine aerosols component;
- Estimation of the impact of marine aerosol on radiation flux in the sea surface;
- Estimation of the vertical CO_2 fluxes in the atmospheric boundary layer;
- Estimation of latent and sensible heat fluxes between ocean and atmosphere;
- Description of the meteorological conditions;
- Description of the CDOM and FDOM properties in surface microlayers: surface-active substances (surfactants);

Attachment 1 List of stations measured during the open ocean part of the AREX2018 (Legs II and III).

File	Station	Latitude	Longi-tude	Water depth	Max Pres	Day	Month	Year	Hour	Min
AREX2018 leg II (21.06-05.07.2018)										
AR18_005.awi	V1	70.500	20.014	132	130	22	6	2018	7	24
AR18_006.awi	V2	70.667	19.967	158	156	22	6	2018	9	1
AR18_007.awi	V3	70.833	19.937	179	178	22	6	2018	10	27
AR18_008.awi	V4	71.001	19.901	188	187	22	6	2018	11	58
AR18_009.awi	V5	71.164	19.869	214	213	22	6	2018	14	32
AR18_010.awi	V6	71.334	19.839	210	209	22	6	2018	16	10
AR18_011.awi	V7	71.500	19.805	240	240	22	6	2018	17	41
AR18_012.awi	V8	71.749	19.735	265	265	22	6	2018	20	47
AR18_013.awi	V9	72.000	19.686	305	305	22	6	2018	22	54
AR18_014.awi	V10	72.248	19.620	324	325	23	6	2018	2	13
AR18_015.awi	V15	72.500	19.568	387	389	23	6	2018	4	40
AR18_016.awi	V12	72.750	19.523	397	399	23	6	2018	8	43
AR18_017.awi	V13	72.999	19.468	413	414	23	6	2018	11	1
AR18_018.awi	V14	73.248	19.404	445	447	23	6	2018	14	12
AR18_019.awi	V15	73.501	19.340	478	482	23	6	2018	16	43

AR18_020.awi	V16	73.667	19.305	347	348	23	6	2018	18	35
AR18_021.awi	V17	73.834	19.273	232	231	23	6	2018	20	19
AR18_022.awi	V18	74.000	19.221	133	132	23	6	2018	22	2
AR18_023.awi	V19	74.166	19.189	71	69	23	6	2018	23	44
AR18_024.awi	V20	74.249	19.169	58	56	24	6	2018	0	51
AR18_025.awi	H1	73.500	18.750	431	433	24	6	2018	6	3
AR18_026.awi	H2	73.503	18.111	407	408	24	6	2018	7	54
AR18_027.awi	H3	73.504	17.514	426	428	24	6	2018	9	44
AR18_028.awi	H5	73.503	16.817	447	450	24	6	2018	11	58
AR18_029.awi	V21	74.534	18.884	27	26	24	6	2018	23	32
AR18_030.awi	V22	74.617	18.749	68	66	25	6	2018	0	33
AR18_031.awi	V23	74.700	18.666	98	96	25	6	2018	1	32
AR18_032.awi	V24	74.778	18.582	223	223	25	6	2018	2	29
AR18_033.awi	V25	74.866	18.501	205	205	25	6	2018	3	44
AR18_034.awi	V26	74.951	18.416	72	70	25	6	2018	4	51
AR18_035.awi	V27	75.099	18.221	68	66	25	6	2018	6	15
AR18_036.awi	V28	75.268	18.061	62	59	25	6	2018	8	22
AR18_037.awi	V29	75.379	17.939	103	101	25	6	2018	9	27
AR18_039.awi	V31	75.701	17.549	213	213	25	6	2018	12	18
AR18_040.awi	V32	75.828	17.359	292	293	25	6	2018	14	45
AR18_041.awi	V33	75.983	17.142	319	320	25	6	2018	16	15
AR18_042.awi	V34	76.127	17.002	286	286	25	6	2018	17	56
AR18_043.awi	V35	76.240	16.849	214	213	25	6	2018	19	16
AR18_044.awi	V36	76.315	16.793	106	105	25	6	2018	20	16
AR18_045.awi	V37	76.347	16.731	53	50	25	6	2018	20	53
AR18_046.awi	V38	76.400	16.608	31	28	25	6	2018	21	36
AR18_047.awi	AUK22	76.446	16.119	43	40	25	6	2018	22	39
AR18_048.awi	AUK13	76.508	15.855	56	55	25	6	2018	23	27
AR18_049.awi	AUK22'	76.549	15.998	25	22	26	6	2018	0	5
AR18_050.awi	AUK13	76.595	15.760	38	36	26	6	2018	0	51
AR18_051.awi	AUK12'	76.611	15.409	56	53	26	6	2018	2	10
AR18_052.awi	AUK12"	76.674	15.427	50	48	26	6	2018	2	52
AR18_053.awi	AUK2'	76.751	15.260	55	52	26	6	2018	3	43
AR18_054.awi	AUK2	76.866	14.751	59	52	26	6	2018	5	2
AR18_055.awi	AUK1`	76.880	15.182	54	53	26	6	2018	5	55
AR18_056.awi	K16	75.001	4.997	3055	3105	28	6	2018	17	8
AR18_057.awi	K15	75.001	5.996	2826	2872	29	6	2018	12	53
AR18_058.awi	K14	75.000	6.829	2018	2046	29	6	2018	17	48
AR18_059.awi	K13	74.998	7.481	2224	2258	29	6	2018	21	20
AR18_060.awi	K12	75.001	8.491	2762	2807	30	6	2018	1	39
AR18_061.awi	K11	75.002	9.164	2578	2617	30	6	2018	6	9
AR18_062.awi	K10	75.001	10.407	2501	2541	30	6	2018	11	24
AR18_063.awi	K9	75.000	11.630	2351	2386	30	6	2018	15	49
AR18_064.awi	K7	75.003	13.169	1970	1998	30	6	2018	20	55
AR18_065.awi	K5	75.001	14.359	1496	1514	1	7	2018	0	50
AR18_066.awi	K4	75.000	14.992	1085	1098	1	7	2018	3	11
AR18_067.awi	K3	75.000	15.385	783	790	1	7	2018	4	59
AR18_069.awi	K2	75.002	15.791	310	309	1	7	2018	7	56
AR18_068.awi	K1	75.003	16.070	216	214	1	7	2018	6	48
AR18_070.awi	K0	75.002	16.494	231	230	1	7	2018	9	34
AR18_071.awi	K-1	75.000	16.996	126	125	1	7	2018	11	8
AR18_072.awi	K-2	75.001	17.492	118	116	1	7	2018	12	18
AR18_073.awi	K-3	75.001	17.994	156	155	1	7	2018	13	29
AR18_074.awi	O8	76.251	18.924	261	260	2	7	2018	17	48
AR18_075.awi	O7	76.222	18.429	249	248	2	7	2018	20	4
AR18_076.awi	O6	76.186	17.923	274	274	2	7	2018	21	28

AR18_077.awi	O5	76.159	17.462	309	310	2	7	2018	22	55
AR18_078.awi	O4	76.134	17.002	281	282	3	7	2018	0	29
AR18_079.awi	O3	76.102	16.511	340	341	3	7	2018	2	24
AR18_080.awi	O2	76.070	16.012	385	386	3	7	2018	3	52
AR18_081.awi	O1	76.035	15.518	363	365	3	7	2018	5	13
AR18_082.awi	M4	76.001	15.015	336	337	3	7	2018	6	33
AR18_083.awi	O-1	75.985	14.717	325	325	3	7	2018	8	2
AR18_084.awi	O-2	75.967	14.371	343	343	3	7	2018	9	11
AR18_085.awi	O-3	75.955	14.160	558	562	3	7	2018	10	6
AR18_086.awi	O-4	75.950	13.787	909	918	3	7	2018	11	27
AR18_087.awi	O-5	75.949	13.522	1098	1109	3	7	2018	12	59
AR18_088.awi	O-6	75.933	13.083	1374	1390	3	7	2018	14	57
File	**Station**	**Latitude**	**Longi-tude**	**Water depth**	**Max Pres**	**Day**	**Month**	**Year**	**Hour**	**Min**
AREX2018 leg III (5.07-24.07.2018)										
AR18_093.awi	NB1	80.550	16.530	56	53	12	7	2018	16	14
AR18_094.awi	NB2	80.616	16.383	138	137	12	7	2018	16	57
AR18_096.awi	NB4	80.680	16.265	177	175	12	7	2018	18	21
AR18_097.awi	NB5	80.696	16.221	382	383	12	7	2018	19	3
AR18_098.awi	NB6	80.710	16.191	546	551	13	7	2018	11	19
AR18_099.awi	NB7	80.725	16.155	660	665	13	7	2018	12	29
AR18_100.awi	NB8	80.742	16.118	758	764	13	7	2018	13	36
AR18_101.awi	NB9	80.757	16.086	958	969	13	7	2018	14	47
AR18_102.awi	NB10	80.774	16.023	1142	1156	13	7	2018	16	19
AR18_103.awi	NB11	80.805	15.962	1559	1578	13	7	2018	17	55
AR18_104.awi	NB12	80.867	15.827	1859	1854	13	7	2018	20	25
AR18_105.awi	NB13	80.930	15.693	1930	1909	13	7	2018	23	9
AR18_106.awi	NB14	80.989	15.567	1795	1797	14	7	2018	1	36
AR18_107.awi	NB15	81.052	15.396	1966	1946	14	7	2018	4	24
AR18_108.awi	NB16	81.113	15.266	1976	1956	14	7	2018	7	21
AR18_109.awi	NB17	81.207	15.054	1931	1942	14	7	2018	10	19
AR18_110.awi	NB18	81.299	14.811	1636	1609	14	7	2018	12	59
AR18_111.awi	NB19	81.383	14.634	1553	1524	14	7	2018	15	12
AR18_112.awi	Y1	79.656	10.357	78	35	17	7	2018	5	6
AR18_113.awi	Y2	79.681	10.228	120	89	17	7	2018	5	42
AR18_114.awi	Y3	79.707	10.097	135	133	17	7	2018	6	18
AR18_115.awi	Y4	79.730	9.991	309	308	17	7	2018	6	49
AR18_116.awi	Y5	79.754	9.837	369	369	17	7	2018	7	37
AR18_117.awi	Y6	79.794	9.606	423	424	17	7	2018	8	28
AR18_118.awi	Y7	79.836	9.374	449	451	17	7	2018	9	24
AR18_119.awi	Y8	79.894	9.052	458	461	17	7	2018	10	22
AR18_120.awi	Y9	79.954	8.724	475	478	17	7	2018	11	32
AR18_121.awi	Y10	80.007	8.433	494	497	17	7	2018	12	39
AR18_122.awi	Y11	80.071	8.069	508	512	17	7	2018	13	53
AR18_123.awi	Y12	80.135	7.687	533	539	17	7	2018	15	15
AR18_124.awi	Y13	80.193	7.345	559	564	17	7	2018	16	32
AR18_125.awi	Y14	80.253	7.001	573	576	17	7	2018	17	50
AR18_126.awi	Y15	80.311	6.670	560	563	17	7	2018	19	3
AR18_127.awi	Y16N	80.418	6.503	590	593	17	7	2018	20	30
AR18_128.awi	Y17N	80.497	6.496	633	638	17	7	2018	21	47
AR18_129.awi	Y18N	80.580	6.510	684	689	17	7	2018	23	17
AR18_130.awi	Y19N	80.663	6.495	754	760	18	7	2018	0	36
AR18_131.awi	Y20N	80.745	6.496	832	841	18	7	2018	2	1
AR18_132.awi	Y21N	80.827	6.481	863	873	18	7	2018	3	24
AR18_133.awi	Y22N	80.916	6.473	887	899	18	7	2018	4	58

AR18_134.awi	EB2-1	78.836	9.261	200	198	18	7	2018	19	22
AR18_135.awi	EB2-1P	78.836	9.043	207	206	18	7	2018	20	39
AR18_136.awi	EB2-2	78.834	8.781	210	208	18	7	2018	21	23
AR18_137.awi	EB2-2P	78.836	8.609	378	376	18	7	2018	22	4
AR18_138.awi	EB2-3	78.833	8.431	644	648	18	7	2018	23	4
AR18_139.awi	EB2-3P	78.833	8.265	826	833	19	7	2018	0	25
AR18_140.awi	EB2-4	78.834	8.092	955	967	19	7	2018	1	40
AR18_141.awi	EB2-4P	78.834	7.835	1056	1068	19	7	2018	3	12
AR18_142.awi	EB2-5	78.833	7.595	1105	1118	19	7	2018	4	59
AR18_143.awi	EB2-5P	78.835	7.355	1196	1208	19	7	2018	6	54
AR18_144.awi	EB2-6	78.834	7.096	1341	1356	19	7	2018	8	36
AR18_145.awi	EB2-7	78.832	6.680	1730	1753	19	7	2018	10	27
AR18_146.awi	EB2-8	78.832	6.174	2355	2360	19	7	2018	12	52
AR18_147.awi	EB2-9	78.831	5.672	2528	2569	19	7	2018	16	4
AR18_148.awi	EB2-10	78.832	5.184	2598	2637	19	7	2018	19	5
AR18_149.awi	N5	76.499	16.003	47	47	21	7	2018	14	53
AR18_150.awi	N4P	76.500	15.500	133	133	21	7	2018	16	1
AR18_151.awi	N4	76.500	15.000	161	160	21	7	2018	17	12
AR18_152.awi	N3P	76.500	14.502	220	219	21	7	2018	18	49
AR18_153.awi	N3PP	76.499	14.202	404	405	21	7	2018	19	41
AR18_154.awi	N3	76.501	13.999	745	750	21	7	2018	20	30
AR18_155.awi	N2P	76.500	13.501	1260	1274	21	7	2018	22	7
AR18_156.awi	N2	76.498	13.022	1530	1548	22	7	2018	0	12
AR18_157.awi	N1P	76.498	12.493	1736	1761	22	7	2018	3	12
AR18_158.awi	N1	76.500	11.991	1890	1914	22	7	2018	5	58
AR18_159.awi	N0P	76.500	11.501	2005	2034	22	7	2018	8	45
AR18_160.awi	N0	76.498	11.003	2087	2116	22	7	2018	11	31
AR18_161.awi	N-1	76.498	10.003	2241	2276	22	7	2018	15	19
AR18_162.awi	N-2	76.501	9.002	2256	2287	22	7	2018	19	33
AR18_163.awi	N-4	76.500	8.002	1711	1732	22	7	2018	23	35
AR18_164.awi	N-6	76.499	7.000	2765	2811	23	7	2018	3	8