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REPORT
FROM THE RESEARCH CRUISE
AREX 2019
R/V OCEANIA
12.06.2019 - 30.08.2019



Coordination

Assoc. Prof. Waldemar Walczowski

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 2019 cruise contributed to several IO PAN statutory research tasks (I.2, I.3, I.4, I.5, I.7, II.1, II.2, II.5, II.7, III.2) and external research projects (national and international): ARGO-Poland, INTAROS (H2020), DWINS, BaSEaf, Ocean Acidification, FAABulous, HIDEA, Adamant, ecoPlast, Tax4Fun, CoastDark, Assemble Plus, Wir 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 AREX2019 cruise

The AREX cruise of the Institute of Oceanology Polish Academy of Sciences (IO PAN) research vessel Oceania, repeated every summer over the same time period, in 2019 took place from June 12 to August 30. The AREX 2019 cruise lasted 80 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, and the southern Nansen Basin of the Arctic Ocean, and in the selected West Spitsbergen fjords. The scientific crew and research equipment were exchanged between the individual cruise legs during short stays in Longyearbyen.

The main legs of the AREX 2019 expedition included:

LEG	PERIOD	CRUISE TRACK	CRUISE LEADER
I	12.06-19.06	Gdańsk - Tromsø	Dr Piotr Markuszewski
II	20.06-05.07	Tromsø - Longyearbyen	Dr Agnieszka Beszczyńska-Möller
III	06.07-22.07	Longyearbyen - Longyearbyen	Dr Agnieszka Beszczyńska-Möller
IVa	23.07-25.07	Longyearbyen - Longyearbyen	Prof. Jan Marcin Węsławski
IVb	26.07-05.08	Longyearbyen - Longyearbyen	Prof. Katarzyna Błachowiak-Samołyk
IVc	06.08-13.08	Longyearbyen - Longyearbyen	Prof. Katarzyna Błachowiak-Samołyk
V	13.08-30.08	Longyearbyen - Gdańsk	Prof. Marek Zajączkowski

During atmospheric measurements collected on the **Leg I** of the research expedition **AREX2019** 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 CO₂ 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);

The standard meteorological observations were carried out according to the SHIP standard.

Additionally, chemical carbon dioxide and oxygen detectors were installed and calibrated in seawater. A popular sciences project (daily briefings and multimedia broadcasts) was carried out to promote measurements onboard RV

Oceania. The LTE internet and satellite communication system on the ship was optimized and updated during the entire AREX cruise.

During the **Legs II** and **III** of the research expedition **AREX2019** measurements were collected to address the following scientific tasks:

- Structure and dynamics of the Norwegian-Atlantic and West Spitsbergen currents in the eastern parts of the Norwegian Sea, the Barents Sea Opening, the Greenland Sea and Fram Strait;
- Variability of temperature, salinity and sea currents over the shelf and continental slope in the eastern parts of the Norwegian Sea, the Barents Sea Opening, the Greenland Sea and Fram Strait.
- Estimation of the volume and heat transport by the Norwegian-Atlantic Current and West Spitsbergen currents;
- Variability of intermediate and deep water masses in the eastern parts of the Norwegian Sea, the Barents Sea Opening, the Greenland Sea and Fram Strait;
- 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 CO₂ 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 black carbon concentration;
- Description of the vertical aerosols structure in the atmospheric boundary layer
- Description of the meteorological conditions;
- Description of the spatial distributions and quantitative-qualitative composition of plankton communities (protozoal plankton and zooplankton) in the epi- and mesopelagic zones in the Norwegian-Atlantic and West Spitsbergen Current;
- Genetic diversity in zooplankton population in the Norwegian-Atlantic-Arctic region;
- Description of the dependence between protozoa and zooplankton in the Hornsund fjords;
- Description of the composition and distributions of meroplankton in the West Spitsbergen Current;
- Creation of the nuclear 18S rRNA and mitochondrial 16S rRNA genetic reference base of selected zooplankton organisms and estimation of zooplankton diversity from the European Arctic region based on metabarcoding;
- Identification of carbonate system variability in the West Spitsbergen Current;
- Characterisation of spectral vertical profiles of solar (absorption and attenuation of light) in water column and surface spectral reflectances;

- Description of the spectral coefficients of absorption and attenuation of the light beam in the vertical profile and the concentration of chlorophyll *a* and suspension;
- Description of the productivity in arctic waters;

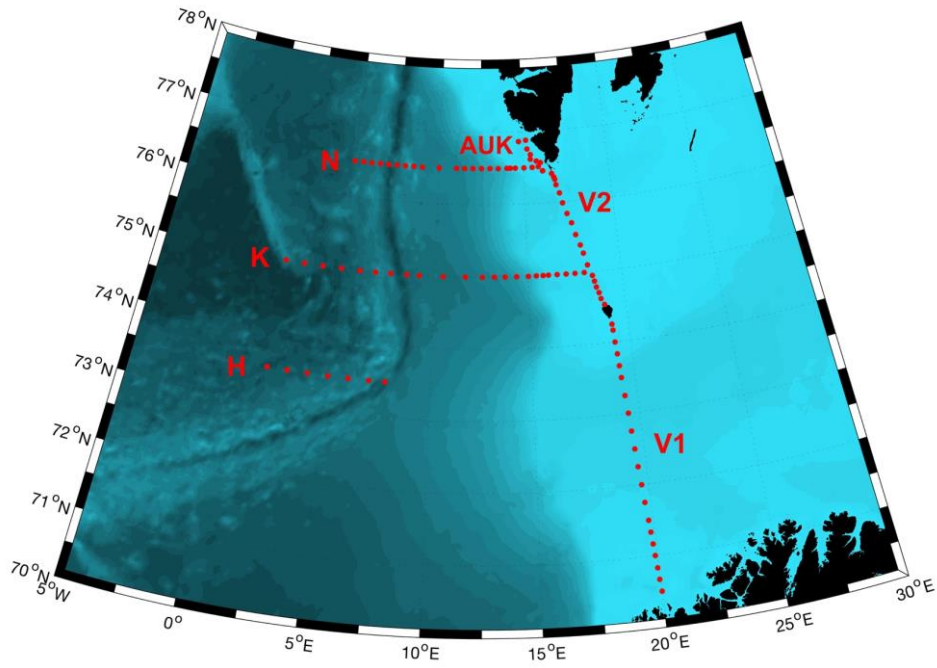
Work at sea

During the **AREX2019** 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 open-ocean legs of the cruise 203 full-depth CTD (Seabird 9/11+) stations were measured (99 stations during the leg II and 104 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. Additionally, on 17 stations (and selected levels) water samples were collected for nutrients content (166 samples in total). The samples were frozen on board and their analysis was performed after the cruise in the IOPAN laboratory. On selected 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).

During the leg II, two profiling Argo floats (Argo float) were deployed in the eastern part of the Norwegian Sea on the K section as part of the ARGO Poland program and the H2020 EA-RISE project. The first float (no. WMO 3902107) was launched on June 22 on station K3 (75 ° 00.09'N 015 ° 25.18'E), while the second float (no. WMO 3902108) was deployed on June 23 on station K12 (75 ° 01.32'N 008 ° 28.83'E). Additionally, two Slocum gliders were launched on June 13 at the section EB2 (78°45'N 10°E) in cooperation with LOCEAN (Laboratoire d'Océanographie et du Climat: Expérimentations et Approches Numériques) University Pierre et Marie Curie.

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. Furthermore, research was conducted in the field of marine chemistry to determine the acid-base properties of oceanic water. Analyzes included measurements of temperature (SST), salinity (SSS), pH, CO₂ partial pressure (pCO₂), oxygen saturation (% O₂) of surface water and 100 discrete samples of surface ocean water for later analysis in the laboratory for metal content (Me: Mg²⁺, Ca²⁺, 10 ml), dissolved inorganic carbon (DIC, 20 ml) and total alkalinity (TA, 250 ml). On selected stations, plankton (zooplankton) samples were collected with various sampling gear (WP2/180, WP2/60 and WP2/20), protozoan plankton and samples of suspension for chlorophyll *a*. Total in the leg II and III were collected samples at 45 stations.

a)



b)

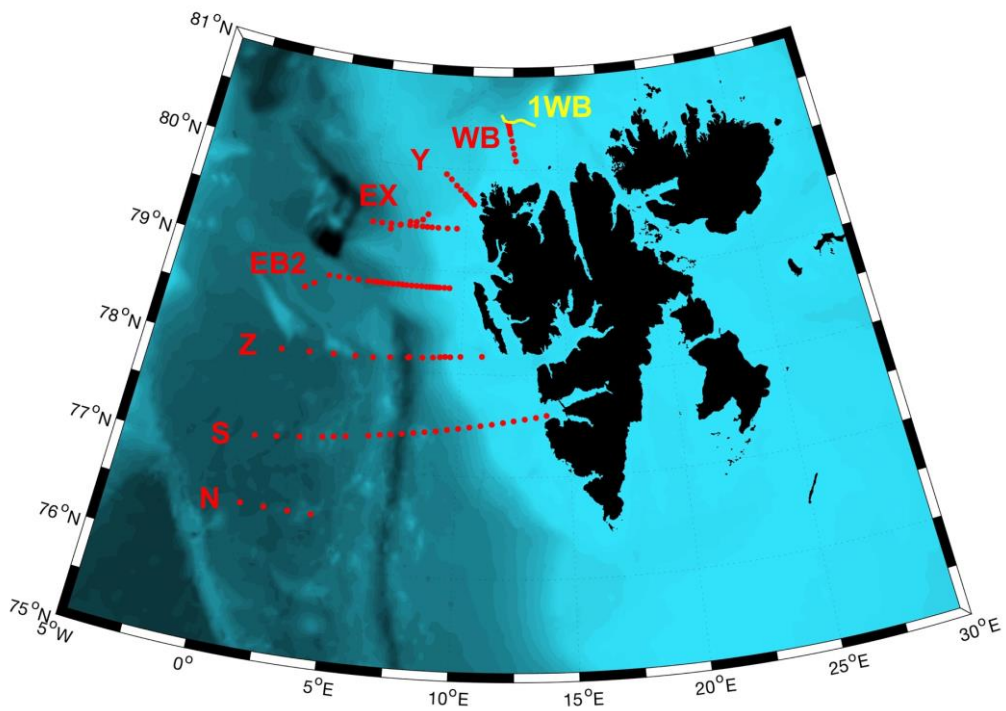


Figure 1 Distribution of CTD stations during the open-ocean legs II (upper map) and leg III (lower map) of the AREX 2019 cruise. Red dots mark CTD stations and yellow line shows the high-resolution towed CTD section.

Number of stations and occupation time for each standard section.

Section	Start (UTC)	End (UTC)	Nb of stations	Time used (h)
V1 (V1 - V20)	20.06, 04:22	21.06, 19:02	20	39
K (K-3 - K19)	22.06, 03:42	24.06, 20:23	23	64
H (H21-H15)	25.06, 08:49	26.06, 07:31	7	11
V2 (V21 - V38)	28.06, 16:17	29.07, 17:21	17	25
Stations AUK	29.06, 18:31	01.07, 21:36	15	10
N (N4P-N-10)	02.07, 00:26	04.07, 05:16	21	53
S (S-1 - S18)	06.07, 20:54	09.07, 06:46	23	58
N (N-14 - N-11)	09.07, 14:39	10.07, 01:32	4	12
Z (Z1 - Z14)	10.07, 15:08	12.07, 05:01	14	39
EB2 (EB2-1 - EB2-13L)	12.07, 14:03	15.07, 18:40	25	56
EX (EX7PL - EX4L)	16.07, 11:37	16.07, 21:41	6	10
WB (WB1 - WB10L)	17.07, 06:01	17.07, 19:09	10	13
Y (Y1 - Y9L)	18.07, 20:10	19.07, 05:08	9	9
EX (EX1 - EX9)	20.07, 06:08	20.07, 23:38	12	18

Preliminary results of oceanographic measurements

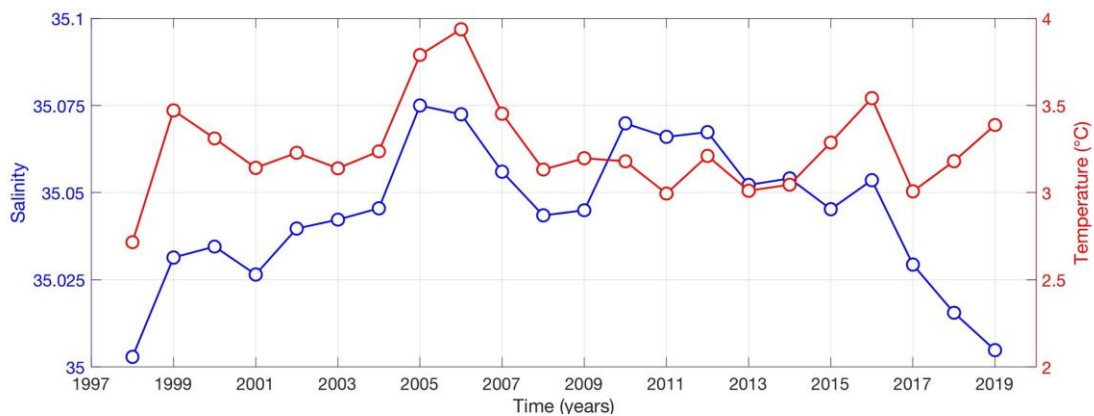
During the AREX2019 cruise hydrographic measurements were performed at the grid of stations, which included 13 standard CTD sections. Collected time series of water properties are used to study long-term changes in the ocean climate in Nordic Seas and Fram Strait. The standard section N, running westward 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 K section along the 75°N crosses the eastern shelf and the continental slope, and includes part of the deep Greenland Sea basin. This section allows tracking properties of the Atlantic water inflow into the Fram Strait before they reached area of the southern recirculation branch (along the northern shores of the Greenland Sea). The temporal variability of Atlantic water on the K section (between 4 and 18°E) shows continuation of trend observed in 2018 - temperature rise and decline of salinity since 2016 (Fig. 2a). Salinity remains below average for the reference period and in 2019 reached the second lowest value in the observed period, while the temperature increased slightly above the long-term average (Fig. 2b). The comparison of temperature and salinity distributions on the K section in 2019 and 2018 (Fig. 3) shows the deeper layer and wider Atlantic water stream in 2018, however salinity values are definitely lower in the entire section, occupied by the Atlantic water.

Oceanographic data from the N section along the 76°30'N represent the longest time series collected by the Institute of Oceanology Polish Academy of

Sciences (Fig. 4). In 1996-2008 quasi-periodic changes in temperature and salinity of the Atlantic water were observed in this section. In addition, there was a strong positive correlation between temperature and salinity. In 2008-2012, the temperature and salinity of Atlantic water changed in the opposite phase. In the years 2013-2016, was observed positively correlated changes in temperature and salinity of the Atlantic water. Compared to the previous year, in 2019 the average temperature of Atlantic water declined, and at the same time significantly dropped salinity (Fig. 4). The negative trend of Atlantic water salinity persists since 2016, and in 2019 the lowest salinity of Atlantic water in the last 20 years was observed on the N section (Fig. 4 and 5). Temperature of the Atlantic water on the N section was close to the long-term average (Fig. 5).

a)



b)

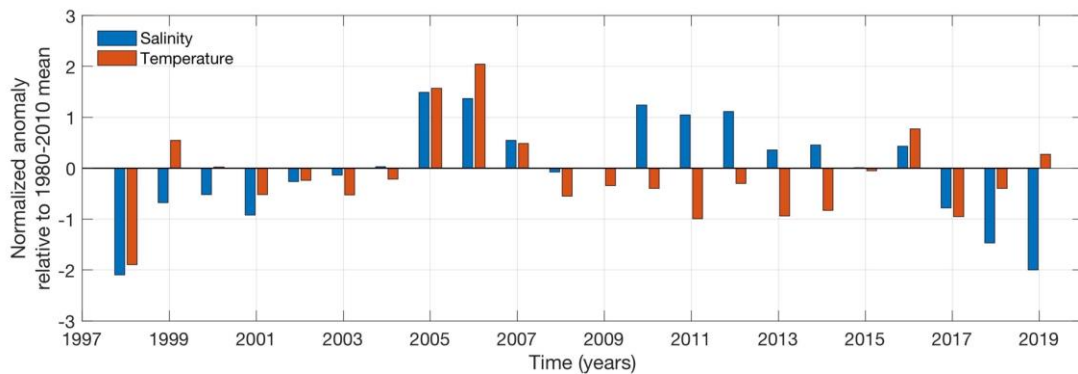


Figure 2 (a) Time series of the vertically averaged temperature and salinity of the Atlantic water ($T > 0^{\circ}\text{C}$ $S > 34.92$) at the section K between 4° and 18°E measured in summers of 1998-2019; (b) normalized anomalies of temperature and salinity of Atlantic waters in relation to average values for 1980-2010.

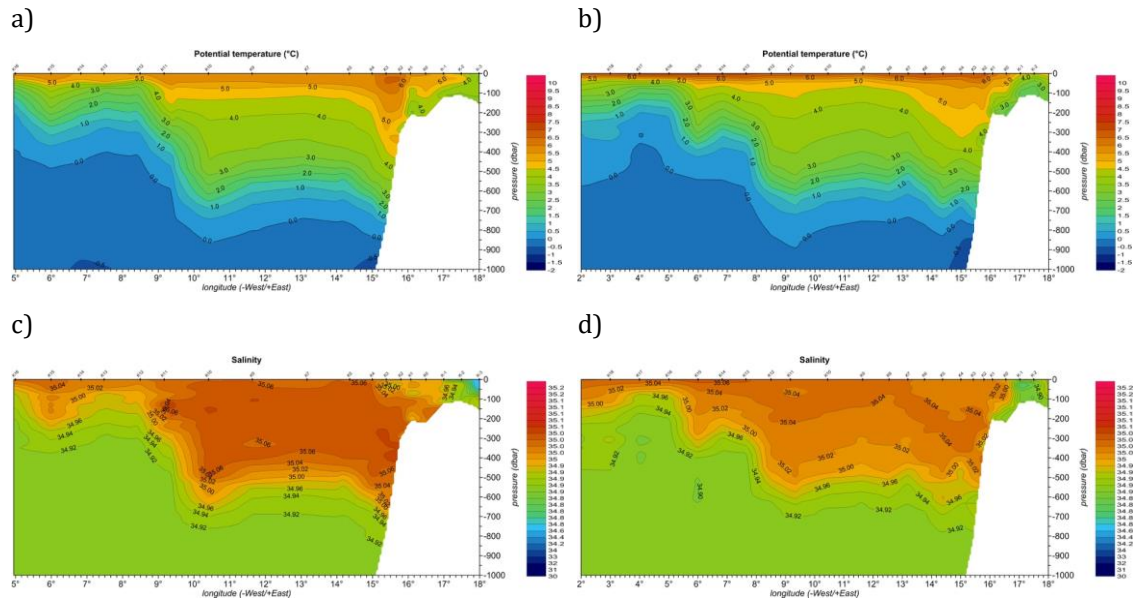


Figure 3 Distributions of temperature (a, b) and salinity (c, d) in the upper layer of 0-1000 m on the K cross-section in July 2018 (a, c) and in July 2019 (b, d).



Figure 4 (a) Time series of the vertically averaged temperature and salinity of the Atlantic water ($T > 0^{\circ}\text{C}$ $S > 34.92$) at the section N along $76^{\circ}30'N$ between 6° and $15^{\circ}E$ measured in summers of 1996-2018; (b) normalized anomalies of temperature and salinity of Atlantic waters in relation to average values for 1980-2010.

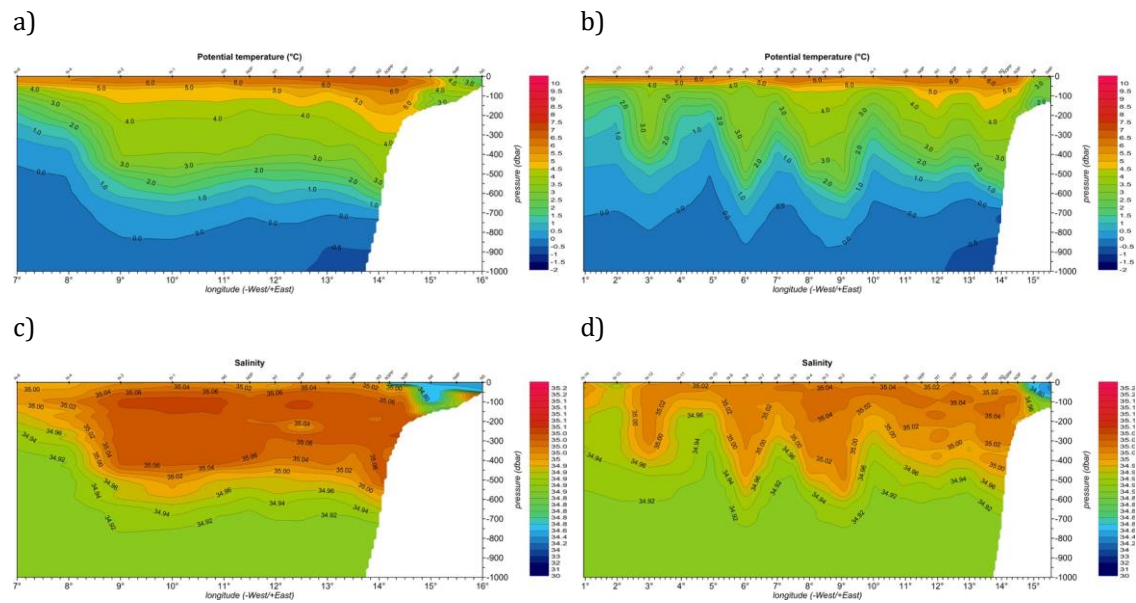


Figure 5 Distributions of temperature (a, b) and salinity (c, d) in the upper layer of 0-1000 m on the N cross-section in July 2018 (a, c) and in July 2019 (b, d).

During **Legs IVa** and **IVb** of the **AREX2019** expedition multidisciplinary observations of marine plankton and benthos, as well as physical (marine optics), hydrographic (CTD profiles and sections), chemical and meteorological (aerosols) measurements were conducted in the West Spitsbergen fjords (Fig. 4; 5a, b, c) and the main studied areas were located in Isfjorden (Dickmanfjorden, Billefjorden, Adventfjorden and Sassenfjorden), Van Mijenfjorden, Torellbreen, Hornsund i Kongsfjorden. Collection of samples and in situ hydrographic and biological measurements will contribute to long-term observations of physical environment and plankton and benthos ecosystems in the Arctic fjords.

The measurements and samples collection included:

- High-resolution hydrographic sections with a towed CTD scanfish system in Hornsund and Kongsfjorden fjords;
- Collection of plankton (zooplankton) and benthos samples in the studied areas;
- Description of the spatial distributions of plankton composition in the Hornsund, Kongsfjorden and Isfjorden 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 CO₂ 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 fjords;
- Measurements of 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;
- Collection of chlorophyll, suspension and primary production (PP) samples;
- Description of the productivity in arctic waters;
- Description of the CDOM properties in surface layer;

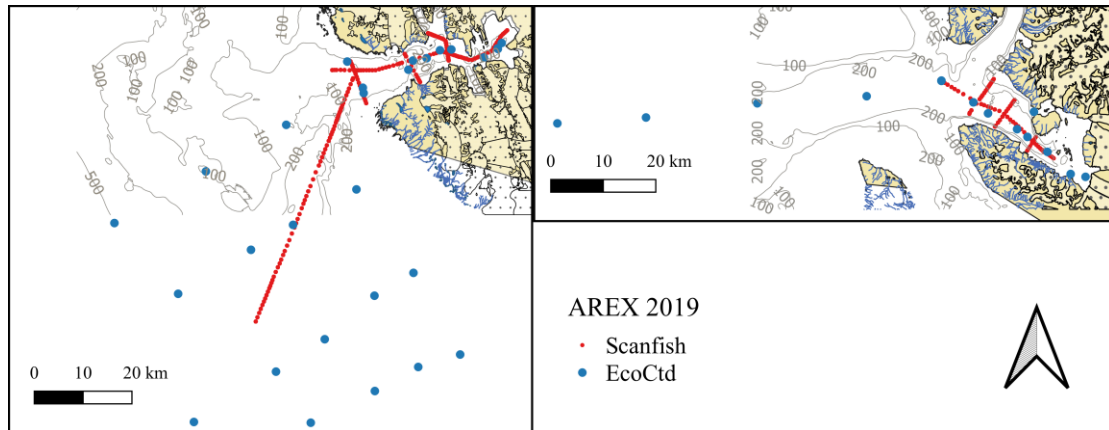


Figure 4 Distribution of CTD stations during the fjord part of the AREX 2019 cruise in the Hornsund and Kongsfjorden fjords.

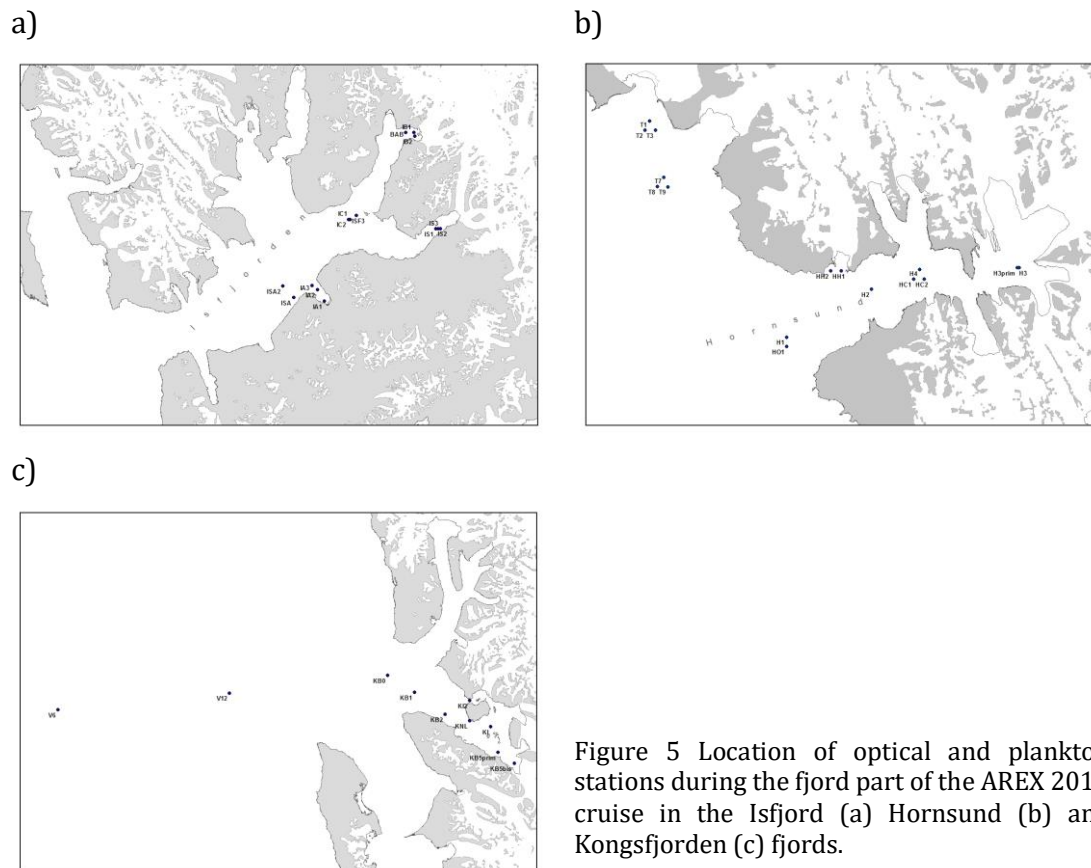


Figure 5 Location of optical and plankton stations during the fjord part of the AREX 2019 cruise in the Isfjord (a) Hornsund (b) and Kongsfjorden (c) fjords.

Paleoceanography measurements carried on under the **Leg V** of the research expedition **AREX2019** were aimed in studying:

- Description of the species composition, location and biodiversity contemporary benthic foraminifers;
- Description of the species composition and DNA of contemporary foraminifers from the Monothalamea class in the sediments;
- Description of the bottom surface and the structure of surface deposits in places of planned geological-environmental research by acoustic equipment;
- Northward advection of Atlantic water along the western and northern Svalbard shelf, the West Boreas Plain region, Jan Mayen ridges and Faroe Island shelf using benthic/plankton foraminifera as a main indicator;
- 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 CO₂ 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);
- Description of the black carbon concentration;

Attachment 1 List of stations measured in the open ocean during the leg II and III of the AREX2019 cruise.

File	Station	Latitude	Longitude	Water depth	Max Pres	Day	Month	Year	Hour	Min
AREX2019 Leg II (20.06-05.07.2019)										
AR19_001.awi	V1	70.501	19.999	128	127	20	6	2019	4	22
AR19_002.awi	V2	70.668	19.961	155	155	20	6	2019	5	57
AR19_003.awi	V3	70.829	19.936	178	177	20	6	2019	7	27
AR19_004.awi	V4	71.001	19.899	187	186	20	6	2019	8	57
AR19_005.awi	V5	71.164	19.867	211	211	20	6	2019	11	31
AR19_006.awi	V6	71.330	19.835	210	210	20	6	2019	13	0
AR19_007.awi	V7	71.496	19.801	238	239	20	6	2019	14	23
AR19_008.awi	V8	71.748	19.733	266	268	20	6	2019	17	16
AR19_009.awi	V9	71.996	19.685	307	308	20	6	2019	19	19
AR19_010.awi	V10	72.249	19.622	322	323	20	6	2019	22	18
AR19_011.awi	V11	72.498	19.571	392	395	21	6	2019	0	21
AR19_012.awi	V12	72.749	19.517	395	397	21	6	2019	3	11
AR19_013.awi	V13	73.000	19.468	411	414	21	6	2019	5	26
AR19_014.awi	V14	73.247	19.403	450	453	21	6	2019	8	38
AR19_015.awi	V15	73.500	19.333	475	479	21	6	2019	10	55
AR19_016.awi	V16	73.666	19.302	347	349	21	6	2019	13	1
AR19_017.awi	V17	73.833	19.269	234	234	21	6	2019	14	27
AR19_018.awi	V18	73.999	19.219	130	130	21	6	2019	16	36
AR19_019.awi	V19	74.165	19.186	67	65	21	6	2019	18	5
AR19_020.awi	V20	74.249	19.166	52	48	21	6	2019	19	2
AR19_021.awi	K-3	74.999	18.000	155	154	22	6	2019	3	42
AR19_022.awi	K-2	74.998	17.506	115	114	22	6	2019	5	38
AR19_023.awi	K-1	74.999	17.029	126	124	22	6	2019	6	48
AR19_024.awi	K0	75.000	16.548	224	223	22	6	2019	7	55

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AR19_025.awi	K1	75.000	16.086	209	208	22	6	2019	9	25
AR19_026.awi	K2	74.999	15.800	362	363	22	6	2019	10	13
AR19_027.awi	K3	74.999	15.433	824	832	22	6	2019	11	16
AR19_028.awi	K4	74.997	15.010	1116	1129	22	6	2019	12	41
AR19_029.awi	K5	74.998	14.380	1517	1536	22	6	2019	16	39
AR19_030.awi	K6	74.998	13.764	1797	1821	22	6	2019	18	57
AR19_031.awi	K7	74.999	13.191	1974	2002	22	6	2019	21	19
AR19_032.awi	K8	74.997	12.547	2145	2176	23	6	2019	0	2
AR19_033.awi	K9	75.000	11.639	2357	2393	23	6	2019	3	47
AR19_034.awi	K10	74.998	10.445	2498	2536	23	6	2019	7	56
AR19_035.awi	K11	74.998	9.168	2607	2649	23	6	2019	12	3
AR19_036.awi	K12	74.999	8.504	2746	2791	23	6	2019	16	1
AR19_037.awi	K13	75.001	7.645	2161	2152	23	6	2019	19	54
AR19_038.awi	K14	75.000	6.832	2015	2045	23	6	2019	23	31
AR19_039.awi	K15	75.000	6.005	2824	2871	24	6	2019	2	56
AR19_040.awi	K16	75.001	5.003	3045	3096	24	6	2019	7	2
AR19_041.awi	K17	75.000	3.999	2995	3046	24	6	2019	11	32
AR19_042.awi	K18	74.999	2.999	2485	2524	24	6	2019	15	55
AR19_043.awi	K19	75.002	2.010	2791	2836	24	6	2019	20	23
AR19_044.awi	H21	73.500	2.000	3367	3365	25	6	2019	8	49
AR19_045.awi	H20	73.500	2.988	2508	2548	25	6	2019	13	17
AR19_046.awi	H19	73.500	3.982	2865	2911	25	6	2019	16	58
AR19_047.awi	H18	73.500	4.988	1255	1222	25	6	2019	21	10
AR19_048.awi	H17	73.499	5.984	2133	2164	26	6	2019	0	28
AR19_049.awi	H16	73.499	6.996	1246	1219	26	6	2019	4	34
AR19_050.awi	H15	73.498	7.782	3120	3173	26	6	2019	7	31
AR19_051.awi	V21	74.532	18.899	23	23	28	6	2019	16	17
AR19_052.awi	V22	74.617	18.750	69	68	28	6	2019	18	48
AR19_053.awi	V23	74.702	18.679	99	98	28	6	2019	20	25
AR19_054.awi	V24	74.783	18.567	231	231	28	6	2019	21	25
AR19_055.awi	V25	74.867	18.500	202	202	28	6	2019	22	29
AR19_056.awi	V26	74.948	18.420	75	73	28	6	2019	23	32
AR19_057.awi	V27	75.100	18.213	72	71	29	6	2019	1	12
AR19_058.awi	V28	75.267	18.051	65	64	29	6	2019	2	51
AR19_059.awi	V29	75.383	17.923	103	102	29	6	2019	4	25
AR19_060.awi	V30	75.532	17.719	123	121	29	6	2019	6	8
AR19_061.awi	V31	75.700	17.551	212	211	29	6	2019	8	15
AR19_062.awi	V32	75.833	17.337	293	294	29	6	2019	10	8
AR19_063.awi	V33	75.984	17.135	321	323	29	6	2019	11	54
AR19_064.awi	V34	76.125	17.000	285	286	29	6	2019	13	32
AR19_065.awi	V35	76.241	16.832	219	220	29	6	2019	14	57
AR19_066.awi	V36	76.317	16.785	109	108	29	6	2019	15	57
AR19_067.awi	V37	76.350	16.736	55	54	29	6	2019	16	38
AR19_068.awi	V38	76.401	16.623	32	31	29	6	2019	17	21
AR19_069.awi	AUK22	76.445	16.098	44	42	29	6	2019	18	31
AR19_070.awi	AUK1prim	76.879	15.185	110	109	1	7	2019	14	24
AR19_071.awi	AUK2	76.865	14.752	116	115	1	7	2019	15	19
AR19_072.awi	AUK2prim	76.757	15.243	59	57	1	7	2019	17	6
AR19_073.awi	AUK12	76.678	15.429	49	47	1	7	2019	18	15
AR19_074.awi	AUK12prim	76.614	15.413	70	67	1	7	2019	19	5
AR19_075.awi	AUK13	76.585	15.762	39	37	1	7	2019	20	0
AR19_076.awi	AUK22prim	76.561	16.001	25	22	1	7	2019	20	59
AR19_077.awi	AUK13prim	76.507	15.865	60	57	1	7	2019	21	36
AR19_078.awi	AUK22	76.446	16.112	46	45	1	7	2019	22	50
AR19_079.awi	N4P	76.500	15.502	128	127	2	7	2019	0	26
AR19_080.awi	N4	76.498	15.016	167	166	2	7	2019	1	24
AR19_081.awi	N3P	76.499	14.502	213	212	2	7	2019	2	43
AR19_082.awi	N3PP	76.500	14.200	384	386	2	7	2019	3	49
AR19_083.awi	N3	76.500	14.000	748	755	2	7	2019	4	50
AR19_084.awi	N2P	76.498	13.489	1277	1292	2	7	2019	7	52
AR19_085.awi	N2	76.500	13.000	1537	1556	2	7	2019	9	55
AR19_086.awi	N1P	76.500	12.502	1748	1772	2	7	2019	12	4
AR19_087.awi	N1	76.500	11.996	1904	1931	2	7	2019	14	43
AR19_088.awi	NOP	76.499	11.501	2012	2040	2	7	2019	17	24
AR19_089.awi	N0	76.499	11.025	2093	2123	2	7	2019	20	24
AR19_090.awi	N-1	76.499	9.997	2210	2242	3	7	2019	0	11
AR19_091.awi	N-2	76.496	9.004	2258	2292	3	7	2019	4	9

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AR19_092.awi	N-3	76.501	8.499	2239	2272	3	7	2019	7	31
AR19_093.awi	N-4	76.501	8.001	1742	1765	3	7	2019	10	33
AR19_094.awi	N-5	76.502	7.505	2521	2561	3	7	2019	13	20
AR19_095.awi	N-6	76.500	6.999	2807	2854	3	7	2019	16	27
AR19_096.awi	N-7	76.502	6.508	2396	2431	3	7	2019	19	55
AR19_097.awi	N-8	76.499	6.007	2565	2606	3	7	2019	23	18
AR19_098.awi	N-9	76.501	5.515	2493	2533	4	7	2019	2	21
AR19_099.awi	N-10	76.499	5.001	2395	2431	4	7	2019	5	16
AREX2019 Leg III (06.07-22.07.2019)										
AR19_100.awi	S-1	77.600	13.998	144	143	6	7	2019	20	54
AR19_101.awi	S0	77.582	13.512	144	143	6	7	2019	23	1
AR19_102.awi	S1	77.567	13.004	134	133	7	7	2019	0	9
AR19_103.awi	S2	77.550	12.500	99	98	7	7	2019	1	16
AR19_104.awi	S3	77.534	12.017	173	172	7	7	2019	2	14
AR19_105.awi	S4	77.516	11.516	276	277	7	7	2019	3	53
AR19_106.awi	S5	77.500	11.003	717	724	7	7	2019	5	7
AR19_107.awi	S6	77.483	10.501	1245	1259	7	7	2019	7	17
AR19_108.awi	S7	77.466	10.004	1583	1604	7	7	2019	9	12
AR19_109.awi	S7P	77.450	9.506	1912	1939	7	7	2019	11	21
AR19_110.awi	S8	77.431	9.002	2055	2086	7	7	2019	13	52
AR19_111.awi	S8P	77.416	8.500	1446	1465	7	7	2019	16	30
AR19_112.awi	S9	77.400	8.002	2282	2316	7	7	2019	18	46
AR19_113.awi	S9P	77.383	7.500	3558	3624	7	7	2019	23	15
AR19_114.awi	S10	77.366	7.002	2650	2694	8	7	2019	3	39
AR19_115.awi	S11	77.353	6.521	2098	2129	8	7	2019	6	47
AR19_116.awi	S12	77.333	6.024	2568	2608	8	7	2019	9	22
AR19_117.awi	S13	77.301	5.022	2382	2419	8	7	2019	13	29
AR19_118.awi	S14	77.283	4.502	2318	2354	8	7	2019	16	24
AR19_119.awi	S15	77.266	4.007	2559	2598	8	7	2019	19	30
AR19_120.awi	S16	77.234	3.012	2877	2926	8	7	2019	23	14
AR19_121.awi	S17	77.201	2.001	2980	3032	9	7	2019	3	27
AR19_122.awi	S18	77.171	1.055	3179	3235	9	7	2019	6	46
AR19_123.awi	N-14	76.500	0.995	3203	3260	9	7	2019	14	39
AR19_124.awi	N-13	76.501	1.991	3204	3260	9	7	2019	18	36
AR19_125.awi	N-12	76.500	2.997	2800	2846	9	7	2019	21	57
AR19_126.awi	N-11	76.501	3.988	2726	2771	10	7	2019	1	32
AR19_127.awi	Z14	78.049	1.510	3060	3113	10	7	2019	15	8
AR19_128.awi	Z13	78.070	2.820	3006	3056	10	7	2019	19	44
AR19_129.awi	Z12	78.085	3.966	2862	2910	11	7	2019	0	34
AR19_130.awi	Z11	78.093	4.990	2621	2663	11	7	2019	3	55
AR19_131.awi	Z10	78.100	5.833	2470	2508	11	7	2019	6	57
AR19_132.awi	Z9	78.118	6.635	2363	2399	11	7	2019	11	0
AR19_133.awi	Z8	78.131	7.490	3416	3478	11	7	2019	14	16
AR19_133A.awi	Z8	78.138	7.553	58	53	11	7	2019	16	52
AR19_134.awi	Z7	78.140	8.162	2116	2146	11	7	2019	17	52
AR19_135.awi	Z6	78.149	8.663	1509	1528	11	7	2019	20	43
AR19_136.awi	Z5	78.156	8.998	1046	1057	11	7	2019	23	2
AR19_137.awi	Z4	78.162	9.236	631	635	12	7	2019	0	50
AR19_138.awi	Z3	78.161	9.487	273	274	12	7	2019	2	12
AR19_139.awi	Z2	78.169	9.967	262	263	12	7	2019	3	16
AR19_140.awi	Z1	78.177	10.989	258	259	12	7	2019	5	1
AR19_141.awi	EB2-1	78.834	9.270	204	204	12	7	2019	14	3
AR19_142.awi	EB2-1P	78.835	9.017	212	212	12	7	2019	15	37
AR19_143.awi	EB2-2	78.834	8.762	215	215	12	7	2019	17	13
AR19_144.awi	EB2-2P	78.834	8.597	387	389	12	7	2019	18	0
AR19_145.awi	EB2-3	78.835	8.428	644	649	12	7	2019	18	46
AR19_146.awi	EB2-3P	78.833	8.267	826	834	12	7	2019	20	7
AR19_147.awi	EB2-4	78.833	8.099	950	961	12	7	2019	21	54
AR19_148.awi	EB2-4P	78.835	7.859	1053	1065	12	7	2019	23	12
AR19_149.awi	EB2-5	78.834	7.611	1105	1117	13	7	2019	0	39
AR19_150.awi	EB2-5P	78.834	7.354	1202	1217	13	7	2019	16	25
AR19_151.awi	EB2-6	78.834	7.102	1347	1363	13	7	2019	18	0
AR19_152.awi	EB2-6P	78.835	6.893	1539	1558	13	7	2019	20	31
AR19_153.awi	EB2-7	78.836	6.676	1746	1771	13	7	2019	23	57
AR19_154.awi	EB2-7P	78.833	6.416	2047	2078	14	7	2019	2	29
AR19_155.awi	EB2-8	78.834	6.168	2296	2331	14	7	2019	4	59

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AR19_156.awi	EB2-8P	78.835	5.925	2434	2470	14	7	2019	7	27
AR19_157.awi	EB2-9	78.835	5.670	2508	2548	14	7	2019	11	2
AR19_158.awi	EB2-9P	78.835	5.454	2559	2600	14	7	2019	13	51
AR19_159.awi	EB2-10	78.834	5.163	2566	2606	14	7	2019	17	6
AR19_160.awi	EB2-10P	78.833	4.665	2576	2617	14	7	2019	20	13
AR19_161.awi	EB2-11	78.836	4.178	2361	2397	14	7	2019	23	48
AR19_162.awi	EB2-11P	78.837	3.671	2265	2282	15	7	2019	2	43
AR19_163.awi	EB2-12	78.836	3.182	2376	2413	15	7	2019	5	48
AR19_164.awi	EB2-12P	78.739	2.501	2515	2555	15	7	2019	9	50
AR19_165.awi	EB2-13L	78.686	2.074	2495	2534	15	7	2019	18	40
AR19_166.awi	EX7PL	79.366	5.997	1720	1743	16	7	2019	11	37
AR19_167.awi	EX7	79.413	6.482	1436	1454	16	7	2019	14	15
AR19_168.awi	EX6L	79.454	6.996	1137	1150	16	7	2019	16	29
AR19_169.awi	EX5L	79.457	7.332	971	981	16	7	2019	18	50
AR19_170.awi	EX4PL	79.485	7.656	783	791	16	7	2019	20	19
AR19_171.awi	EX4L	79.541	7.918	706	712	16	7	2019	21	41
AR19_172.awi	WB1	80.089	12.633	186	185	17	7	2019	6	1
AR19_173.awi	WB2	80.155	12.558	177	176	17	7	2019	6	55
AR19_174.awi	WB3	80.217	12.484	197	197	17	7	2019	8	15
AR19_175.awi	WB4	80.286	12.405	185	185	17	7	2019	9	9
AR19_176.awi	WB5	80.353	12.317	167	167	17	7	2019	16	14
AR19_177.awi	WB6	80.380	12.293	181	181	17	7	2019	16	45
AR19_178.awi	WB7	80.416	12.248	239	239	17	7	2019	17	24
AR19_179.awi	WB8	80.433	12.228	364	366	17	7	2019	17	55
AR19_180.awi	WB9	80.450	12.209	473	474	17	7	2019	18	31
AR19_181.awi	WB10L	80.465	12.166	568	572	17	7	2019	19	9
AR19_182.awi	Y1	79.661	10.360	35	33	18	7	2019	20	10
AR19_183.awi	Y2	79.683	10.230	85	82	18	7	2019	20	46
AR19_184.awi	Y3	79.707	10.130	133	132	18	7	2019	22	2
AR19_185.awi	Y4	79.732	9.979	304	305	18	7	2019	22	48
AR19_186.awi	Y5	79.756	9.863	375	376	18	7	2019	23	36
AR19_187.awi	Y6	79.796	9.601	421	423	19	7	2019	0	50
AR19_188.awi	Y7	79.837	9.371	452	455	19	7	2019	2	29
AR19_189.awi	Y8	79.897	9.060	455	458	19	7	2019	3	52
AR19_190.awi	Y9L	79.943	8.771	475	478	19	7	2019	5	8
AR19_191.awi	EX1	79.418	9.493	122	120	20	7	2019	6	8
AR19_192.awi	EX2	79.416	8.994	129	126	20	7	2019	7	49
AR19_193.awi	EX3	79.416	8.500	185	182	20	7	2019	8	49
AR19_194.awi	EX3P	79.416	8.166	276	276	20	7	2019	9	40
AR19_195.awi	EX4	79.417	7.916	493	497	20	7	2019	11	20
AR19_196.awi	EX4P	79.418	7.662	754	761	20	7	2019	12	25
AR19_197.awi	EX5	79.417	7.319	1008	1018	20	7	2019	13	56
AR19_198.awi	EX6	79.419	6.992	1190	1203	20	7	2019	16	3
AR19_199.awi	EX7	79.418	6.505	1443	1461	20	7	2019	17	44
AR19_200.awi	EX7P	79.418	6.002	1777	1801	20	7	2019	19	39
AR19_201.awi	EX8	79.416	5.498	1258	1219	20	7	2019	21	53
AR19_202.awi	EX9	79.415	5.017	2473	2512	20	7	2019	23	38

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