REPORT

FROM THE RESEARCH CRUISE

AREX 2013

LEG II (22.06 - 10.07.2013)

LEG III (11.07 - 25.07.2013)

Chief scientist

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Coordination

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1. Scientific background and objectives

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 undergo cooling, freezing and melting. As a result it is transformed into freshened shelf 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.

Fram Strait is the only deep passage linking the Nordic Seas and the Arctic Ocean. The northward transport of warm and salty Atlantic water, carried by the Norwegian-Atlantic Current and farther by the West Spitsbergen Current, has a significant impact on conversion and circulation of water masses in the Arctic Ocean as well as on sea ice and atmospheric fluxes in the Arctic. The complex bottom topography of the northern Greenland Sea and Fram Strait results in splitting of both currents into several branches, located along the underwater ridges and the continental slope. Spatial extent and relative intensity of these branches to a great degree determine oceanic heat flux into the Arctic Ocean.

The Institute of Oceanology Polish Academy of Sciences (IO PAS) in Sopot has been carrying out the oceanographic, atmospheric, biogeochemical and ecological observations in the Nordic Seas and Fram Strait since 1987. The main aim is to recognize and describe processes of the ocean-atmosphere interactions and exchanges, ocean climate and ecosystem of the sub-Arctic and Arctic regions with the special focus on the European Arctic. Initially the long-term observations had been carried under national projects and later continued in the frame of international European projects VEINS (Variability of Exchanges in the Nordic Seas, 1997-2000), ASOF-N (Arctic and sub-Arctic Oceanic Fluxes - North, 2003-2005), DAMOCLES (Developing Arctic Modelling and Observing Capabilities for Long-term Environment Studies, 2006-2009). In recent years the annual measuring campaigns in the Nordic Seas, Fram Strait and in last 2 years in the northern Nansen Basin took place under the Polish-Norwegian projects (Polish-Norwegian Funds) AWAKE, AWAKE-2 and PAVE as well as under the statuory research programs of IO PAS the GAME project, funded by NCN.

During the second and third leg of the research expedition AREX2013 the following scientific tasks and questions were addressed:

- Structure and dynamics of the Norwegian-Atlantic and West Spitsbergen Currents;
- Variability of temperature, salinity and sea currents over the shelf and continental slope west and north of Svalbard;

- Estimation of the volume and heat transport by the West Spitsbergen Current,
- Overflow of dense brine waters in the Storfjordrenna;
- Measurements of the $_{16}O$ i $_{18}O$ tracers in the water column;
- Description of water masses and mixing processes in the frontal zones from distributions of temperature, salinity and nutrients;
- Estimation of the droplet flux from the sea surface and their impact on ocean-atmosphere mass and energy exchanges
- 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 marine aerosols in the Arctic region, aerosol optical thickness and ozone concentration in atmosphere;
- Description of the optical properties of waters and light transmission in the water column in the Greenland Sea and Arctic Ocean;
- Observations of the spectral characteristics of light transmission in the euphotic zone and outgoing radiation in the West Spitsbergen fjords;
- 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.

2. Work at sea

2.1. Oceanographic measurements

During the AREX2013 expedition 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 s shown on Fig. 1. During the second and third leg of the cruise 242 full-depth CTD stations were measured, providing profiles of temperature, salinity, dissolved oxygen and fluorescence (as proxy for chla). The standard CTD system Seabird 9/11+ was equipped with double pairs of temperature and conductivity sensors (primary temperature SBE3 SN4670, primary conductivity SBE4 SN3342, secondary temperature SBE3 SN2937, secondary conductivity SBE4 SN2971) and pressure sensor Digiquartz 410K-105 SN100967. Additionally CTD system carried two oxygen sensors (one standard SeaBird sensor SBE43 SN1620 and Rinko optode SN72, connected directly to the CTD registration system), fluorescence sensor SeaPoint SN… and altimeter Benthos PSA-916 SN…. The CTD system was mounted on the SeaBird bathymetric rosette (carousel) equipped with 9 Nansen bottles, 12 l each. Originally the rosette is designed to carry 12 bottles but due to the mounting system for LADCP only 9 bottles can be use in the current configuration. The collected data were registered on the PC hard drive with a second back-up on the same unit and third one on the external drive. The preliminary data processing was done in the near-real time while the final data set will be available after the post-cruise calibration of sensors.

All sensors of the CTD system have been working properly during the 2nd and 3rd leg of the cruise, except the fluorescence sensor. Due to lacking spares, the cable of the fluorescence sensor had to be repaired onboard. At the section S several CTD stations were measured with the CTD probe installed in the smaller frame (cage-frame) without altimeter since remounting the altimeter sensor was technically not possible. Mounting system of the rosette cable has to be redesigned since in the current setup the carousel lifting bail (with a raw thimble) hits and possibly damages the bottles' latches when instrument is lowered into the water under a rough sea state. Due to that often one or more bottles have not been closed during a cast. For future applications it is recommended redesign the whole mounting and termination system of the carousel.

The water samples were collected from a deep layer of small vertical gradients of hydrographic properties for calibration of conductivity sensor. Additionally ?? water samples at ?? stations were collected and frozen at -5°C for post-cruise lab analysis of nutrients. ?? samples at ?? stations were also collected for the post-cruise lab analysis of $_{16}$O and $_{18}$O tracers (will be done by AARI, data will be shared with IOPAS).

During the entire cruise the underway measurements of sea currents in the upper ocean were collected with the Vessel Mounted Acoustic Doppler Current Profiler (RDI VM-ADCP 150 Hz).

CTD casts were distributed along 14 hydrographic sections in total, 7 section during the 2nd leg and 7 sections during the 3rd leg of the cruise. The standard section EB along 78°50’N had to be shortened due to unfavorable ice conditions (ice edge at 2°E). Only a half of the planned length of section Y was covered due to sudden change of the weather (high waves). The detailed schedule of CTD casts is given in the cruise itinerary (Att. 1).

In addition to CTD casts, four high-resolution hydrographic sections (about 10 hours each) down to 300 m were measured with a towed scanfish CTD system. The scanfish system is equipped with the CTD Seabird SBE49 built into the frame constructed at IOPAS. The CTD data are received and recorded in the real-time. Two scanfish sections (1HP and 2HP) were measured at the continental slope and shelf next to the Horsund outlet under the projects AWAKE-2 and MIXAR. Another two scanfish sections (1NB and 1 WB) were occupied in the southern Nansen Basin, from the deep basin towards the shelf north of Svalbard, contributing to the projects PAVE and MIXAR. Location of all scanfish sections is indicated at he Fig. 1.

For the quasi-continuous year-long oceanographic observations, two moorings were recovered and one mooring was deployed during the 2nd and 3rd leg of the AREX2013 cruise. Positions of all moorings are shown at Fig. 1. The mooring MIXAR-1, equipped with CTD sensor Seabird SBE37 and 5 thermistors TinyTag was deployed next to the section N at the position 76°29.34’N, 014°21.90’E. After deployment, mooring AWAKE-3, located at 76°59.101’N 016°10.365’E at the depth of 76 m, was recovered. This mooring, equipped with current meter AADI RDCP600 and 10 thermistors TinyTag, was released acoustically and all instruments were recovered without technical problems. However, an attempt to read the data out from the current meter revealed that instrument had been flooded during deployment period due to a leak in the instrument pressure case. Due to corrosion of the battery, only data from first several days of measurements (in July 2012) were recorded, mostly as erroneous values. The instrument required a repair and refurbishment by manufacturer and could not be deployed as originally planned in the cruise schedule. During the 3rd leg of the AREX2013 cruise, mooring AWAKE-2, located at the Horsund shelf at the position 76°53.775’N, 015° 12.183’E and the depth of 90 m, was recovered. This short mooring was equipped with one CTD sensor Seabird SBE37 which provided a year-long time series of temperature and salinity data.

2.2. Biological measurement - plankton sampling

During the 2nd leg of AREX2013 the zoo- and phytoplankton samples were collected at the selected stations in the Norwegian, Barents and Greenland Seas for post-cruise analysis.

Standard AREX2013 stations

Zooplankton samples were collected with use of the WP2 nets (180µm) at the stations: H7, H10, H13, H19, V5 (V4), V15, V27, V31, K4, K7, K10, K16, O4, M4, O-4, additional samples were collected due to difficulties to collect samples at the originally planned stations. At the section , plankton samples were collected at the even-numbered stations while stations with odd numbers were skipped during AREX 2013. Collected zooplankton were treated with formaldehyde (4%) with addition of borax.

Based on the CTD profiles, three layers were identified during each sample collection: deep layer (DL), intermediate layer with thermocline (IL) and mixed surface layer (ML). Due to technical problems with premature closing of the net during rough sea conditions, at some stations (V15, O-12, O-4) samples were collected from the layer 0-200 m instead from the defined DL. It is also possible that at some other stations the nets might have been closed too early due to sudden pulling and loosing the net wire.

Due to harsh atmospheric conditions and rough seas, collections of samples at the stations O-8, O-9 and N-11 was not possible.

Technical problems with using the zooplankton nets were in our opinion due to the wrong design of the net lock and connection between a net and wire. When lowering a net to 200 m depth, a lack of swivel on the wire termination resulted each time in gradual damage of the wire of the plankton winch. Due to that the occupation of each station lasted longer than planned when maximum lowering rate was only 0.2-0.3 m/s. On July 5 the net WP2/180 was lost at the station O8 due to a loose thimble at the wire termination and in result breaking the wire. The lost net was replaced with old, back-up net. Surprisingly, due to different construction of the old net, it was easier and more efficient to use and allow higher speed of lowering.

Station of the PAVE project

At the PAVE project's stations the samples were collected with Hydrobios WP2/60 net , hand net, bathometers at the CZD carousel and Multi-Net (Multi Plankton Sampler). Additionally light transmission depth was measured with Secchi disk. Samples were collected at all three planed stations: V9, V13, N2 and N-2.

During the first cast with MPS net at the station V9, due to software problems when the net was at ca. 50 m, the first net was activated during lowering of the instrument. Remaining casts and sampling were obtained without further problems. At the second station (V13) due to unknown reasons the first net (in the layer 390-200 m) was not closed. At the next station, N2, problems were encountered during heaving the net WP2/60. Due to a strong surface current and suddenly stronger drift of the ship, the net wire got entangled in the cable of the CTD rosette during heaving of the net. To complete sampling at this stations, additional cast was performed with the net WP2/180µm. At the station N-2 all casts were completed without any technical problems from all planned depths.

The collected samples were treated according with standard procedures and prepared for the post-cruise analysis in the lab.

2.3. Meteorological and aerosol measurements

Atmospheric measurements during 2nd and 3rd leg of the AREX2013 cruise were aimed in studying variability of the vertical structure of the marine aerosols physical and optical properties in the polar region and their impact on solar radiation (direct climatic impact). The measurements included:

- Measurements of the vertical concentration of marine aerosols with laser particle counter (PMS) and condensation particles counter (CPC).

- Parallel infrared measurements of CO_2 and H_2O in atmosphere with the analyser LI-7500A.
- Measurements of aerosol optical properties with photometer Microtops II.
- Estimation of spatial and temporal variability of physical properties of marine aerosol.

Collected data will be applied for description of the direct aerosol effect thus they will contribute to improvement of climate models. This study is carried on under the frameworks of international projects POLAR-AOD (www. nadc.isti.cnr.it:8080/PolarAOD/jsp/home/) and ASTAR-Arctic Study of Tropospheric Aerosols, Clouds and Radiation (http://www.awi-bremerhaven.de/www-pot/astar/index.html).

On June 25 and July 15, 2013 measurements of the vertical structure of aerosol, lasting 5 hours each, were performed from the observational platform on the foredeck by means of the PMS counter.

Atmospheric CO2 concentration of CO2 was continuously measured during 24 days with the LI-7500A analyzer and 61 measurements were done with photometer and ozonemeter Microtops II.

Additionally the meteorological observations 'SHIP' were collected 8 times per day during the entire cruise except the fjord leg. Collected meteo data will be used for validation and calibration of the ship automatic meteorological station 'Observator'. Data will be archived in and accessible from the IOPAS database.

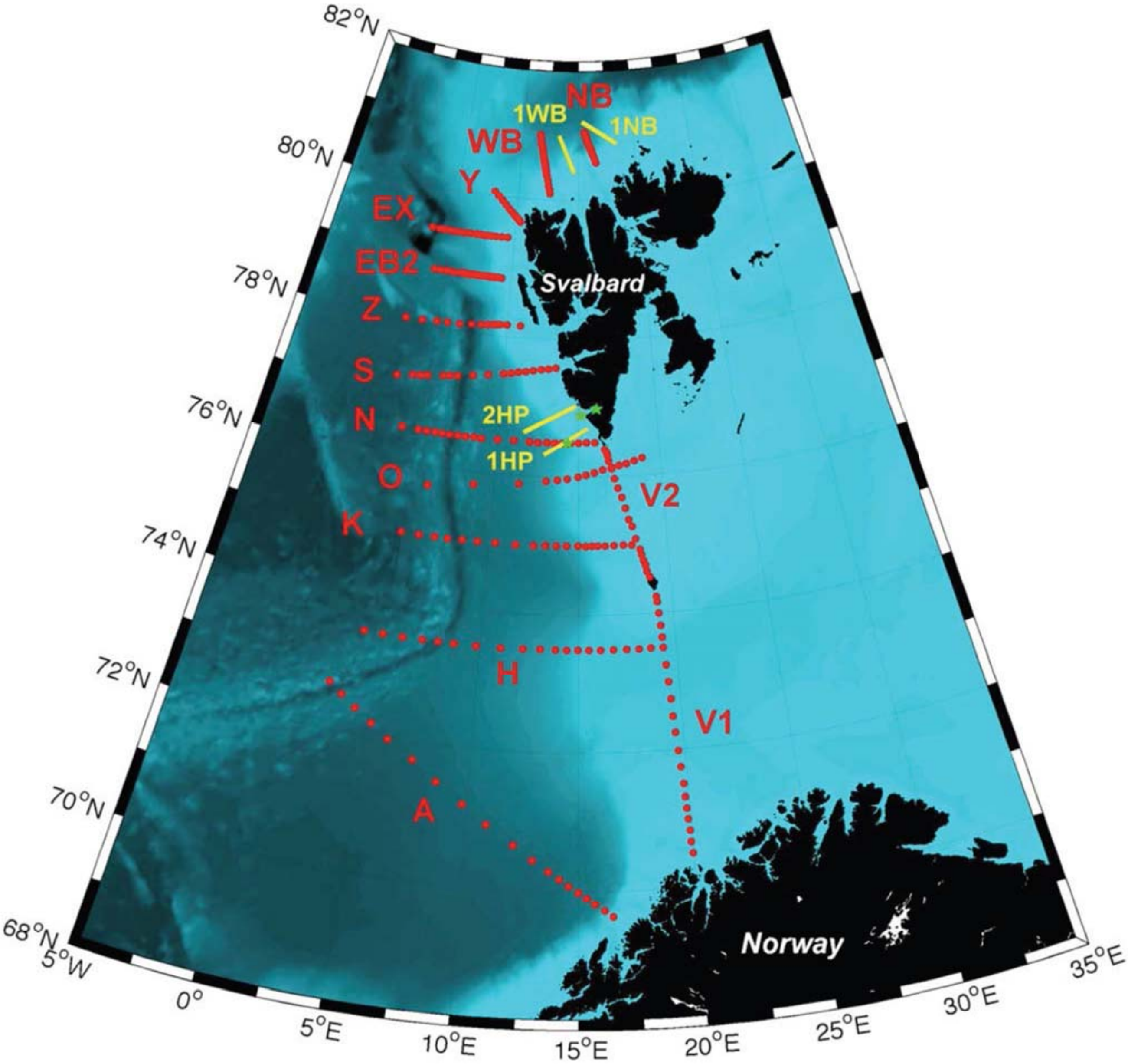

Fig. 1 Distribution of CTD stations and sections during the 2nd and 3rd leg of the AREX2013 cruise. Red dots represent CTD stations. Yellow lines depict high-resolution towed scanfish sections. Green stars indicate locations of deployed moorings.

3. Preliminary results

During the AREX2013 cruise hydrographic measurements were performed at the grid of stations which included 14 standard sections and 4 sections with the towed scanfish CTD. The station grid is shown on Fig. 1. Standard sections A, H, K, N, V1, V2, O, S, Z and EB2 has been repeated every year with the same positions of CTD stations. The westward extent of the northern sections depends on the ice edge location in each year. In 2013 additional sections located north-west of Svalbard (section Y) and north of Svalbard (sections WB and NB) were also measured.

The standard section A is located in the north-western direction off the northern Norway coast. Temperature, salinity and density distributions observed in 2013 were very similar to those from 2012. The surface layer (depth<50m) was slightly warmer and less dense while a thickness of the Atlantic water (AW) layer, where AW is defined after Rudels et al. (2005) as warmer than 2°C and with potential density $27.7<\sigma_\Theta<27.97$ has not changed as compared to 2012. In 2013 the mean AW temperature at the whole section was 4.31°C (4.32°C in 2012) and mean salinity was 35.125 (35.13 in 2012). The mean temperatures of intermediate and deep waters were similar to the year before.

The standard section H, located southward from the Bear Island and running westward, revealed larger differences between 2012 and 2013 (Fig. 3). In the surface layer above the upper continental slope the freshened water originating from the Barents Sea was observed in 2013. Thickness of the AW layer spreading westwards was larger in 2013 than in the previous year. The mean temperature and salinity at the section H were slightly lower than in 2012 (3.85°C as compared to 4.02°C and 35.107 as compared to 35.115).

The Atlantic water inflow to the Barents Sea and its partial recirculation are captured by the standard sections V1 and V2, closing the Barents Sea Opening and area between the Bear Island and Sørkapp (Fig 5). In 2013 AW in the Barents Sea Opening was slightly colder and less saline than in 2012 (4.51°C and 35.093 in 2013 and 4.96°C and 35.12 in 2012, respectively). At the same time, very warm surface layer with temperature exceeding 10°C was observed in 2013, which resulted in the surface layer of lower density, covering entire section. At the section V2 Atlantic water entering the Storfjordrenna was colder and less saline as compared to previous year. At the northern slope the lenses of cold and dense brine water, created during freezing processes, were clearly observed in 2013. Similar lenses of dense brine water were also found in the near-bottom layer of the eastern part of section O, located along the Storfjordrenna axis (not shown). In the previous year, the brine lenses were less pronounced.

At the standard section K, located south of Sørkapp and running westward (Fig. 6), differences between temperature and salinity distributions in 2013 and 2012 were negligible. The westward extent of Atlantic water and its thickness were close to observed in 2012 while the surface layer was significantly warmer in 2013 than in 2012. A distribution of potential density in the westward part of the section K reflects more complex structure of the western AW branch (being a continuation of the Norwegian-Atlantic Front Current) than observed in previous year.

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. In 2013 AW at the section N (Fig. 7) was slightly colder (with mean temperature of 3.66°C) and less saline (mean salinity 35.09) than in 2012 (mean values of 3.79°C and 35.11, respectively). While AW water in the core of the West Spitsbergen Current (WSC) was warmer in 2013, temperature in the lower AW layer decreased as compared to 2012. In 2013 the western boundary of the West Spitsbergen Current was strongly pronounced in the frontal zone, where significant sloping of isopycnals implied stronger geostrophic flow. The front between warm and saline AW and cold and fresher coastal waters in the Sørkapp Current was on the other hand much less outstanding as in the year before.

At the standard section N, located farther northward, distributions of temperature and salinity in 2013 were similar to observed in 2012 (Fig. 8). In 2013, thickness of AW layer in the central part of the section was smaller than in 2012 and a frontal zone with strongest horizontal gradients of hydrographic properties was less pronounced. Differences between mean temperature and salinity of AW, averaged over entire section, were small: 3.66°C and 35.07 in 2013 and 3.75°C and 35.08 in 2012, respectively.

At the standard section Z, located westward from the Isfjorden outlet, differences in the West Spitsbergen Current structure between 2012 and 2013 were clearly visible. In 2012, the AW layer was quasi-continuous at the entire section, and the boundary between the WSC off-shore branch and WSC core was not clearly pronounced. Temperature and salinity distributions observed in 2013 indicate strong and stable northward flow in the WSC core over the upper slope, while the off-shore branch manifested through several eddies and meanders, shed off the main northward flow.

A westward extent of the standard section EB2, running westward from the Kongsfjorden outlet, was significantly limited in 2013 due to the ice edge, located already at 3°E. Temperature and salinity distributions (Fig. 10) reflect a convergence of two West Spitsbergen Current branches where AW layer extends continuously along the whole section. Remnants of the off-shore WSC branch are still visible in the salinity distribution as the second salinity maximum located in the western part of the section. Mean temperature at the section EB2 in 2013 was 3.36°C and salinity 35.06.

The special attention was paid to new sections, located north of Svalbard and measured by IOPAN for the first time in 2013. The new section Y was going to the north-west from the north-western tip of Svalbard towards the Yermak Plateau. The hydrographic measurements at this relatively shallow section were focused on splitting of the AW flow into two further branches, one continuing along the Nansen Basin continental slope directly into the Arctic Ocean and second, circumventing the Yermak Plateau on the north-east side and joining the Arctic Ocean Boundary Current farther to the north. Unfortunately, due to the weather break-down, the originally planned section Y could not be completed. Nevertheless, temperature and salinity distributions (Fig. 11) clearly reveal the Atlantic water core in the inner branch, located over the upper slope.

The new section WB (named after the Whalers Bay, ice free area north of Svalbard), located north of Svalbard and running meridionally, clearly reveals the core of Atlantic water flow over the Eurasian Basin continental slope which constitutes an origin of the AW cyclonic circulation around the Arctic Ocean, known as the Arctic Circumpolar Boundary Current. Warm and highly saline core of the Atlantic water is located at the section WB over the upper slope, between 100 and 700 m (Fig. 12). In the western part of the section, the signature of the West Spitsbergen Current off-shore branch is clearly manifested as the layer of increased salinity and temperature about 2°C occupying the depths between 200 and 600 m. Along the entire section the Atlantic water layer is covered by the about 100 m thick surface layer of freshened waters, originating from sea ice melting and flow of cold and fresh Polar water from the north.

The easternmost new section NB (named after the Nansen Basin), located north-east of Spitsbergen, shows modification of Atlantic water in the Arctic Circumpolar Boundary Current. Due to lateral exchanges and vertical mixing temperature and salinity of Atlantic water at the section NB are significantly lower than at the upstream section WB. The AW layer over the upper slope (in the AW core) is thicker at the section NB than WB, reaching down to about 900 m. Smaller inclination of isopycnals indicates also lower geostrophic baroclinic velocities at the section NB than at the section WB.

To complement standard hydrographic measurements north of Svalbard, two high-resolution sections were measured with towed CTD scanfish, reaching down to max. 350 m. Data processing is on-going and their results will be available after data analysis is completed. Preliminary results indicate a significant role of meso- and small-scale processes for oceanic exchanges between Atlantic water and the Arctic Ocean interior.

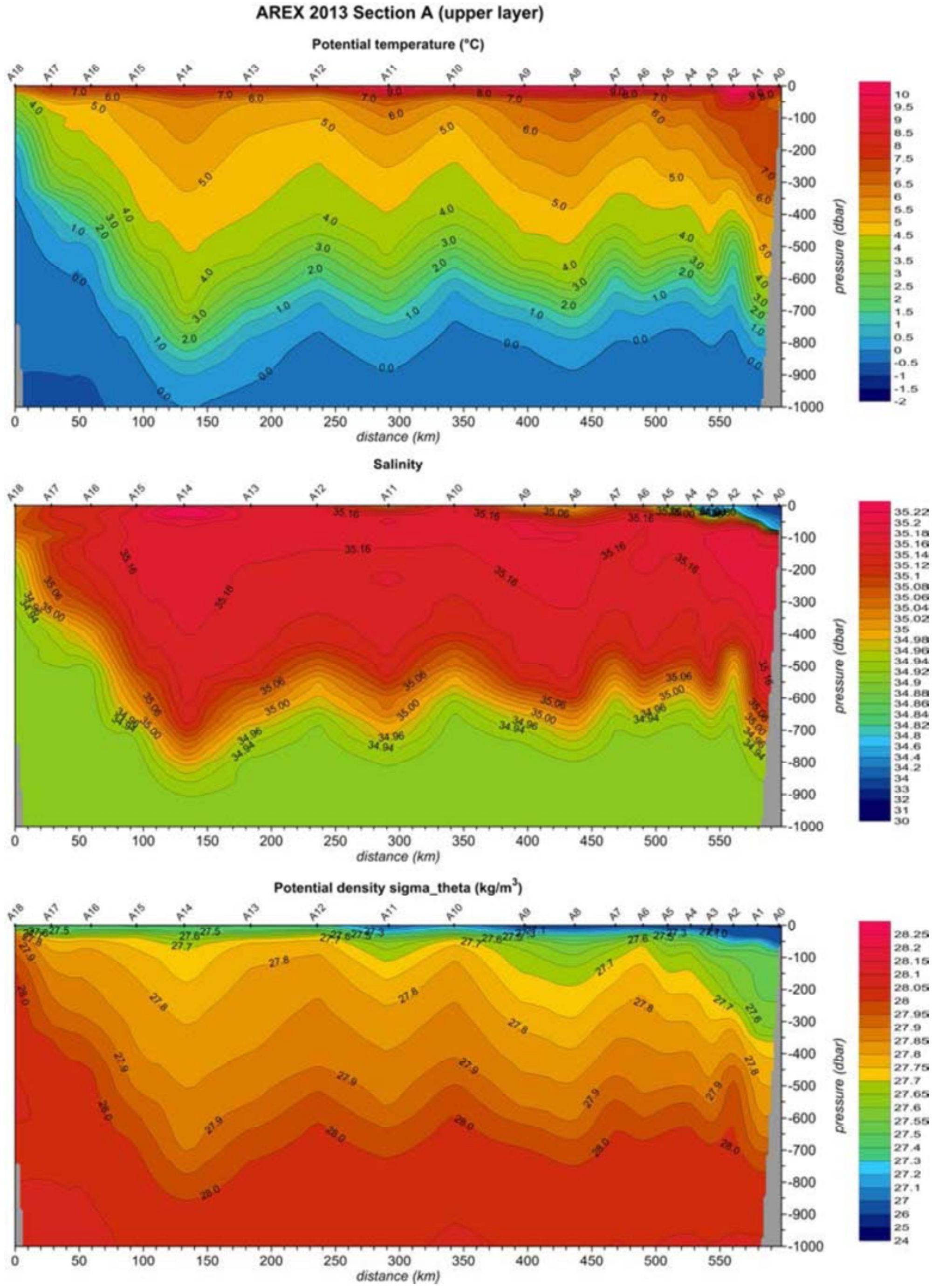

Fig. 2 Temperature, salinity and density distributions at the section A.

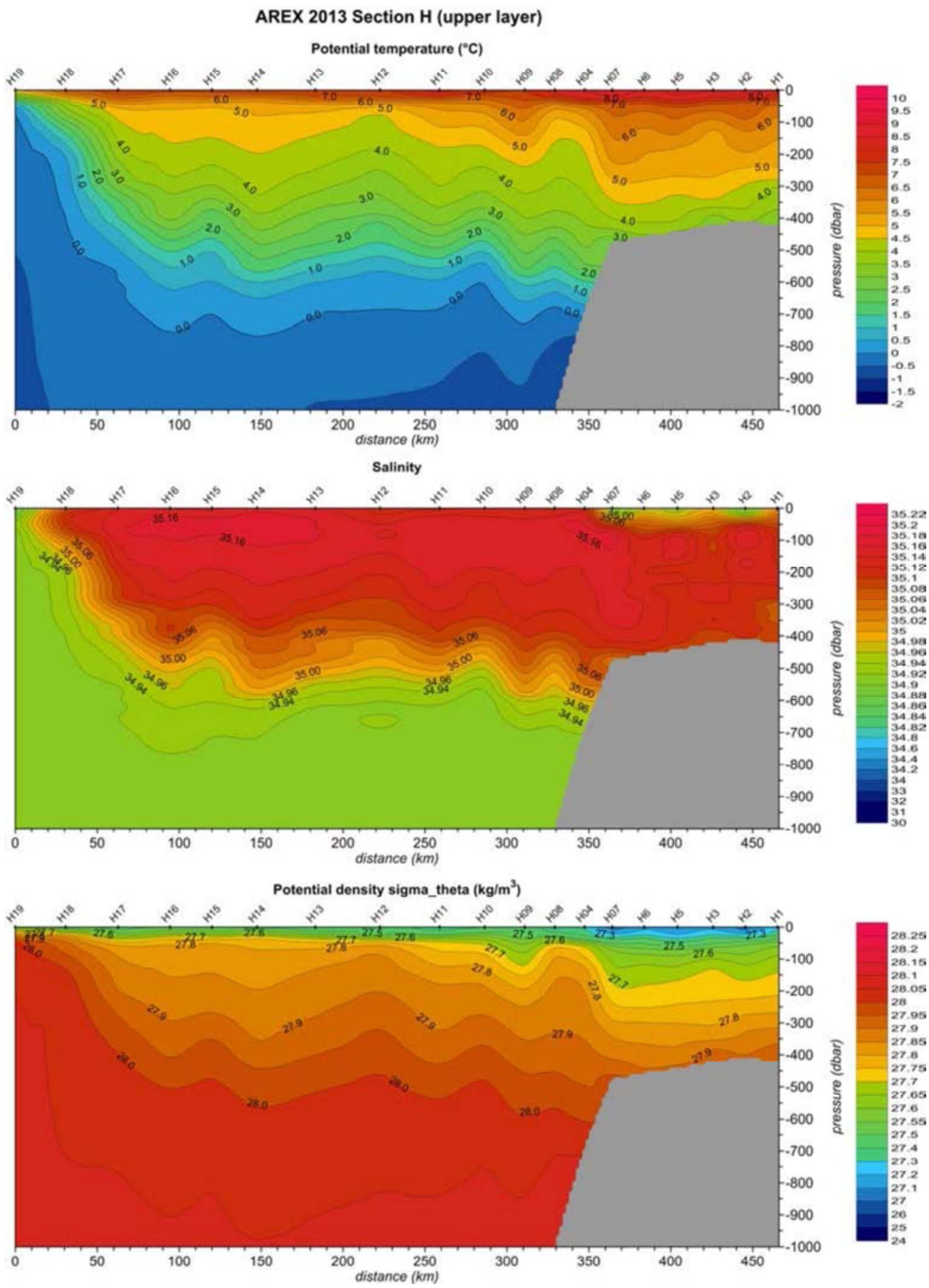

Fig. 3 Temperature, salinity and density distributions at the section H.

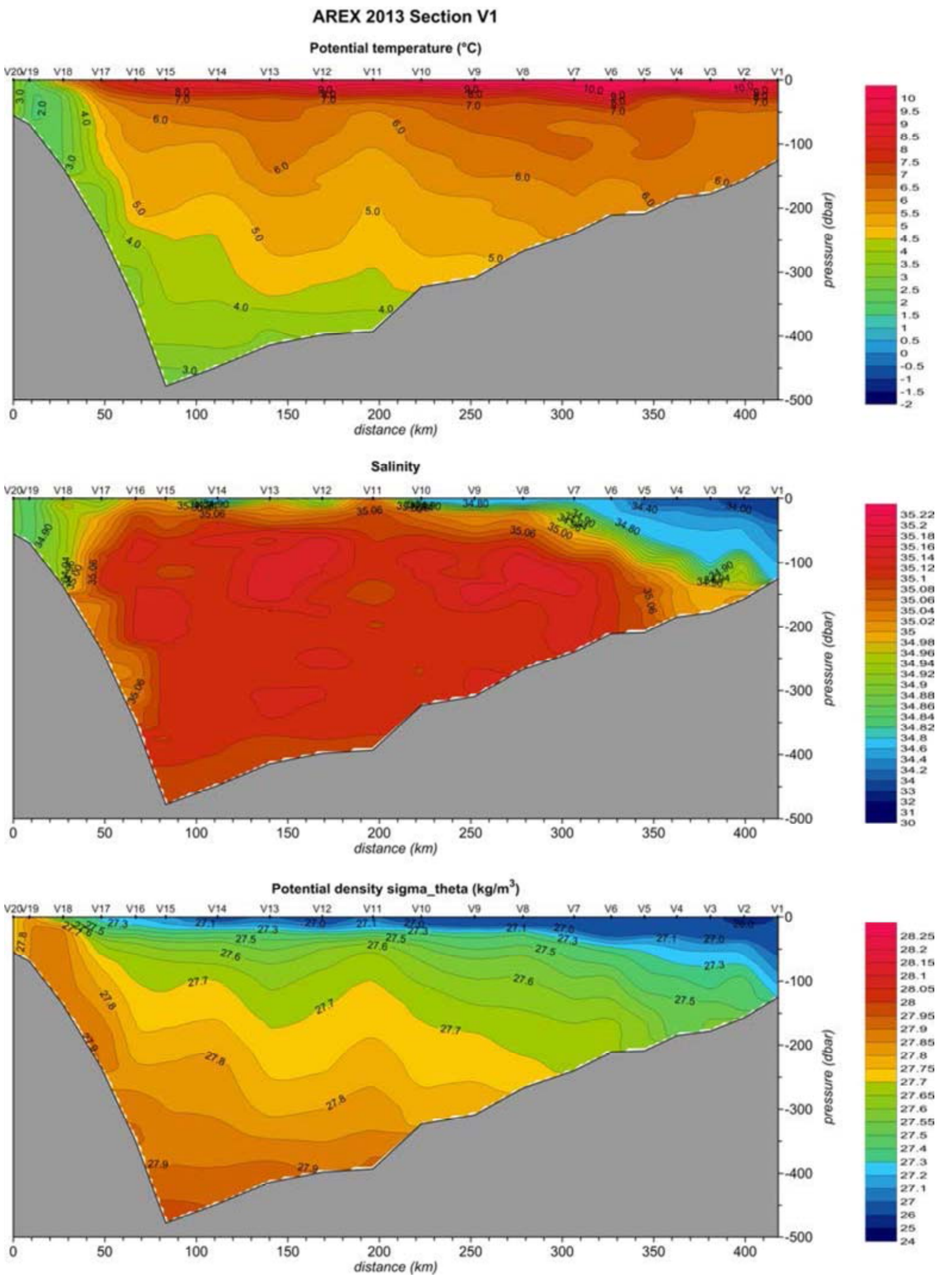

Fig. 4 Temperature, salinity and density distributions at the section V1.

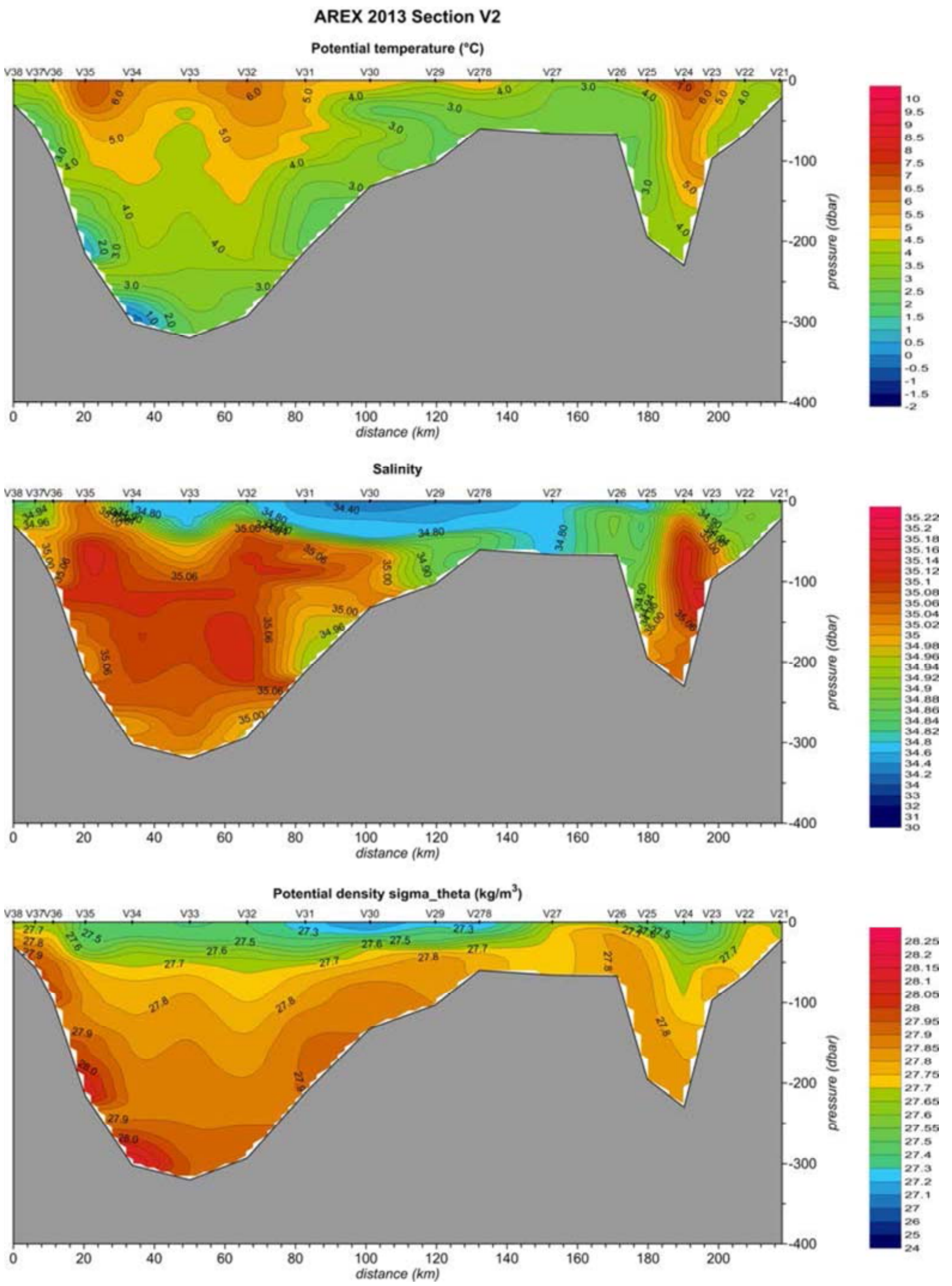

Fig. 5 Temperature, salinity and density distributions at the section V2.

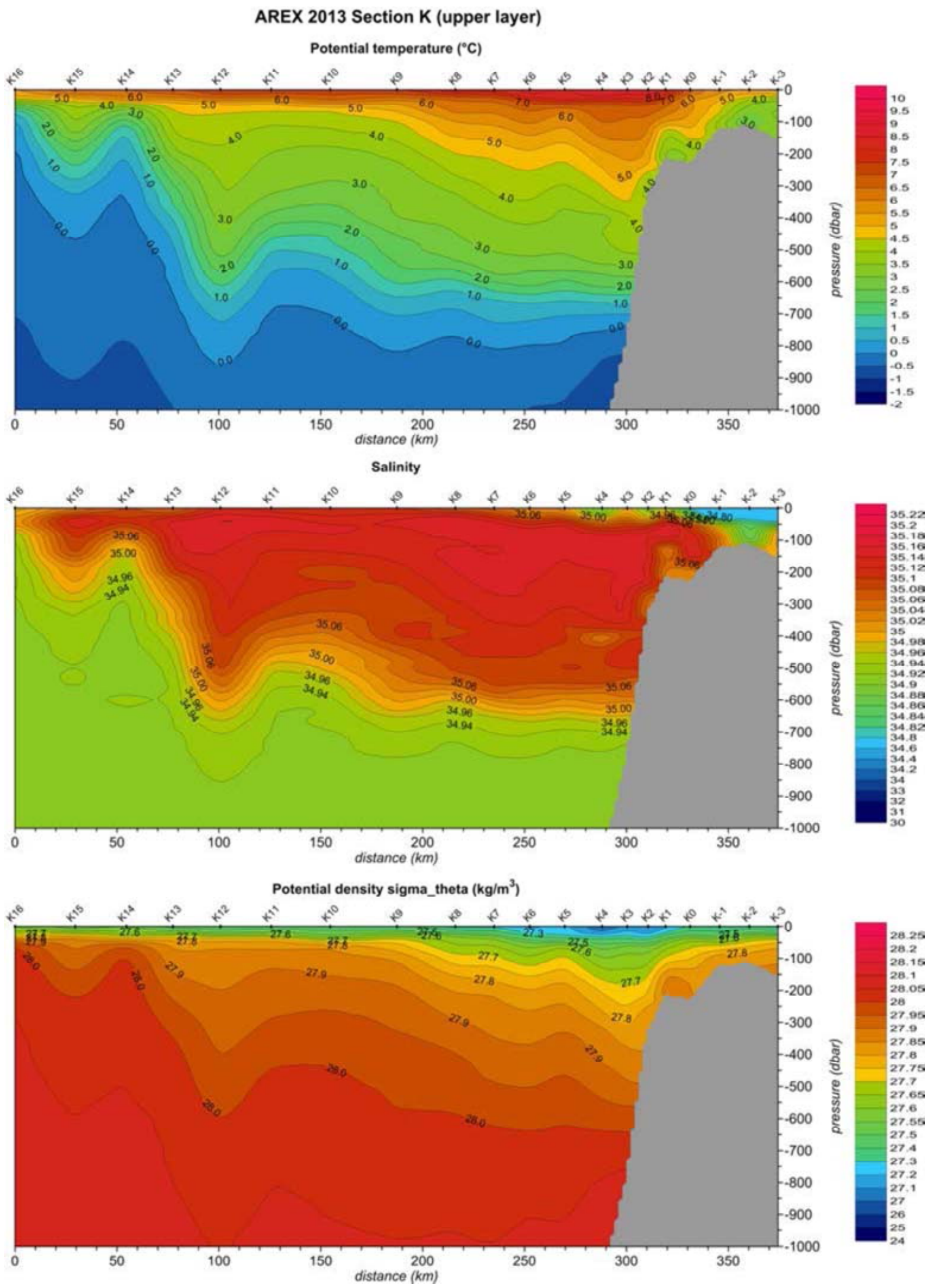

Fig. 6 Temperature, salinity and density distributions at the section K.

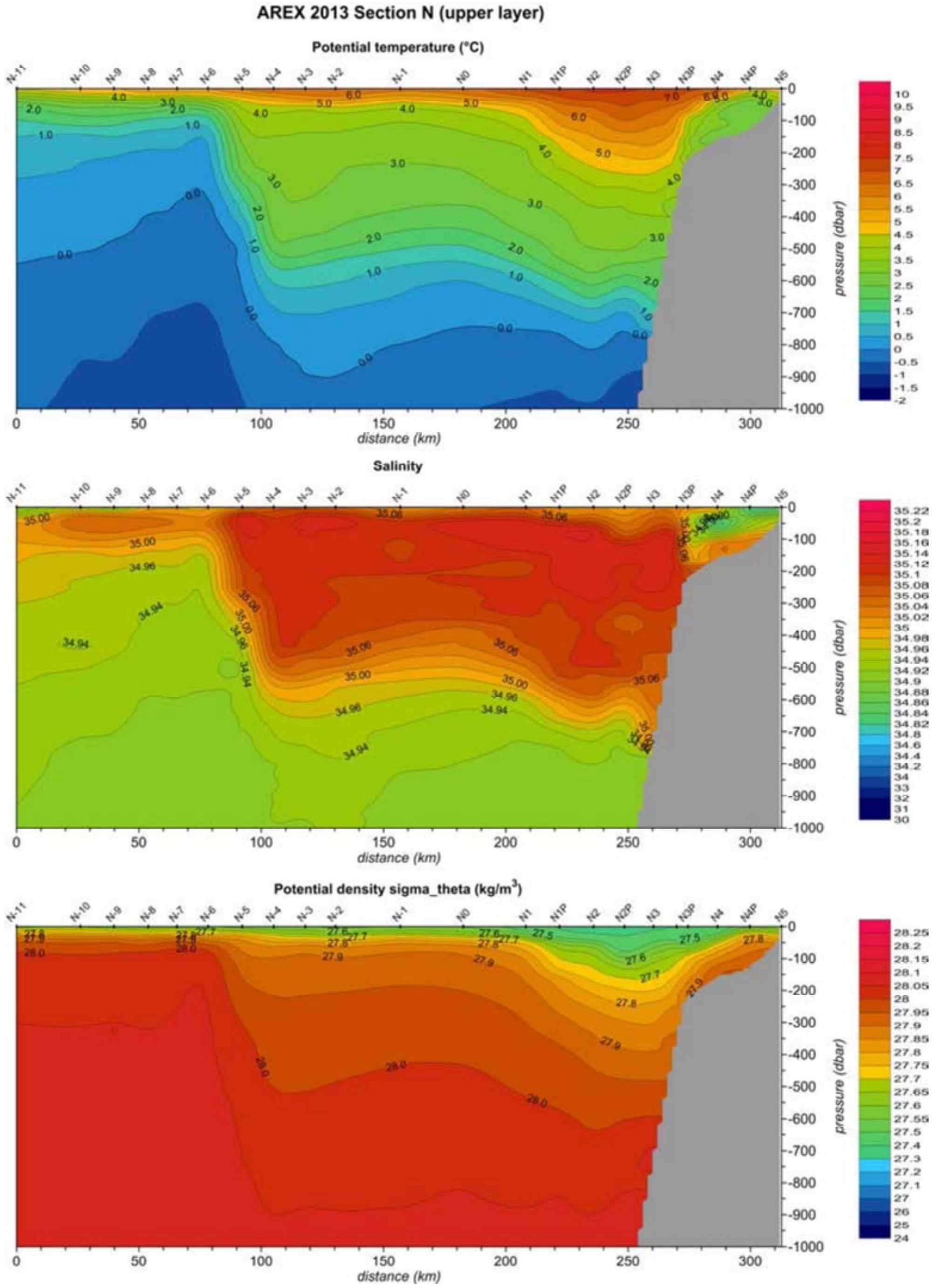

Fig. 7 Temperature, salinity and density distributions at the section N.

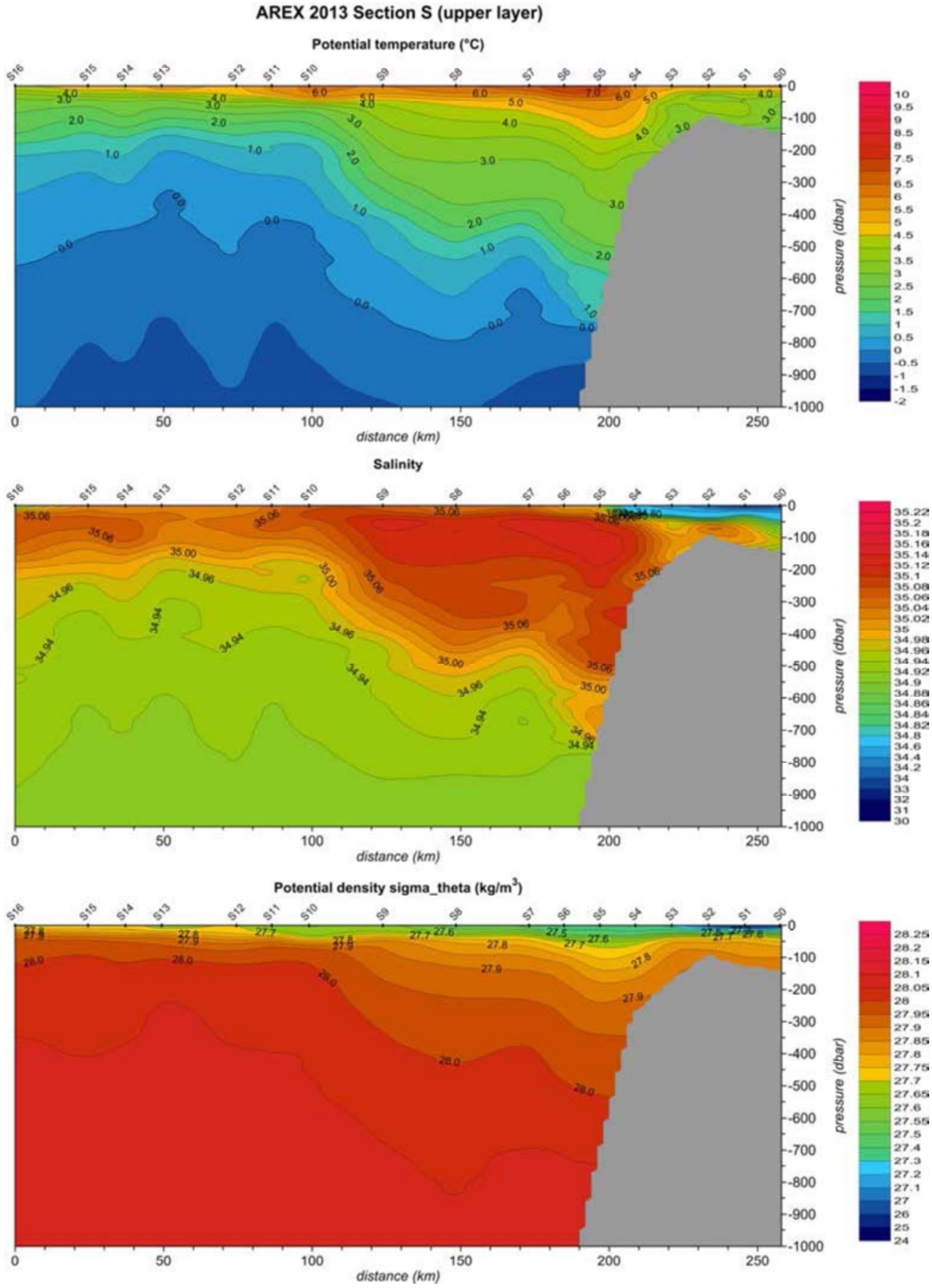

Fig. 8 Temperature, salinity and density distributions at the section S.

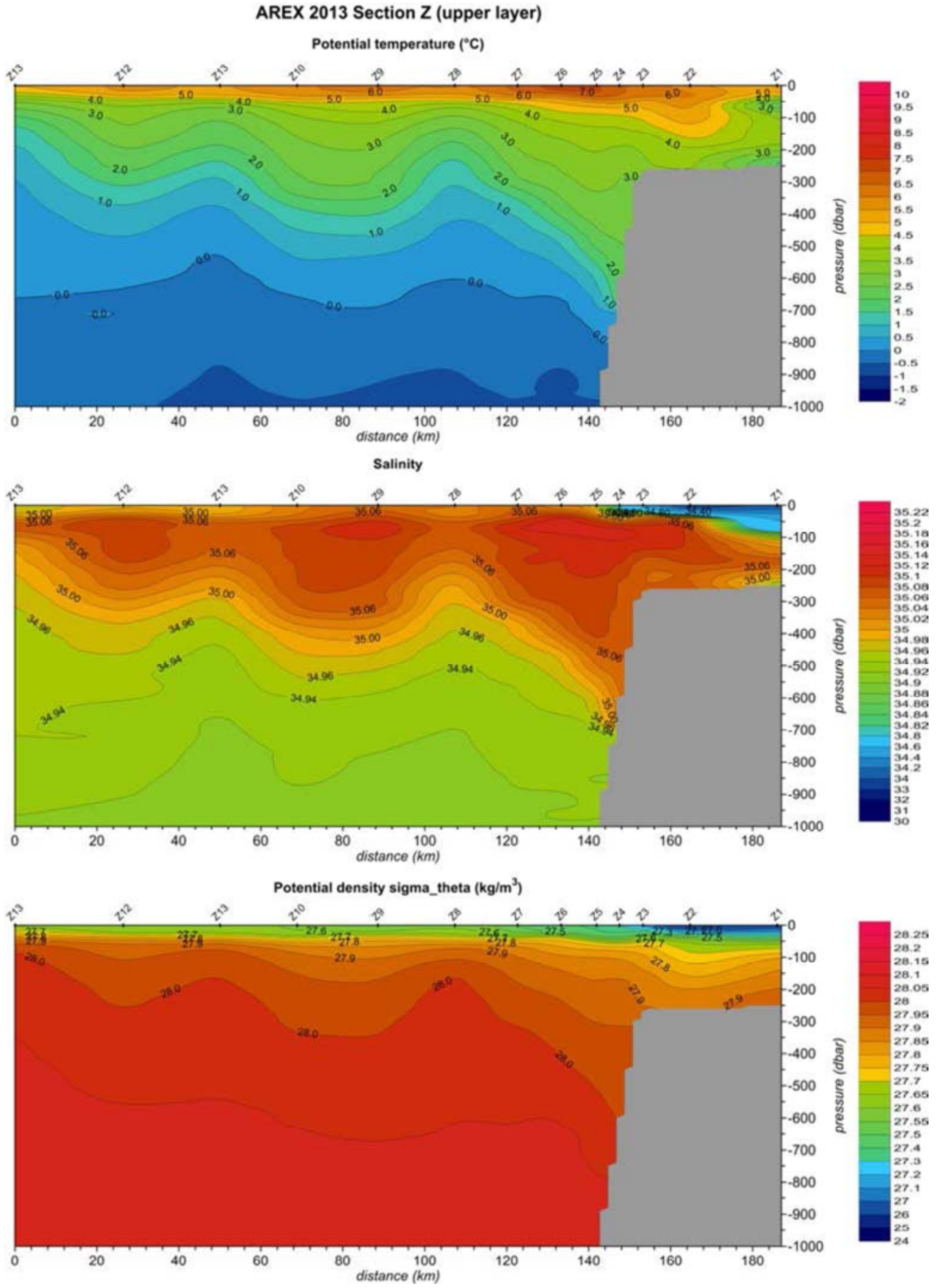

Fig. 9 Temperature, salinity and density distributions at the section Z.

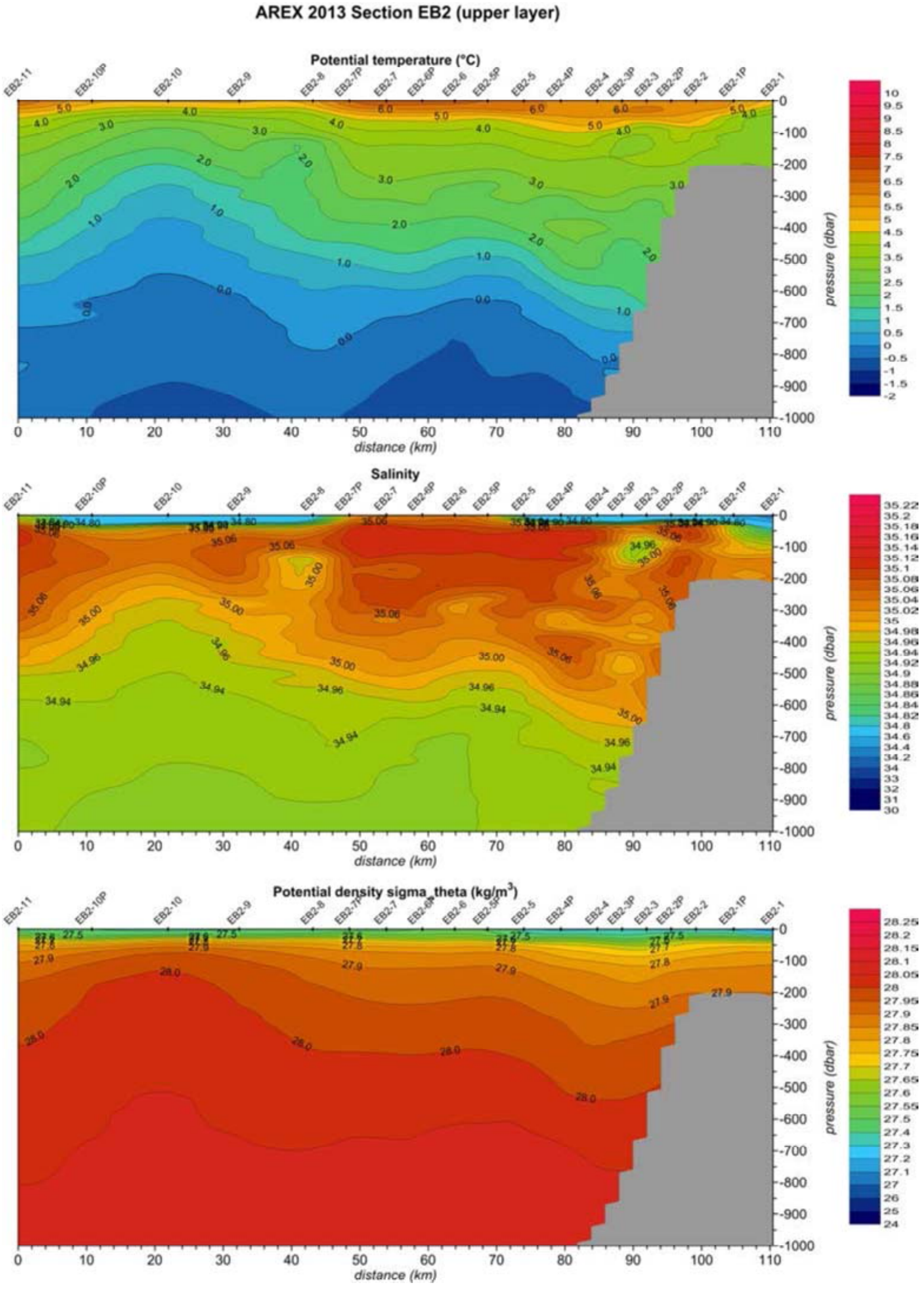

Fig. 10 Temperature, salinity and density distributions at the section EB2.

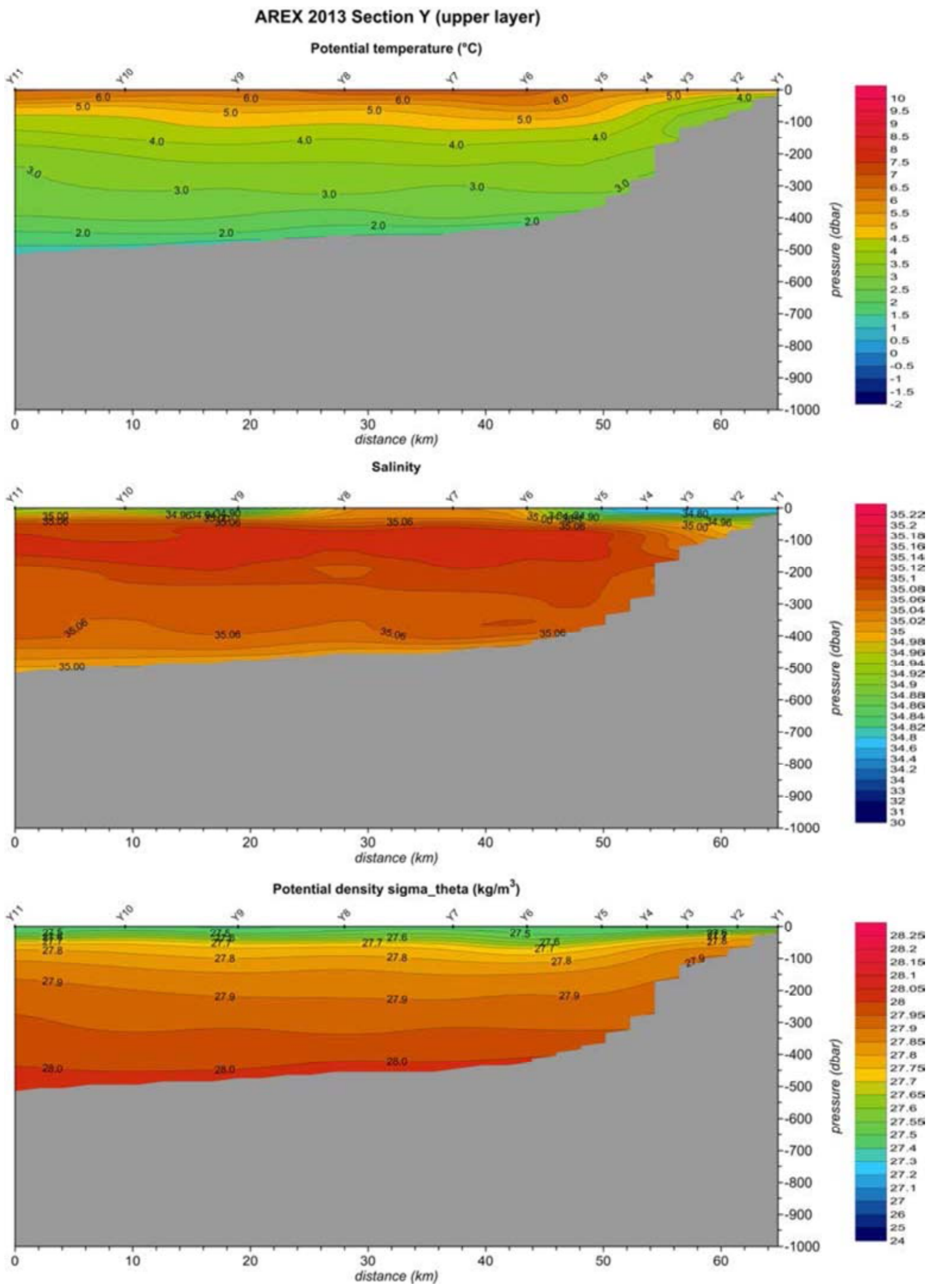

Fig. 11 Temperature, salinity and density distributions at the section Y.

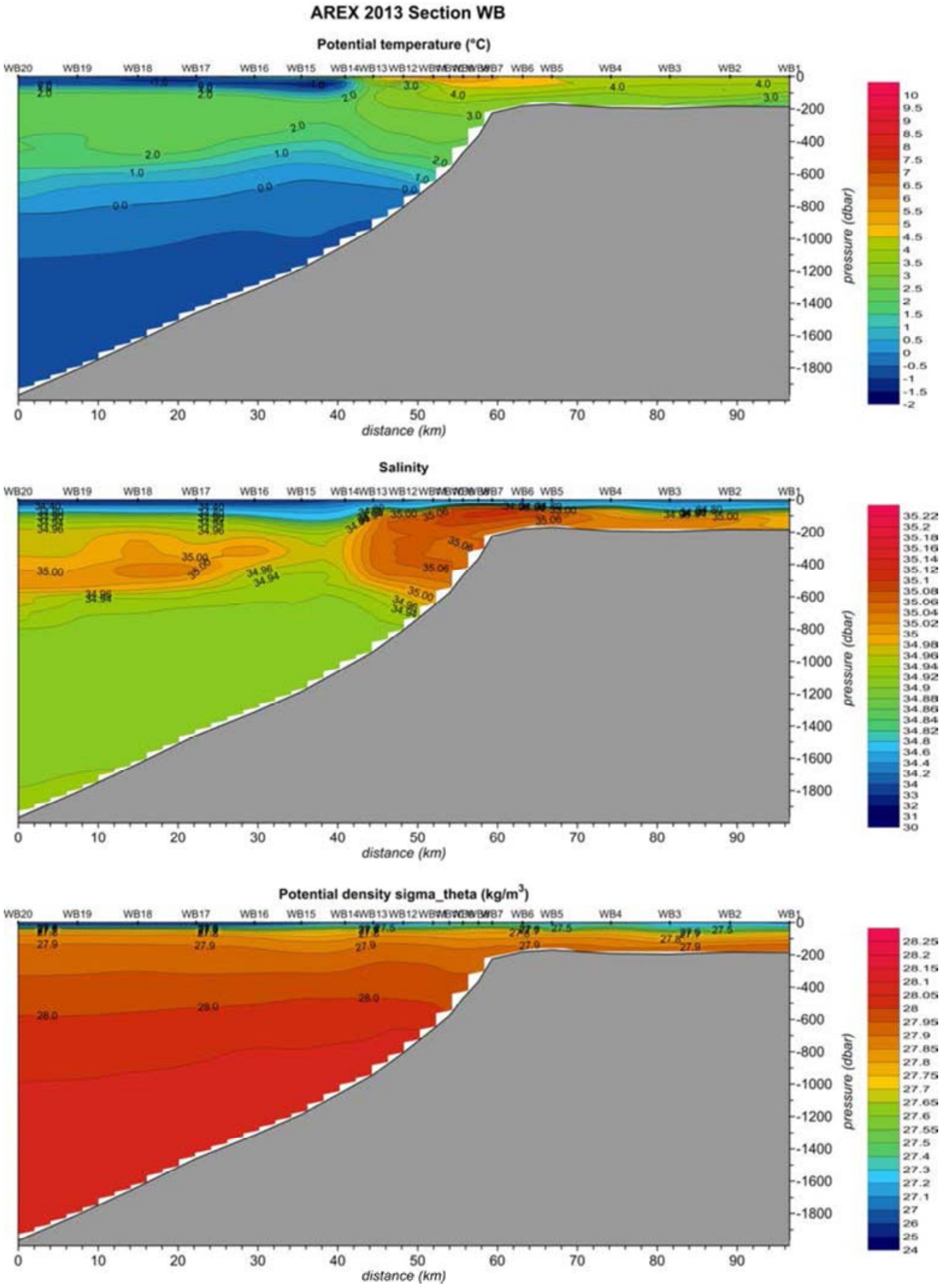

Fig. 12 Temperature, salinity and density distributions at the section WB.

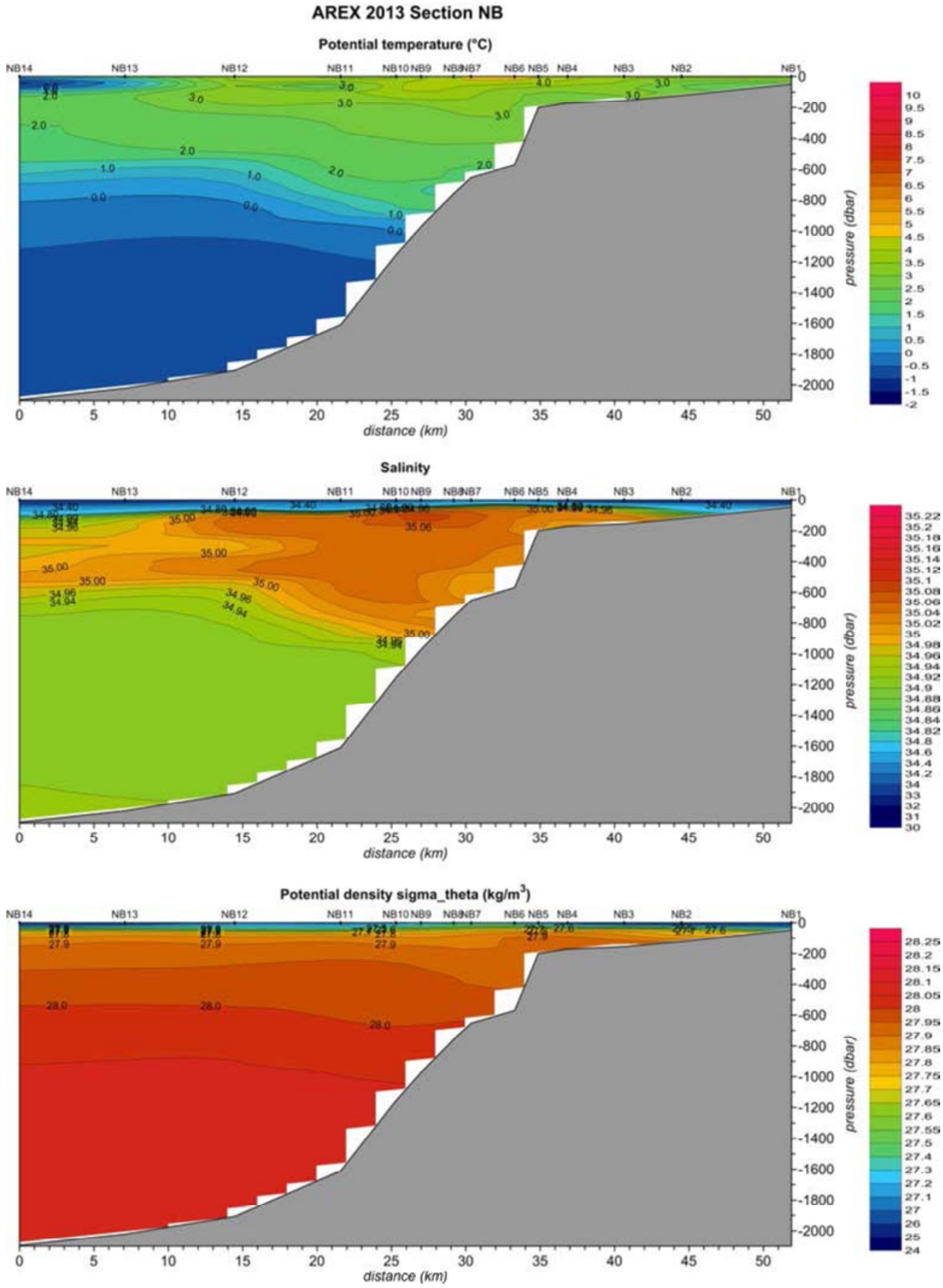

Fig. 13 Temperature, salinity and density distributions at the section WB.

4. Final conclusions

The 2nd and 3rd legs of the AREX2013 cruise were successful due to good collaboration between the scientists and the ship crew. All planned research tasks were fulfilled. To optimize ship-borne measurements and to use available ship time more efficiently during future Arctic field campaigns, following issues should be addressed:

The navigation maps for the regions north of Svalbard should be acquired and updated. Due to retraction of the sea ice edge north- and eastward and intensification of the IOPAS measurements in this area as a part of numerous international projects, save navigation is prerequisite for further scientific activities from 'Oceania'.

A technical modification of the CTD carousel lifting bail is recommended due to failing system which is easily damaged even under the moderate waves. The ship time, lost when measurements had to be stopped due to the high risk of damaging the carousel bail, was significantly more valuable than costs of rebuilding the bail. In addition, in the current set-up, latches of the bathymetric bottles often get damaged when the carousel bail hits the ring of latches.

It is also recommended to refurbish the old CTD system with the Seabird probe in the frame (without the carousel) to be used as a back-up system under the rough sea conditions. Using the carousel CTD system under stronger waves is not feasible due to a high freeboard and strong pitching and rolling of the ship. During the AREX2013 cruise the measurements had to be cancelled several times due to weather conditions, preventing using the CTD carousel. However, work with the CTD probe in a frame, which is much smaller and lighter and this safer to use, would be still possible under similar weather conditions. The back-up CTD system would increase efficiency of ship-borne measurements and usage of ship time.

Regarding the AREX cruise schedule, some modifications are suggested in future years due to intensification of measurements in the northern Fram Strait and north of Svalbard. Due to a strong seasonal variability, sea ice conditions usually significantly improve in late summer when the are of open water largely increases and the ice edge is shifted eastward). It creates new possibilities for 'Oceania' to collect observations in these extremely interesting regions. Therefore I would recommend to shift the 3rd leg of the Arctic cruise to take place after the fjord leg, which would result in 2-3 weeks of delay in respect to the current cruise schedule. Due to the very time consuming measurements at the section A (which is also measured during Norwegian cruises), I suggest bi-annual occupation of this section and using resulting ship time for measurements north-east and north of Svalbard. Taking into account the interactions between Atlantic water inflow and sea ice and atmosphere, these regions are among the most interesting areas for field measurements under several international projects with IOPAS participation.

Attachment 1 Cruise itinerary

21 June	Embarkation of the scientific team for the 2nd cruise leg. Preparations for departure.
22 June	Departure 01:00 LT. Transit to the section A (7 hours). Preparation of instruments. Test station at A0. Mechanical problem with closing some bathymetric bottles on the carousel. Stations CTD A0 ÷ A5.
23 June	Stations CTD A6 ÷ A11.
24 June	Stations CTD A12 ÷ A17.
25 June	Station CTD A18. Deployment of Seaglider AWI MK558. Stations CTD H19 ÷ H15. Problems with fluorimeter (spikes, missing data). Exchanging the cable.
26 June	Stations CTD H14 ÷ H10. Further problems with fluorimeter, cable repaired. At noon, measurements cancelled due to high waves (4-5°B, waves 1-1.5 m).
27 June	Continuation of measurements from noon on. Stations CTD H9 ÷ H2
28 June	Station CTD H1. Transit to the section V1. Stations CTD V1 ÷ V3.
29 June	Stations CTD V4 ÷ V14.
30 June	Stations CTD V15 ÷ V21. Short break near the Bear Island (2h). Stations CTD V22 ÷ V31.
1 July	Stations CTD V32 ÷ V38. Transit to the section K. Stations CTD K-3 ÷ K2.
2 July	Stations CTD K3 ÷ K12.
3 July	Stations CTD K13 ÷ K16. Transit to the section O. Stations CTD O-12 ÷ O-10.
4 July	Stations CTD O-8 ÷ O6. At the station O-8 the plankton net WP2/180 was lost due when the wire broke due to a loose thimble.
5 July	Stations CTD O7 ÷ O8. Transit to the section N. Stations CTD N5 ÷ N3P. Deployment of the mooring MIXAR1 and CTD station at its position. Stations CTD N3 ÷ N1. At the station N2 the plankton net WP2/60 was damaged due to entangling the net wire with a cable of the CTD rosette under the strong drift.
6 July	Stations CTD N0 ÷ N-6.
7 July	Stations CTD N-7 ÷ N-11. Due to bad weather conditions and high waves (up to 2 m) the CTD probe was remounted from the carousel system into the single frame to make the CTD operations easier and safer.
8 July	A break in measurements due to a bad weather. In the afternoon transit towards Hornsund and start of measurements with the CTD towed scanfish at the section 1HP
9 July	Continuation of scanfish measurements at the section 1HP. Transit into Horsund and recovery of the mooring AWAKE-3 (RDCP600 and a chain of 10 thermistors). Exchange of scientists with Horsung station (one person off the ship, one person on). Departure from Horsund.
10 July	Transit and arrival to Longyearbyen.
11 July	Exchange of the scientific crew (5 persons off the ship, 5 new embarked). Departure from Longyearbyen 17:00 LT. Transit to the position of mooring AWAKE-4 at the Horsund shelf.

12 July	Recovery of the AWAKE-4 mooring. Transit to the position and measurements with the scanfish at the section 2HP near the Horsund outlet. Transit to the section S.
13 July	Stations CTD S0 ÷ S12.
14 July	Stations CTD S13 ÷ S16. Transit to the section Z. Station Z13.
15 July	Station CTD Z12. In the morning measurements cancelled due to high waves. Restarting the measurements in the afternoon. Stations CTD Z11 ÷ Z9. Again, a breal in measurements due to the weather break-down (6-7°B).
16 July	Restarting the measurements in the afternoon. Stations CTD Z8 ÷ Z6.
17 July	Stations Z5 ÷ Z1. Transit to the section EB2. Stations CTD EB2-1 ÷ EB2-6.
18 July	Stations CTD EB2-6P ÷ EB2-11. Transi to the section EX. Station CTD EX11.
19 July	Stations CTD EX10 ÷ EX1. Transit to the section Y.
20 July	Stations Y1 ÷ Y11. In the early morning cancelling the measurements due to the weather break-down and increasing sea state. After a few hours, cancelling the rest of stations at the section Y and transit to the section WB.
21 July	Stations CTD WB1 ÷ WB20. Transit to the section NB.
22 July	Stations CTD NB14 ÷ NB1. Beginning of the scanfish CTD measurements at the section 1NB.
23 July	Scanfish CTD measurements at the section 1NB (11 h). Transit to the beginning of the section 1WB. Scanfish CTD measurements at the section 1 WB (10 h). Departure from the studied region at 22:00 LT and transit to Isfjorden to the biological section UniPlankton.
24 July	Transit to Isfjorden. Beginning of work at the section UniPlankton at 18:00 LT.
25 July	Completion of measurements at the section UniPlankton. Arrival to Longyearbyen 12:00 LT. End of the 3rd leg of the AREX2013 cruise.

Attachment 2 Station list

File name	Station	Latitude (decimal degree)	Longitude (decimal degree)	Water depth (m)	Max pressure (dbar)	Day	Month	Year	Hour	Min
ar13_001.awi	**A0**	69.635	16.467	72	69	22	6	2013	7	40
ar13_002.awi	**A1**	69.718	16.115	1258	1270	22	6	2013	9	3
ar13_003.awi	**A2**	69.816	15.714	2238	2268	22	6	2013	11	24
ar13_004.awi	**A3**	69.903	15.353	2291	2323	22	6	2013	14	38
ar13_005.awi	**A4**	69.989	15.003	2420	2455	22	6	2013	17	49
ar13_006.awi	**A5**	70.078	14.604	2512	2549	22	6	2013	20	47
ar13_007.awi	**A6**	70.174	14.187	2537	2575	23	6	2013	0	28
ar13_008.awi	**A7**	70.288	13.719	2617	2657	23	6	2013	3	39
ar13_009.awi	**A8**	70.447	13.018	2627	2666	23	6	2013	7	57
ar13_010.awi	**A9**	70.650	12.150	2614	2654	23	6	2013	12	29
ar13_011.awi	**A10**	70.932	10.922	2607	2646	23	6	2013	16	53
ar13_012.awi	**A11**	71.196	9.770	2635	2675	23	6	2013	21	8
ar13_013.awi	**A12**	71.478	8.474	2733	2775	24	6	2013	2	3
ar13_014.awi	**A13**	71.753	7.278	2815	2858	24	6	2013	6	55
ar13_015.awi	**A14**	71.999	6.003	2857	2901	24	6	2013	11	41
ar13_016.awi	**A15**	72.197	5.129	2767	2810	24	6	2013	17	14
ar13_017.awi	**A16**	72.370	4.249	2455	2491	24	6	2013	21	5
ar13_018.awi	**A17**	72.533	3.500	2515	2552	25	6	2013	0	13
ar13_019.awi	**A18**	72.677	2.801	604	606	25	6	2013	3	10
ar13_020.awi	**H19**	73.501	4.003	2822	2866	25	6	2013	9	4
ar13_021.awi	**H18**	73.499	4.976	2757	2800	25	6	2013	12	23
ar13_022.awi	**H17**	73.499	5.988	1926	1952	25	6	2013	15	31
ar13_023.awi	**H16**	73.500	6.992	2182	2212	25	6	2013	18	24
ar13_024.awi	**H15**	73.501	7.798	3062	3111	25	6	2013	21	25
ar13_025.awi	**H14**	73.500	8.667	2488	2525	26	6	2013	0	59
ar13_026.awi	**H13**	73.498	9.791	2294	2326	26	6	2013	4	40
ar13_027.awi	**H12**	73.501	11.040	2059	2086	26	6	2013	8	41
ar13_028.awi	**H11**	73.501	12.189	1799	1818	26	6	2013	12	7
ar13_029.awi	**H10**	73.502	13.063	1575	1590	26	6	2013	15	39
ar13_030.awi	**H09**	73.500	13.832	1294	1306	27	6	2013	10	59
ar13_031.awi	**H08**	73.500	14.415	1010	1018	27	6	2013	13	21
ar13_032.awi	**H04**	73.500	14.995	693	697	27	6	2013	15	23
ar13_033.awi	**H07**	73.497	15.528	481	481	27	6	2013	16	56
ar13_034.awi	**H6**	73.494	16.140	461	461	27	6	2013	18	46
ar13_035.awi	**H5**	73.499	16.782	445	446	27	6	2013	20	27
ar13_036.awi	**H3**	73.500	17.469	428	426	27	6	2013	22	17
ar13_037.awi	**H2**	73.500	18.092	412	412	28	6	2013	0	0
ar13_038.awi	**H1**	73.500	18.709	430	430	28	6	2013	1	41
ar13_039.awi	**V1**	70.502	19.978	129	125	28	6	2013	20	1
ar13_040.awi	**V2**	70.666	19.928	160	157	28	6	2013	21	35
ar13_041.awi	**V3**	70.832	19.926	181	178	28	6	2013	23	7
ar13_042.awi	**V4**	70.996	19.890	189	185	29	6	2013	0	34
ar13_043.awi	**V5**	71.155	19.866	212	209	29	6	2013	2	11
ar13_044.awi	**V6**	71.318	19.837	212	211	29	6	2013	4	27
ar13_045.awi	**V7**	71.500	19.807	241	240	29	6	2013	6	21

ar13_046.awi	**V8**	71.750	19.733	267	267	29	6	2013	8	6
ar13_047.awi	**V9**	71.987	19.686	310	309	29	6	2013	9	56
ar13_048.awi	**V10**	72.247	19.616	325	323	29	6	2013	13	33
ar13_049.awi	**V11**	72.485	19.564	393	393	29	6	2013	15	24
ar13_050.awi	**V12**	72.733	19.526	398	398	29	6	2013	17	24
ar13_051.awi	**V13**	72.990	19.467	413	414	29	6	2013	19	26
ar13_052.awi	**V14**	73.246	19.409	448	448	29	6	2013	23	6
ar13_053.awi	**V15**	73.499	19.334	478	478	30	6	2013	1	19
ar13_054.awi	**V16**	73.647	19.307	350	350	30	6	2013	3	14
ar13_055.awi	**V17**	73.816	19.280	237	235	30	6	2013	4	42
ar13_056.awi	**V18**	74.002	19.225	140	137	30	6	2013	6	22
ar13_057.awi	**V19**	74.167	19.183	71	69	30	6	2013	7	42
ar13_058.awi	**V20**	74.246	19.166	60	55	30	6	2013	8	25
ar13_059.awi	**V21**	74.534	18.877	26	21	30	6	2013	11	1
ar13_060.awi	**V22**	74.617	18.754	71	67	30	6	2013	13	7
ar13_061.awi	**V23**	74.698	18.672	101	97	30	6	2013	13	58
ar13_062.awi	**V24**	74.766	18.595	232	230	30	6	2013	14	47
ar13_063.awi	**V25**	74.857	18.506	198	195	30	6	2013	15	50
ar13_064.awi	**V26**	74.932	18.439	68	67	30	6	2013	16	43
ar13_065.awi	**V27**	75.088	18.239	70	66	30	6	2013	18	3
ar13_066.awi	**V28**	75.268	18.058	64	60	30	6	2013	19	40
ar13_067.awi	**V29**	75.372	17.884	107	103	30	6	2013	20	30
ar13_068.awi	**V30**	75.533	17.719	134	132	30	6	2013	22	11
ar13_069.awi	**V31**	75.692	17.545	214	212	30	6	2013	23	26
ar13_070.awi	**V32**	75.830	17.328	294	293	1	7	2013	1	26
ar13_071.awi	**V33**	75.969	17.145	321	320	1	7	2013	2	45
ar13_072.awi	**V34**	76.112	17.005	302	302	1	7	2013	4	18
ar13_073.awi	**V35**	76.226	16.854	222	216	1	7	2013	5	32
ar13_074.awi	**V36**	76.307	16.793	100	98	1	7	2013	6	33
ar13_075.awi	**V37**	76.350	16.733	58	57	1	7	2013	7	17
ar13_076.awi	**V38**	76.398	16.613	32	30	1	7	2013	8	0
ar13_077.awi	**K-3**	75.000	17.994	158	158	1	7	2013	17	5
ar13_078.awi	**K-2**	75.003	17.510	121	116	1	7	2013	18	19
ar13_079.awi	**K-1**	75.000	17.001	130	127	1	7	2013	19	40
ar13_080.awi	**K0**	75.000	16.499	235	233	1	7	2013	20	52
ar13_081.awi	**K1**	74.999	16.081	221	218	1	7	2013	21	59
ar13_082.awi	**K2**	74.998	15.781	342	340	1	7	2013	22	54
ar13_083.awi	**K3**	74.997	15.427	795	800	2	7	2013	0	0
ar13_084.awi	**K4**	75.000	14.999	1104	1113	2	7	2013	1	51
ar13_085.awi	**K5**	75.001	14.364	1507	1524	2	7	2013	3	50
ar13_086.awi	**K6**	75.001	13.767	1896	1815	2	7	2013	6	8
ar13_087.awi	**K7**	74.999	13.161	1985	2012	2	7	2013	8	27
ar13_088.awi	**K8**	74.998	12.499	2154	2184	2	7	2013	10	45
ar13_089.awi	**K9**	74.998	11.504	2374	2410	2	7	2013	13	32
ar13_090.awi	**K10**	75.004	10.371	2505	2541	2	7	2013	16	39
ar13_091.awi	**K11**	75.001	9.364	2548	2586	2	7	2013	19	45
ar13_092.awi	**K12**	74.999	8.500	2838	2883	2	7	2013	22	50
ar13_093.awi	**K13**	74.998	7.691	2160	2191	3	7	2013	1	56
ar13_094.awi	**K14**	74.998	6.898	2102	2132	3	7	2013	4	31
ar13_095.awi	**K15**	74.997	6.025	2836	2883	3	7	2013	7	8

ar13_096.awi	**K16**	75.000	5.003	3105	3157	3	7	2013	10	27
ar13_097.awi	**O-12**	75.725	6.095	2557	2595	3	7	2013	17	1
ar13_098.awi	**O-10**	75.817	8.828	2355	2389	3	7	2013	23	15
ar13_099.awi	**O-8**	75.879	11.479	2071	2098	4	7	2013	5	42
ar13_100.awi	**O-6**	75.933	13.082	1380	1393	4	7	2013	9	50
ar13_101.awi	**O-4**	75.950	13.768	907	914	4	7	2013	11	54
ar13_102.awi	**O-2**	75.966	14.344	347	344	4	7	2013	13	37
ar13_103.awi	**M4**	75.998	14.987	339	337	4	7	2013	15	8
ar13_104.awi	**O1**	76.030	15.459	366	365	4	7	2013	16	52
ar13_105.awi	**O2**	76.064	15.970	388	387	4	7	2013	18	8
ar13_106.awi	**O3**	76.102	16.482	344	344	4	7	2013	19	25
ar13_107.awi	**O4**	76.135	16.994	285	285	4	7	2013	20	37
ar13_108.awi	**O5**	76.159	17.454	310	307	4	7	2013	22	10
ar13_109.awi	**O6**	76.184	17.900	277	274	4	7	2013	23	14
ar13_110.awi	**O7**	76.219	18.403	252	250	5	7	2013	0	21
ar13_111.awi	**O8**	76.251	18.888	265	263	5	7	2013	1	26
ar13_112.awi	**N5**	76.501	16.009	51	47	5	7	2013	6	53
ar13_113.awi	**N4p**	76.502	15.509	138	136	5	7	2013	7	55
ar13_114.awi	**N4**	76.500	15.001	164	162	5	7	2013	9	4
ar13_115.awi	**N3P**	76.500	14.536	224	222	5	7	2013	10	4
ar13_116.awi	**MIXAR1**	76.489	14.365	376	376	5	7	2013	11	12
ar13_117.awi	**N3**	76.496	14.002	751	756	5	7	2013	13	10
ar13_118.awi	**N2P**	76.495	13.546	1261	1272	5	7	2013	14	44
ar13_119.awi	**N2**	76.498	13.059	1534	1551	5	7	2013	16	26
ar13_120.awi	**N1p**	76.495	12.524	1745	1765	5	7	2013	21	20
ar13_121.awi	**N1**	76.504	11.996	1894	1919	5	7	2013	23	19
ar13_122.awi	**N0**	76.507	11.013	2090	2118	6	7	2013	2	2
ar13_123.awi	**N-1**	76.502	10.021	2228	2259	6	7	2013	5	3
ar13_124.awi	**N-2**	76.497	9.003	2259	2292	6	7	2013	8	14
ar13_125.awi	**N-3**	76.504	8.529	2268	2299	6	7	2013	13	43
ar13_126.awi	**N-4**	76.501	8.031	1804	1729	6	7	2013	16	16
ar13_127.awi	**N-5**	76.500	7.535	2480	2521	6	7	2013	20	36
ar13_128.awi	**N-6**	76.497	6.999	2726	2773	6	7	2013	23	27
ar13_129.awi	**N-7**	76.500	6.509	2473	2514	7	7	2013	2	16
ar13_130.awi	**N-8**	76.502	6.057	2510	2552	7	7	2013	4	40
ar13_131.awi	**N-9**	76.496	5.518	2538	2581	7	7	2013	7	23
ar13_132.awi	**N-10**	76.499	4.991	2356	2394	7	7	2013	9	55
ar13_133.awi	**N-11**	76.501	3.987	2442	2482	7	7	2013	13	33
ar13_134.awi	**S0**	77.583	13.501	146	143	13	7	2013	0	0
ar13_135.awi	**S1**	77.567	13.014	138	135	13	7	2013	1	13
ar13_136.awi	**S2**	77.550	12.511	100	97	13	7	2013	2	23
ar13_137.awi	**S3**	77.533	12.000	179	176	13	7	2013	3	42
ar13_138.awi	**S4**	77.514	11.497	277	276	13	7	2013	5	3
ar13_139.awi	**S5**	77.500	11.002	724	728	13	7	2013	6	16
ar13_140.awi	**S6**	77.480	10.512	1252	1264	13	7	2013	7	28
ar13_141.awi	**S7**	77.463	10.032	1602	1622	13	7	2013	9	17
ar13_142.awi	**S8**	77.431	9.025	2057	2084	13	7	2013	11	43
ar13_143.awi	**S9**	77.398	8.021	2304	2337	13	7	2013	14	44
ar13_144.awi	**S10**	77.365	7.012	2649	2689	13	7	2013	17	46
ar13_145.awi	**S11**	77.350	6.501	2090	2118	13	7	2013	20	23

ar13_146.awi	**S12**	77.332	6.020	2582	2620	13	7	2013	22	25
ar13_147.awi	**S13**	77.300	5.000	2349	2386	14	7	2013	2	3
ar13_148.awi	**S14**	77.283	4.506	2285	2320	14	7	2013	4	56
ar13_149.awi	**S15**	77.266	4.001	2566	2608	14	7	2013	7	17
ar13_150.awi	**S16**	77.230	3.015	2886	2933	14	7	2013	11	24
ar13_151.awi	**Z13**	78.066	2.833	2991	3040	14	7	2013	18	39
ar13_152.awi	**Z12**	78.080	3.981	2908	2955	15	7	2013	1	29
ar13_153.awi	**Z11**	78.094	5.006	2613	2653	15	7	2013	13	9
ar13_154.awi	**Z10**	78.106	5.822	2485	2522	15	7	2013	16	43
ar13_155.awi	**Z9**	78.115	6.682	2241	2273	15	7	2013	20	8
ar13_156.awi	**Z8**	78.131	7.498	3432	3493	16	7	2013	16	29
ar13_157.awi	**Z7**	78.140	8.166	2162	2193	16	7	2013	20	18
ar13_158.awi	**Z6**	78.149	8.629	1557	1575	16	7	2013	22	50
ar13_159.awi	**Z5**	78.158	9.002	1081	1092	17	7	2013	0	34
ar13_160.awi	**Z4**	78.160	9.248	686	691	17	7	2013	2	23
ar13_161.awi	**Z3**	78.163	9.498	268	267	17	7	2013	3	30
ar13_162.awi	**Z2**	78.165	10.001	267	265	17	7	2013	4	35
ar13_163.awi	**Z1**	78.172	10.930	257	257	17	7	2013	6	18
ar13_164.awi	**EB2-1**	78.826	9.287	204	202	17	7	2013	11	25
ar13_165.awi	**EB2-1P**	78.833	9.023	212	210	17	7	2013	12	39
ar13_166.awi	**EB2-2**	78.833	8.767	214	212	17	7	2013	13	30
ar13_167.awi	**EB2-2P**	78.834	8.598	399	399	17	7	2013	14	28
ar13_168.awi	**EB2-3**	78.834	8.432	663	667	17	7	2013	15	21
ar13_169.awi	**EB2-3P**	78.834	8.266	843	849	17	7	2013	17	39
ar13_170.awi	**EB2-4**	78.834	8.098	964	972	17	7	2013	18	41
ar13_171.awi	**EB2-4P**	78.834	7.851	1058	1068	17	7	2013	20	4
ar13_172.awi	**EB2-5**	78.834	7.598	1105	1114	17	7	2013	21	7
ar13_173.awi	**EB2-5P**	78.833	7.352	1198	1210	17	7	2013	22	24
ar13_174.awi	**EB2-6**	78.833	7.130	1345	1359	17	7	2013	23	24
ar13_175.awi	**EB2-6P**	78.833	6.909	1538	1556	18	7	2013	0	52
ar13_176.awi	**EB2-7**	78.833	6.665	1742	1764	18	7	2013	2	11
ar13_177.awi	**EB2-7P**	78.834	6.415	2050	2079	18	7	2013	3	54
ar13_178.awi	**EB2-8**	78.834	6.167	2316	2350	18	7	2013	5	41
ar13_179.awi	**EB2-9**	78.833	5.668	2524	2562	18	7	2013	9	46
ar13_180.awi	**EB2-10**	78.834	5.184	2589	2629	18	7	2013	11	52
ar13_181.awi	**EB2-10P**	78.834	4.667	2458	2495	18	7	2013	14	17
ar13_182.awi	**EB2-11**	78.832	4.167	2363	2399	18	7	2013	16	23
ar13_183.awi	**EX11**	79.417	3.431	2771	2815	18	7	2013	23	11
ar13_184.awi	**EX10**	79.416	4.004	3111	3164	19	7	2013	2	23
ar13_185.awi	**EX9**	79.416	4.498	2509	2547	19	7	2013	4	43
ar13_186.awi	**EX8P**	79.416	4.961	2468	2504	19	7	2013	6	56
ar13_187.awi	**EX8**	79.417	5.486	2212	2243	19	7	2013	9	5
ar13_188.awi	**EX7P**	79.417	5.999	1772	1794	19	7	2013	11	31
ar13_189.awi	**EX7**	79.419	6.485	1446	1462	19	7	2013	13	27
ar13_190.awi	**EX6**	79.416	6.995	1191	1202	19	7	2013	15	28
ar13_191.awi	**EX5**	79.417	7.333	1022	1031	19	7	2013	17	1
ar13_192.awi	**EX4P**	79.417	7.642	781	786	19	7	2013	18	35
ar13_193.awi	**EX4**	79.417	7.916	512	516	19	7	2013	19	31
ar13_194.awi	**EX3P**	79.416	8.164	266	266	19	7	2013	20	25
ar13_195.awi	**EX3**	79.416	8.498	191	191	19	7	2013	21	6

ar13_196.awi	**EX2**	79.417	8.972	131	129	19	7	2013	22	10
ar13_197.awi	**EX1**	79.418	9.463	129	126	19	7	2013	23	1
ar13_198.awi	**Y1**	79.656	10.355	33	29	20	7	2013	1	15
ar13_199.awi	**Y2**	79.680	10.246	89	86	20	7	2013	1	43
ar13_200.awi	**Y3**	79.708	10.101	137	134	20	7	2013	3	44
ar13_201.awi	**Y4**	79.730	9.979	310	309	20	7	2013	4	12
ar13_202.awi	**Y5**	79.755	9.845	373	372	20	7	2013	5	16
ar13_203.awi	**Y6**	79.795	9.616	427	429	20	7	2013	6	1
ar13_204.awi	**Y7**	79.835	9.391	454	454	20	7	2013	6	50
ar13_205.awi	**Y8**	79.894	9.060	457	458	20	7	2013	7	57
ar13_206.awi	**Y9**	79.952	8.735	479	482	20	7	2013	8	53
ar13_207.awi	**Y10**	80.013	8.385	498	498	20	7	2013	10	13
ar13_208.awi	**Y11**	80.072	8.039	508	512	20	7	2013	11	19
ar13_209.awi	**WB1**	80.089	12.638	188	186	21	7	2013	0	14
ar13_210.awi	**WB2**	80.155	12.568	185	183	21	7	2013	1	14
ar13_211.awi	**WB3**	80.221	12.482	198	196	21	7	2013	2	14
ar13_212.awi	**WB4**	80.286	12.401	195	192	21	7	2013	3	4
ar13_213.awi	**WB5**	80.351	12.324	171	170	21	7	2013	4	24
ar13_214.awi	**WB6**	80.383	12.278	183	181	21	7	2013	4	58
ar13_215.awi	**WB7**	80.417	12.248	227	225	21	7	2013	5	40
ar13_216.awi	**WB8**	80.432	12.228	367	366	21	7	2013	6	11
ar13_217.awi	**WB9**	80.449	12.207	468	469	21	7	2013	6	44
ar13_218.awi	**WB10**	80.464	12.190	573	576	21	7	2013	7	32
ar13_219.awi	**WB11**	80.482	12.167	656	660	21	7	2013	8	15
ar13_220.awi	**WB12**	80.515	12.129	801	807	21	7	2013	9	3
ar13_221.awi	**WB13**	80.548	12.085	933	942	21	7	2013	10	2
ar13_222.awi	**WB14**	80.579	12.048	1030	1039	21	7	2013	11	10
ar13_223.awi	**WB15**	80.627	11.984	1176	1188	21	7	2013	12	23
ar13_224.awi	**WB16**	80.679	11.931	1303	1315	21	7	2013	13	58
ar13_225.awi	**WB17**	80.743	11.841	1442	1459	21	7	2013	15	21
ar13_226.awi	**WB18**	80.807	11.754	1615	1635	21	7	2013	17	3
ar13_227.awi	**WB19**	80.874	11.679	1787	1809	21	7	2013	18	42
ar13_228.awi	**WB20**	80.939	11.591	1942	1967	21	7	2013	20	20
ar13_229.awi	**NB14**	80.988	15.553	2065	2094	22	7	2013	1	4
ar13_230.awi	**NB13**	80.928	15.687	1994	2021	22	7	2013	3	6
ar13_231.awi	**NB12**	80.866	15.836	1880	1907	22	7	2013	5	34
ar13_232.awi	**NB11**	80.805	15.957	1590	1610	22	7	2013	7	43
ar13_233.awi	**NB10**	80.774	16.034	1145	1156	22	7	2013	9	17
ar13_234.awi	**NB9**	80.762	16.092	963	972	22	7	2013	10	28
ar13_235.awi	**NB8**	80.743	16.123	753	758	22	7	2013	11	24
ar13_236.awi	**NB7**	80.735	16.166	650	653	22	7	2013	12	21
ar13_237.awi	**NB6**	80.709	16.190	566	570	22	7	2013	13	15
ar13_238.awi	**NB5**	80.695	16.210	202	199	22	7	2013	13	53
ar13_239.awi	**NB4**	80.679	16.255	173	171	22	7	2013	14	27
ar13_240.awi	**NB3**	80.647	16.327	157	155	22	7	2013	15	37
ar13_241.awi	**NB2**	80.614	16.395	123	121	22	7	2013	16	14
ar13_242.awi	**NB1**	80.551	16.523	50	48	22	7	2013	17	20

Attachment 3 Cruise participants

Leg II (22.06 - 09.07.2013)

No	***Name***	***Institute***	***Department***	***Project***
1	Agnieszka Beszczyńska-Möller	IOPAN	ZDM (of)	AREX, AWAKE-2,PAVE
2	Piotr Wieczorek	IOPAN	ZDM (of)	AREX, AWAKE-2, GAME
3	Ilona Goszczko	IOPAN	ZDM (of)	AREX, MIXAR
4	Łukasz Hoppe	IOPAN	ZFM	AREX, GAME
5	Kajetan Deja	IOPAN	ZEM	AREX, PAVE
6	Jakub Kowalczyk	IOPAN	ZDM (atm)	AREX
7	Paulina Pakszys	IOPAN	ZDM (atm)	AREX
8	Przemysław Makuch	IOPAN	ZDM (atm)	AREX
9	Irina Semeryuk	AARI	ZDM (of)	AREX
10	Sara Voit	UG	ZDM (of)	PAVE
11	Michał Czub	IOPAN	ZEM	AREX, PAVE
12	Ilona Wiśniewska	prasa	ZDM (of)	AREX

Leg III (10.07 - 25.07.2013)

No	***Name***	***Institute***	***Department***	***Project***
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4	Kajetan Deja	IOPAN	ZEM	AREX, PAVE
5	Jakub Kowalczyk	IOPAN	ZDM (atm)	AREX
6	Paulina Pakszys	IOPAN	ZDM (atm)	AREX
7	Przemysław Makuch	IOPAN	ZDM (atm)	AREX
8	Irina Semeryuk	AARI	ZDM (of)	AREX
9	Emilia Trudnowska	IOPAN	ZEM	AREX, UniPlankton
10	Sławomir Sagan	IOPAN	ZFM (opt)	GAME
11	Mirosław Darecki	IOPAN	ZFM (opt)	GAME
12	Agnieszka Zdun	IOPAN	ZFM (opt)	GAME
13	Katarzyna Dragańska	IOPAN	ZFM (opt)	GAME