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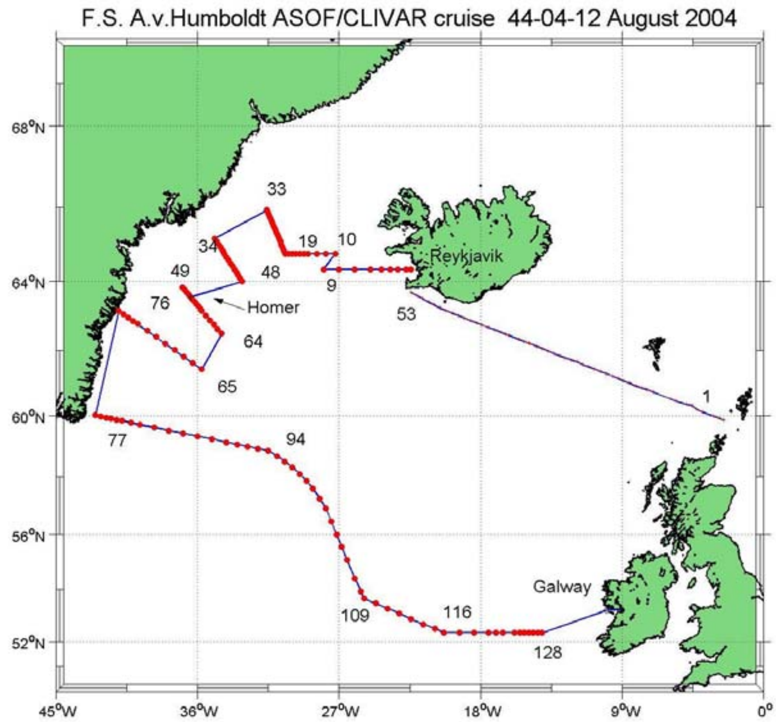
Cruise Report
FS Alexander von Humboldt 44-04-12

Rostock - Reykjavik – Galway - Kiel
7.8. – 12.8. – 31.8. – 5.9.2004
Chief Scientist: Detlef Quadfasel
Captain: Gerhard Herzig

Technical Report 1-04

On citing this report in a bibliography, the reference should be followed by the words *unpublished manuscript.*

The scientific party of RV Alexander von Humboldt cruise 44-04-12 after having completed the last of 2^7 CTD station (Photograph **Dieter Johanns).**



Ship track of RV Alexander von Humboldt cruise 44-04-12 with locations of XBT and CTD casts marked. HOMER marks the position of the mooring recovery.

1. Objectives

RV ALEXANDER VON HUMBOLDT cruise 44 – 04 – 12 was carried out by the Institut für Meereskunde at the Centre for Marine and Atmospheric Sciences of the University of Hamburg with participation of the Scottish Association for Marine Science, Oban. The measurements contributed to two projects:

- the Arctic Subarctic Ocean Flux (ASOF-W) study, funded by the European Union, and
- the Climate Variability and Predictability (CLIVAR) project, funded by the German Ministry of Education and Research.

The cruise had the following objectives:

- to map the cold overflow from the Nordic Seas through Denmark Strait to the North Atlantic and to quantify the mixing of the plume with ambient water masses,
- to contribute to the detection of inter-annual and longer term variability of the water mass structure in the Irminger Basin as part of an early warning system for climate change,
- to map the East Greenland Current between Denmark Strait and Cape Farewell, in particular the hydrographic structure of the Polar Water over the shelf, and to quantify the associated freshwater fluxes,
- to recover the CTD-profiler mooring HOMER on the East Greenland continental slope,
- to measure the vertical distribution of hydrographic parameters along the WOCE A1E section (Greenland to Ireland) and to contribute to the investigation of inter-annual to decadal changes of the circulation of the northern North Atlantic, and
- to educate undergraduate students in the handling of oceanographic instrumentation and in the collection and analysis of field data.

Within ASOF and its predecessor VEINS hydrographic observations over the East Greenland slope have been made on an annual basis since 1997. In parallel a current meter mooring array consisting of up to 12 moorings has been in place off Angmagssalik providing continuous measurements of transports in the overflow plume. CLIVAR is a follow-up of the World Ocean Circulation Experiment. The transatlantic section was occupied annually between 1991 and 2000 and in 2002.

This was the last scientific cruise of RV ALEXANDER VON HUMBOLDT, which will be decommissioned in September 2004.

2. Narrative

<u>Friday 6. August 2004:</u>
Noon position: Rostock
Air temperature: 28° C, wind: E 6 Bft

The scientific instrumentation was loaded on board at the vessel’s home berth Warnowpier in Rostock and installed in the laboratories. Technicians from the Institut für Osteeforschung Warnemünde gave an introduction to the ship’s data acquisition system and their CTD system that was used throughout the cruise. The three students from the University of Hamburg embarked. In the evening they had the opportunity to watch the tall ship’s parade with traditional sail ships participating in the ‘Hanse Sail’ regatta.

Saturday 7. August 2004:
Noon position: 54° 29' N, 11° 38' E
Air temperature: 19 °C, wind: E 3 Bft, air pressure: 1021 hPa

At 9:00 hrs RV ALEXANDER VON HUMBOLDT sailed from Rostock and set course to the Store Belt, the main shipping route between the Baltic and the Kattegatt and North Sea. During the morning the students received a safety instruction by the first mate.

Sunday 8. August 2004:
Noon position: 57° 50'N, 8° 48' E
Air temperature: 21 °C, wind: E 4 Bft, air pressure: 1022 hPa

The day was spent cleaning and labelling water bottles for the salinity samples

Monday 9. August 2004:
Noon position: 59° 21' N, 00° 06' W
Air temperature: 19 °C, wind: ESE 5 Bft, air pressure: 1018 hPa

After passing the Orkney Islands the measurement programme of the cruise started on the NW European shelf with hourly XBT casts.

Tuesday 10. August 2004
Noon position: 61° 05' N, 8° 51' W
Air temperature: 15 °C, wind: E 6 Bft, air pressure: 1018 hPa

XBT casts continued and the students began to get used to working in shifts.

Wednesday 11. August 2004
Noon position: 62° 45' N, 17° 50' W
Air temperature: 14 °C, wind: ENE 5 Bft, air pressure: 1023 hPa

XBT casts continued, last drop 24:00 hrs

Thursday 12. August 2004
Noon position: 64° 06' N, 22°45' W
Air temperature: 17°C, wind: S 2 Bft, air pressure: 1023 hPa

The favourable tail winds during the last days resulted in an early arrival off Reykjanes Peninsula and the vessel was stopped, allowing it to drift over the shallow Icelandic shelf. The sailors got their fishing rods out went and for cod and redfish. At 2 p.m. Reykjavik anchorage was reached and the remainder of the scientific crew embarked via a pilot boat. Customs and immigration formalities were finished soon and at 15:20 hrs the anchor was lifted and course set to the first CTD station at the eastern end of Faxaflói section. Upon arrival it turned out that the electrical connection at the end of the conducting wire was broken. The vessel anchored again and the repair was made, allowing the first CTD cast to be taken at 19:50 hrs.

Friday 13. August 2004
Noon position: 64° 20’ N, 27° 42’ W
Air temperature: 13 °C, wind: WSW 3 Bft, air pressure: 1020 hPa

Work continued along Faxaflói section without any problems and the last station (#9) was finished at 13:20 hrs. This section is one of several Icelandic standard sections, which have been taken once every 3 months over the past 20 years. They provide a valuable time series of hydrographic data, which can be used for the detection of short term climate variability in Icelandic waters. This summer the research vessel of the Icelandic Institute of Marine Research was engaged elsewhere and our colleagues had asked us to run this section. We then proceeded to the start of the northernmost ASOF section where the first station (#10) was taken at 16:30 hrs.

Saturday 14. August 2004
Noon position: 64° 44’ N, 30° 25’ W
Air temperature: 10 °C, wind: NW 4 Bft, air pressure: 1017 hPa

During the night the traces of the salinity profiles became more and more noisy and all plugs on the CTD and rosette were cleaned and greased. This gave a slight improvement of the signal to noise ratio, but it was still not as good as usual with the Seabird system. On station #20 we observed the first traces of dense overflow water from Denmark Strait, capped by a thin layer with low salinity but dense water originating from the upper part of the strait. This strong haline stratification has recently been reported in a paper by Rudels et al. (1999, GRL). During station #23 the salinity profile suddenly showed unreasonably strong longer-wavelength fluctuations. The cast was aborted and we exchanged conductivity sensors (#1144 was replaced with #1329). The repeat cast was o.k., but the high frequency noise seen on the previous profiles remained, indicating that it was caused by external influences.

Sunday 15. August 2004
Noon position: 65° 52’ N, 31° 33’ W
Air temperature: 7°C, wind: NNE 3-4 Bft, air pressure: 1017 hPa

Work along section ASOF 1 continued. During the morning we crossed the Polar Front located above the shelf break and saw the first icebergs of the cruise. At Sunday church the sermon was a chapter on Kutteldatteldu from Ringelnatz, followed by an essay on the awful German language by Mark Twain. Section one finished at station #33, the northernmost point on our voyage, on the East Greenland Shelf at 12:30 hrs. The sunny weather allowed a spectacular view on the snow covered mountains of Greenland and the many dolphins and whales inhabiting the cold shelf waters. These remained steady companions during our work in Greenland waters. Course was set to the start of ASOF section 2 about 90 miles south and we used the afternoon for a discussion of the scientific programme of the cruise. John gave an overview over ocean climate variability observed on the Faxaflói section, Colin explained the techniques behind the CTD profiling mooring HOMER, and Clare told us about chemistry and her use of trace metal measurements. After coffee we discussed the XBT temperature observations along the section that covered most of the inflow of Atlantic Water from the Atlantic into the Nordic Seas, but also the deep outflows in the Faroe Bank Channel. Station work was resumed at 20:30 hrs (#34 on section ASOF 2).

Monday, 16. August 2004
Noon position: 64° 20’ N, 33° 39’ W
Air temperature: 11 °C, wind: ENE 2 Bft, air pressure: 1010 hPa

Work continued along ASOF section 2, down the continental slope into the deep Irminger Basin. We discussed the HOMER mooring recovery with captain and boson and decided to sail directly to the mooring position after completion of section 2. During the afternoon’s seminar Saul reported on the Rudels et al. paper (1999, GRL) about structure and mixing of the Denmark Strait overflow plume and discussed our own observation in relation to Rudels’ interpretation. To reduce the salinity noise of the CTD we frequently cleaned the plugs, exchanged cables and after the end of the section at 22:10 hrs the board electrician made a new end connection to the conducting cable. Unfortunately this did not help much.

Tuesday, 17. August 2004
Noon position: 63° 50’ N, 36° 59’ W
Air temperature: 10 °C, wind: N 3 Bft, air pressure: 1015

We arrived at the HOMER position at 06:00 hrs in the morning. Contact with the acoustic transponders was made and the release command sent half an hour later. HOMER surfaced at 08:20 hrs about half a mile away from the ship and the mooring team lead by Colin went with a rubber dinghy to retrieve the glass sphere containing the sensor package and the data storage unit. It turned out that the batteries supplying the winch were flat and the sphere was not in it’s docking position on the bottom frame. Fortunately the connecting fishing line was not broken and the sphere could be recovered after railing in some 500 m of line. At 09:10 hrs HOMER was safe on deck. With seas being calm the boson offered to take the students and the stewardess on a little excursion in the dinghy, which they used to take photographs of Humboldt in the high seas. After this tourist trip we sailed to the start of ASOF section 3 on the shelf, where station #49 was begun at 11:30 hrs. After three stations with increasing salinity noise we decided to try the second CTD system on board in order to test, whether the problem was caused internally within the CTD or came from the outside, for example through the electrical power supply. With great skill and the help of two winches the crew moved the CTDs from the wet laboratory to the aft deck through the water outside the ship and vice versa. A cast with this spare system, however, showed an even higher noise level on the salinity profiles and we decided to change the system back again.

Wednesday, 18. August 2004
Noon position: 63° 02’ N, 35° 29’ W
Air temperature: 11 °C, wind: SSW 3 Bft, air pressure: 1019 hPa

Work continued along section 3, carefully avoiding to drop the CTD onto one of the nine moorings deployed along this line. At around noon a group of some 50 whales visited us, coming as close as 50 m to the vessel. This was quite a spectacular sight and we hope that the many photographs taken will show more than just a few fins sticking out of the water. During the afternoon seminar Martin talked about the Dickson et al. (2002, NATURE) paper on freshening trends in the subpolar North Atlantic. On station #62 in the late afternoon the temperature sensor of the CTD failed just a hundred meters above the bottom and had to be replaced before the next cast (#2231 was replaced with #4324). The day ended with a birthday party for Willi the baker and was continued with an after midnight party for Katrin, who turned sweet 26.

Thursday, 19. August 2004
Noon position: 61° 38' N, 36° 18' W
Air temperature: 10 °C, wind: W 2 Bft, air pressure: 1023 hPa

Station #64 marked the end of ASOF section 3 and the vessel proceeded to the start of section 4, in the centre of the Irminger Basin. Work resumed at 07:15 hrs with station #65. An analysis, done during the night, of the vertical distribution of noise on all CTD sensor profiles from the first 60 stations of the cruise showed no apparent correlation pattern with depth, time of the cast or sensor. We had suspected that some machinery operated on the vessel such as pumps may introduce the noise via the electrical power supply. The results were inconclusive and it will probably need a Sherlock Holmes to solve this mystery. During the afternoon seminar Katrin summarised the paper by Bower et al. (2002, NATURE) on the mid-depth circulation in the northern North Atlantic. After that talk she continued her birthday celebration, with help of crew and scientific party. At this very same afternoon the boson informed us that the beer stock has come to an end. Just halfway into the cruise that came as a severe blow to all of us.

Friday, 20. August 2004
Noon position: 62° 58' N 40° 25' W
Air temperature: 6° C, wind: W 1 Bft, air pressure : 1022 hPa

We continued CTD work along section ASOF 4. During the night there had been several unscheduled water bottle releases due to spikes in the pressure recordings. The cause for these pressure jumps is unknown and there was really nothing we could do about that. Around 11 a.m. we crossed the Polar Front again and both, air and water temperatures, dropped markedly, by 6 °C and 10 °C, respectively. Sea surface salinities were as low as 28. We finished the section at station #76, about 7 miles off Cape Niels Juel, named after a famous Danish admiral of the 18th century. His statue proudly overlooks one of the big squares in Copenhagen, which is named after himself and located between the Royal Opera and Holmens Kirke. As an aside, the names of capes, islands and peninsulas along this part of the East Greenland coast read like the tombstones in the admiral wing of the above named church: Jens Munk Ø, Kap Niels Juel, Kap Tordenskjold etc. The sky was clear with bright sunshine, there were icebergs up to a few hundred meters long and raising some 30-40 m above sea level, whales, seals and flocks of puffins. Greenland formed the scenic backdrop, with its snow covered mountains and glaciers, calving their breed into the ocean and thereby contributing to the southward freshwater flux necessary to keep our climate stable. This view nearly made up for the ridiculously low daily allowance German universities pay their scientists and technicians while at sea. Upon finishing the station we sailed to the south, Cape Farewell, the start of the transatlantic section from Greenland to Ireland. During the afternoon seminar Nina gave a talk about the hydrological cycle and the salinity changes in the North Atlantic, based on a paper by Curry et al. (2003, NATURE).

Saturday, 21 August 2004
Noon position: 59° 56' N, 41° 55' W
Air temperature: 4 °C, wind: WSW 3 Bft, air pressure : 1018 hPa

During the night heavy pack ice forced the vessel to deviate from the direct route, but station position #77 was reached with only a small delay at 09:30 hrs. Fog lay over the ice, the Greenland coast could not be seen and even the sea gulls displayed some kind of depressive attitude. Not the bright day appropriate for the captain’s birthday. It was dull, but work proceeded in a timely manner.

Sunday, 22. August 2004
Noon position: 59° 31' N, 37° 50' W
Air temperature:11 °C, wind: SSE 4 Bft, air pressure : 1015 hPa

Work along the CLIVAR section. We passed the central Irminger Sea where recent work by Bob Pickard and co-workers of the Woods Hole Oceanographic Institution suggests deep convection to occur during winter. However, we found the water column to be stratified, albeit weakly, indicating that no deep reaching mixing had taken place in the previous winter. At the front separating the central low salinity part of the Irminger Gyre and the boundary current carrying warm Atlantic Water we observed strong lateral intrusions, possibly forced by double-diffusive processes. Later in the evening, while approaching the Reykjanes Ridge, the barometer fell and winds from an easterly direction picked up.

Monday, 23 August 2004
Noon position: 59° 07' N, 33° 52' W
Air temperature:10 °C, wind: ESE 9 Bft, air pressure : 994 hPa

Winds became stronger during the day and after completing station #90 work had to be abandoned. By noon waves were as high as 7 m and it was impossible to open the side hatch of the wet laboratory without risking the whole place getting flooded. We slowly steamed against wind and waves, and after having passed the position of station #91 by some ten miles in the later afternoon, the winds eased to 5 Bft. Waves were still pretty high, though. Station #91 was successfully completed at 21:00 hrs and after that normal station work continued, at a somewhat lower pace.

Tuesday, 24. August 2004
Noon position: 58° 30' N, 30° 53' W
Air temperature: 12 °C, wind: NW 4 Bft., air pressure : 1014 hPa

During the night the wind veered into a northerly direction and sure enough the back of the low-pressure system arrived with clear skies and bright sunshine. Swell and wind waves from different directions gave us a shaky ride, and even the most experienced sailors had problems with finding sleep. Work with the CTD continued and Martin gave a seminar on the Pickard et al. paper (2003, DSR) on water mass formation in the Irminger Sea. On station #98 at around 8 p.m. the CTD showed severe data transmission failures and it turned out that the connection to the conducting wire was broken again. The repair took the remainder of this evening.

Wednesday, 25. August 2004
Noon position: 57° 15' N, 28° 14'W
Air temperature: 11 °C, wind: SW 4 Bft., air pressure : 1017 hPa

The CTD cast at station #98 began at 1 a.m. and work continued during the day. There is not much to report on the actual work, except for Katrin’s seminar on the surface circulation and it’s NAO related variability, a paper by Flatau et al. (2003, J. of Climate), and Colin’s kind invitation to a glass of wine during steaming time just before tea. In the evening winds picked up to little more than 10 m/s from west, associated with a low pressure system passing north of us.

Thursday, 26. August 2004
Position: 55° 05' N 26° 29' 'W
Air temperature: 13 °C, wind: NW 5-6 Bft., air pressure : 1012 hPa

Work continued at station #104 on the western flank of the Maury Channel. This position is the one farthest away from land, about 600 miles both from Greenland and Ireland and 580 miles away from Iceland. The temperature and salinity profiles in the upper 800 – 1000 m showed strong fluctuations with amplitudes of 0.5 °C and 0.15, respectively, indicating strong mixing in the region of confluence of low salinity Subarctic Water from the Labrador Sea and Atlantic Water, carried northward via the Gulfstream and North Atlantic Current. Around noon a cold front associated with the low-pressure system in the north passed and rewarded our hard work with sunshine and blue skies. After coffee and cakes Nina gave a seminar on Hendrik van Aken's and de Boer's paper on water masses and circulation in the Iceland Basin (1995, DSR). There interpretation of the low oxygen layer around 600 m depth as being caused by advection of water masses either from Antarctica or Africa raised some doubts. John later told us that is more likely caused by local oxygen consumption associated with sinking debris.

Friday, 27. August 2004
Noon position: 53° 19' N 24° 05'W
Air temperature: 14 °C, wind: W 4 Bft., air pressure : 1019 hPa

On station #110 run in the early morning hours the pipe system of the CTD was clogged, resulting in poor salinity and oxygen profiles. Back on deck pipes and sensors were cleaned with a 1% triton solution and the second cast on the station was of the usual IfM/SAMS quality. In the afternoon Saul gave the last talk in our little seminar series, on a paper by Bersch on NAO induced variability of the upper layer circulation in the North Atlantic (2002, JGR). The students appeared to be a bit tired and so far had not started on their essays for the cruise report. We will here not explore the reason behind this. At station #112 after tea we were greeted by a pod of pilot whales who stayed with us during the whole time of the CTD cast. Elegant swimmers indeed.

Saturday, 28. August 2004
Noon position: 52° 30' N 20° 43' W
Air temp: 14 °C, wind: W 6 Bft., air pressure : 1013 hPa

Winds had picked up during the night and swell developed. In combination with strong surface currents this led the vessel to drift at a speed of more than 2 knots while on station. Wire angles became large and on station #115 the CTD did not reach the bottom layer despite of 5250 m of wire having paid out at a water depth of only 3690 m. During the next stations the CTD was lowered at a speed of 1.2 m/s instead of the usual 1.0 m/s and we came close to the bottom again. Because of the time delay involved we decided to skip one of the deep stations on our zonal leg to the continental slope and to skip all of the shallow shelf stations.

Sunday 29. August 2004
Noon position: 52° 19' N 16° 34' W
Air temp: 14 °C, wind: NW 5-6 Bft., air pressure : 1018 hPa

CTD work continued with swells from northwest running 6 m high. During station # 122 the spooling gear of the CTD winch failed and had to be repaired. This took about four hours and a second cast was begun only at 11:15 p.m. The pressure record of this cast was contaminated with positive spikes which caused the water bottles to close not at the pre-determined but at the spike depth.

Monday 30. August 2004
Noon position: 52° 22' N 13° 37' W
Air temp: 15°C, wind: NNW 2 Bft., air pressure : 1025 hPa

The last CTD station of this cruise, # 128, finished at 10:01 a.m. and was celebrated with a bottle of "Red Riding Hood" sparkling wine. Winds had ceased, the sun was out, and although the swells were still running high, this was very appropriate weather for the last working day of a very successful cruise.

Student reports:

Tuesday 31. August 2004
Noon position: Galway
Air temp: 9,1° C, wind: NNW 2 Bft., air pressure : 1021 hPa

At breakfast we arrived in Galway and began packing all that equipment Martin, Nina and Katrin did not need during the next days. After our colleagues from SAMS had unloaded their gear, some of us went into Galway for some shopping while others went for a swim at the sunny beach. The water was quite chilly (~16°C), but it was great to finally jump **into** it, after having been **on** it for quite some time. Clare and Saul were the first to leave with Willie, who had picked them up with a lorry. Detlef, Colin and John left around 4 p.m. heading for the coach station to catch a bus to Dublin - leaving Martin, Nina and Katrin behind. These three students felt as if their parents had gone on vacation, only that they couldn't invite a bunch of people to ruin the place. The night went by with having some beers bought in Galway.

Wednesday 1. September 2004
Noon position: 55° 58.2' N 009° 12.6' W
Air temp: 9,2° C, wind: N 5 Bft., air pressure : 1010 hPa

A fairly calm and rainy day that we used to work on our contributions to the cruise report. At night a traditonal 'christmas party' was initiated by the boson – hot red wine and confy music.

Thursday 2. September 2004
Noon position: 59° 26.4' N 003°36.6' W
Air temp: 13.5° C, wind: N 4 Bft., air pressure : 1011 hPa

Just when we thought that we could lay back on the sun deck and have a look at our newly collected data, Detlef called telling us that Prof. Jens Meincke wanted us to make a poster about our cruise – to be presented on the final voyage of RV Alexander von Humboldt cruise from Kiel to Rostock. We translated some of the texts that had been written before for the cruise report and selected figures and maps for the poster. In the evening the last birthday of the cruise was celebrated. Olaf and Rainer invited to a party. It started out with everybody gathering on the main deck, where the second round of smoked fish in the ghetto censer was prepared. Time-zone shift at night.

Friday 3. September 2004
Noon position: 58° 16.2' N 003° 54.6' E
Air temp: 15.9° C, wind: N 6 Bft., air pressure : 1021 hPa

Only Martin and a small minority of crew members appeared for lunch, but later the three of us got together again, finishing the wrinting and poster making, so that the remaining gear could be packed and the laboratories ready to be cleaned on Saturday morning.

Saturday 4. September 2004
No noon position ('another party?' editor)

We packed the rest of the equipment and with help of the crew we put it all into the load. After that we had some time to lie on the sundeck and admire the scenery - the coasts of Denmark.

Sunday 5. September 2004
No noon position

In the afternoon RV Alexander von Humboldt arrived at Kiel and the three students disembarked.

3. Cruise participants

Scientific party:

Colin Griffiths	Scientist	SAMS
Clare Johnson	Ph.D. student	SAMS
John Mortensen	Scientist	IfM – ZMAW
Detlef Quadfasel	Chief Scientist	IfM – ZMAW
Saul Reynolds	Student	SAMS
Katrin Uhlmann	Student	IfM – ZMAW
Martin Vogt	Student	IfM – ZMAW
Nina Wilkens	Student	IfM – ZMAW

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Ship crew:

Gerhard Herzig	Master
Rüdiger Hansch	Chief Mate
Dieter Johanns	2nd officer
Klaus Beckmann	Chief Engineer
Karsten Hollatz	2nd Engineer
Jürgen Ommer	Electrician
Gert Klingbeil	Engine assistent
Olaf Wiechert	Engine assistent
Günther Wohlfahrt	Boatswain
Hans Behm	A.B.
Wolfgang Heine	A.B.
Klaus Beesdo	A.B.
Rainer Badtke	A.B.
Thomas Wolff	1st Cook
Wilfried Kluge	Cook
Iris Seidel	Stewardess

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4. Student seminars

The following papers were presented and discussed during our afternoon seminars:

Bersch, M. (2002) North Atlantic Oscillation-induced changes of the upper layer circulation in the northern North Atlantic Ocean. J. Geophys. Res., 107, doi:10.1029/2001JC000901.

Bower, A.S., B. Le Cann, T. Rossby, W. Zenk, J. Gould, K. Speer, P.L. Richardson, M.D. Prater and H.-M. Zhang (2002) Directly measured mid-depth circulation in the northeastern North Atlantic Ocean. *NATURE*, 419, 603-607.

Curry, R., B. Dickson and I. Yashayaev (2003) A change in the freshwater balance of the Atlantic Ocean over the past four decades. *NATURE*, 426, 826-829.

Dickson, B., I. Yashayaev, J. Meincke, B. Turrell, s. Dye and J. Holfort (2002) Rapid freshening of the deep North Atlantic Ocean over the past four decades. *NATURE*, 416, 832-837.

Flatau, M. K., L. Talley and P. P. Niiler (2003) The North Atlantic Oscillation, Surface Current Velocities, and SST Changes in the Subpolar North Atlantic. *J. of Climate*, 16, 2355-2369.

Pickart, R. S., F. Straneo and G. W. K. Moore (2003) Is Labrador Sea Water formed in the Irminger Basin? *Deep-Sea. Res. I*, 50, 23-52.

Rudels, B., P. Eriksson, H. Grönvall, R. Hietala,J. Launiainen (1999) Hydrographic observations in Denmark Strait in fall 1997, and their implications for the entrainment into the overflow plume. *Geophys. Res. Let*., 26, 1325-1328.

Van Aken, H. M., and C. J. de Boer (1995) On the synoptic hydrography of intermediate and deep water masses in the Iceland Basin. *Deep-Sea Res*. I, 42, 165-189.

5. Technical information

CTD/Rosette

Altogether 128 full depth hydrographic stations were occupied during the cruise, employing a SeaBird SBE911plus CTD-O2 sonde, attached to a SeaBird carousel 14 bottle water sampler. We had borrowed the complete system from the Institut für Ostseeforschung (IOW), since our own CTD/rosette arrangement was too wide and did not properly fit through the opening hatch of the wet laboratory. Profiles were run to within 5-10 m of the bottom. At most stations water samples were taken at 5-9 depth levels evenly distributed within the water column. The water samples will be analysed in Hamburg for salinity, using a Guildline Autosal salinometer.

Due to malfunctioning of the conductivity and temperature sensors these had to be replaced during the cruise.
At station #23 conductivity sensor #1144 was replaced with #1329.
After station #62 temperature sensor #2231 was replaced with #4324.
On several stations also the pressure sensor showed some strange behaviour. On station #48 at depths of about 500, 1000, 1500 and 2000 m the pressure jumped by about 50 dbar, stayed there for about 10 seconds, and jumped back to the proper value. This also occurred at other stations, although not at such regular intervals.

As mentioned in the narrative, on many stations during the first half of the cruise the temperature and salinity sensor traces had small-wavelength noise superimposed that did not correlate and led to noisy salinity recordings. Change of sensors, cables, connections, even the whole CTD system did not help and we suspect that the noise is introduced by external means, i.e. the electrical power supply. For reasons unknown to us the situation improved during the second half of the cruise.

Underway data

Underway temperature and salinity measurements were made with a SeaBird thermo-salinograph installed in the ship's well, and logged in the ship's data acquisition system. Likewise meteorological parameters such as wind speed and direction, dry and wet temperatures, echo sounder water depths, radiation and position data from the GPS were recorded at a rate of 1 Hz.

Expandable bathythermograph

XBT probes (T-7 with a range of 750 m) were dropped along a section from the Scottish shelf to south of Iceland, using a Sippican Mk9 acquisition system. The recording programme was slightly modified to allow data down to depths of 900 m to be recorded instead of the usual 750 m. Only very few probes malfunctioned and altogether 55 clean profiles were acquired.

Water Chemistry

Water samples were taken for analysis of nutrients and reactive aluminium at 40 stations spread over all sections. Water was also collected for trace metal determination at 5 stations, these were designed to target key water masses. Samples were taken at between 6 and 11 depths at each location. In addition samples were taken for procedural and reagent blanks, and precision analysis.

Water for nutrient determination was drawn directly into a syringe and filtered into 60ml bottles. These were frozen for later analysis at the Scottish Association for Marine Science using standard techniques. The nutrients of nitrate and nitrite, phosphate and silicate will be determined.

Water samples for aluminium analysis were taken directly from the rosette bottles into pre-cleaned 60ml LDPE bottles. These samples were not filtered to avoid contamination problems experienced on a previous cruise Samples were sealed in plastic bags and again frozen until later fluorimetric analysis at the Scottish Association for Marine Science. This determines the total of dissolved and easily available particulate forms (reactive aluminium).

Trace metal water samples were pressure filtered through 37mm 0.4μm Nuclepore filters into acid-cleaned 1litre bottles. Samples were acidified with 1ml ultrapure nitric acid, before being sealed in plastic bags and stored in the dark. Analysis will again be performed at the Scottish Association for Marine Science.

HOMER

Homer (**Hom**ing **E**nvironmental **R**ecorder) is designed to measure the vertical properties of the oceanic water column by cycling a buoyant instrumented sphere from the sea bed to and from a preprogrammed altitude. Homer is essentially a CTD that operates from the sea floor.

Homer was developed to measure the thermohaline characteristics of the Denmark Strait Overflow Water which sits at depths down to ~3000m in the Irminger Basin and has a thickness of approximately 300m.

The package consists of a 26cm instrumented glass sphere which is winched in both directions at 0.2 m/s through the water column. During it's profile it records temperature, conductivity and pressure. It is designed to measure this profile once a week for up to 15 months. The glass sphere contains a microprocessor to control it's operation, sample the sensor outputs and store the observed data. A logger unit within the frame contains another microprocessor which controls the the capstan and spooling motors, this unit also contains the batteries. The spool contains 500m of 15 kg b.s. monofilament nylon line. For this deployment a 400m profile was performed every Wednesday @ 1300 UTC.

Homer is mounted in a modified POL popup frame, buoyancy is provided by eight glass spheres and there are two Benthos XT6000 acoustic release units with burn wires. There is also a Benthos radio beacon (154.585MHz) attached to the frame.

Deployment Details (F.S. Meteor)
Tuesday 15th July 2003
Final assembly completed 12:00Z

Acoustics:	Benthos XT6000	47136 10kHz/E
		46428 14.5kHz/D

Radio Beacon Benthos Channel A

Homer Initialised	12:43Z	
On Station	13:00Z	
In Water	13:10Z	
On bottom	13:45Z	
Position	N63° 33.91	W°036 28.01
Depth	1800m	

Recovery Details
Tuesday 17th July 2004

On Station	06:21Z
Acoustic contact	06:22Z
Fired	06:28Z
Released	07:31Z
On surface	08:20Z
On board	09:10Z

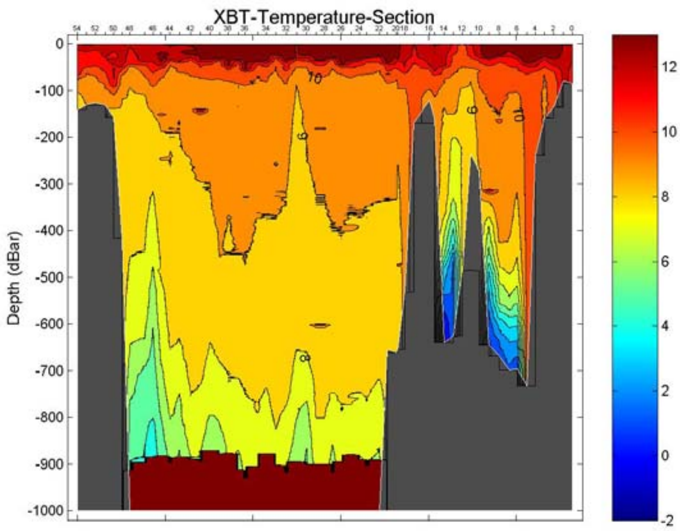
On recovery the instrument was found to be in good condition. It appeared that both the battery pack for the sphere and the pack for winch controller were flat. The instrument will now be returned to SAMS were it will be re-batteried and only then the data can be downloaded.

6. Preliminary results

The results presented here are the outcome from the on board analysis of the data and discussions during watches and seminars and were compiled by the students. The role of Griffiths, Mortensen and Quadfasel was limited to counselling and minor editing of the essays. The reader has to be aware of that all data have NOT BEEN CALIBRATED yet. We therefore take no responsibility for the correctness of the interpretation.

The northern XBT line: Temperature structure of the inflow into the Nordic Seas (Nina Wilkens)

A XBT section with altogether 55 profiles was occupied starting on the Scottish shelf, crossing the Faroe-Shetland Channel, the Faroe-Bank Channel, the Iceland Basin and ending on the Iceland shelf.



Vertical distribution of temperature along the XBT section, starting at 59° 51.5 N ; 2° 30.5 W on August 9th, 2004, 18:00 Z and ending at 63° 41.61 N ; 22° 24.85 W on the 11th August 2004, 24:00 Z. XBTs were taken at hourly intervals.

Starting from the eastern side of the section one can see the well mixed layer of relatively warm water on top of the shallow Hebridean Shelf. Then going across the Faroe-Shetland-Channel the Iceland-Scotland-Overflow is clearly visible hugging the western side of the basin up to a depth of about 500 m. On the eastern side of the Channel a thin vertical layer of warm Atlantic water is reaching down all the way to the bottom of the Channel.

In the Faroe-Bank-Channel the cold Overflow water starts at a depth of 450 m, doming strongly in the centre. This doming is very likely caused by re-circulation of the Overflow waters, because not all of it can exit through the very narrow Faroe-Bank-Channel. Compared with data from last year's student cruise, the two plots fit relatively well. The section from last year was taken further north at the entrance of the channel where the

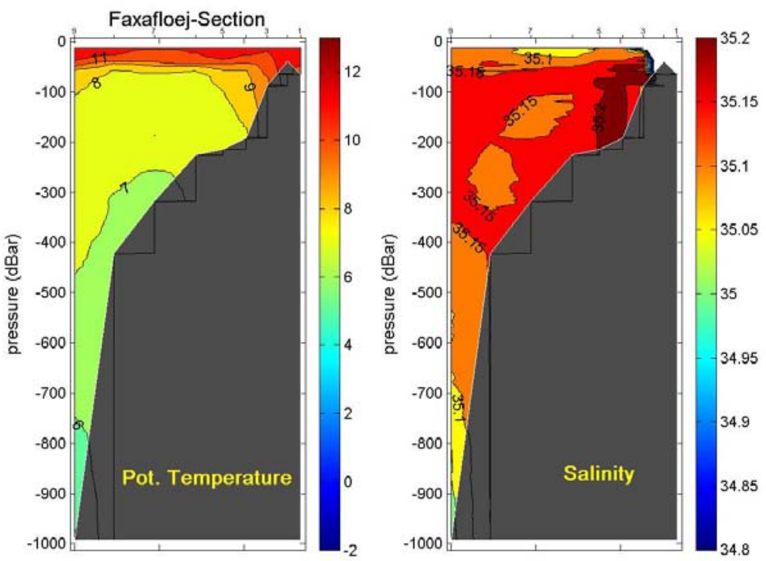
Overflow plume is hugging the northern side indicating a strong flow through the Channel when it is not re-circulating anymore.

After that we entered the Iceland-Basin where a similar behaviour of the cooler water can be seen, reaching up much higher on the western side of the basin compared to the east. This cold water very likely marks the upper part of the cold Overflow waterspassing through the Faroe-Bank-Channel mixing with the surrounding water masses, following the topographical boundary of the northern basin due to Coriolis deflection. In the centre of the basin there is indication of a cyclonic eddy.

Over the whole section a sloping thermocline indicates northward geostrphic flow of the warmer Atlantic water and southward flow of the colder Overflow water coming from the Nordic Seas.

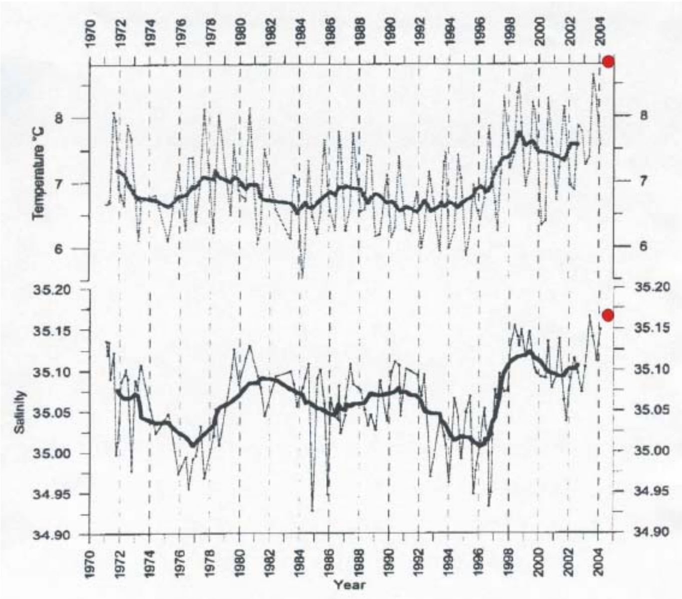
Climate variability seen on the Faxaflói section
(John Mortensen, acting as a student)

The Faxaflói section was occupied on request from Icelandic colleagues. Faxafloi is a relatively old Icelandic hydrographic standard section, which has been operated by the Marine Research Institute, Reykjavik, on a seasonal basis (February, May, August and November) since 1984. It is a continuation of the former Reykjanes section, which was occupied in the period 1971 to 1984. The unfortunate plan is to cut the future August cruises away, and hereby loosing important information about the warmest season.



Vertical distribution of temperature and salinity along Faxaflói section, taken 12.-13. August 2004.

The section is mainly occupied by warm and saline Subpolar Mode Water or Atlantic Water, supplying water to the Irminger Current found along the East Greenland continental slope and the North Icelandic Irminger Current north of Iceland. The mean temperature and salinity of the upper 200m on Faxaflói station #9, the deepest station on the section, were 8.74°C and 35.16, the highest values ever recorded since 1971. On Thursday August 11th, the day before RV Alexander von Humboldt arrived in Reykjavik, the town experienced the highest air temperature ever measured (~24.9°C). In other parts of Iceland air temperatures above 28°C were observed on the same day. Global warming? If kept alive, the Faxaflói section can perhaps with time contribute to the answer of this question. We hope that the Icelanders have success in continuing their monitoring work around Iceland four times annually.



Mean temperatures and salinities at the shelf break east of Iceland, 1971-2004. Combined data from stations RE8 (1971-1984) and FX9 (1984-2004). The thick line is a 3 year running mean (from the report of the ICES oceanic hydrographic working group 2004). The red dots indicate the observations made during the A. v. Humboldt cruise in August 2004.

The Denmark Strait overflow plume and its mixing with ambient waters (Saul Reynolds)

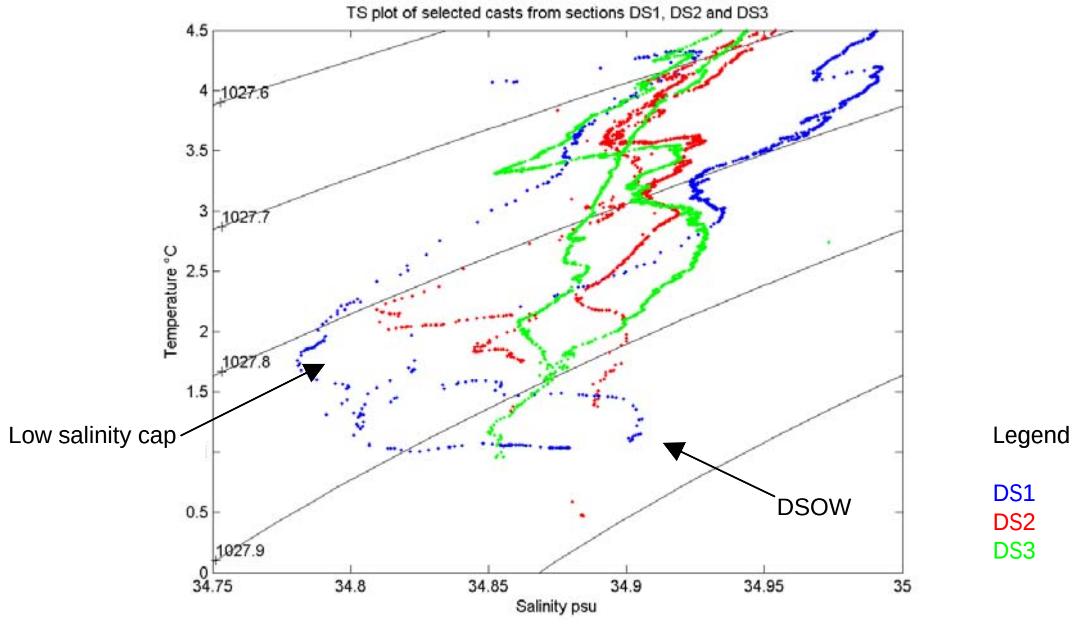
Denmark Strait is one of the major exit points for water masses formed north of the Greenland-Scotland Ridge. Waters flowing over the 620 metre deep sill between Iceland and Greenland, termed Denmark Strait Overflow Water (DSOW), make a significant contribution to the North Atlantic Deep Water.

In 1999, Rudels *et al*. reported that the water from the Atlantic layer of the Arctic Ocean (MAW) and the Recirculating Atlantic Water (RAC) could well be a source of the DSOW. MAW becomes less saline in the Artic Ocean and the salinity of the RAC is further reduced by interaction with Arctic Intermediate Water (AIW), as the plume flows south in the East Greenland Current (EGC).

As this water passes over the sill it sinks down the Greenland slope and travels southward between depths of 500 to >2000 metres (Appendix C), constantly remaining close to the continental slope. The DSOW can clearly be seen in the profiles produced from sections DS1 to DS4 (Appendix D) and is also visible in the Irminger Basin on the Clivar section. It is identifiable from its characteristic properties: a potential temperature of 1^{o}C, a salinity of 34.9 and a potential density of >27.9 kg m^{-3}. The section profiles show that the properties of the plume waters remain almost constant at all of the sections where data was collected, which indicates that there is little or no entrainment with surrounding water masses. The data collected from section DS2 shows that there is some mixing occurring internally within the plume, with waters of a lower salinity of around 34.85 psu. It is this less saline water that creates a low salinity lid over the top of the main body of the plume water and hampers mixing with ambient water masses (Rudels *et al.*, 1999).

However, closer inspection of data collected from the first three sections south of the sill, DS1, DS2 and DS3, shown in the TS plot below, reveals that there is a slight shift in the characteristics of the DSOW as it moves south along the Greenland slope. From section

DS1 to DS2 the salinity of the plume increases as does the temperature, which could be a consequence of the internal mixing within the plume. From Section DS2 to DS3 the characteristics of the plume change again and the water mass becomes more homogenous. This shows that as the DSOW travels south, the low salinity lid may be sheared off or completely mixed with the plume water below, therefore allowing the overflow water to be mixed with ambient water masses, such as Labrador Sea Water or Modified Atlantic Water. Further investigation into the entire range of data colleted will give more information into the amount of mixing that occurs between the DSOW and ambient water masses.

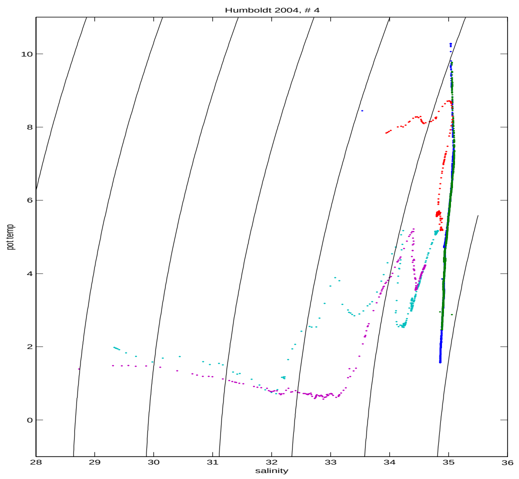


Potential temperature – salinity diagrams from selected stations on the three northern ASOF sections

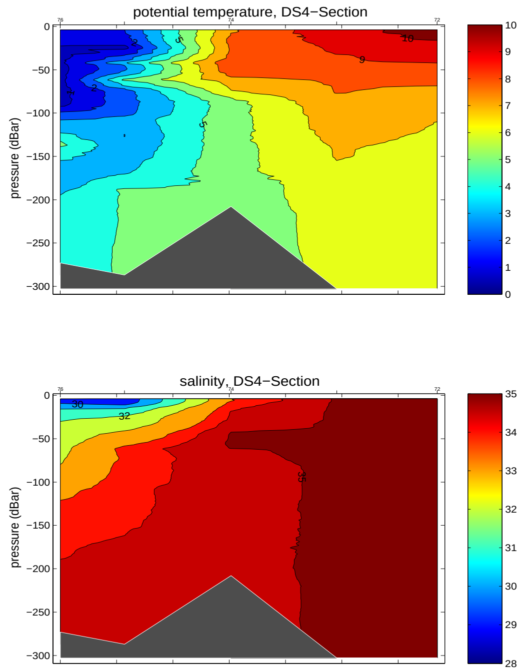
The Polar Water on the East Greenland shelf
(Katrin Uhlmann and Martin Vogt)

Currents in the North Atlantic contribute to the meridional heat flux. In equatorial latitudes ingoing radiation is higher than outgoing radiation whereas in polar regions the situation is opposite. This leads to an excess of heat at lower latitudes and to a deficit of heat in polar latitudes. To compensate that imbalance a meridional heat flux is needed. This heat can either be transferred as sensible heat via the ocean or as sensible and latent heat via the atmosphere. The latter goes along with a flux of freshwater, which is about 0.4 Sv (1 Sv = 10^6 $m^{3/}s$). This freshwater is returned southward in thee major ocean currents: the overflows across the Greenland-Scotland Ridge and flow of Polar Water in the East Greenland Current system and the flows through the Canadian Arctc Archipelago. The question we asked ourselves is, how big the contribution of the three currents to the 0.4 Sv is?

The northward advection of sensible heat and salt is accomplished by the North Atlantic Current (NAC), which has a volume transport of about 8 Sv and a mean salinity of 35.2. We take this 35.2 as a reference value. The overflows carry about 6 Sv with a mean salinity of 34.9. Their share in freshwater is then 6 Sv * (35.2-34.9)/35.2 = 0.05 Sv. So the overflow contribute about 10-20% to the southward freshwater flux.



T-S Diagram for Stations 72-76



The potential temperature and salinity distributions of Stations 72-76 along the ASOF-4 section. Polar Water is characterized by a temperature of about –1°C down to about 1.9°C and a salinity lower than 34.5. It is found only over the shallow Greenland Shelf down to a depth of ~90 m.

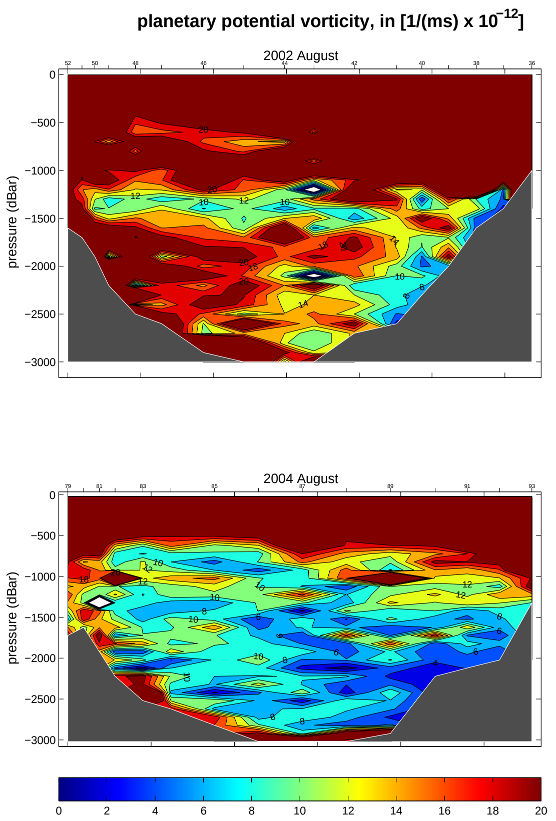
The transport of Polar Water in the East Greenland Current has not been measured directly but budget considerations put it to about 2 Sv for the calculation. Using the mean salinities calculated from our hydrographic section results in a fresh water flux of about 0.1 Sv, or 20-30% of the requires total flux. This means that the return freshwater flux from the Arctic Ocean is about equally distributed between the passages east and west of Greenland.

Was there convection in the Irminger Sea?
(Martin Vogt)

Stimulated by the paper 'Is Labrador Sea Water formed in the Irminger basin?' (Pickart et al., 2003) we asked whether we can see convectively formed Labrador Sea water in the Irminger Basin. In the paper Labrador Sea Water (LSW) is defined as a water mass with potential temperature between 3 and 4°C, salinities between 34.88 and 34.9 and a planetary potential vorticity PV=(f/ρ)(∂ρ/∂z) below $2 \times 10^{-12} \times 1/(ms)$. Here f is the Coriolis parameter, ρ the density and z the depth. The main hypothesis of Pickart *et al.* is that convection occurs in the Irminger basin and produces LSW. As the main reason for this idea the huge amount of LSW with low PV is mentioned, which is too much for being advected from the Labrador Sea within just ½-1 year. Therefore convection must occur in the Irminger Basin, forming water with the same properties as LSW.

The two sections crossing the Irminger Basin discussed here are at the western end of the WOCE-A1E line, which is the same as our CLIVAR-section. Pickart *et al.* discuss data from the same section, collected during the 1990s. The central part of the Irminger Basin (see Appendix C), shows a water mass with low salinity (<34.9) and temperature (~3.5°C) in depths between 500m and 1700m. This is the LSW-core. However, the distribution of PV (see below) for that section shows that only a small fraction of this core fulfils Pickart's criteria for LSW. We also looked at the data of the A1E-section taken in July 2002. Here stratification is strong above 1000m, as shown by a high PV. Between 1300m and 1500m there is water with a lower PV, but none of it has the above mentioned properties. Below 1500m the PV is again very high due to strong stratification, except where the recirculated Faroe-Bank-Channel overflow water sits on the eastern side of the basin.

We conclude that in the Irminger Basin the core of LSW in 2002 and 2004 is smaller and not as homogeneous as in previous years, which were analysed by Pickart et al. This may be due to horizontal exchange and mixing with the stratified surrounding water, leading to a re-stratification of the LSW core. In 2002 low PV was found below 1300 m depth but in 2004 the low PV-core reaches up to 800m. This indicates that the amount of LSW has grown over the last 2 years. Since the stratification is strong in the upper part of the water column we may conclude that this increase of low-PV water is due to advection from the Labrador Sea.



Distribution of planetary potential vorticity, PV=(f/ρ)(∂ρ/∂z)
(in Units of [1/(ms) x 10^{-12}]), using a vertical resolution of ∂z=100m.

The upper panel shows data from July 2002, the lower those of our cruise in August 2004.

The CLIVAR section in summer 2004: were there any changes from previous years?

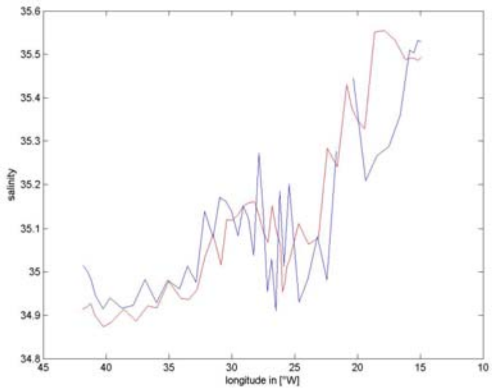
(Nina Wilkens and Clare Johnson)

The Clivar section runs between Cape Farewell and the Irish shelf and was first occupied in 1991 as part of WOCE. The line was designed to survey exchanges between the Atlantic and Nordic Seas and therefore provides an important time series. We are mainly comparing our data collected with those collected in 2002.

The mean salinity over the upper 600m increased by around 0.03 in the Irminger Basin between 2002 and 2004. This increase appears to be concentrated in a layer between 100-300m depth and may represent the intrusion of Atlantic derived waters into the central Irminger Basin, increasing the stratification in this area. Labrador Sea Water

(LSW) has become split into two layers between 1991 and 2004, with a decrease in the volume of water with a salinity of less than 34.88. These layers are more distinct than in 2002 and centred around 900 and 1500m. These may be upper and classical Labrador Sea Water respectively. Alternatively this may represent the erosion of a LSW type water mass formed by convection in the Irminger Basin in periods of higher NAO indices (Pickart *et al.,* 2003); or a combination of the two. The Denmark Strait Overflow Water (DSOW) plume has freshened and cooled between 2002 and 2004 and appears to have increased in volume.

In the Iceland Basin the upper 600m have generally become more saline from 1999 to 2001 to 2002 to present, with salinities of 35.3 being observed at 28°W in 2004. This is consistent with the westward movement of the Subarctic Front during a low phase of the NAO (Bersch, 2002). A comparison of mean salinity over the upper 600m between 2002 and 2004 shows higher spatial variability between stations in 2004 with fluctuations of up to 0.35 compared to 0.10 in the same area in 2002. Again two layers of LSW are present although these are less distinct than in the Irminger Basin; this is a change from the single LSW mass present in the Iceland Basin in 2002.
The southern Rockall Trough has become less saline over the upper 600m between 2002 and 2004 by up to 0.25.



Mean salinity over the top 600m for the Clivar section in 2002 (red) and 2004 (blue).

Another interesting feature in the Iceland Basin is an oxygen minimum of 5.5ml l^{-1} between 100-1000m; no corresponding signal is seen in the potential temperature or salinity distributions (Appendix C). A possible explanation is that this is an old intermediate water mass, which explains the depleted oxygen levels. Van Aken and de Boer (1995) suggested this may be Antarctic Intermediate Water due to the high reported silicate levels. An alternative interpretation is that the minimum is just a consequence of the usual decrease in oxygen concentration with depth, due to the degradation of organic matter, being interrupted by the intrusion of oxygen rich LSW. This produces a strong oxygen gradient and the appearance of a minimum. This oxygen minimum is not observed in the Irminger Basin, possibly due to convection in recent winters adding oxygen to this region and eroding the minimum. Oppositely oxygen is depleted in the eastern Iceland Basin and southern Rockall Trough to just below the immediate surface layer.

An oxygen minimum is associated with the Lower Deep Water (LDW) present as bottom water in the Iceland Basin and southern Rockall Trough. This is due to the age of this water mass which is of Antarctic origin. LDW is also represented by lower salinity and potential temperature. Iceland-Scotland Overflow Water (ISOW) is distinguishable as a slight salinity maximum hugging the eastern side of the Reykjanes Ridge between 1500-2500m. A smaller salinity maximum is also present at around 2000m on the western side of the ridge as the ISOW enters the Irminger Basin. No signal is detected in the oxygen or potential temperature distributions.

7. Acknowledgements

We like to thank captain Gerhard Herzig and his crew of FS ALEXANDER VON HUMBOLDT for their support of our measurement programme and for creating a very friendly atmosphere on board. It was certainly not easy for most of the crew to see their long term home and working place go on the last scientific expedition. We wish all crew members all the best for their future.

Financial support for the cruise was provided though the EU-Project ASOF-W (Arctic-Subarctic Ocean Flux – West study), the Climate Variability and Predictability (CLIVAR) project, funded by the German Ministry of Education and Research, the University of Hamburg and the Scottish Association for Marine Sciences. This support is gratefully acknowledged.

Appendix A: List of XBT drops

No.	Date	time	Lat	Long
0	07-Aug-2004	18:04	N 59 52	W 02 30
1	07-Aug-2004	19:03	N 59 55	W 02 49
2	07-Aug-2004	20:01	N 59 59	W 03 10
3	07-Aug-2004	21:00	N 60 04	W 03 32
4	07-Aug-2004	22:00	N 60 07	W 03 53
5	07-Aug-2004	23:00	N 60 12	W 04 15
6	08-Aug-2004	00:01	N 60 19	W 04 31
7	08-Aug-2004	00:59	N 60 21	W 04 53
8	08-Aug-2004	01:59	N 60 21	W 05 16
9	08-Aug-2004	02:58	N 60 28	W 05 36
10	08-Aug-2004	03:59	N 60 32	W 05 56
11	08-Aug-2004	05:00	N 60 36	W 06 18
12	08-Aug-2004	06:00	N 60 40	W 06 40
13	08-Aug-2004	07:01	N 60 45	W 07 02
14	08-Aug-2004	08:02	N 60 49	W 07 25
15	08-Aug-2004	09:00	N 60 52	W 07 45
16	08-Aug-2004	09:59	N 60 56	W 08 08
17	08-Aug-2004	10:59	N 61 01	W 08 31
18	08-Aug-2004	11:58	N 61 05	W 08 53
19	08-Aug-2004	13:00	N 61 10	W 09 16
20	08-Aug-2004	13:58	N 61 14	W 09 37
21	08-Aug-2004	14:58	N 61 18	W 09 59
22	08-Aug-2004	15:59	N 61 22	W 10 23
23	08-Aug-2004	17:00	N 61 27	W 10 46
24	08-Aug-2004	18:02	N 61 31	W 11 08
25	08-Aug-2004	19:01	N 61 35	W 11 30
26	08-Aug-2004	20:01	N 61 40	W 11 52
27	08-Aug-2004	21:00	N 61 43	W 12 13
28	08-Aug-2004	22:03	N 61 47	W 12 36
29	08-Aug-2004	23:00	N 61 51	W 12 58
30	08-Aug-2004	23:59	N 61 55	W 13 21
31	09-Aug-2004	00:57	N 61 59	W 13 42
32	09-Aug-2004	01:59	N 62 04	W 14 06
33	09-Aug-2004	02:56	N 62 0 8	W 14 27
34	09-Aug-2004	04:01	N 62 13	W 14 52
35	09-Aug-2004	04:11	N 62 13	W 14 55
36	09-Aug-2004	04:59	N 62 17	W 15 13
37	09-Aug-2004	05:58	N 62 21	W 15 36
38	09-Aug-2004	07:34	N 62 27	W 16 12
39	09-Aug-2004	08:04	N 62 29	W 16 24
40	09-Aug-2004	09:01	N 62 33	W 16 46
41	09-Aug-2004	10:07	N 62 37	W 17 07
42	09-Aug-2004	10:59	N 62 41	W 17 30
43	09-Aug-2004	11:59	N 62 45	W 17 53
44	09-Aug-2004	12:57	N 62 49	W 18 15
45	09-Aug-2004	13:58	N 62 53	W 18 38
46	09-Aug-2004	14:58	N 62 57	W 19 01
47	09-Aug-2004	16:03	N 63 02	W 19 26
48	09-Aug-2004	17:01	N 63 06	W 19 49
49	09-Aug-2004	18:00	N 63 10	W 20 12
50	09-Aug-2004	18:57	N 63 15	W 20 34
51	09-Aug-2004	20:01	N 62 20	W 20 58
52	09-Aug-2004	20:58	N 63 25	W 21 19
53	09-Aug-2004	21:59	N 63 31	W 21 41
54	09-Aug-2004	23:05	N 63 36	W 22 03
55	09-Aug-2004	23:58	N 63 42	W 22 25

Appendix B: List of CTD-O_2 stations

EXPO-CODE	Section Name	Stat. No.	Cast No.	Cast Type	Date mmddyy	Time UTC	Code	Position Latitude	Longitude	Code	Bottom depth	Max Press.	Bottom Dist.	Param.	Comments
07AL0412	FX1	001	01	ROS/CTD	081204	1950	BE	64 20.00 N	22 25.02 W	GPS	70				
07AL0412	FX1	001	01	ROS/CTD	081204	1953	BO	99 99.99 N	99 99.99 W	GPS	70	65	8		Used CTD: Sonde1
07AL0412	FX1	001	01	ROS/CTD	081204	1958	EN	99 99.99 N	99 99.99 W	GPS	70				
07AL0412	FX2	002	01	ROS/CTD	081204	2110	BE	64 20.02 N	22 44.78 W	GPS	43				
07AL0412	FX2	002	01	ROS/CTD	081204	2117	BO	64 19.98 N	22 44.76 W	GPS	44	39	7		
07AL0412	FX2	002	01	ROS/CTD	081204	2121	EN	64 19.94 N	22 44.70 W	GPS	46				
07AL0412	FX3	003	01	ROS/CTD	081204	2236	BE	64 19.97 N	23 14.89 W	GPS	96				
07AL0412	FX3	003	01	ROS/CTD	081204	2246	BO	64 19.88 N	23 14.89 W	GPS	93	88	7		
07AL0412	FX3	003	01	ROS/CTD	081204	2250	EN	64 19.38 N	23 14.89 W	GPS	91				
07AL0412	FX4	004	01	ROS/CTD	081304	0009	BE	64 20.02 N	23 44.98 W	GPS	202				
07AL0412	FX4	004	01	ROS/CTD	081304	0022	BO	64 20.02 N	23 44.73 W	GPS	197	192	7		
07AL0412	FX4	004	01	ROS/CTD	081304	0027	EN	64 20.02 N	23 44.65 W	GPS	195				
07AL0412	FX5	005	01	ROS/CTD	081304	0200	BE	64 20.01 N	24 19.97 W	GPS	216				
07AL0412	FX5	005	01	ROS/CTD	081304	0212	BO	64 19.92 N	24 19.85 W	GPS	216	214	5		
07AL0412	FX5	005	01	ROS/CTD	081304	0216	EN	64 19.89 N	24 19.82 W	GPS	217				
07AL0412	FX6	006	01	ROS/CTD	081304	0408	BE	64 19.95 N	24 59.97 W	GPS	230				
07AL0412	FX6	006	01	ROS/CTD	081304	0414	BO	64 19.90 N	24 59.91 W	GPS	232	225	7	1	
07AL0412	FX6	006	01	ROS/CTD	081304	0420	EN	64 19.85 N	24 59.80 W	GPS	232				
07AL0412	FX7	007	01	ROS/CTD	081304	0649	BE	64 20.00 N	25 59.99 W	GPS	323				
07AL0412	FX7	007	01	ROS/CTD	081304	0701	BO	64 19.94 N	26 00.11 W	GPS	323	318	7	1	
07AL0412	FX7	007	01	ROS/CTD	081304	0709	EN	64 19.93 N	26 00.17 W	GPS	323				
07AL0412	FX8	008	01	ROS/CTD	081304	0933	BE	64 19.94 N	26 59.90 W	GPS	422				
07AL0412	FX8	008	01	ROS/CTD	081304	0951	BO	64 19.81 N	26 59.76 W	GPS	426	422	6	1	
07AL0412	FX8	008	01	ROS/CTD	081304	1001	EN	64 19.75 N	26 59.75 W	GPS	425				
07AL0412	FX9	009	01	ROS/CTD	081304	1232	BE	64 20.01 N	27 57.96 W	GPS	1002				
07AL0412	FX9	009	01	ROS/CTD	081304	1301	BO	64 19.97 N	27 57.13 W	GPS	986	993	9	1	
07AL0412	FX9	009	01	ROS/CTD	081304	1321	EN	64 19.98 N	27 56.68 W	GPS	980				
07AL0412	ASOF-1	010	01	ROS/CTD	081304	1630	BE	64 45.01 N	27 14.91 W	GPS	492				
07AL0412	ASOF-1	010	01	ROS/CTD	081304	1641	BO	64 45.05 N	27 14.70 W	GPS	488	485	7	1	
07AL0412	ASOF-1	010	01	ROS/CTD	081304	1651	EN	64 45.06 N	27 14.52 W	GPS	488				

07AL0412	ASOF-1	011	01	ROS/CTD	081304	1828	BE	64 45.04 N	27 49.91 W	GPS	879				
07AL0412	ASOF-1	011	01	ROS/CTD	081304	1850	BO	64 45.15 N	27 49.70 W	GPS	874	878	8	1	
07AL0412	ASOF-1	011	01	ROS/CTD	081304	1906	EN	64 45.21 N	27 49.48 W	GPS	870				
07AL0412	ASOF-1	012	01	ROS/CTD	081304	2044	BE	64 44.98 N	28 24.96 W	GPS	1153				
07AL0412	ASOF-1	012	01	ROS/CTD	081304	2111	BO	64 45.17 N	28 24.06 W	GPS	1155	1158	9	1	
07AL0412	ASOF-1	012	01	ROS/CTD	081304	2134	EN	64 45.34 N	28 23.36 W	GPS	1158				
07AL0412	ASOF-1	013	01	ROS/CTD	081304	2318	BE	64 45.05 N	28 59.83 W	GPS	1068				
07AL0412	ASOF-1	013	01	ROS/CTD	081304	2343	BO	64 45.34 N	28 59.13 W	GPS	1088	1078	9	1	
07AL0412	ASOF-1	013	01	ROS/CTD	081404	0001	EN	64 45.52 N	28 58.64 W	GPS	1102				
07AL0412	ASOF-1	014	01	ROS/CTD	081404	0107	BE	64 45.13 N	29 14.78 W	GPS	1306				
07AL0412	ASOF-1	014	01	ROS/CTD	081404	0133	BO	64 45.41 N	29 13.99 W	GPS	9999	1329	9	1	sounding problems
07AL0412	ASOF-1	014	01	ROS/CTD	081404	0155	EN	64 45.60 N	29 13.20 W	GPS	9999				
07AL0412	ASOF-1	015	01	ROS/CTD	081404	0255	BE	64 45.00 N	29 29.78 W	GPS	9999				CDT cast aborted
07AL0412	ASOF-1	015	02	ROS/CTD	081404	0308	BE	64 45.01 N	29 29.47 W	GPS	9999				
07AL0412	ASOF-1	015	02	ROS/CTD	081404	0342	BO	64 45.09 N	29 28.93 W	GPS	1842	1860	7	1	
07AL0412	ASOF-1	015	02	ROS/CTD	081404	0412	EN	64 45.19 N	29 28.31 W	GPS	9999				
07AL0412	ASOF-1	016	01	ROS/CTD	081404	0504	BE	64 45.02 N	29 44.94 W	GPS	2063				
07AL0412	ASOF-1	016	01	ROS/CTD	081404	0547	BO	64 45.07 N	29 44.14 W	GPS	2051	2093	9	1,3,4,5,6,99	
07AL0412	ASOF-1	016	01	ROS/CTD	081404	0623	EN	64 45.15 N	29 43.48 W	GPS	2033				
07AL0412	ASOF-1	017	01	ROS/CTD	081404	0720	BE	64 45.00 N	29 59.98 W	GPS	2168				
07AL0412	ASOF-1	017	01	ROS/CTD	081404	0800	BO	64 45.11 N	29 59.25 W	GPS	2174	2197	9	1	
07AL0412	ASOF-1	017	01	ROS/CTD	081404	0838	EN	64 45.21 N	29 58.42 W	GPS	2168				
07AL0412	ASOF-1	018	01	ROS/CTD	081404	0931	BE	64 44.91 N	30 13.00 W	GPS	2188				
07AL0412	ASOF-1	018	01	ROS/CTD	081404	1012	BO	64 44.83 N	30 12.02 W	GPS	2195	2218	8	1	
07AL0412	ASOF-1	018	01	ROS/CTD	081404	1049	EN	64 44.73 N	30 11.34 W	GPS	2193				
07AL0412	ASOF-1	019	01	ROS/CTD	081404	1141	BE	64 44.89 N	30 25.03 W	GPS	2213				
07AL0412	ASOF-1	019	01	ROS/CTD	081404	1220	BO	64 44.68 N	30 24.44 W	GPS	2211	2240	7	1,3,4,5,6,99	
07AL0412	ASOF-1	019	01	ROS/CTD	081404	1258	EN	64 44.44 N	30 23.91 W	GPS	2214				
07AL0412	ASOF-1	020	01	ROS/CTD	081404	1350	BE	64 50.00 N	30 30.10 W	GPS	2122				CTD cast aborted
07AL0412	ASOF-1	020	02	ROS/CTD	081404	1428	BE	64 49.58 N	30 29.88 W	GPS	2132				
07AL0412	ASOF-1	020	02	ROS/CTD	081404	1508	BO	64 49.04 N	30 29.63 W	GPS	2142	2161	8	1	
07AL0412	ASOF-1	020	02	ROS/CTD	081404	1547	EN	64 48.57 N	30 29.60 W	GPS	2154				
07AL0412	ASOF-1	021	01	ROS/CTD	081404	1641	BE	64 54.97 N	30 35.16 W	GPS	2019				
07AL0412	ASOF-1	021	01	ROS/CTD	081404	1718	BO	64 54.63 N	30 35.55 W	GPS	2027	2044	9	1,3,4,5,6,99	

07AL0412	ASOF-1	021	01	ROS/CTD	081404	1754	EN	64 54.26 N	30 35.63 W	GPS	2037				
07AL0412	ASOF-1	022	01	ROS/CTD	081404	1846	BE	65 00.02 N	30 39.99 W	GPS	1875				
07AL0412	ASOF-1	022	01	ROS/CTD	081404	1927	BO	64 59.55 N	30 40.56 W	GPS	1890	1896	9	1	
07AL0412	ASOF-1	022	01	ROS/CTD	081404	2007	EN	64 59.12 N	30 41.19 W	GPS	1906				
07AL0412	ASOF-1	023	01	ROS/CTD	081404	2055	BE	65 05.73 N	30 45.07 W	GPS	1743				
07AL0412	ASOF-1	023	01	ROS/CTD	081404	2132	BO	64 04.74 N	30 45.84 W	GPS	1746	9999	9		CTD cast aborted
07AL0412	ASOF-1	023	02	ROS/CTD	081404	2232	BE	99 99.99 N	99 99.99 W	GPS	9999				test st. New conductivity sensor
07AL0412	ASOF-1	023	03	ROS/CTD	081404	2308	BE	65 05.01 N	30 45.06 W	GPS	1743				
07AL0412	ASOF-1	023	03	ROS/CTD	081404	2345	BO	65 04.79 N	30 45.57 W	GPS	1745	1747	8	1	
07AL0412	ASOF-1	023	03	ROS/CTD	081504	0020	EN	65 04.48 N	30 46.01 W	GPS	1751				
07AL0412	ASOF-1	024	01	ROS/CTD	081504	0107	BE	65 09.98 N	30 50.20 W	GPS	1496				
07AL0412	ASOF-1	024	01	ROS/CTD	081504	0136	BO	65 09.74 N	30 51.01 W	GPS	1505	1504	7	1,99	
07AL0412	ASOF-1	024	01	ROS/CTD	081504	0205	EN	65 09.53 N	30 51.80 W	GPS	1513				
07AL0412	ASOF-1	025	01	ROS/CTD	081504	0252	BE	65 14.97 N	30 55.14 W	GPS	1233				
07AL0412	ASOF-1	025	01	ROS/CTD	081504	0316	BO	65 14.76 N	30 55.64 W	GPS	1243	1239	6	1,3,4,5,6,99	
07AL0412	ASOF-1	025	01	ROS/CTD	081504	0339	EN	65 14.59 N	30 56.16 W	GPS	1253				
07AL0412	ASOF-1	026	01	ROS/CTD	081504	0450	BE	65 20.10 N	30 59.81 W	GPS	960				
07AL0412	ASOF-1	026	01	ROS/CTD	081504	0509	BO	65 19.90 N	30 59.71 W	GPS	971	964	9	1	
07AL0412	ASOF-1	026	01	ROS/CTD	081504	0526	EN	65 19.70 N	30 59.58 W	GPS	983				
07AL0412	ASOF-1	027	01	ROS/CTD	081504	0613	BE	65 24.99 N	31 04.07 W	GPS	668				
07AL0412	ASOF-1	027	01	ROS/CTD	081504	0630	BO	65 24.75 N	31 04.96 W	GPS	684	675	8	1	
07AL0412	ASOF-1	027	01	ROS/CTD	081504	0644	EN	65 24.57 N	31 04.95 W	GPS	696				
07AL0412	ASOF-1	028	01	ROS/CTD	081504	0731	BE	65 30.03 N	31 10.10 W	GPS	376				
07AL0412	ASOF-1	028	01	ROS/CTD	081504	0740	BO	65 29.88 N	31 10.56 W	GPS	373	368	7	1	CLARE
07AL0412	ASOF-1	028	01	ROS/CTD	081504	0749	EN	65 29.88 N	31 10.96 W	GPS	372				
07AL0412	ASOF-1	029	01	ROS/CTD	081504	0827	BE	65 35.01 N	31 15.27 W	GPS	359				
07AL0412	ASOF-1	029	01	ROS/CTD	081504	0837	BO	65 34.91 N	31 15.97 W	GPS	351	347	8	1	
07AL0412	ASOF-1	029	01	ROS/CTD	081504	0846	EN	65 34.84 N	31 16.45 W	GPS	363				
07AL0412	ASOF-1	030	01	ROS/CTD	081504	0923	BE	65 40.09 N	31 19.91 W	GPS	338				
07AL0412	ASOF-1	030	01	ROS/CTD	081504	0934	BO	65 40.13 N	31 20.55 W	GPS	335	338	7	1,3,4,5,6,99	
07AL0412	ASOF-1	030	01	ROS/CTD	081504	0941	EN	65 40.14 N	31 20.86 W	GPS	328				
07AL0412	ASOF-1	031	01	ROS/CTD	081504	1018	BE	65 45.07 N	31 25.04 W	GPS	367				
07AL0412	ASOF-1	031	01	ROS/CTD	081504	1027	BO	65 45.07 N	31 25.28 W	GPS	362	357	8	1	
07AL0412	ASOF-1	031	01	ROS/CTD	081504	1036	EN	65 45.04 N	31 25.49 W	GPS	362				

07AL0412	ASOF-1	032	01	ROS/CTD	081504	1112	BE	65 50.04 N	31 30.02 W	GPS	370			
07AL0412	ASOF-1	032	01	ROS/CTD	081504	1124	BO	65 50.08 N	31 30.49 W	GPS	363	352	9	1
07AL0412	ASOF-1	032	01	ROS/CTD	081504	1133	EN	65 50.08 N	31 30.77 W	GPS	368			
07AL0412	ASOF-1	033	01	ROS/CTD	081504	1213	BE	65 55.04 N	31 34.87 W	GPS	342			
07AL0412	ASOF-1	033	01	ROS/CTD	081504	1221	BO	65 55.06 N	31 34.93 W	GPS	341	336	8	1
07AL0412	ASOF-1	033	01	ROS/CTD	081504	1228	EN	65 55.04 N	31 34.93 W	GPS	341			
07AL0412	ASOF-2	034	01	ROS/CTD	081504	2034	BE	65 09.96 N	34 55.19 W	GPS	286			
07AL0412	ASOF-2	034	01	ROS/CTD	081504	2045	BO	65 09.94 N	34 55.51 W	GPS	290	285	8	1,3,4,5,6,99
07AL0412	ASOF-2	034	01	ROS/CTD	081504	2051	EN	65 09.93 N	34 55.59 W	GPS	290			
07AL0412	ASOF-2	035	01	ROS/CTD	081504	2131	BE	65 05.01 N	34 48.41 W	GPS	364			
07AL0412	ASOF-2	035	01	ROS/CTD	081504	2141	BO	65 05.04 N	34 48.46 W	GPS	363	360	6	1
07AL0412	ASOF-2	035	01	ROS/CTD	081504	2149	EN	65 04.97 N	34 48.45 W	GPS	363			
07AL0412	ASOF-2	036	01	ROS/CTD	081504	2229	BE	64 59.99 N	34 39.87 W	GPS	375			
07AL0412	ASOF-2	036	01	ROS/CTD	081504	2241	BO	64 59.86 N	34 39.84 W	GPS	379	372	8	1
07AL0412	ASOF-2	036	01	ROS/CTD	081504	2249	EN	64 59.83 N	34 39.84 W	GPS	387			
07AL0412	ASOF-2	037	01	ROS/CTD	081504	2329	BE	64 55.01 N	34 32.33 W	GPS	872			
07AL0412	ASOF-2	037	01	ROS/CTD	081504	2350	BO	64 54.88 N	34 32.49 W	GPS	875	874	8	1
07AL0412	ASOF-2	037	01	ROS/CTD	081604	0005	EN	64 54.81 N	34 32.69 W	GPS	875			
07AL0412	ASOF-2	038	01	ROS/CTD	081604	0050	BE	64 49.88 N	34 24.89 W	GPS	1046			
07AL0412	ASOF-2	038	01	ROS/CTD	081604	0111	BO	64 49.59 N	34 24.92 W	GPS	1054	1052	8	1,3,4,5,6,99
07AL0412	ASOF-2	038	01	ROS/CTD	081604	0129	EN	64 49.39 N	34 25.07 W	GPS	1059			
07AL0412	ASOF-2	039	01	ROS/CTD	081604	0214	BE	64 44.94 N	34 17.42 W	GPS	1108			
07AL0412	ASOF-2	039	01	ROS/CTD	081604	0235	BO	64 44.78 N	34 17.46 W	GPS	1111	1111	7	1
07AL0412	ASOF-2	039	01	ROS/CTD	081604	0255	EN	64 44.62 N	34 17.52 W	GPS	1114			
07AL0412	ASOF-2	040	01	ROS/CTD	081604	0342	BE	64 40.01 N	34 10.08 W	GPS	1233			
07AL0412	ASOF-2	040	01	ROS/CTD	081604	0405	BO	64 39.88 N	34 10.22 W	GPS	1239	1240	8	1
07AL0412	ASOF-2	040	01	ROS/CTD	081604	0427	EN	64 39.77 N	34 10.42 W	GPS	1241			
07AL0412	ASOF-2	041	01	ROS/CTD	081604	0516	BE	64 35.00 N	34 02.64 W	GPS	1416			
07AL0412	ASOF-2	041	01	ROS/CTD	081604	0543	BO	64 34.79 N	34 03.27 W	GPS	1423	1431	8	1
07AL0412	ASOF-2	041	01	ROS/CTD	081604	0612	EN	64 34.55 N	34 03.84 W	GPS	1431			
07AL0412	ASOF-2	042	01	ROS/CTD	081604	0704	BE	64 30.05 N	33 55.05 W	GPS	1593			
07AL0412	ASOF-2	042	01	ROS/CTD	081604	0734	BO	64 29.84 N	33 55.45 W	GPS	1598	1609	7	1,3,4,5,6,99
07AL0412	ASOF-2	042	01	ROS/CTD	081604	0806	EN	64 29.66 N	33 55.77 W	GPS	1602			
07AL0412	ASOF-2	043	01	ROS/CTD	081604	0856	BE	64 25.02 N	33 47.22 W	GPS	1759			
07AL0412	ASOF-2	043	01	ROS/CTD	081604	0930	BO	64 24.91 N	33 46.98 W	GPS	1764	1778	8	1
07AL0412	ASOF-2	043	01	ROS/CTD	081604	1005	EN	64 24.76 N	33 46.78 W	GPS	1768			

07AL0412	ASOF-2	044	01	ROS/CTD	081604	1049	BE	64 20.06 N	33 39.85 W	GPS	1910				
07AL0412	ASOF-2	044	01	ROS/CTD	081604	1126	BO	64 19.96 N	33 39.48 W	GPS	1916	1936	10	1	
07AL0412	ASOF-2	044	01	ROS/CTD	081604	1200	EN	64 19.82 N	33 39.19 W	GPS	1922				
07AL0412	ASOF-2	045	01	ROS/CTD	081604	1249	BE	64 15.04 N	33 32.46 W	GPS	2062				
07AL0412	ASOF-2	045	01	ROS/CTD	081604	1326	BO	64 15.19 N	33 32.58 W	GPS	2058	2086	6	1,3,4,5,6,99	
07AL0412	ASOF-2	045	01	ROS/CTD	081604	1402	EN	64 15.25 N	33 32.49 W	GPS	2057				
07AL0412	ASOF-2	046	01	ROS/CTD	081604	1452	BE	64 10.00 N	33 25.01 W	GPS	2205				
07AL0412	ASOF-2	046	01	ROS/CTD	081604	1532	BO	64 09.94 N	33 25.47 W	GPS	2205	2235	7	1	
07AL0412	ASOF-2	046	01	ROS/CTD	081604	1613	EN	64 09.77 N	33 26.07 W	GPS	2202				
07AL0412	ASOF-2	047	01	ROS/CTD	081604	1704	BE	64 05.02 N	33 17.71 W	GPS	2324				
07AL0412	ASOF-2	047	01	ROS/CTD	081604	1746	BO	64 04.74 N	33 19.11 W	GPS	2329	2355	9	1,3,4,5,6,99	
07AL0412	ASOF-2	047	01	ROS/CTD	081604	1830	EN	64 04.50 N	33 20.47 W	GPS	2322				
07AL0412	ASOF-2	048	01	ROS/CTD	081604	1924	BE	64 00.08 N	33 10.19 W	GPS	2420				CTD cast aborted
07AL0412	ASOF-2	048	02	ROS/CTD	081604	1957	BE	64 00.06 N	33 11.25 W	GPS	2418				CTD cast aborted
07AL0412	ASOF-2	048	02	ROS/CTD	081604	2012	EN	64 00.04 N	33 11.75 W	GPS	2416				
07AL0412	ASOF-2	048	03	ROS/CTD	081604	2033	BE	64 00.06 N	33 10.12 W	GPS	2420				
07AL0412	ASOF-2	048	03	ROS/CTD	081604	2124	BO	64 00.04 N	33 11.34 W	GPS	2417	2451	8	1,98	
07AL0412	ASOF-2	048	03	ROS/CTD	081604	2210	EN	63 59.95 N	33 12.46 W	GPS	2415				
07AL0412		999	01	MOR	081704		RE	63 33.93 N	36 27.99 W	GPS	1798				Recovery of HOMER
07AL0412	ASOF-3	049	01	ROS/CTD	081704	1133	BE	63 49.97 N	36 58.05 W	GPS	354				
07AL0412	ASOF-3	049	01	ROS/CTD	081704	1142	BO	63 49.85 N	36 58.37 W	GPS	352	348	7	1	
07AL0412	ASOF-3	049	01	ROS/CTD	081704	1150	EN	63 49.77 N	36 58.49 W	GPS	350				
07AL0412	ASOF-3	050	01	ROS/CTD	081704	1231	BE	63 45.93 N	36 50.75 W	GPS	655				
07AL0412	ASOF-3	050	01	ROS/CTD	081704	1245	BO	63 45.75 N	36 51.00 W	GPS	670	676	8	1,3,4,5,6,99	
07AL0412	ASOF-3	050	01	ROS/CTD	081704	1257	EN	63 45.62 N	36 51.29 W	GPS	675				
07AL0412	ASOF-3	051	01	ROS/CTD	081704	1342	BE	63 41.82 N	36 43.24 W	GPS	1589				
07AL0412	ASOF-3	051	01	ROS/CTD	081704	1412	BO	63 41.49 N	36 43.98 W	GPS	1615	1663	9	1	high noise level
07AL0412	ASOF-3	051	01	ROS/CTD	081704	1441	EN	63 41.14 N	36 44.77 W	GPS	1677				
07AL0412	ASOF-3	051	02	ROS/CTD	081704	1554	BE	63 41.88 N	36 43.34 W	GPS	1578				
07AL0412	ASOF-3	051	02	ROS/CTD	081704	1622	BO	63 41.65 N	36 44.36 W	GPS	1603	1614	9		New CTD: Sonde5
07AL0412	ASOF-3	051	02	ROS/CTD	081704	1654	EN	63 41.43 N	36 45.67 W	GPS	1671				
07AL0412	ASOF-3	052	01	ROS/CTD	081704	1812	BE	63 38.13 N	36 35.79 W	GPS	1643				
07AL0412	ASOF-3	052	01	ROS/CTD	081704	1844	BO	63 38.17 N	36 36.61 W	GPS	1645	1652	9	1	changed back to Sonde1
07AL0412	ASOF-3	052	01	ROS/CTD	081704	1916	EN	63 38.23 N	36 37.45 W	GPS	1642				used previously

07AL0412	ASOF-3	053	01	ROS/CTD	081704	2005	BE	63 34.12 N	36 28.09 W	GPS	1776				
07AL0412	ASOF-3	053	01	ROS/CTD	081704	2042	BO	63 34.22 N	36 28.81 W	GPS	1758	1781	7	1	
07AL0412	ASOF-3	053	01	ROS/CTD	081704	2116	EN	63 34.31 N	36 29.33 W	GPS	1744				
07AL0412	ASOF-3	054	01	ROS/CTD	081704	2203	BE	63 30.06 N	36 21.42 W	GPS	1906				
07AL0412	ASOF-3	054	01	ROS/CTD	081704	2243	BO	63 29.90 N	36 22.18 W	GPS	1916	1931	7	1	
07AL0412	ASOF-3	054	01	ROS/CTD	081704	2320	EN	63 29.74 N	36 22.83 W	GPS	9999				
07AL0412	ASOF-3	055	01	ROS/CTD	081804	0013	BE	63 26.04 N	36 14.04 W	GPS	2064				
07AL0412	ASOF-3	055	01	ROS/CTD	081804	0050	BO	63 26.17 N	36 14.56 W	GPS	2057	2082	7	1,3,4,5,6,99	
07AL0412	ASOF-3	055	01	ROS/CTD	081804	0121	EN	63 26.27 N	36 15.00 W	GPS	2052				
07AL0412	ASOF-3	056	01	ROS/CTD	081804	0208	BE	63 21.97 N	36 06.56 W	GPS	2173				
07AL0412	ASOF-3	056	01	ROS/CTD	081804	0248	BO	63 21.97 N	36 07.13 W	GPS	2171	2197	8	1	
07AL0412	ASOF-3	056	01	ROS/CTD	081804	0321	EN	63 21.99 N	36 07.49 W	GPS	2169				
07AL0412	ASOF-3	057	01	ROS/CTD	081804	0405	BE	63 18.00 N	35 58.95 W	GPS	2277				
07AL0412	ASOF-3	057	01	ROS/CTD	081804	0446	BO	63 18.10 N	35 59.21 W	GPS	2274	2303	9	1	
07AL0412	ASOF-3	057	01	ROS/CTD	081804	0525	EN	63 18.23 N	35 59.56 W	GPS	2272				
07AL0412	ASOF-3	058	01	ROS/CTD	081804	0616	BE	63 14.04 N	35 51.58 W	GPS	2381				
07AL0412	ASOF-3	058	01	ROS/CTD	081804	0700	BO	63 14.10 N	35 52.21 W	GPS	2366	2409	8	1,3,4,5,6,99	
07AL0412	ASOF-3	058	01	ROS/CTD	081804	0740	EN	63 14.23 N	35 52.67 W	GPS	2373				
07AL0412	ASOF-3	059	01	ROS/CTD	081804	0825	BE	63 10.04 N	35 43.86 W	GPS	2478				
07AL0412	ASOF-3	059	01	ROS/CTD	081804	0915	BO	63 10.36 N	35 44.18 W	GPS	2472	2509	7	1	
07AL0412	ASOF-3	059	01	ROS/CTD	081804	1001	EN	63 10.66 N	35 44.44 W	GPS	2467				
07AL0412	ASOF-3	060	01	ROS/CTD	081804	1115	BE	63 02.04 N	35 28.88 W	GPS	2622				
07AL0412	ASOF-3	060	01	ROS/CTD	081804	1204	BO	63 02.21 N	35 28.71 W	GPS	2620	2661	7	1	
07AL0412	ASOF-3	060	01	ROS/CTD	081804	1249	EN	63 02.34 N	35 28.33 W	GPS	2619				
07AL0412	ASOF-3	061	01	ROS/CTD	081804	1401	BE	62 53.96 N	35 13.90 W	GPS	2686				
07AL0412	ASOF-3	061	01	ROS/CTD	081804	1448	BO	62 53.97 N	35 14.02 W	GPS	2686	2725	8	1,3,4,5,6,99	
07AL0412	ASOF-3	061	01	ROS/CTD	081804	1534	EN	62 54.03 N	35 14.22 W	GPS	2685				
07AL0412	ASOF-3	062	01	ROS/CTD	081804	1647	BE	62 45.98 N	34 58.98 W	GPS	2736				problems with the
07AL0412	ASOF-3	062	01	ROS/CTD	081804	9999	BO	99 99.99 N	99 99.99 W	GPS	9999	2690	9999	1	temperature sensor
07AL0412	ASOF-3	062	01	ROS/CTD	081804	1740	EN	99 99.99 N	99 99.99 W	GPS	9999				stopped at depth
07AL0412	ASOF-3	062	02	ROS/CTD	081804	1740	BE	62 46.24 N	34 59.15 W	GPS	2736				restarted in depth
07AL0412	ASOF-3	062	03	ROS/CTD	081804	1753	BE	62 46.29 N	34 59.10 W	GPS	2737				restarted in depth
07AL0412	ASOF-3	062	03	ROS/CTD	081804	1822	EN	62 46.44 N	34 59.13 W	GPS	2730				

07AL0412	ASOF-3	063	01	ROS/CTD	081804	1943	BE	62 38.01 N	34 43.96 W	GPS	2781			Test st. New temperature sensor
07AL0412	ASOF-3	063	02	ROS/CTD	081804	1951	BE	62 38.03 N	34 43.92 W	GPS	2781			
07AL0412	ASOF-3	063	02	ROS/CTD	081804	2043	BO	62 38.25 N	34 44.01 W	GPS	2778	2823	8	1,3,4,5,6,99
07AL0412	ASOF-3	063	02	ROS/CTD	081804	2134	EN	62 38.46 N	34 44.10 W	GPS	2776			
07AL0412	ASOF-3	064	01	ROS/CTD	081804	2248	BE	62 29.99 N	34 29.09 W	GPS	2809			
07AL0412	ASOF-3	064	01	ROS/CTD	081804	2344	BO	62 30.33 N	34 29.15 W	GPS	2809	2852	9	1
07AL0412	ASOF-3	064	01	ROS/CTD	081904	0028	EN	62 30.63 N	34 29.19 W	GPS	2807			
07AL0412	ASOF-4	065	01	ROS/CTD	081904	0729	BE	61 26.09 N	35 43.96 W	GPS	2881			
07AL0412	ASOF-4	065	01	ROS/CTD	081904	0821	BO	61 26.57 N	35 44.19 W	GPS	2881	2929	8	1
07AL0412	ASOF-4	065	01	ROS/CTD	081904	0911	EN	61 27.09 N	35 44.27 W	GPS	2880			
07AL0412	ASOF-4	066	01	ROS/CTD	081904	1110	BE	61 38.00 N	36 17.84 W	GPS	2769			
07AL0412	ASOF-4	066	01	ROS/CTD	081904	1159	BO	61 37.91 N	36 17.32 W	GPS	2771	2813	8	1,3,4,5,6,98,99
07AL0412	ASOF-4	066	01	ROS/CTD	081904	1245	EN	61 37.84 N	36 16.72 W	GPS	2773			
07AL0412	ASOF-4	067	01	ROS/CTD	081904	1455	BE	61 48.91 N	36 53.02 W	GPS	2657			
07AL0412	ASOF-4	067	01	ROS/CTD	081904	1548	BO	61 48.93 N	36 52.51 W	GPS	2658	2696	7	1
07AL0412	ASOF-4	067	01	ROS/CTD	081904	1633	EN	61 49.06 N	36 52.12 W	GPS	2658			
07AL0412	ASOF-4	068	01	ROS/CTD	081904	1838	BE	62 00.84 N	37 28.03 W	GPS	2536			
07AL0412	ASOF-4	068	01	ROS/CTD	081904	1925	BO	62 00.76 N	37 28.01 W	GPS	2537	2570	6	1
07AL0412	ASOF-4	068	01	ROS/CTD	081904	2000	EN	62 00.65 N	37 28.08 W	GPS	2539			
07AL0412	ASOF-4	069	01	ROS/CTD	081904	2159	BE	62 11.94 N	38 03.03 W	GPS	2466			
07AL0412	ASOF-4	069	01	ROS/CTD	081904	2244	BO	62 11.74 N	38 03.46 W	GPS	2460	2490	8	1,3,4,5,6,99
07AL0412	ASOF-4	069	01	ROS/CTD	081904	2322	EN	62 11.66 N	38 03.75 W	GPS	2460			
07AL0412	ASOF-4	070	01	ROS/CTD	082004	0120	BE	62 24.01 N	38 38.02 W	GPS	2256			
07AL0412	ASOF-4	070	01	ROS/CTD	082004	0201	BO	62 23.97 N	38 38.04 W	GPS	2255	2284	7	1,3,4,5,6,99
07AL0412	ASOF-4	070	01	ROS/CTD	082004	0234	EN	62 23.85 N	38 37.98 W	GPS	2253			
07AL0412	ASOF-4	071	01	ROS/CTD	082004	0433	BE	62 35.00 N	39 13.02 W	GPS	2009			
07AL0412	ASOF-4	071	01	ROS/CTD	082004	0510	BO	62 34.98 N	39 13.37 W	GPS	2004	2016	6	1,3,4,5,6,99
07AL0412	ASOF-4	071	01	ROS/CTD	082004	0541	EN	62 34.96 N	39 13.65 W	GPS	2001			
07AL0412	ASOF-4	072	01	ROS/CTD	082004	0741	BE	62 46.96 N	39 49.05 W	GPS	1916			
07AL0412	ASOF-4	072	01	ROS/CTD	082004	0817	BO	62 46.68 N	39 49.34 W	GPS	1922	1932	7	1
07AL0412	ASOF-4	072	01	ROS/CTD	082004	0845	EN	62 46.46 N	39 49.72 W	GPS	1927			
07AL0412	ASOF-4	073	01	ROS/CTD	082004	0951	BE	62 51.92 N	40 07.08 W	GPS	1680			
07AL0412	ASOF-4	073	01	ROS/CTD	082004	1022	BO	62 51.66 N	40 07.29 W	GPS	1670	1683	8	1,3,4,5,6,99
07AL0412	ASOF-4	073	01	ROS/CTD	082004	1048	EN	62 51.45 N	40 07.56 W	GPS	1649			

07AL0412	ASOF-4	074	01	ROS/CTD	082004	1157	BE	62 57.99 N	40 25.04 W	GPS	213			
07AL0412	ASOF-4	074	01	ROS/CTD	082004	1203	BO	62 58.02 N	40 25.11 W	GPS	210	208	6	1
07AL0412	ASOF-4	074	01	ROS/CTD	082004	1207	EN	62 58.02 N	40 25.14 W	GPS	210			
07AL0412	ASOF-4	075	01	ROS/CTD	082004	1314	BE	63 03.90 N	40 43.30 W	GPS	252			
07AL0412	ASOF-4	075	01	ROS/CTD	082004	1323	BO	63 03.76 N	40 43.67 W	GPS	307	287	10	1,3,4,5,6,98,99
07AL0412	ASOF-4	075	01	ROS/CTD	082004	1328	EN	63 03.68 N	40 43.88 W	GPS	295			
07AL0412	ASOF-4	076	01	ROS/CTD	082004	1416	BE	63 07.62 N	40 54.11 W	GPS	249			
07AL0412	ASOF-4	076	01	ROS/CTD	082004	1424	BO	63 07.58 N	40 54.30 W	GPS	284	273	7	1
07AL0412	ASOF-4	076	01	ROS/CTD	082004	1429	EN	63 07.57 N	40 54.40 W	GPS	288			
07AL0412	A1E/ASOF-6	077	01	ROS/CTD	082104	0931	BE	59 59.83 N	42 29.97 W	GPS	188			
07AL0412	A1E/ASOF-6	077	01	ROS/CTD	082104	0934	BO	59 59.64 N	42 29.93 W	GPS	189	177	9	1
07AL0412	A1E/ASOF-6	077	01	ROS/CTD	082104	0940	EN	59 59.56 N	42 29.91 W	GPS	190			
07AL0412	A1E/ASOF-6	078	01	ROS/CTD	082104	1043	BE	59 57.79 N	42 10.11 W	GPS	505			
07AL0412	A1E/ASOF-6	078	01	ROS/CTD	082104	1053	BO	59 57.63 N	42 10.11 W	GPS	500	493	9	1
07AL0412	A1E/ASOF-6	078	01	ROS/CTD	082104	1102	EN	59 57.49 N	42 10.07 W	GPS	498			
07AL0412	A1E/ASOF-6	079	01	ROS/CTD	082104	1209	BE	59 55.87 N	41 49.96 W	GPS	1799			
07AL0412	A1E/ASOF-6	079	01	ROS/CTD	082104	1243	BO	59 55.44 N	41 50.37 W	GPS	1798	1823	7	1,3,4,5,6,99
07AL0412	A1E/ASOF-6	079	01	ROS/CTD	082104	1312	EN	59 55.14 N	41 50.84 W	GPS	1795			
07AL0412	A1E/ASOF-6	080	01	ROS/CTD	082104	1427	BE	59 53.99 N	41 29.99 W	GPS	1875			
07AL0412	A1E/ASOF-6	080	01	ROS/CTD	082104	1502	BO	59 54.09 N	41 29.83 W	GPS	1875	1900	7	1
07AL0412	A1E/ASOF-6	080	01	ROS/CTD	082104	1527	EN	59 54.11 N	41 29.49 W	GPS	1876			
07AL0412	A1E/ASOF-6	081	01	ROS/CTD	082104	1638	BE	59 51.99 N	41 09.92 W	GPS	2026			
07AL0412	A1E/ASOF-6	081	01	ROS/CTD	082104	1715	BO	59 51.86 N	41 09.47 W	GPS	2032	2060	7	1
07AL0412	A1E/ASOF-6	081	01	ROS/CTD	082104	1750	EN	59 51.61 N	41 09.23 W	GPS	2035			
07AL0412	A1E/ASOF-6	082	01	ROS/CTD	082104	1858	BE	59 49.96 N	40 49.94 W	GPS	2344			
07AL0412	A1E/ASOF-6	082	01	ROS/CTD	082104	1940	BO	59 49.81 N	40 49.93 W	GPS	2343	2384	8	1,3,4,5,6,99
07AL0412	A1E/ASOF-6	082	01	ROS/CTD	082104	2017	EN	59 49.70 N	40 50.09 W	GPS	2339			
07AL0412	A1E/ASOF-6	083	01	ROS/CTD	082104	2215	BE	59 45.96 N	40 15.08 W	GPS	2595			
07AL0412	A1E/ASOF-6	083	01	ROS/CTD	082104	2301	BO	59 46.07 N	40 15.57 W	GPS	2591	2641	9	1
07AL0412	A1E/ASOF-6	083	01	ROS/CTD	082104	2329	EN	59 46.09 N	40 16.06 W	GPS	2590			
07AL0412	A1E/ASOF-6	084	01	ROS/CTD	082204	0139	BE	59 42.05 N	39 40.05 W	GPS	2752			
07AL0412	A1E/ASOF-6	084	01	ROS/CTD	082204	0230	BO	59 42.56 N	39 40.67 W	GPS	2744	2805	6	1,3,4,5,6,99
07AL0412	A1E/ASOF-6	084	01	ROS/CTD	082204	0307	EN	59 42.88 N	39 40.99 W	GPS	2739			
07AL0412	A1E/ASOF-6	085	01	ROS/CTD	082204	0559	BE	59 36.62 N	38 44.92 W	GPS	2939			
07AL0412	A1E/ASOF-6	085	01	ROS/CTD	082204	0656	BO	59 37.23 N	38 44.76 W	GPS	2937	3000	9	1,3,4,5,6,99
07AL0412	A1E/ASOF-6	085	01	ROS/CTD	082204	0739	EN	59 37.48 N	38 44.64 W	GPS	2936			

07AL0412	A1E/ASOF-6	086	01	ROS/CTD	082204	1019	BE	59 30.98 N	37 49.89 W	GPS	3112			
07AL0412	A1E/ASOF-6	086	01	ROS/CTD	082204	1113	BO	59 31.06 N	37 49.64 W	GPS	3111	3184	9	1
07AL0412	A1E/ASOF-6	086	01	ROS/CTD	082204	1158	EN	59 31.08 N	37 49.67 W	GPS	3111			
07AL0412	A1E	087	01	ROS/CTD	082204	1444	BE	59 25.48 N	36 54.82 W	GPS	3080			
07AL0412	A1E	087	01	ROS/CTD	082204	1540	BO	59 25.66 N	36 55.10 W	GPS	3080	3155	6	1,3,4,5,6,99
07AL0412	A1E	087	01	ROS/CTD	082204	1626	EN	59 25.86 N	36 55.45 W	GPS	3080			
07AL0412	A1E	088	01	ROS/CTD	082204	1917	BE	59 20.11 N	35 59.87 W	GPS	3067			
07AL0412	A1E	088	01	ROS/CTD	082204	2020	BO	59 21.44 N	35 59.71 W	GPS	3066	3136	10	1
07AL0412	A1E	088	01	ROS/CTD	082204	2111	EN	59 22.36 N	35 59.83 W	GPS	3065			
07AL0412	A1E	089	01	ROS/CTD	082304	0008	BE	59 14.60 N	35 05.11 W	GPS	2990			
07AL0412	A1E	089	01	ROS/CTD	082304	0104	BO	59 15.43 N	35 05.91 W	GPS	3006	3060	8	1
07AL0412	A1E	089	01	ROS/CTD	082304	0151	EN	59 16.10 N	35 06.59 W	GPS	3020			
07AL0412	A1E	090	01	ROS/CTD	082304	0634	BE	59 07.53 N	34 09.91 W	GPS	2262			cast aborted at 35 m winch wire was jumping
07AL0412	A1E	090	02	ROS/CTD	082304	0639	BE	59 07.66 N	34 10.04 W	GPS	2263			restarted in depth
07AL0412	A1E	090	02	ROS/CTD	082304	0734	BO	59 08.70 N	34 11.68 W	GPS	2330	2326	10	1
07AL0412	A1E	090	02	ROS/CTD	082304	0821	EN	59 09.48 N	34 13.29 W	GPS	2386			
07AL0412	A1E	091	01	ROS/CTD	082304	1933	BE	59 03.95 N	33 29.94 W	GPS	2286			
07AL0412	A1E	091	01	ROS/CTD	082304	2017	BO	59 04.10 N	33 30.57 W	GPS	2283	2315	15	1
07AL0412	A1E	091	01	ROS/CTD	082304	2053	EN	59 04.06 N	33 31.42 W	GPS	2276			
07AL0412	A1E	092	01	ROS/CTD	082304	2331	BE	58 59.98 N	32 49.94 W	GPS	2136			
07AL0412	A1E	092	01	ROS/CTD	082404	0012	BO	58 59.81 N	32 50.56 W	GPS	2148	2176	8	1,3,4,5,6,99
07AL0412	A1E	092	01	ROS/CTD	082404	0044	EN	58 59.56 N	32 50.99 W	GPS	2148			
07AL0412	A1E	093	01	ROS/CTD	082404	0351	BE	58 55.99 N	32 10.36 W	GPS	1313			
07AL0412	A1E	093	01	ROS/CTD	082404	0419	BO	58 55.83 N	32 10.82 W	GPS	1374	1437	9	1
07AL0412	A1E	093	01	ROS/CTD	082404	0443	EN	58 55.73 N	32 11.08 W	GPS	1363			
07AL0412	A1E	094	01	ROS/CTD	082404	0712	BE	58 51.99 N	31 30.14 W	GPS	1500			cast aborted at 139 m depth
07AL0412	A1E	094	01	ROS/CTD	082404	0722	EN	58 51.92 N	31 30.09 W	GPS	1479			due to conductivity problems
07AL0412	A1E	094	02	ROS/CTD	082404	0735	BE	58 51.83 N	31 29.95 W	GPS	1479			
07AL0412	A1E	094	02	ROS/CTD	082404	0804	BO	58 51.60 N	31 29.78 W	GPS	1500	1516	14	1
07AL0412	A1E	094	02	ROS/CTD	082404	0826	EN	58 51.45 N	31 29.53 W	GPS	1547			
07AL0412	A1E	095	01	ROS/CTD	082404	1032	BE	58 40.97 N	30 56.97 W	GPS	1480			
07AL0412	A1E	095	01	ROS/CTD	082404	1105	BO	58 40.61 N	30 56.14 W	GPS	1567	1573	16	1,3,4,5,6,99
07AL0412	A1E	095	01	ROS/CTD	082404	1132	EN	58 40.31 N	30 55.60 W	GPS	1541			

07AL0412	A1E	096	01	ROS/CTD	082404	1324	BE	58 29.90 N	30 28.09 W	GPS	1814				
07AL0412	A1E	096	01	ROS/CTD	082404	1352	BO	58 29.45 N	30 27.75 W	GPS	1845	1863	9	1	
07AL0412	A1E	096	01	ROS/CTD	082404	1426	EN	58 29.20 N	30 27.56 W	GPS	1855				
07AL0412	A1E	097	01	ROS/CTD	082404	1616	BE	58 18.99 N	30 00.05 W	GPS	2233				
07AL0412	A1E	097	01	ROS/CTD	082404	1656	BO	58 19.05 N	29 59.62 W	GPS	2259	2291	11	1,3,4,5,6,99	
07AL0412	A1E	097	01	ROS/CTD	082404	1729	EN	58 19.18 N	29 59.14 W	GPS	2275				
07AL0412	A1E	098	01	ROS/CTD	082404	1942	BE	58 05.01 N	29 29.90 W	GPS	2214				cast aborted at 400 m depth
															due to display and firing bottles problems
07AL0412	A1E	098	01	ROS/CTD	082404	2000	EN	58 05.19 N	29 29.35 W	GPS	2217				end at 5 m depth
07AL0412	A1E	098	02	ROS/CTD	082404	2002	BE	58 05.21 N	29 29.33 W	GPS	2217				restarted in depth
															cast aborted due to same problems as in cast 1
07AL0412	A1E	098	02	ROS/CTD	082404	2013	EN	58 05.32 N	29 29.01 W	GPS	9999				
07AL0412	A1E	098	03	ROS/CTD	082404	2025	BE	58 05.42 N	29 28.63 W	GPS	2209				restarted in depth
															cast aborted due to spikes in S and T
07AL0412	A1E	098	03	ROS/CTD	082404	2037	EN	58 05.53 N	29 28.23 W	GPS	2205				
07AL0412	A1E	098	04	ROS/CTD	082404	2112	BE	58 05.77 N	29 27.12 W	GPS	2196				cast aborted at 5 m depth due to
															missing contact to CTD
07AL0412	A1E	098	05	ROS/CTD	082404	2119	BE	99 99.99 N	99 99.99 W	GPS	9999				on-board test – negativ
															CTD-cable termination renewed
07AL0412	A1E	098	06	ROS/CTD	082504	0050	BE	58 05.07 N	29 29.55 W	GPS	2215				
07AL0412	A1E	098	06	ROS/CTD	082504	0130	BO	58 05.13 N	29 28.59 W	GPS	2198	2257	8	1	
07AL0412	A1E	098	06	ROS/CTD	082504	0203	EN	58 05.15 N	29 27.75 W	GPS	2184				
07AL0412	A1E	099	01	ROS/CTD	082504	0359	BE	57 51.06 N	29 04.74 W	GPS	2241				
07AL0412	A1E	099	01	ROS/CTD	082504	0441	BO	57 51.06 N	29 03.80 W	GPS	2310	2358	13	1,98	
07AL0412	A1E	099	01	ROS/CTD	082504	0520	EN	57 51.06 N	29 03.00 W	GPS	2301				
07AL0412	A1E	100	01	ROS/CTD	082504	0718	BE	57 35.93 N	28 40.10 W	GPS	2351				
07AL0412	A1E	100	01	ROS/CTD	082504	0800	BO	57 34.94 N	28 39.86 W	GPS	2354	2397	13	1	
07AL0412	A1E	100	01	ROS/CTD	082504	0836	EN	57 35.99 N	28 39.66 W	GPS	2359				
07AL0412	A1E	101	01	ROS/CTD	082504	1109	BE	57 15.04 N	28 14.85 W	GPS	2437				
07AL0412	A1E	101	01	ROS/CTD	082504	1200	BO	57 15.61 N	28 13.54 W	GPS	2658	2712	9	1	
07AL0412	A1E	101	01	ROS/CTD	082504	1243	EN	57 16.18 N	28 12.58 W	GPS	2654				
07AL0412	A1E	102	01	ROS/CTD	082504	1523	BE	56 54.05 N	27 49.71 W	GPS	2893				
07AL0412	A1E	102	01	ROS/CTD	082504	1616	BO	56 54.82 N	27 48.49 W	GPS	2842	2944	9	1,3,4,5,6,99	
07AL0412	A1E	102	01	ROS/CTD	082504	1659	EN	56 55.22 N	27 47.81 W	GPS	2823				
07AL0412	A1E	103	01	ROS/CTD	082504	1954	BE	56 27.00 N	27 30.04 W	GPS	9999				
07AL0412	A1E	103	01	ROS/CTD	082504	2044	BO	56 27.35 N	27 30.03 W	GPS	2729	2781	14	1	
07AL0412	A1E	103	01	ROS/CTD	082504	2124	EN	56 27.63 N	27 30.12 W	GPS	2739				

07AL0412	A1E	104	01	ROS/CTD	082604	0030	BE	56 00.07 N	27 09.80 W	GPS	2774				
07AL0412	A1E	104	01	ROS/CTD	082604	0121	BO	56 00.49 N	27 08.61 W	GPS	2779	2844	9	1,3,4,5,6,99	
07AL0412	A1E	104	01	ROS/CTD	082604	0205	EN	56 00.89 N	27 07.78 W	GPS	2785				
07AL0412	A1E	105	01	ROS/CTD	082604	0508	BE	55 33.02 N	26 49.81 W	GPS	3122				
07AL0412	A1E	105	01	ROS/CTD	082604	0614	BO	55 33.10 N	26 47.64 W	GPS	3132	3205	11	1	
07AL0412	A1E	105	01	ROS/CTD	082604	0706	EN	55 32.80 N	26 46.01 W	GPS	3148				
07AL0412	A1E	106	01	ROS/CTD	082604	0956	BE	55 04.97 N	26 30.01 W	GPS	3325				
07AL0412	A1E	106	01	ROS/CTD	082604	1054	BO	55 04.92 N	26 29.13 W	GPS	3326	3409	11	1	
07AL0412	A1E	106	01	ROS/CTD	082604	1147	EN	55 04.97 N	26 28.51 W	GPS	3331				
07AL0412	A1E	107	01	ROS/CTD	082604	1446	BE	54 37.92 N	26 10.03 W	GPS	3373				
07AL0412	A1E	107	01	ROS/CTD	082604	1545	BO	54 38.06 N	26 09.46 W	GPS	3386	3475	8	1,3,4,5,6,99	
07AL0412	A1E	107	01	ROS/CTD	082604	1635	EN	54 38.14 N	26 09.07 W	GPS	3393				
07AL0412	A1E	108	01	ROS/CTD	082604	1934	BE	54 09.98 N	25 50.11 W	GPS	2999				
07AL0412	A1E	108	01	ROS/CTD	082604	2028	BO	54 09.86 N	25 49.44 W	GPS	2939	3098	9	1	
07AL0412	A1E	108	01	ROS/CTD	082604	2115	EN	54 09.69 N	25 48.76 W	GPS	2962				
07AL0412	A1E	109	01	ROS/CTD	082704	0017	BE	53 38.85 N	25 24.76 W	GPS	3502				
07AL0412	A1E	109	01	ROS/CTD	082704	0132	BO	53 37.52 N	25 21.58 W	GPS	3507	3609	14	1,3,4,5,6,99	
07AL0412	A1E	109	01	ROS/CTD	082704	0239	EN	53 36.64 N	25 19.45 W	GPS	3542				
07AL0412	A1E	110	01	ROS/CTD	082704	0448	BE	53 27.93 N	24 39.86 W	GPS	3511				
07AL0412	A1E	110	01	ROS/CTD	082704	0605	BO	53 27.00 N	24 38.44 W	GPS	3501	3586	13	1	due to salinity
07AL0412	A1E	110	01	ROS/CTD	082704	0702	EN	53 26.33 N	24 37.31 W	GPS	9999				problems a new cast
07AL0412	A1E	110	02	ROS/CTD	082704	0756	BE	53 27.90 N	24 39.85 W	GPS	3511				
07AL0412	A1E	110	02	ROS/CTD	082704	0901	BO	53 27.08 N	24 38.32 W	GPS	3494	3592	8	1	
07AL0412	A1E	110	02	ROS/CTD	082704	0959	EN	53 26.53 N	24 36.87 W	GPS	3484				
07AL0412	A1E	111	01	ROS/CTD	082704	1231	BE	53 16.49 N	23 54.82 W	GPS	3673				cast aborted
07AL0412	A1E	111	02	ROS/CTD	082704	1239	BE	53 16.50 N	23 54.69 W	GPS	3669				
07AL0412	A1E	111	02	ROS/CTD	082704	1344	BO	53 16.69 N	23 53.36 W	GPS	3602	3745	8	1	
07AL0412	A1E	111	02	ROS/CTD	082704	1441	EN	53 16.84 N	23 52.20 W	GPS	3610				
07AL0412	A1E	112	01	ROS/CTD	082704	1718	BE	53 04.91 N	23 09.70 W	GPS	3814				
07AL0412	A1E	112	01	ROS/CTD	082704	1839	BO	53 04.08 N	23 07.29 W	GPS	3829	3939	9	1,3,4,5,6,99	
07AL0412	A1E	112	01	ROS/CTD	082704	1949	EN	53 03.32 N	23 05.57 W	GPS	3893				

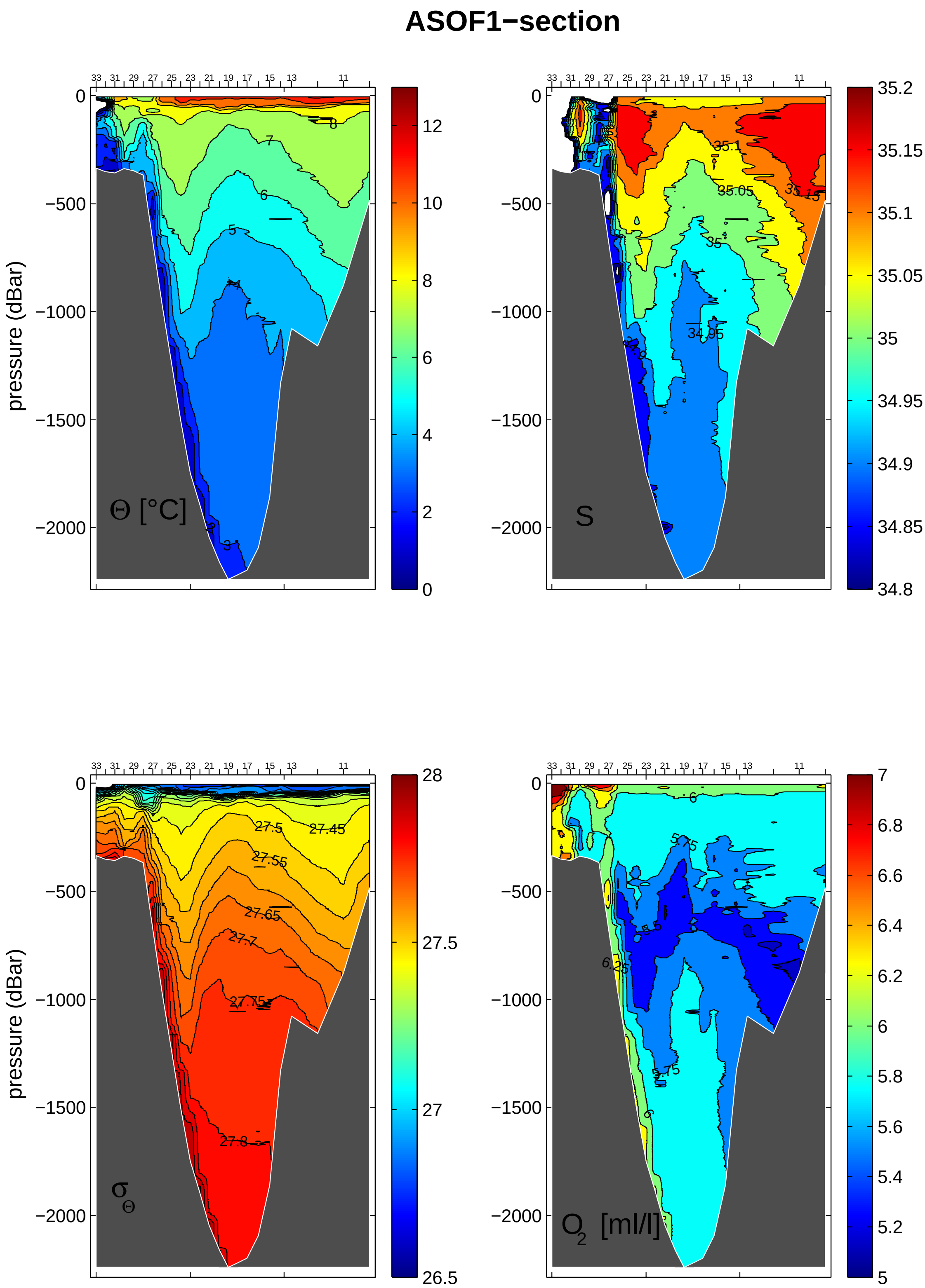
07AL0412	A1E	113	01	ROS/CTD	082704	2222	BE	52 52.00 N	22 24.98 W	GPS	3970				
07AL0412	A1E	113	01	ROS/CTD	082704	2333	BO	52 52.27 N	22 24.03 W	GPS	3945	4086	11	1	
07AL0412	A1E	113	01	ROS/CTD	082804	0037	EN	52 52.56 N	22 22.95 W	GPS	3954				
07AL0412	A1E	114	01	ROS/CTD	082804	0324	BE	52 40.00 N	21 39.74 W	GPS	3932				
07AL0412	A1E	114	01	ROS/CTD	082804	0455	BO	52 41.06 N	21 36.26 W	GPS	3923	4067	12	1	
07AL0412	A1E	114	01	ROS/CTD	082804	0614	EN	52 42.00 N	21 32.68 W	GPS	3839				
07AL0412	A1E	115	01	ROS/CTD	082804	0838	BE	52 30.00 N	20 54.79 W	GPS	3690				
07AL0412	A1E	115	01	ROS/CTD	082804	1013	BO	52 30.40 N	20 49.50 W	GPS	3660	3504	~250	1,3,4,5,6,99	
07AL0412	A1E	115	01	ROS/CTD	082804	1135	EN	52 30.31 N	20 44.52 W	GPS	3693				
07AL0412	A1E	116	01	ROS/CTD	082804	1318	BE	52 19.81 N	20 19.90 W	GPS	3751				
07AL0412	A1E	116	01	ROS/CTD	082804	1425	BO	52 18.98 N	20 17.10 W	GPS	3784	3901	14	1,3,4,5,6,99	
07AL0412	A1E	116	01	ROS/CTD	082804	1533	EN	52 18.31 N	20 15.03 W	GPS	3782				
07AL0412	A1E	117	01	ROS/CTD	082804	1839	BE	52 20.02 N	19 19.72 W	GPS	3608				
07AL0412	A1E	117	01	ROS/CTD	082804	1950	BO	52 20.20 N	19 16.64 W	GPS	3740	3728	13	1,3,4,5,6,99	
07AL0412	A1E	117	01	ROS/CTD	082804	2101	EN	52 20.20 N	19 13.34 W	GPS	3701				
07AL0412	A1E	118	01	ROS/CTD	082804	2343	BE	52 19.82 N	18 25.28 W	GPS	4241				
07AL0412	A1E	118	01	ROS/CTD	082904	0053	BO	52 19.46 N	18 22.98 W	GPS	4247	4390	10	1	
07AL0412	A1E	118	01	ROS/CTD	082904	0204	EN	52 19.14 N	18 20.45 W	GPS	4245				
07AL0412	A1E	119	01	ROS/CTD	082904	0501	BE	52 19.93 N	17 29.84 W	GPS	3983				
07AL0412	A1E	119	01	ROS/CTD	082904	0613	BO	52 19.18 N	17 27.62 W	GPS	4099	4186	13	1,3,4,5,6,99	
07AL0412	A1E	119	01	ROS/CTD	082904	0727	EN	52 18.62 N	17 25.55 W	GPS	4144				
07AL0412	A1E	120	01	ROS/CTD	082904	1033	BE	52 19.87 N	16 35.07 W	GPS	3579				
07AL0412	A1E	120	01	ROS/CTD	082904	1129	BO	52 19.51 N	16 34.06 W	GPS	3563	3683	13	1,3,4,5,6,99	
07AL0412	A1E	120	01	ROS/CTD	082904	1229	EN	52 19.18 N	16 33.14 W	GPS	3558				
07AL0412	A1E	121	01	ROS/CTD	082904	1526	BE	52 20.12 N	15 49.64 W	GPS	3223				
07AL0412	A1E	121	01	ROS/CTD	082904	1618	BO	52 20.07 N	15 48.90 W	GPS	3217	3325	12	1,3,4,5,6,99	
07AL0412	A1E	121	01	ROS/CTD	082904	1710	EN	52 19.93 N	15 47.62 W	GPS	3213				
07AL0412	A1E	122	01	ROS/CTD	082904	1826	BE	52 19.96 N	15 30.05 W	GPS	2746				winch problems stopped at 500m
07AL0412	A1E	122	01	ROS/CTD	082904	1912	EN	52 19.65 N	15 29.72 W	GPS	2722				new cast.
07AL0412	A1E	122	02	ROS/CTD	082904	2322	BE	52 19.95 N	15 29.53 W	GPS	2689				
07AL0412	A1E	122	02	ROS/CTD	083004	0012	BO	52 19.60 N	15 28.52 W	GPS	2576	2723	13	1	
07AL0412	A1E	122	02	ROS/CTD	083004	0057	EN	52 19.26 N	15 27.63 W	GPS	2476				

07AL0412	A1E	123	01	ROS/CTD	083004	0208	BE	52 19.91 N	15 12.81 W	GPS	1236			
07AL0412	A1E	123	01	ROS/CTD	083004	0232	BO	52 19.62 N	15 12.47 W	GPS	1218	1251	8	1,3,4,5,6,99
07AL0412	A1E	123	01	ROS/CTD	083004	0254	EN	52 19.37 N	15 12.17 W	GPS	1204			
07AL0412	A1E	124	01	ROS/CTD	083004	0404	BE	52 19.81 N	14 55.97 W	GPS	827			
07AL0412	A1E	124	01	ROS/CTD	083004	0420	BO	52 19.64 N	14 55.79 W	GPS	824	836	9	1,3,4,5,6,99
07AL0412	A1E	124	01	ROS/CTD	083004	0436	EN	52 19.43 N	14 55.57 W	GPS	818			
07AL0412	A1E	125	01	ROS/CTD	083004	0547	BE	52 19.94 N	14 38.90 W	GPS	404			
07AL0412	A1E	125	01	ROS/CTD	083004	0556	BO	52 19.84 N	14 38.86 W	GPS	403	404	10	1
07AL0412	A1E	125	01	ROS/CTD	083004	0605	EN	52 19.76 N	14 38.77 W	GPS	405			
07AL0412	A1E	126	01	ROS/CTD	083004	0710	BE	52 20.12 N	14 22.03 W	GPS	344			
07AL0412	A1E	126	01	ROS/CTD	083004	0717	BO	52 20.09 N	14 22.07 W	GPS	337	342	10	1
07AL0412	A1E	126	01	ROS/CTD	083004	0723	EN	52 20.07 N	14 22.09 W	GPS	337			
07AL0412	A1E	127	01	ROS/CTD	083004	0829	BE	52 19.91 N	14 05.03 W	GPS	319			
07AL0412	A1E	127	01	ROS/CTD	083004	0836	BO	52 19.90 N	14 05.03 W	GPS	320	9999	9	1
07AL0412	A1E	127	01	ROS/CTD	083004	0841	EN	52 19.88 N	14 05.02 W	GPS	319			
07AL0412	A1E	128	01	ROS/CTD	083004	0947	BE	52 19.83 N	13 48.08 W	GPS	359			
07AL0412	A1E	128	01	ROS/CTD	083004	0955	BO	52 19.73 N	13 48.09 W	GPS	360	360	9	1
07AL0412	A1E	128	01	ROS/CTD	083004	1001	EN	52 19.68 N	13 48.10 W	GPS	359			

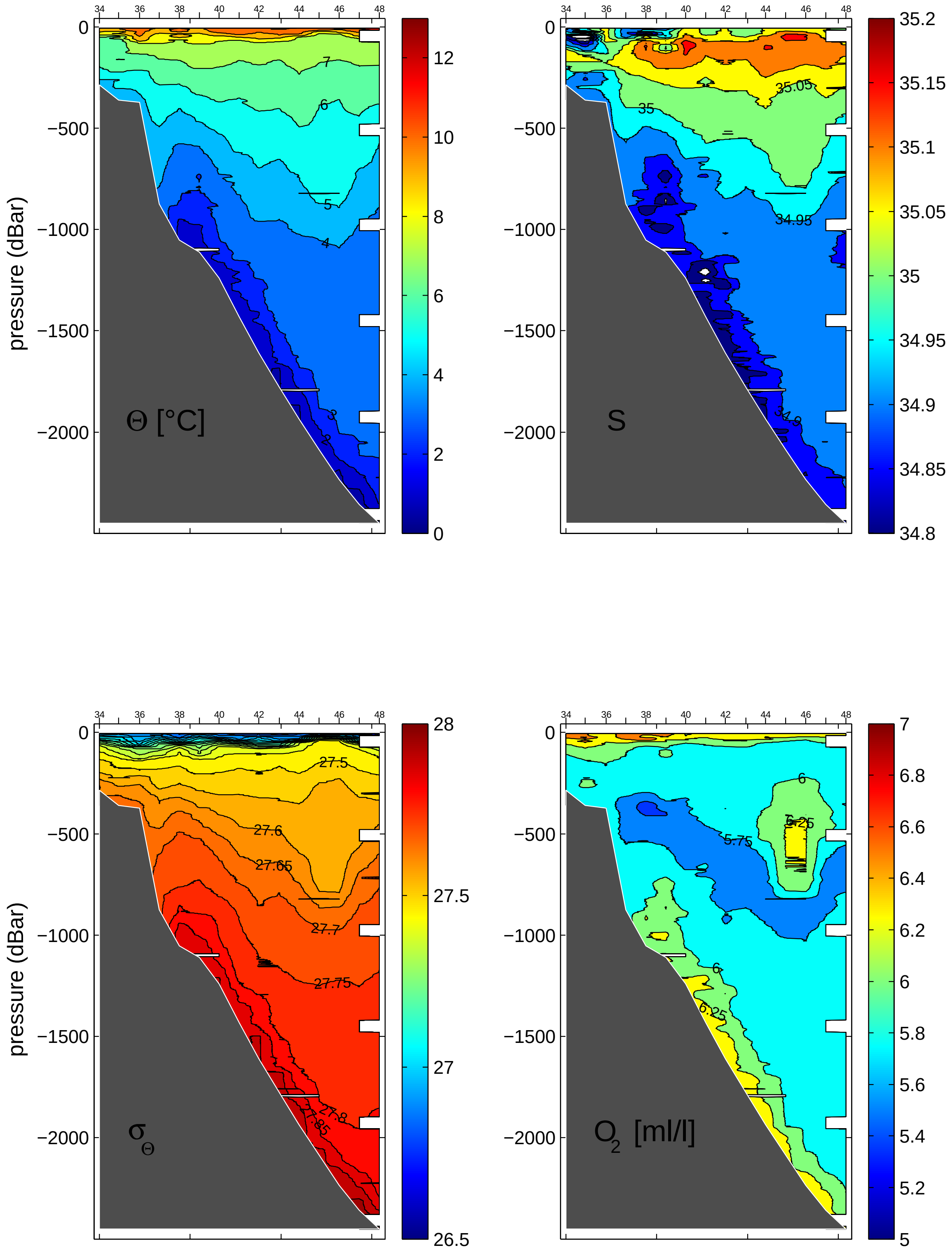
Parameter:

1: Salinity
3: Silicate
4: Nitrate
5: Nitrite
6: Phosphate
98: Trace metals
99: Aluminium (not WOCE standard)

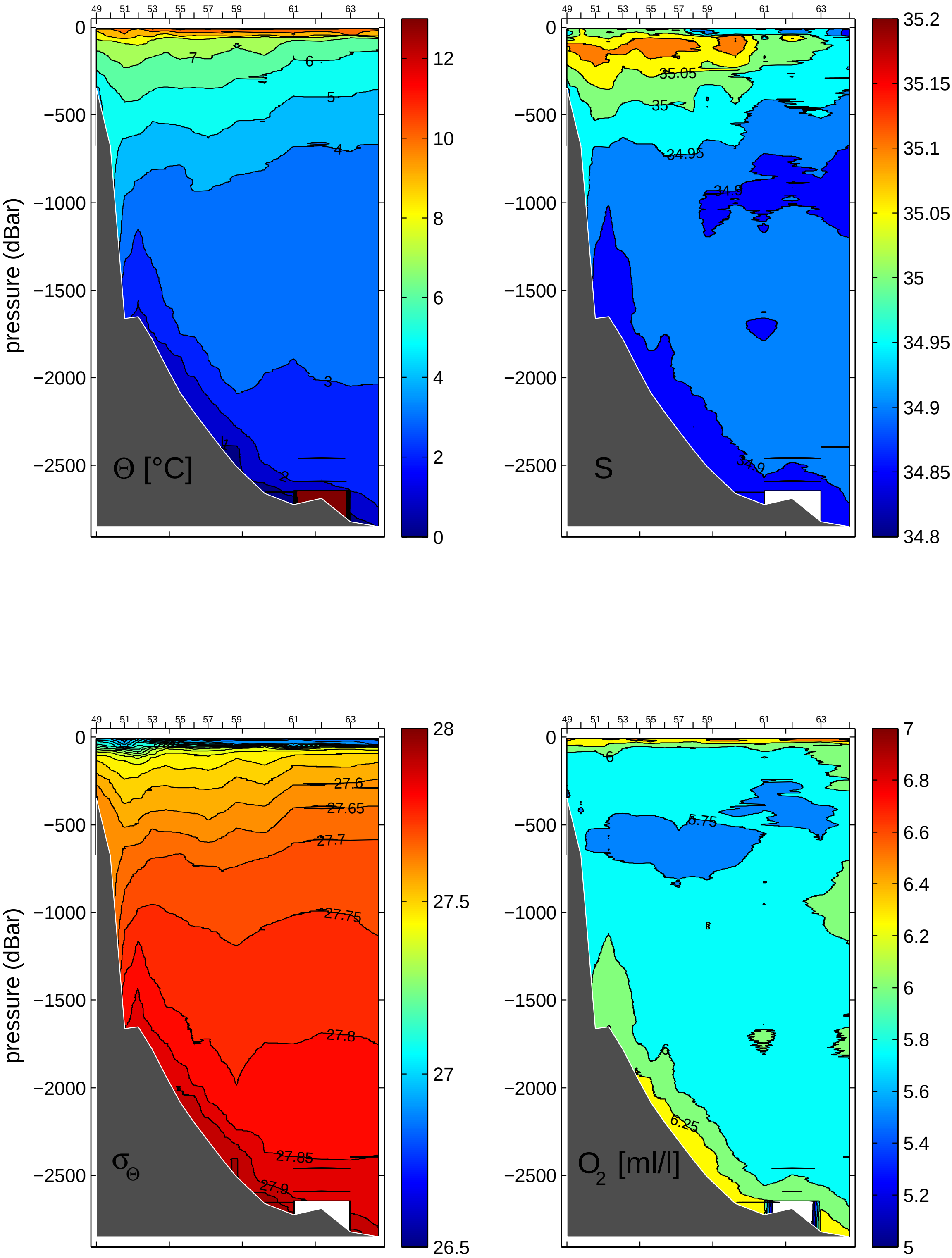
Appendix C: Section plots

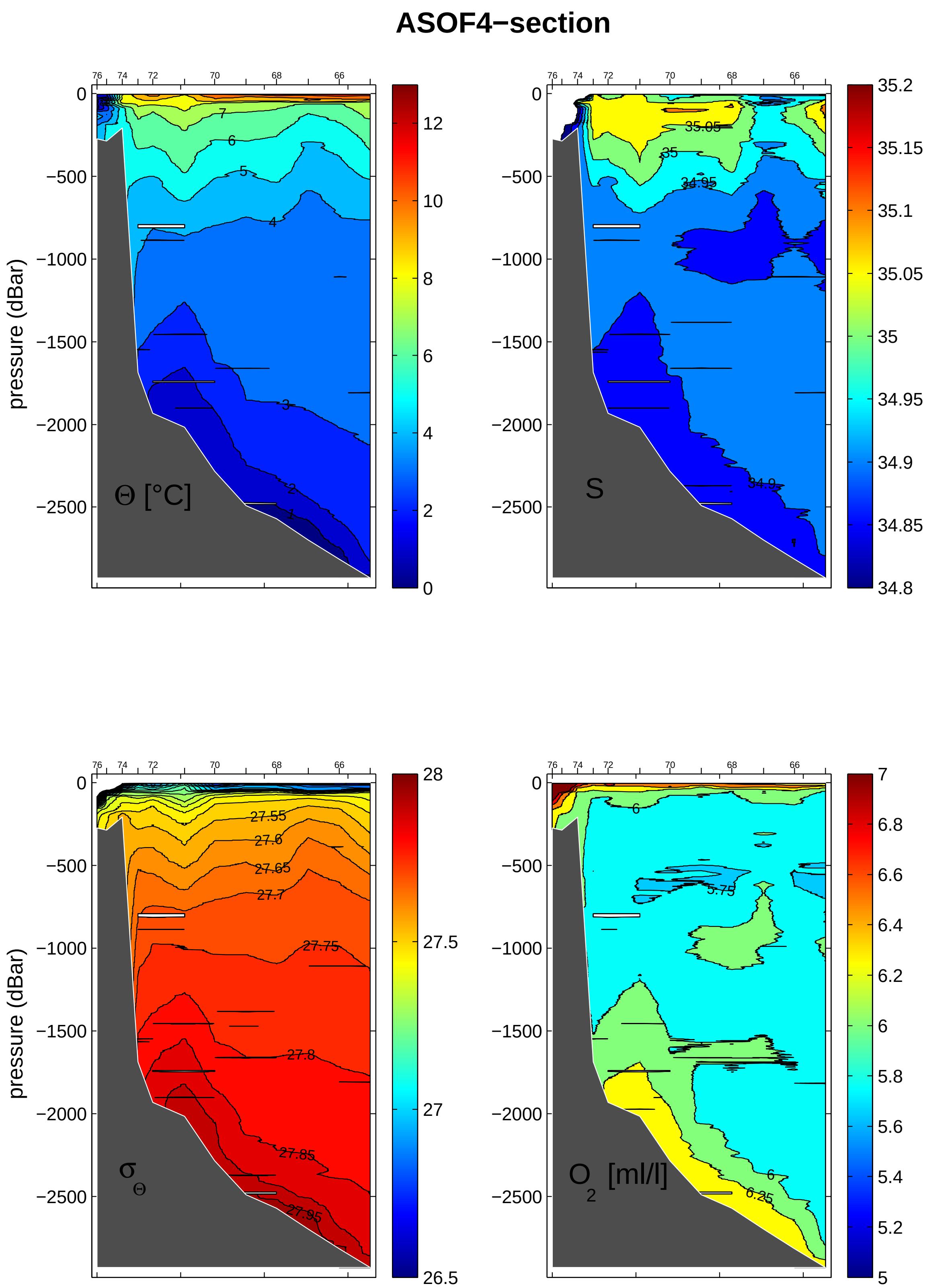


ASOF2−section

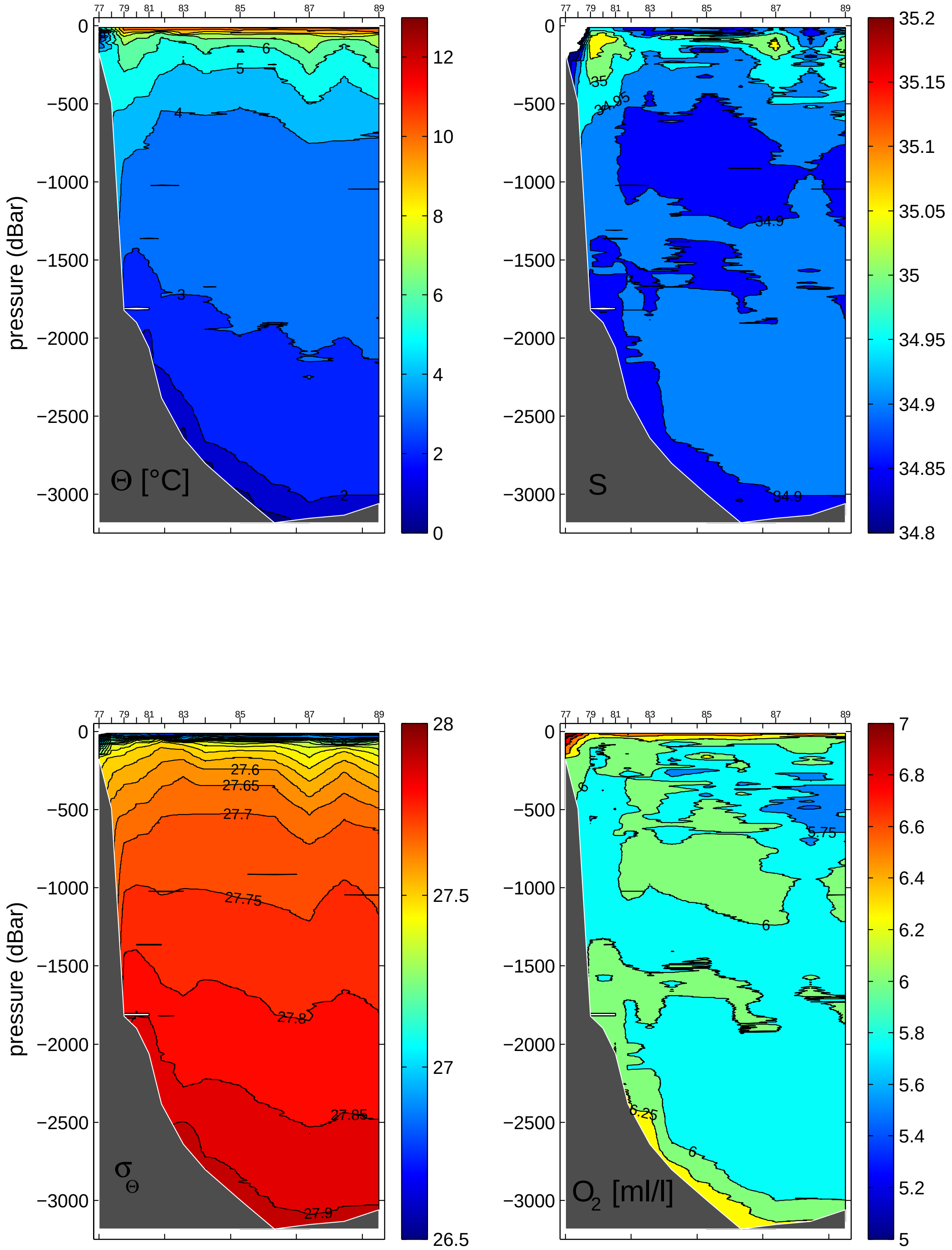


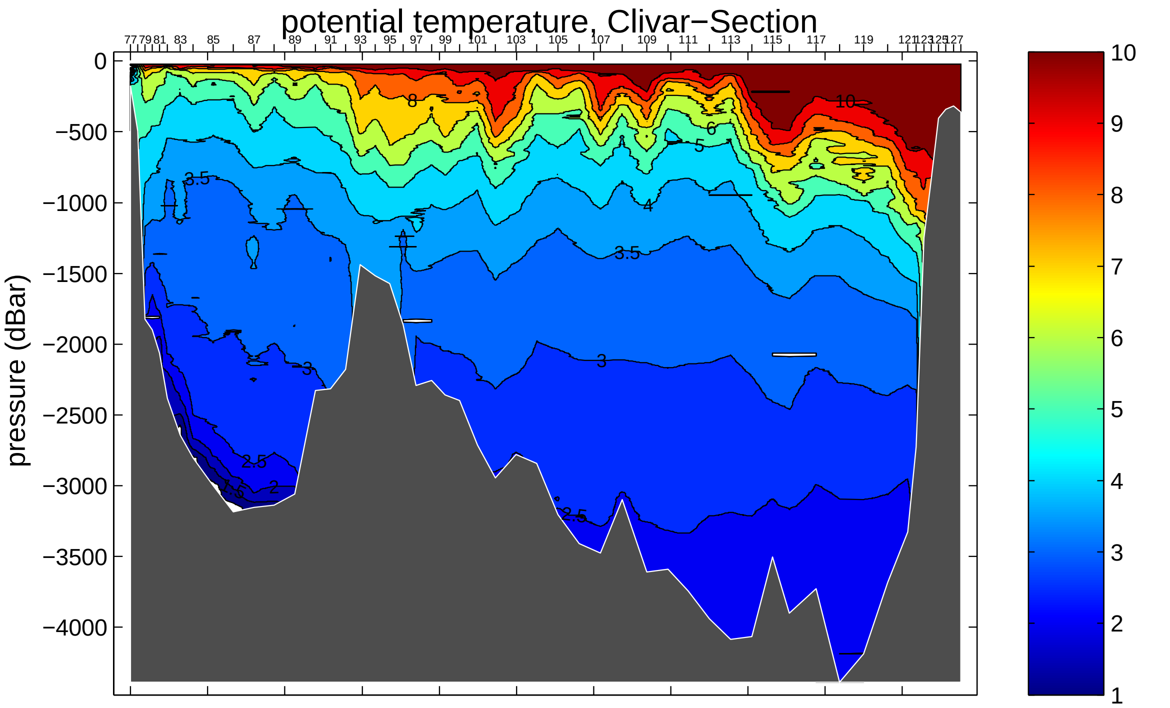
ASOF3−section

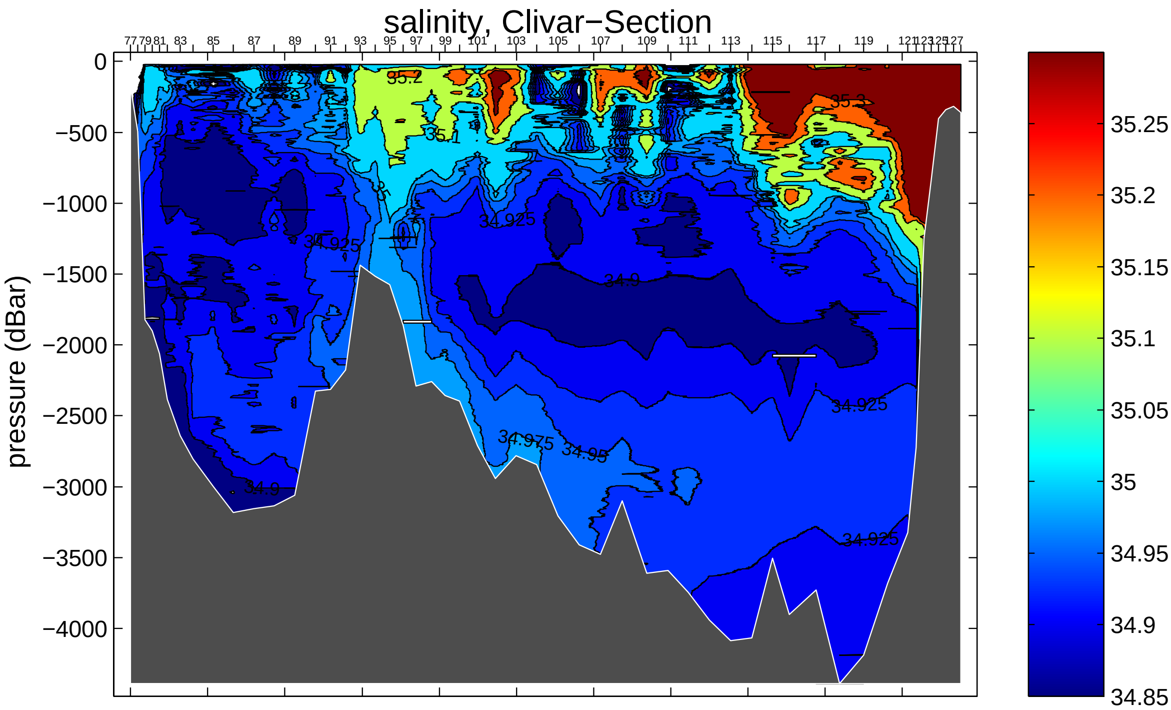


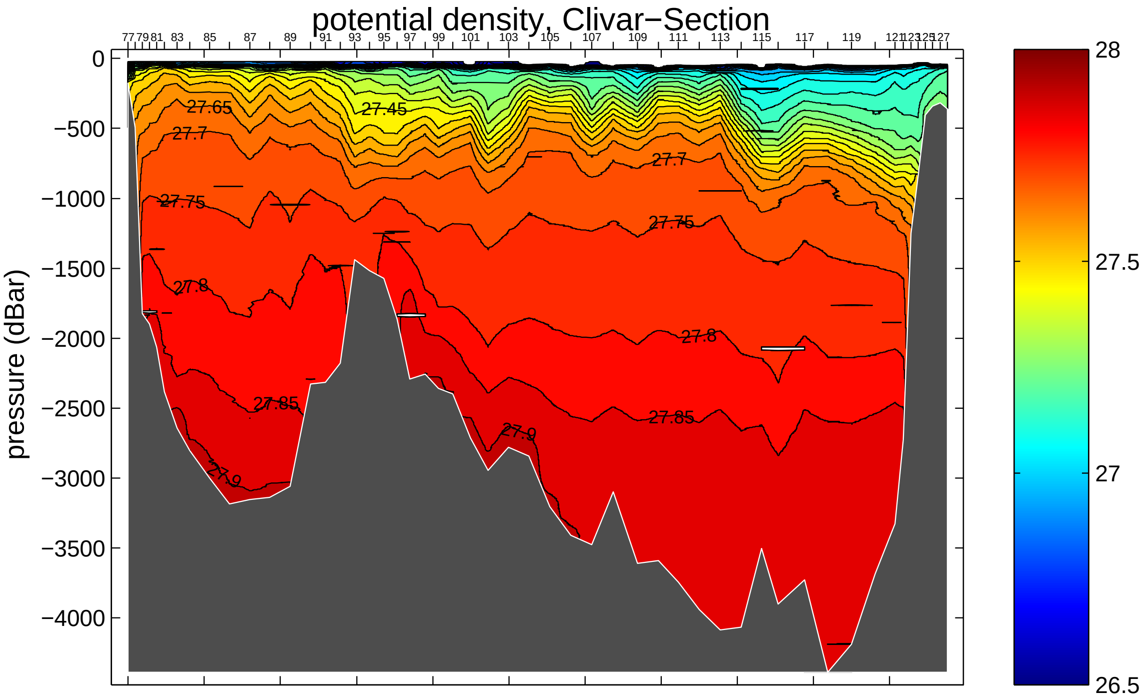

ASOF4−section
76 74 72 70 68 66
pressure (dBar)
0
−500
−1000
−1500
−2000
−2500
Θ [°C]
7
6
5
4
3
2
1
12
10
8
6
4
2
0
S
35.05
35
34.95
34.9
35.2
35.15
35.1
35.05
35
34.95
34.9
34.85
34.8
σ
Θ
27.55
27.6
27.65
27.7
27.75
27.8
27.85
27.95
28
27.5
27
26.5
O
2
[ml/l]
6
5.75
6.25
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5

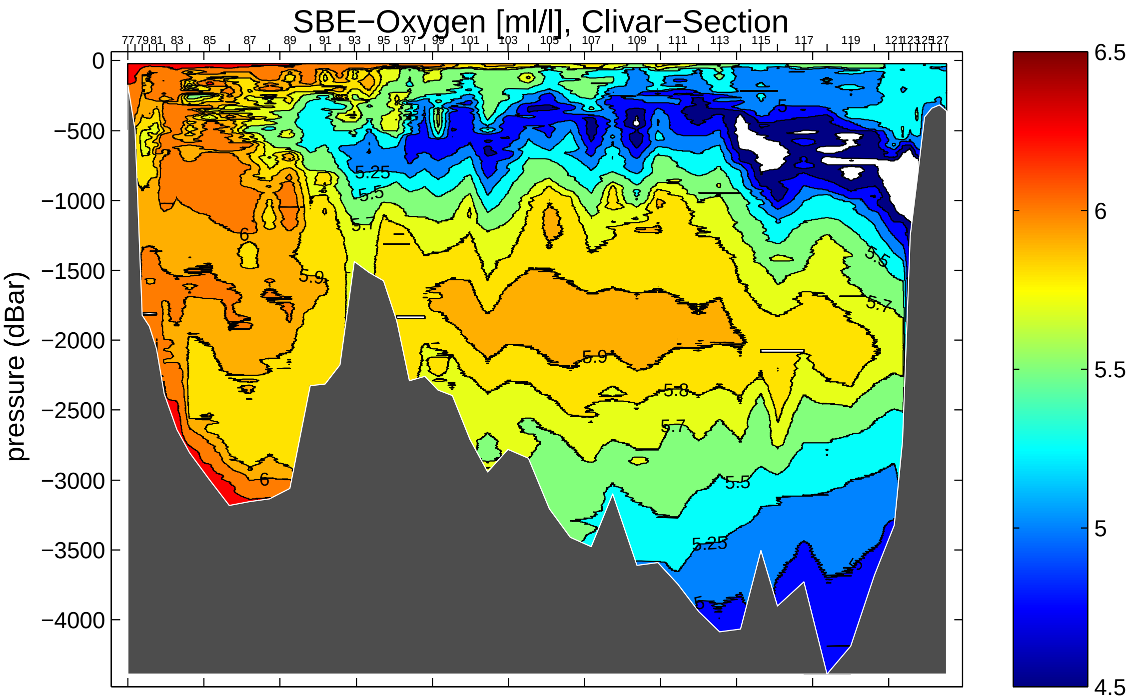
ASOF6−section



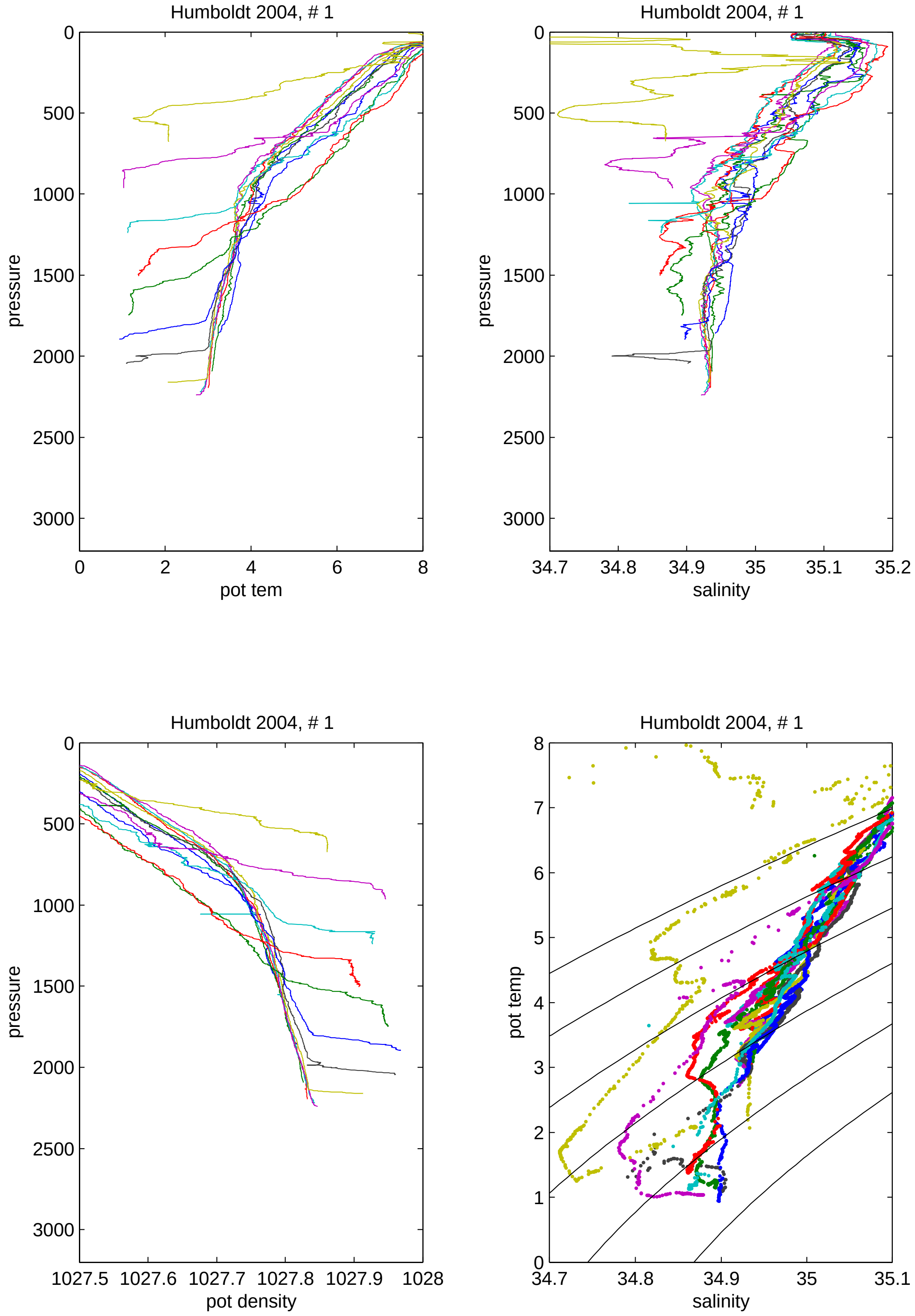

potential temperature, Clivar−Section
pressure (dBar)
0
−500
−1000
−1500
−2000
−2500
−3000
−3500
−4000
10
9
8
7
6
5
4
3
2
1

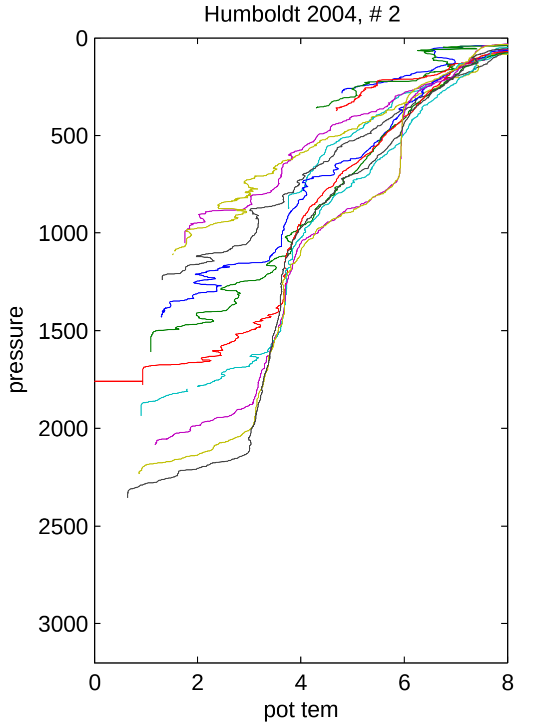

salinity, Clivar−Section
pressure (dBar)
0
−500
−1000
−1500
−2000
−2500
−3000
−3500
−4000
35.25
35.2
35.15
35.1
35.05
35
34.95
34.9
34.85

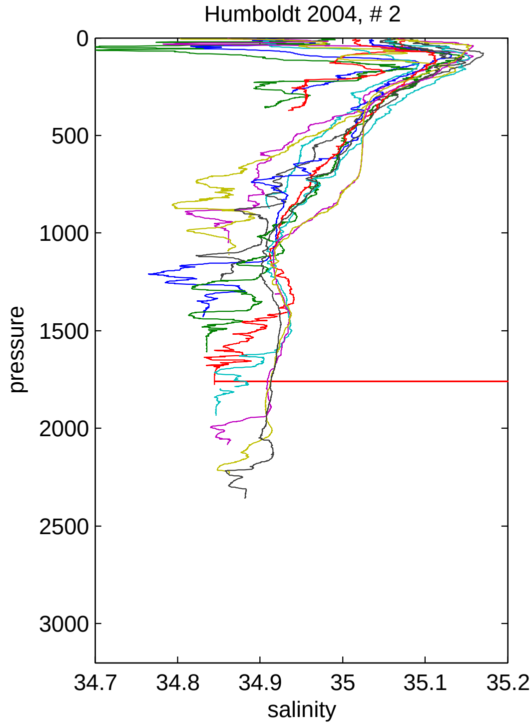

potential density, Clivar−Section
pressure (dBar)
27.65
27.45
27.7
27.75
27.8
27.85
27.9
28
27.5
27
26.5

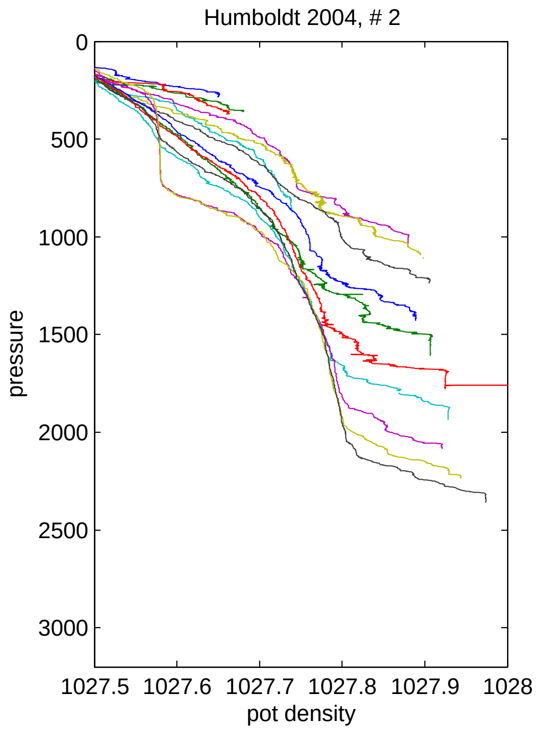

SBE−Oxygen [ml/l], Clivar−Section
pressure (dBar)
5.25
5.5
5.9
5.8
5.7
6
6.5
5

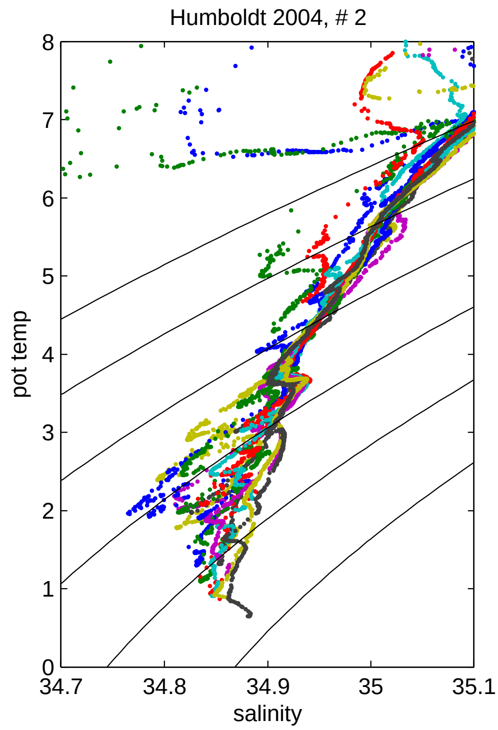
Appendix D: Profile and Theta-S plots ASOF sections

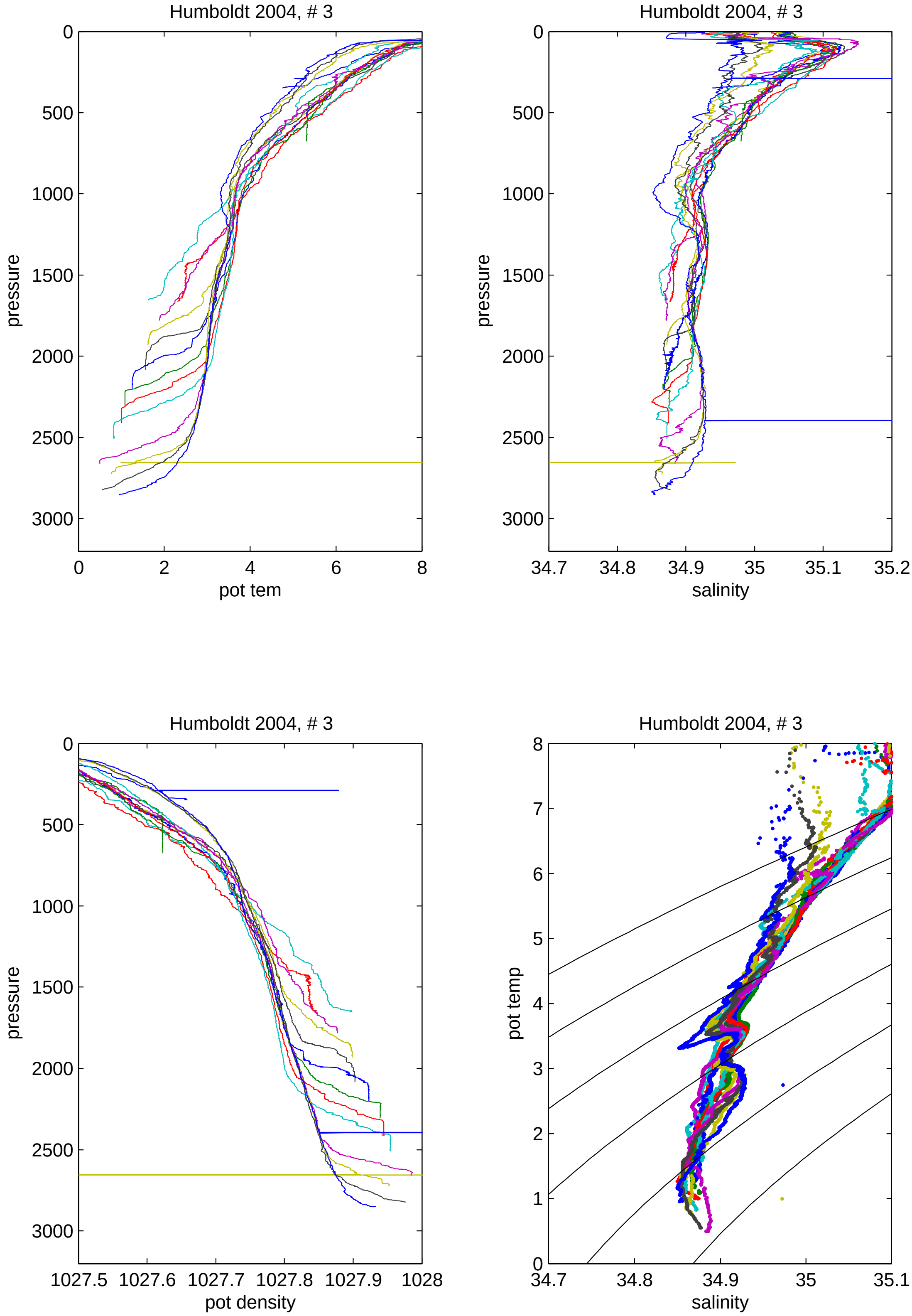



Humboldt 2004, # 2
pressure
0
500
1000
1500
2000
2500
3000
0
2
4
6
8
pot tem

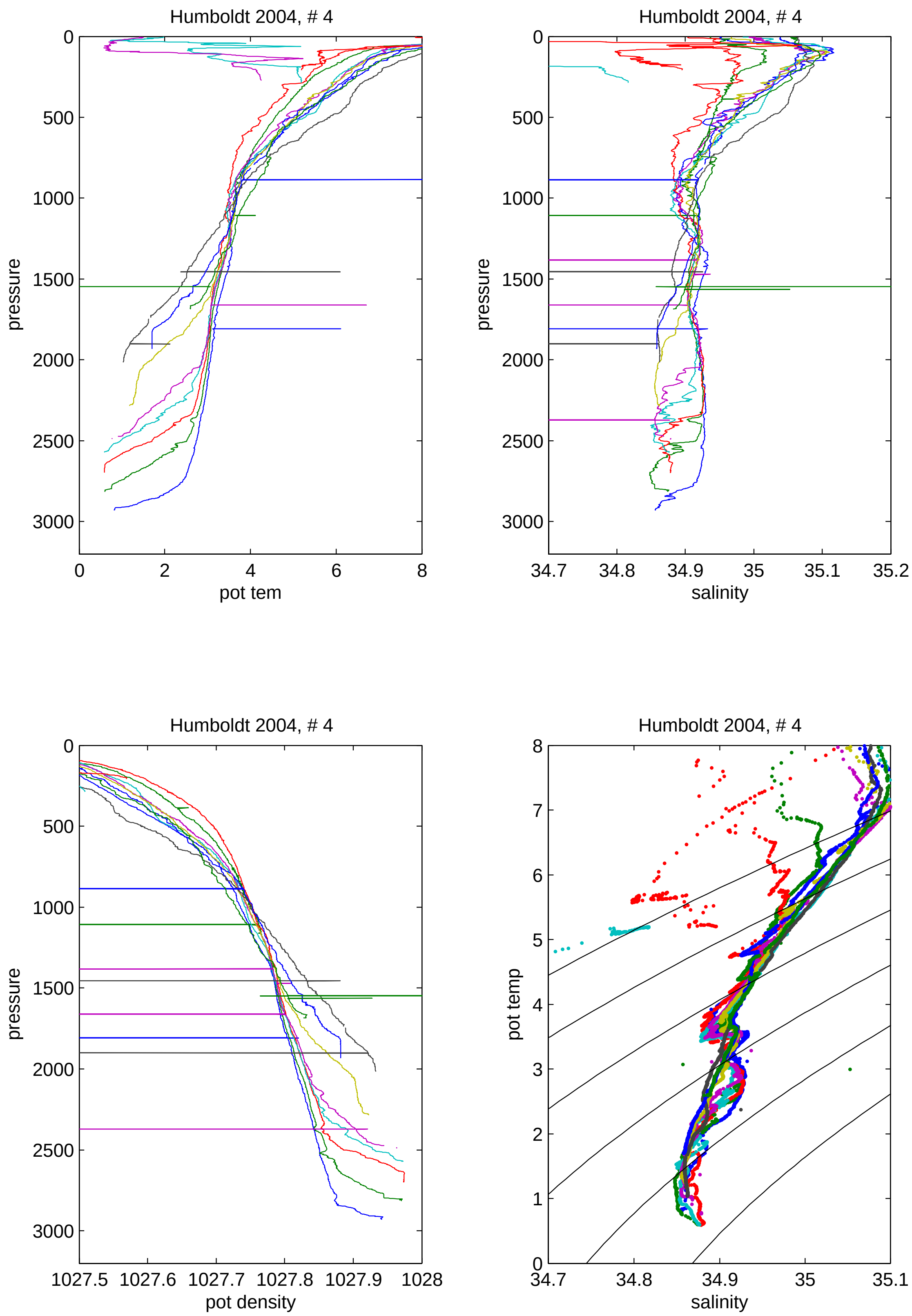

Humboldt 2004, # 2
pressure
0
500
1000
1500
2000
2500
3000
34.7
34.8
34.9
35
35.1
35.2
salinity

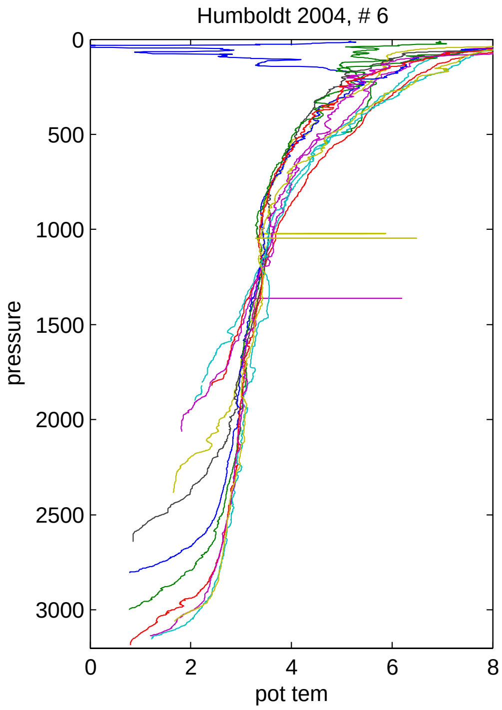

Humboldt 2004, # 2
pressure
0
500
1000
1500
2000
2500
3000
1027.5
1027.6
1027.7
1027.8
1027.9
1028
pot density

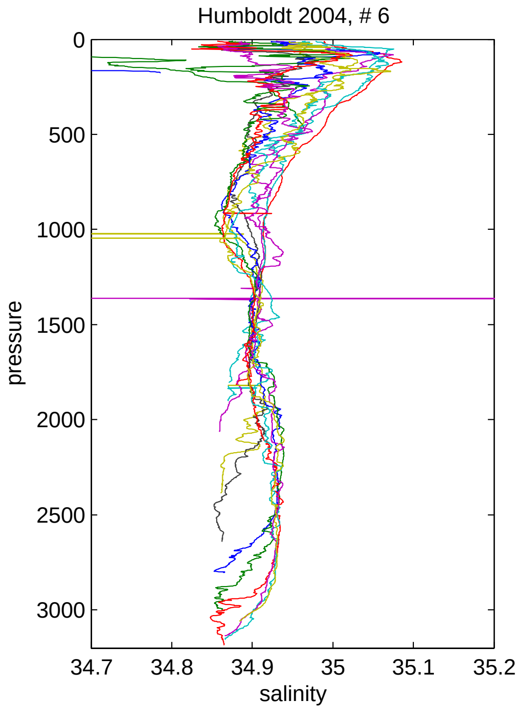

Humboldt 2004, # 2
pot temp
0
1
2
3
4
5
6
7
8
34.7
34.8
34.9
35
35.1
salinity

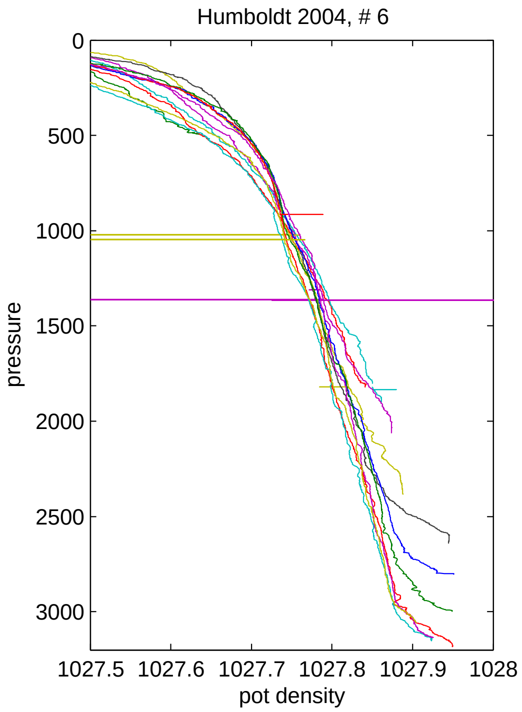


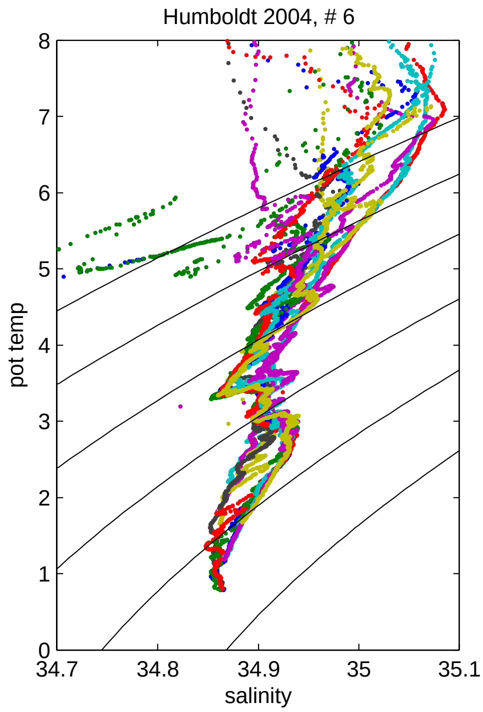
Humboldt 2004, # 3
pressure
pot tem
Humboldt 2004, # 3
pressure
salinity
Humboldt 2004, # 3
pressure
pot density
Humboldt 2004, # 3
pot temp
salinity


Humboldt 2004, # 4
pressure
pot tem
Humboldt 2004, # 4
pressure
salinity
Humboldt 2004, # 4
pressure
pot density
Humboldt 2004, # 4
pot temp
salinity


Humboldt 2004, # 6
pressure
pot tem
0
500
1000
1500
2000
2500
3000
0
2
4
6
8


Humboldt 2004, # 6
pressure
salinity
0
500
1000
1500
2000
2500
3000
34.7
34.8
34.9
35
35.1
35.2


Humboldt 2004, # 6
pressure
pot density
0
500
1000
1500
2000
2500
3000
1027.5
1027.6
1027.7
1027.8
1027.9
1028


Humboldt 2004, # 6
pot temp
salinity
0
1
2
3
4
5
6
7
8
34.7
34.8
34.9
35
35.1

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