ALKOR-Berichte

Student cruise: Observing techniques for Physical Oceanographers

Cruise No. AL578

August 15 – 18, 2022,
Kiel (Germany) – Kiel (Germany)
MNF-PherPraO

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2022

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1 Cruise Summary

1.1 Summary in English

The main purpose of the ALKOR cruise AL578 was the training of students in observational techniques applied by physical oceanographers. The students who participated in the trip attend the module (Measurements Methods of Oceanography) which is offered in the Bachelor program "Physics of the Earth System" at CAU Kiel. During the AL578 the students were instructed in instrument calibration and in the interpretation of measurement data at sea. In addition, the students had the opportunity to learn about working and living at sea and to explore and study the impact of physical processes in the western Baltic Sea. The observations show a quasi-synoptic picture of the hydrography and currents in the western Baltic Sea. Twice-repeated hydrographic and current sections across the Fehmarn Belt usually show well the short time scales where significant changes occur. A zonal section along the deepest topography, from about 010°40' E to 013°30' E, shows very nicely the two-layer system of outflowing low salinity and inflowing North Sea water. A bottom shield anchorage shows the currents in the water column and the near-bottom temperature and salinity variations in the Fehmarn Belt area.

1.2 Zusammenfassung

Die ALKOR-Reise AL578 diente vorrangig der Ausbildung von Studierenden in Bezug auf Beobachtungsmethoden, die von physikalischen Ozeanographen angewandt werden. Die Studierenden, die an der Reise teilnahmen, belegen das Modul Messmethoden der Ozeanographie, das im Bachelor-Studiengang "Physik des Erdsystems" an der CAU Kiel angeboten wird. Während AL578 wurden die Studierenden in Instrumentenkalibration und in die Interpretation von Messdaten auf See eingewiesen. Zudem bekamen die Studierenden die Möglichkeit, das Arbeiten und Leben auf See kennenzulernen und das Wirken physikalischer Prozesse in der westlichen Ostsee zu erforschen und zu untersuchen. Die Beobachtungen zeigen ein quasi-synoptisches Bild der Hydrographie und der Strömungen in der westlichen Ostsee. Zweimal wiederholte hydrographische und Strömungschnitte über den Fehmarnbelt zeigen üblicherweise gut die kurzen Zeitskalen auf, in denen deutliche Änderungen auftreten können. Ein Zonalschnitt entlang der tiefsten Topographie von etwa 010°40‘ O bis 013°30’ O, zeigt sehr schön das Zwei-Schichten System von ausströmendem, salzarmem Oberflächenwasser und einströmendem, salzreichem Nordseewasser. Eine Bodenschildverankerung zeigt die Strömungen in der Wassersäule und die bodennahen Temperatur- und Salzgehaltsschwankungen im Bereich des Fehmarnbelts.

2 Participants

2.1 Principal Investigators

Name	Institution
Czeschel, Rena, Dr.	GEOMAR

2.2 Scientific Party

Name	Discipline	Institution
Czeschel, Rena, Dr.	Physical Oceanography	GEOMAR
Körner, Mareike	Physical Oceanography	GEOMAR
Roch, Marisa	Physical Oceanography	GEOMAR
Witt, René	Technician	GEOMAR
Angerer, Jakob	Student	CAU
Born, Kim Sarina	Student	CAU
Fiedler, Sam Benedikt	Student	CAU
Gebhardt, Hannah	Student	CAU
Glüsen, Lasse Alexander	Student	CAU
Günther, Solveigh	Student	CAU
Kampmann, Anna	Student	CAU
Knaack, Carmen	Student	CAU
Könecke, Finn	Student	CAU
Schampera, Mika	Student	CAU
Waitzmann, Daniel	Student	CAU
Werner, Julius	Student	CAU

2.3 Participating Institutions

GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
CAU Christian-Albrechts-Universität zu Kiel

3 Research Program

3.1 Description of the Work Area

The cruise operated in the western Baltic region, eastern boundary of Kiel Bay and as far east as the Arkona Basin. During the cruise the Fehmarn Belt, which is key region for the water exchange for the Baltic Sea, was surveyed twice to capture short term variability at the section. One additional survey was done at another gateway, the Kadetrinne. Moreover, a survey along a zonal section, following roughly the deepest topography is done to capture the west (upper layer) and east (lower layer) propagations of the outflowing low salinity and inflowing North Sea water.

3.2 Aims of the Cruise

The main purpose of the ALKOR cruise AL578 was the training of students in observational methods of physical oceanographers. Undergraduate students in the Bachelor program ”Physik des Erdsystems” at the CAU Kiel are introduced into modern observational techniques in physical oceanography, including instrument calibration and interpretation of observations. The course (MNF-PherPraO) is part of the ”Messmethoden und Feldpraktikum Ozeanographie” lecture. The cruise will give the students an opportunity to experience the work and life at sea and also to explore and investigate physical oceanography processes in the western Baltic Sea. The scientific motivation of the cruise is to obtain a rather synoptic picture of the hydrography and water movement in the western Baltic.

3.3 Agenda of the Cruise

The cruise operated along a zonal section that starts slightly west of the Fehmarn Belt and leads over the Kadetrinne to the Arkona Basin (Fig. 3.1). This section was intended to provide the base for a description of the vertical structure of the western Baltic Sea. In particular it nicely shows the decreasing influence of North Sea water towards the eastern Baltic proper. The second section is crossing the Fehmarn Belt perpendicular to the topography. This section was carried out at the beginning and at the end of the cruise and the intention is to show the high temporal variability of stratification in the region. During AL578 a third section, crossing the Kadetrinne, was carried out once.

The work at the different stations should mimic a “real” expedition, including active interactions with the ship’s crew (CTD stations, mooring operations) and staying at least one night at sea. At the eastern exit of the Fehmarn Belt a bottom-shield mooring is installed, located at the periphery of the restricted area “Marienleuchte”. The students participate in recovery or deployment and in the data recovery and sensor handling. The time series are discussed (seasonal cycles etc.).

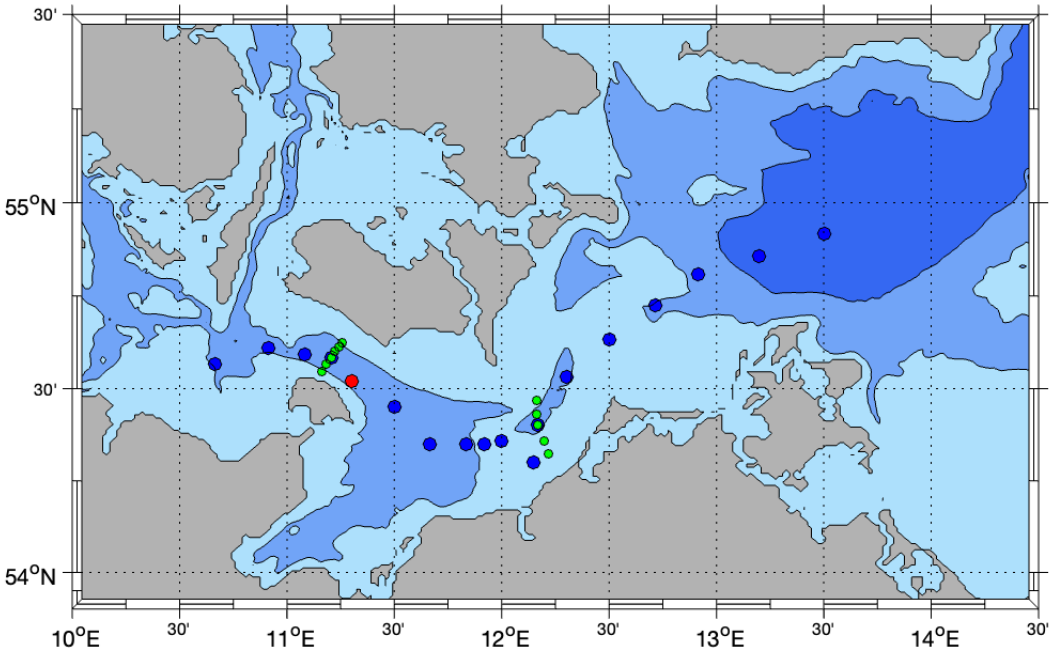


Fig. 3.1 Track chart of R/V ALKOR Cruise AL578. CTD stations along the zonal section (big blue dots) and the strait along the Fehmarn Belt and the Kadetrinne (green dots). The red dot marks the position of the bottom shield mooring at the southern exit of the Fehmarn Belt.

4 Narrative of the Cruise

The ALKOR left for cruise AL578 from Westufer pier on Monday 15. August 2022 at 08:00 (LT). A safety training was held at 08:15 were the 1st Officer Oliver Sauerland introduced the scientific party to the facilities on ALKOR in general and the safety features in particular. TSG and ships ADCP (600kHz) were switched on shortly after.

At 10:47 the first test station (part of the L-section) was acquired, all systems were running well. We approached the Fehmarn Belt after two more CTD stations on the L-section and did the C-section for the first time starting at 14:00. Water sampling from the TSG as well as samples from CTD rosette for later calibration with the salinometer were taken. At 18:00 we started recovery of the mooring at the Sperrgebiet Marienleuchte in very calm seas with perfect visibility. At 18:10 the pop-up element was recovered and at 18:20 the whole mooring was on deck. The mooring has been deployed in October 2021 with RV ALKOR. The biofouling on the frame was stronger than during the years before. After the mooring recovery we continued with CTD station work until 21:17. In the night we steamed east to start a westerly course with stations towards the port call in Warnemünde on the 16. August 2022.

Work started again on the 16. August 2022 at 07:00 with a CTD station north of Warnemünde which is part of the L-section (Standard station #15). The weather conditions were still good. We worked our way eastward to the most easterly station of leg 1 and then worked back towards Warnemünde, where we moored at Pier 1 at 14:20. The Beckmann salinometer measurements were started on the 16th August at 10:00 am and continued until 14:00. After the arrival of the second student science crew a safety training was held followed by another CTD introduction.

We left Warnemünde at 08:00 on the 17th August heading northeast for a test CTD (for the new student crew) and a section across the Kadetrinne. Wind was nearly zero and the ocean was very calm. Close to station standard station #19, an ADCP test was carried out with different rope lengths. Then, we worked our station plan up to the northernmost station (Praktikum Station 19) north of Rügen that was finished at 20:52. During night we steamed back west towards the Fehmarn Belt. We started work again on 18. August at 07:00 with the deployment of the V431 mooring (33th deployment). The tripod mooring was lowered with a second release attached over the side close to the seafloor and released. All operations went well. After a CTD cast at the mooring position we did a second occupation of the Fehmarn Belt (C-section) with CTD, which started at 6.10 am and was finished at 8.25. Afterwards we departed for Kiel. The ALKOR was moored at 14:42 at the GEOMAR Westshore pier, which ended a successful AL578 cruise.

5 Preliminary Results

5.1 Conductivity Temperature Depth (CTD) Sonde

(K.S. Born, B. Fiedler, S. Günther, C. Knaack, M. Körner, R. Czeschel)

During AL578 a HydroBios Multi Water Sampler (MWS 622) was used. The sampler is a rosette system with 12 sample bottles and a CTD that hosts additional sensors (oxygen, fluorescence). The rosette is operated via inductive cable and a control unit from the ship’s laboratory. The Software used for CTD Data is Ocean Lab 3.

Preliminary scientific results

The Fehmarn Belt Section – C-Section

The Fehmarn Belt section (also called “C section”) was occupied twice during the cruise, on the 15.08.2022 and on the 18.08.2022, with six CTD casts each (Fig. 5.1). The first occupation (15.08.) took place on a calm day with 9-10 m/s (15-20 kn) wind speed and easterly winds with equally calm days before. The second occupation (18.08.) took place with equally calm winds (8-10 m/s) and also very calm days before (1-5 m/s).

Both sections show warm and fresh water over cold and salty water. The surface temperature shows higher values than the deep water. This is a result from the extreme sunny days with temperature between 17°C at night and around 30°C by day. The interface depth, defined here where the strong salinity gradient is located, is inclined. During the first section the upper layer is deepest in the north (15 m), same for the second occupation. Oxygen and Chlorophyll are both very homogenous for both occupations.

The driving factor for density differences, stratification and the general pattern of the section is salinity. For the first occupation salinity varied from 10 up to 22 g/kg. The pattern resamples the density/stratification. For the second occupation the salinity became lower, the temperature dropped for about 0.5°C to 2°C in the upper 15 m and the oxygen level decreased, too. All that is mirrored by the density which also became lower by the second occupation. There was therefore only a little turbulence regarding the atmospheric-sea relation and the water started to mix again to become the typical two-layer Baltic Sea stratification with cooler fresher water overlayering warm and salty water was one can see between 10 and 15 m.

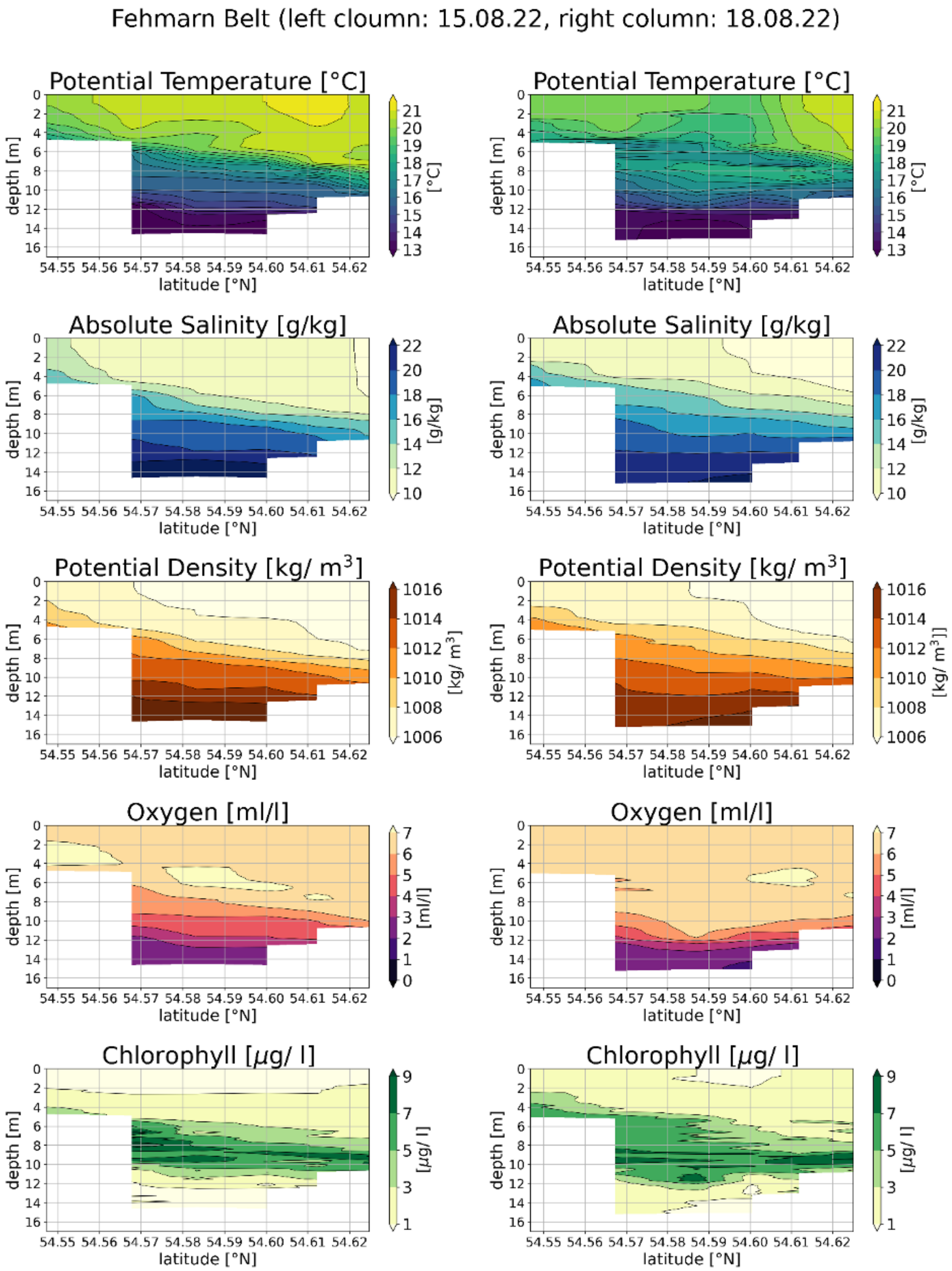


Fig. 5.1 From top to bottom row: potential temperature, absolute salinity, potential density, oxygen and chlorophyll across the Fehmarn Belt during AL578 on 15.08.2022 (left) and 18.08.2022 (right). Values see respective color scales.

The Zonal Section - L-Section

The zonal or "L-Section" was surveyed not strictly consecutive (as the C-Section) but as a composite of stations acquired between the 15th and 18th of August 2022 (Fig. 5.2). During the first day of the cruise the easterly winds were calm 3-5 m/s (6-9 kn) and then turned on the second day and came from the west and became stronger with 5-7 m/s (9-13 kn).

The bottom near spreading of the North Sea can be seen in all properties. The temperature rises again in the Arkona Basin (13°-14°E). The higher salinity values near the bottom in the west also indicate the influence of North Sea water. The rising temperature at the bottom of the Arkona Basin shows again the typical two-layer Baltic Sea stratification.

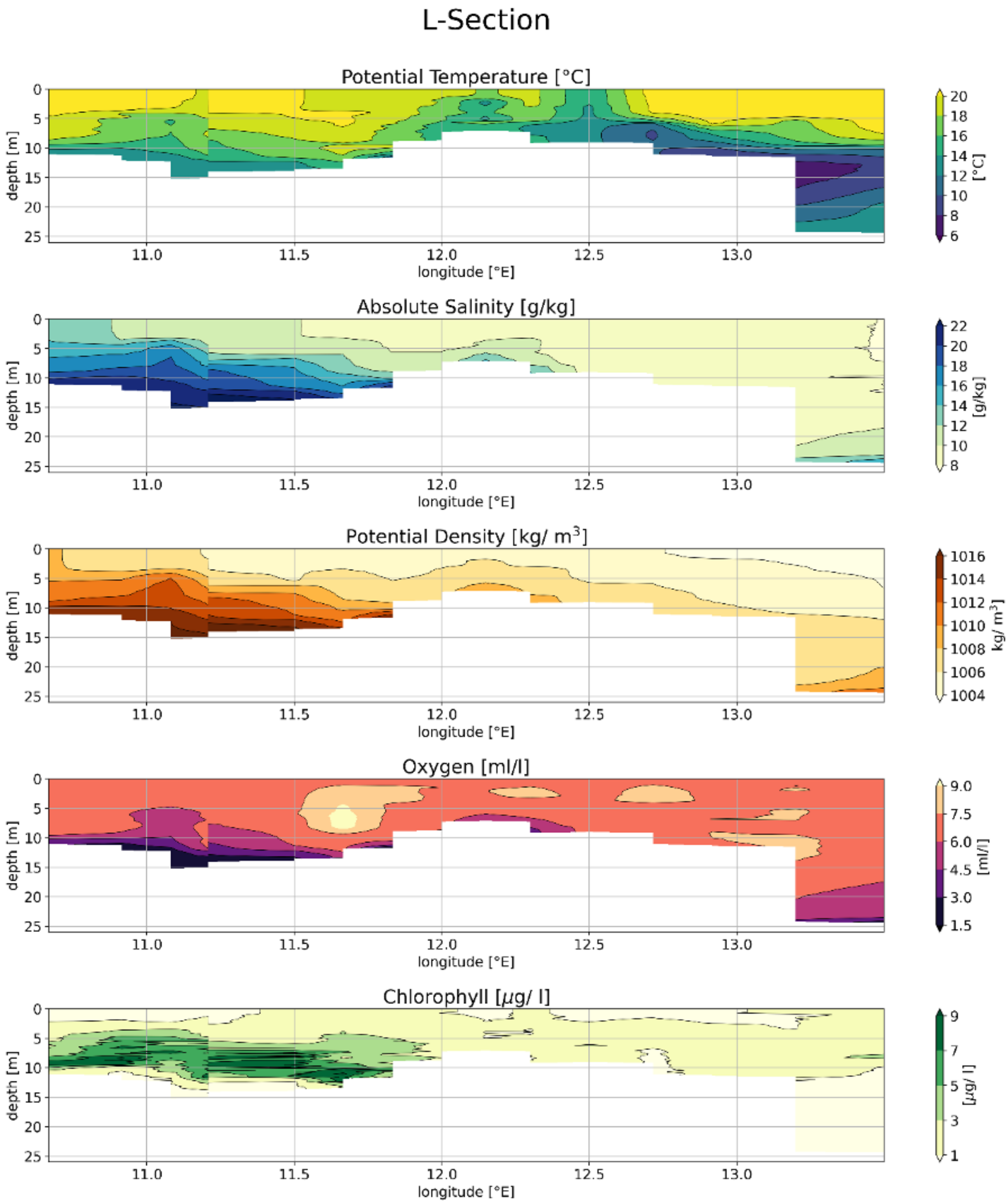


Fig 5.2 *From top to bottom row: potential temperature, absolute salinity, potential density, oxygen and chlorophyll for the zonal section during AL578. Values see respective color scales.*

The gradient in salinity with high values in the west and low values in the east is remarkable as well. The halocline represents a barrier to the exchange of oxygen and nutrients. The oxygen distribution shows the typical oxygen poor bottom water and higher values near the surface.

Kadetrinne

The stations in the Kadetrinne were not approached strictly successively (as for example the C-Section) but as a composition of stations acquired on the 17.08.2022 (Fig. 5.3). The occupation took place on a day with very calm baffling wind with 1-3 m/s (1-5 kn) and temperatures between 17°C and 29°C. This area is extremely shallow with 12 to 28 meter depth. The deepest point the CTD measured was 24 meters.

The potential temperature shows again the spread of the North Sea water. The typical two-layer Baltic Sea stratification with cooler, fresher water overlaying warm and salty water can be seen. The sea surface water had a temperature maximum of 18°C due to the high temperatures and possibly an inflow from the Unterwarnow. This would also explain the low salinity and higher oxygen rate of the water mass. The salinity increases with depth supporting the halocline as well as the oxygen content.

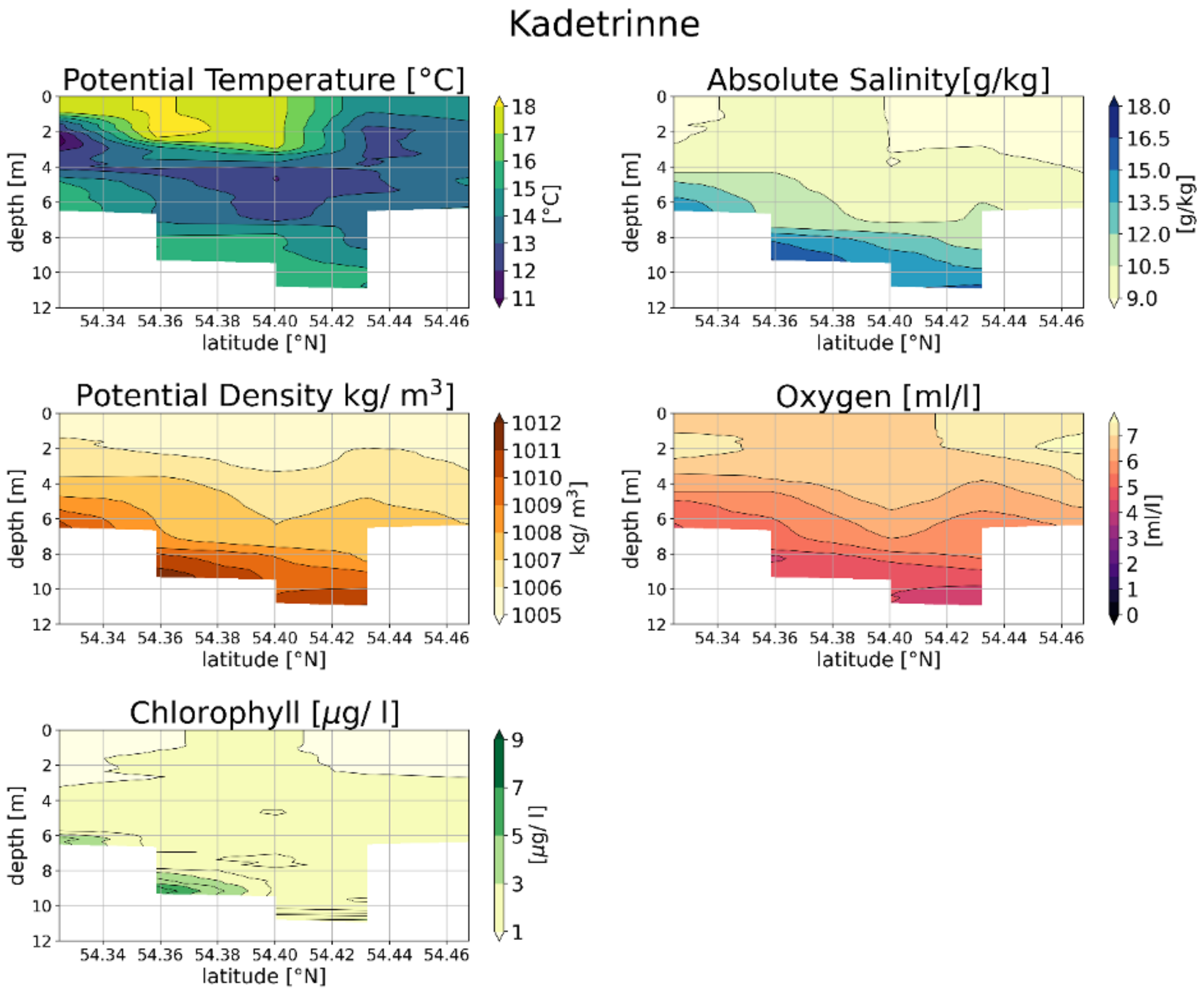


Fig. 5.3 *From top left to bottom right: potential temperature, absolute salinity, potential density, oxygen and chlorophyll along the Kadetrinne during AL578. Values see respective color scales.*

5.2 Underway data D-SHIP

(L. Glüsen, F. Könecke, M. Schampera, D. Waitzmann, M. Körner, R. Czeschel)

The RV ALKOR is equipped with a meteorological sensor package maintained by the Deutsche Wetterdienst (DWD). It consists of sensors for air temperature (PT-100; 1/3 DIN B resolution) and a humidity sensor (voltage reading 0-100mV) both mounted in a Young-cage at 27m, air pressure (0.1 hPa resolution) is mounted underneath the bridge, water temperature (PT-100; 1/3 DIN B resolution) recorded at 3m water depth, wind direction (resolution 2.5°) and speed (resolution 0.3m/s) mounted at top of mast at (29m). The IR- and SW radiation is recorded with Eppley PIR and a Kipp & Zonen CM11, respectively. The Thermosalinograph (TSG) is a SeaBird SBE21 with remote temperature sensor SBE38, a Valeport SV+T Sonde and a Wetlabs ECO-FLRT.

The weather during the cruise was dominated by a rise of air pressure, with the high pressure system over southern Europe gaining influence over the Baltic Sea (Fig. 5.4). The sky remained mostly clear, although the visibility was limited, especially on the 17th in the morning. The sea surface remained very calm.

The large-scale atmospheric pattern is also reflected in the recorded weather observations (Fig. 5.5).

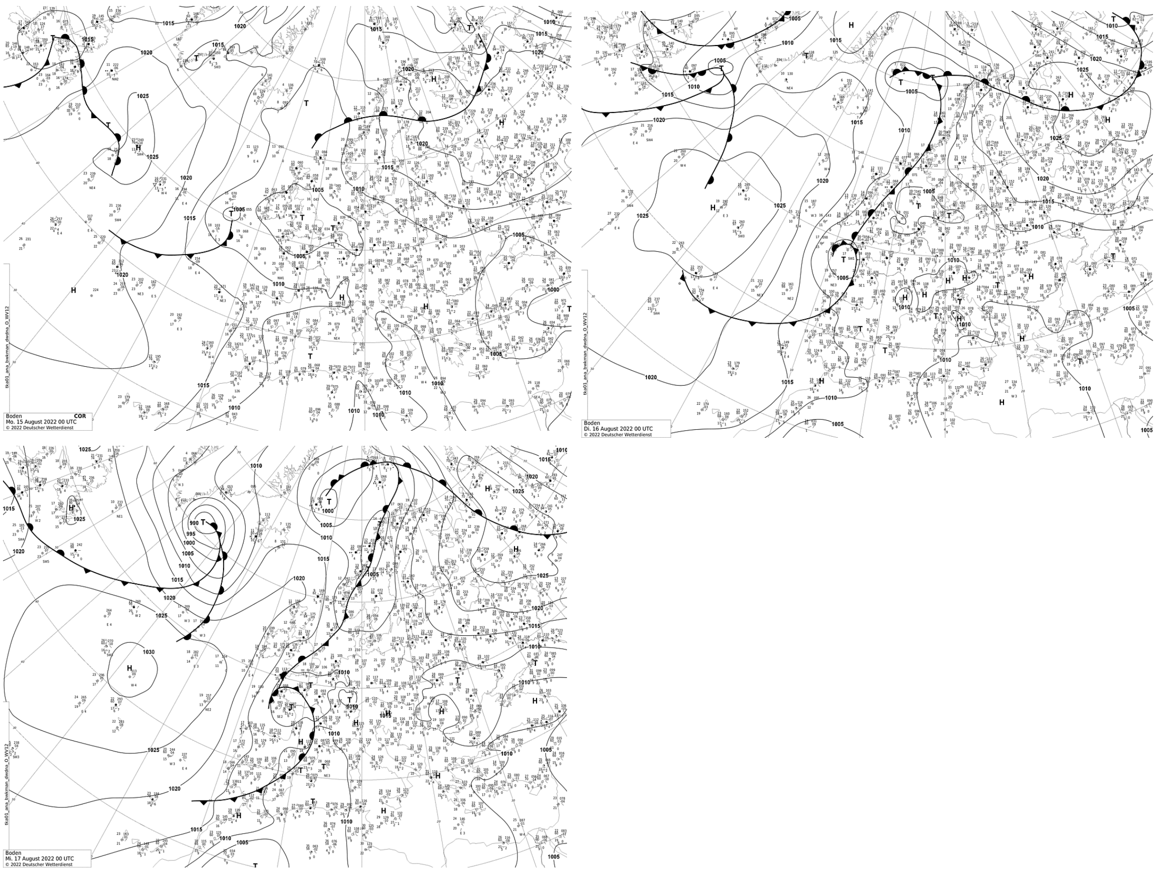


Fig. 5.4 *Surface air pressure and fronts for August 15 (upper left), August 16 (upper right) and August 17 (lower left).*

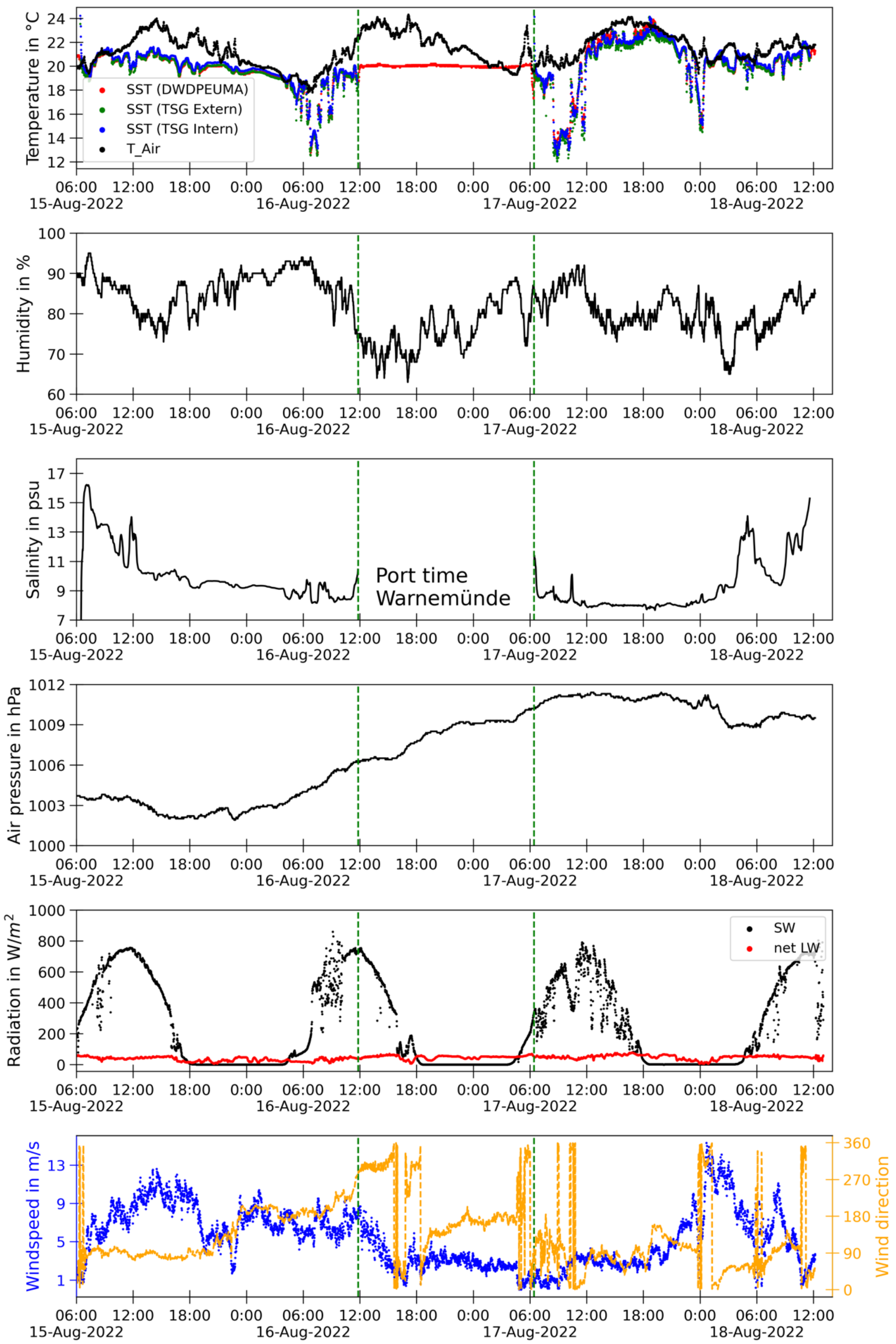


Fig. 5.5: *(from top to bottom) Underway data from AL578 for air and sea surface temperature, relative humidity, salinity, air pressure under the bridge (1) and at sea surface (2), shortwave and net longwave radiation, wind speed and direction. Time in UTC.*

The sea surface temperature (SST) generally oscillated between 18°C and 22°C mostly due to the day and night cycle with three big spikes of 12 °C recorded by the TSG on the 16th 6:00 UTC, on the 17th 10:00 UTC and on the 18th 0:00 UTC. All spikes are located roughly at the same area with the coordinates 54°N 30,0' and 012°E 18,0'. It can also be seen that the water in this area has a minimum in salinity. A possible explanation for these circumstances could be that there was fresher and colder water coming from the east, as another very cold area can be seen from satellite data. Also, cold and fresh water could have come from one of the Bodden south of the Darß sill.

The air temperature stayed relatively constant following the day-night-cycle fluctuating between 18°C and 24°C approaching the SST at night but staying well above during the day.

Cruising eastward the sea surface salinity (SSS) decreased significantly from about 16 psu in Kiel to about 8 psu at the most eastward point of the journey. This shows the decrease of salinity in the Baltic Sea traveling away from the North Sea's influence. On the 15th at 12:00 UTC and on the 18th at 06:00 UTC, when the Fehmarn Belt was surveyed, a spike in SSS was measured.

In the global shortwave radiation one can very clearly see the day-night-cycle of the sun, while the deviations from the curve indicate the influence of clouds. This can be seen especially on the 17th, while the sky on the 15th remained nearly cloud-free. The net longwave radiation remained fairly constant as the water temperature did not change a lot.

The air pressure kept rising through the course of the journey due to the high pressure system over southern Europe displacing the initial low pressure system. On the 18th the pressure dropped a bit due to the low pressure system over Scandinavia moving southwards.

The relative humidity oscillated between 75 and 95% on the 15th and 16th and dropped a bit towards the 17th and 18th, then oscillating 65 and 85%. The humidity also followed the day-night-cycle with higher daytime temperatures inducing lower humidity values and lower temperatures at night leading to higher humidity.

On the 15th the wind came from the east and turned to a southerly wind on the 16th. On the 17th and 18th, the wind direction fluctuated between a northerly and easterly wind, but remained mostly easterly. Generally, wind speeds were quite low, registering winds of around 10 m/s on the 15th then dying down to barely 1 m/s over the next two days. The night between 17th and 18th showed the peak in windspeed with 14 m/s.

5.3 Salinometer and Calibration

(J. Angerer, H. Gebhardt, A. Kampmann, J. Werner, M. Roch, R. Witt)

During the cruise a Beckmann RS10 salinometer was used in order to calibrate the salinity data of the CTD and the Thermosalinograph. Water samples that were taken at every station were placed over night at the laboratory to adapt to room temperature for accuracy reasons. In the beginning of the cruise a large amount of homogenous water was collected as substandard, which was used to calibrate the Beckmann salinometer after six to eight sample measurements. In addition, a calibration with IAPSO standard seawater was performed every day.

Since the measurements with the salinometer are temperature-dependant and the room temperature was not constant, one had to re-determine the temperature frequently in the unit. Before measuring, the salinometer was rinsed two times with each sample and then the salinity was measured at least

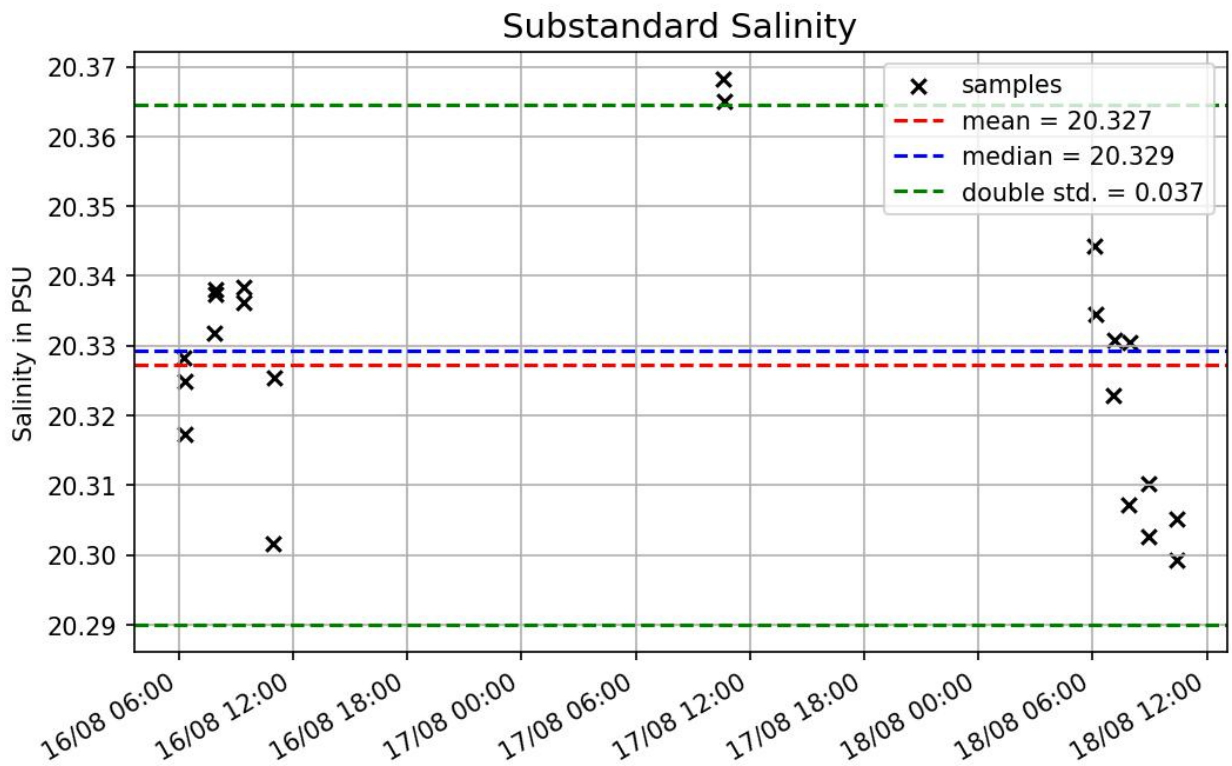


Fig. 5.6: *Substandard salinities in chronological order. The mean (red dotted line), the median (blue dotted line) and the double standard deviation (green dotted line) are plotted. Only those results are shown, which laid within the former double std. deviation (only one value laid outside and therefore was discharged) and have been considered in calculating the new mean/median/double std. shown in the diagram.*

two times to achieve a minimum precision of 0.01. In the following the mean values of each measuring series was used.

Substandard

The substandard salinities as shown in Figure 5.6 provide a mean of 20.327 and a slightly larger median of 20.329. The double standard deviation is 0.037. Calculating the substandard stability correlation coefficient gives a value of -0.25, so no significant temporal trend can be identified.

CTD Samples

For each water probe the salinity difference between CTD measurement and Beckmann results were calculated. When considering every sample, the mean deviation is -0.427 with a double standard deviation of 1.467. After removing the data of one sample whose salinity value was outside the double standard deviation, the mean deviation improved to -0.369 and the double standard deviation to 1.113 (Fig. 5.7). The slope of the linear regression is 0.06 psu per day and the correlation coefficient is 0.08. Therefore, no significant correlation or trend exist.

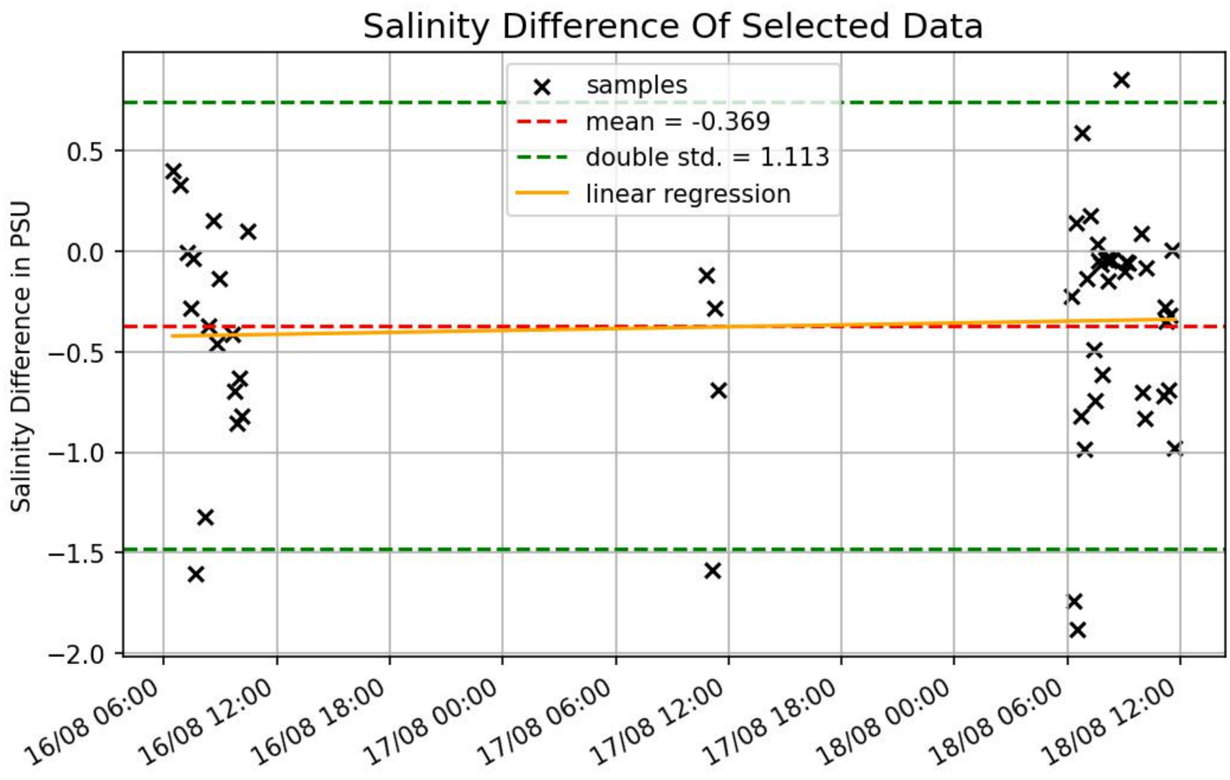
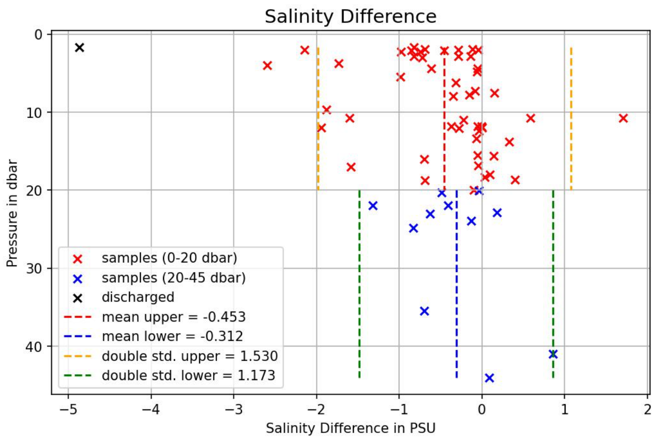


Fig. 5.7 *Differences in salinities between CTD and Beckmann salinities after data correction (see text). The mean value (red dotted line), the double standard deviation (green dotted line) and the linear regression (yellow line) are shown.*

When comparing salinity differences from various water depths, a smaller difference can be found below 20 dbar (Fig. 5.8a) but one should be cautious with this comparison because the sample size is also much smaller in deeper waters. In the upper 20 dbar the difference mean amounts to -0.453 and the double standard deviation to 1.530, while the mean is -0.312 in the lower 20-45 dbar depth and the double standard deviation is 1.173.

In Figure 5.8b, a direct comparison between Beckmann Salinometer and CTD values is shown. It is visible that the Beckmann Salinometer values are slightly larger than those taken from the CTD since the mean is -0.427. In conclusion – even though this difference still lays clearly within the double standard deviation of 1.467 – one should consider re-calibrating the CTD's salinity sensor in the near future.



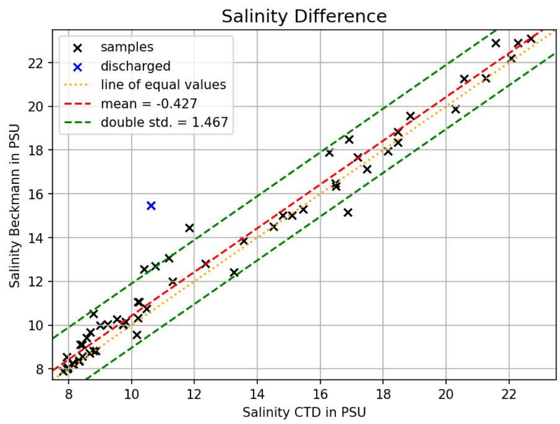


Fig. 5.8a *Left: Differences in salinity between CTD and Beckmann in dependence of depth. Blue ticks mark samples from 20-45 dbar and red ones from 0-20 dbar. Mean of the upper layer (red dotted line), from the lower layer (blue dotted line) as well as double std. deviations from upper (yellow dotted line) and lower (green dotted lines) layers are shown.*

Fig. 5.8b Right: *Beckmann and CTD salinities side-by-side. The line of 1:1 equal values is shown as yellow dotted line, the mean as red dotted line and the double std. deviation as green dotted line.*

5.4 Mooring

(R. Czeschel, R. Witt)

During this cruise on a tripod mooring was recovered that was deployed during the ALKOR cruise AL564 at the southeastern exit of the Fehmarn Belt at 54°31' N, 011°19' E at 28 m depth on 16.09.2021. The mooring showed heavy biofouling.

The ADCP data (Fig. 5.9) show alternating currents along the bathymetry of the Fehmarn Belt which is predominantly in southeastward direction. The currents are mainly confined to the upper 12-15 m depth. However, in October/November 2021 and from March to June 2022, a high data loss is observed in the upper 8 and 12 m, respectively. Note that the data above 5 m depth are corrupt due to the strong influence by surface reflection caused by side lobes.

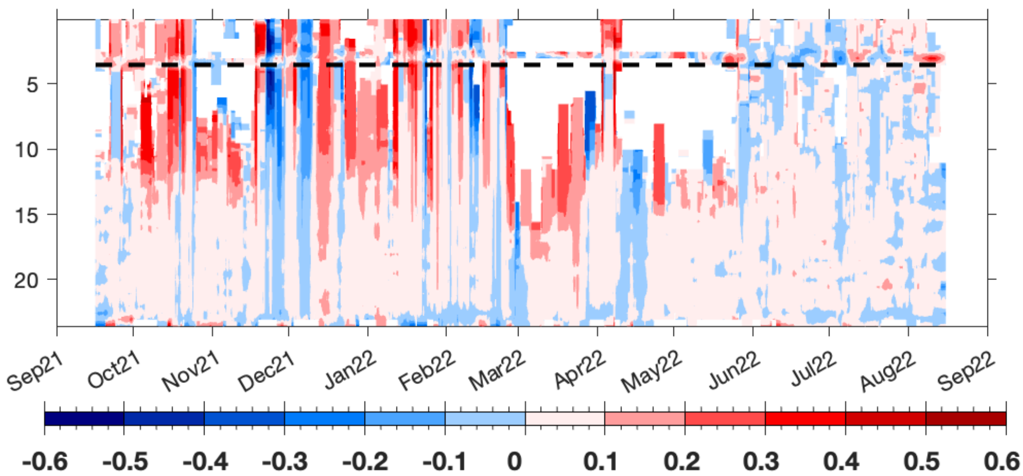


Fig. 5.9 *Timeseries of the velocity in the Fehmarn Belt. The velocity is 90-hour low-pass filtered and rotated along the bathymetry (-63°). Positive velocity is southeastward, negative northwestward.*

The tripod mooring was again deployed at the southeastern exit of the Fehmarn Belt at 54°31’ N, 011°19’ E at a water depth of 27 m on 18.08.2022. The tripod contained a 500 kHz Nortek Signature 500 ADCP with a sampling interval of 60 minutes, a SeaBird SBE37-IM MicroCat CT and an Aandera oxygen optode 3830 and data logger both with a sampling interval of 300 seconds. It is planned to recover the mooring during the student cruise next year.

5.5 Vessel Mounted ADCP

(R. Czeschel, R. Witt)

A 600 kHz ADCP was mounted in the ship’s hull and provided underway current measurements during the entire cruise. The instrument was run in narrow band mode and was configured with 128 bins of 0.5 m and a blanking distance of 1 m. Postprocessing of the data was carried out using the Ocean Surveyor Sputum Interpreter Toolbox. The applied mean misalignment angle and amplitude factor were -47.5501 and 0.9793, respectively.

The two sections, that were performed in the Fehmarn Belt on 15.8. 2022 and three days later on 18.08.2022, indicate the change of the currents in response to the wind conditions and therefore confirm the short time scales on which significant changes can occur (Fig. 5.10). Due to stable easterly winds in the period before and during the 15th August, we see a strong westward flow over almost the entire section and a weak eastward outflow near the bottom on the southern part of the section. Due to weak and rather westerly winds in the time before the second section on 18.08.2022, we can see a weak westward flow in the upper 7 m depth. The eastward outflow has increased with velocities of up to 0.6 m/s and dominates the Fehmarn Belt between about 7 m depth and bottom.

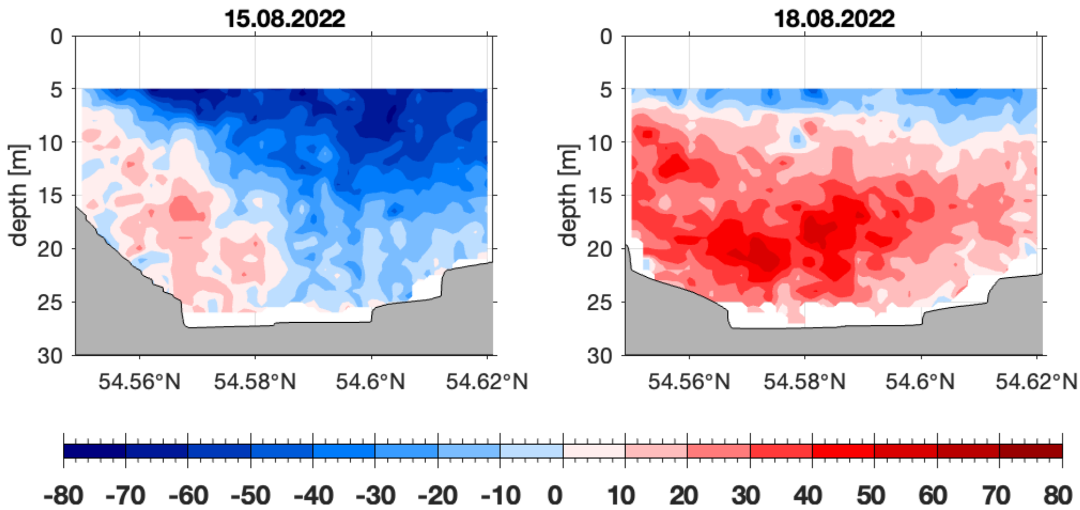


Fig. 5.10 *Velocity in the Fehmarn Belt from the vessel mounted ADCP on 15.08 2022 (left) and 18.08.2022 (right). The velocity components are rotated in across-section direction (35°). Positive velocity is southeastward, negative northwestward.*

6 Station List AL578

Station No.	CTD internal No.	Date	Time	Latitude	Longitude	Water Depth	Device	Standard Station No.
ALKOR		2022	(UTC)	[°N]	[°E]	[m]		
AL578_1-1	01	15.8.	08:47	54°33.98’	10°39.97’	21	CTD	01
AL578_2-1	02	15.8.	10:06	54°36.53’	10°54.90’	22	CTD	02
AL578_3-1	03	15.8.	11:08	54°35.51’	11°04.99’	32	CTD	03
AL578_4-1	04	15.8.	12:03	54°32.83’	11°09.66’	10	CTD	04
AL578_5-1	05	15.8.	12:31	54°34.06’	11°10.98’	28	CTD	05
AL578_6-1	06	15.8.	12:59	54°35.00’	11°12.53’	27	CTD	06
AL578_7-1	07	15.8.	13:26	54°36.01’	11°13.46’	27	CTD	07
AL578_8-1	08	15.8.	13:51	54°36.73’	11°14.41’	23	CTD	08
AL578_9-1	09	15.8.	14:14	54°37.48’	11°15.45’	20	CTD	09
AL578_9-2		15.8.	14:29	54°37.41’	11°15.54’		ADCP	
AL578_10-1		15.8.	16:00	54°30.553’	11°18.685’	27	Mooring recovery	
AL578_10-2	10	15.8.	15:30	54°31.31’	11°18.20’	28	CTD	10
AL578_11-1	11	15.8.	17:16	54°26.99’	11°30.04’	25	CTD	11
AL578_12-1	12	15.8.	18:21	54°21.01’	11°39.94’	25	CTD	12
AL578_13-1	13	15.8.	19:10	54°21.01’	11°49.99’	22	CTD	13
AL578_14-1	14	16.8.	05:05	54°24.03’	12°10.00’	21	CTD	15
AL578_15-1	15	16.8.	07:03	54°38.00’	12°29.97’	17	CTD	17
AL578_16-1	16	16.8.	08:10	54°32.03’	12°18.01’	23	CTD	16
AL578_17-1	17	16.8.	10:11	54°21.45’	12°00.07’	17	CTD	14
AL578_18-1	18	16.8.	10:46	54°21.00’	11°55.03’	19	CTD	13a
AL578_19-1	19	17.8.	07:08	54°17.96’	12°08.92’	14	CTD test station	
AL578_20-1	20	17.8.	07:40	54°19.48’	12°13.01’	12	CTD	40
AL578_21-1	21	17.8.	08:08	54°21.52’	12°11.99’	17	CTD	41
AL578_22-1	22	17.8.	09:16	54°28.06’	12°09.91’	12	CTD	43
AL578_23-1	23	17.8.	09:43	54°25.92’	12°09.01’	25	CTD	42
AL578_24-1	24	17.8.	12:33	54°43.49’	12°42.94’	21	CTD	18a
AL578_25-1	25	17.8.	13:38	54°48.52’	12°55.00’	21	CTD	18
AL578_26-1		17.8.	14:43	54°50.84’	13°08.74’	43	ADCP test station	
AL578_26-2	26	17.8.	17:17	54°51.51’	13°12.03’	43	CTD	19a
AL578_27-1	27	17.8.	18:37	54°55.01’	13°29.98’	46	CTD	19
AL578_28-1		18.8.	05:00	54°30.527’	11°18.708’	27	Mooring deployment	
AL578_28-2	28	18.8.	05:24	54°31.32’	11°18.23’	28	CTD	10
AL578_29-1	29	18.8.	06:10	54°32.81’	11°09.78’	10	CTD	04
AL578_30-1	30	18.8.	06:36	54°34.00’	11°11.10’	28	CTD	05
AL578_31-1	31	18.8.	06:57	54°35.22’	11°12.50’	27	CTD	06
AL578_32-1	32	18.8.	07:33	54°36.02’	11°13.49’	27	CTD	07
AL578_33-1	33	18.8.	08:00	54°36.70’	11°14.44’	24	CTD	08
AL578_34-1	34	18.8.	08:21	54°37.49’	11°15.37’	20	CTD	09

7 Data and Sample Storage and Availability

In Kiel a joint Datamanagement-Team is active, which stores the data in a web based multiuser-system. The data will be made public by distributing them to national and international data archives through the GEOMAR data management team, but also by sending it to the Deutsches Ozeanographisches Datenzentrum (DOD) at the BSH in Hamburg, Germany.

Table 7.1 Overview of data availability

Type	Database	Available	Free Access	Contact
CTD	DOD	11/2022	11/2022	rczeschel@geomar.de
mooring	DOD	11/2022	11/2022	rczeschel@geomar.de

8 Acknowledgements

A big thank to Tino Kaufmann (master) and all crew members of RV ALKOR for a successful and comfortable cruise.

9 Abbreviations

ADCP	Acoustic Doppler Current Profiler
Bft	Beaufort scale for wind speed
CTD	Conductivity Temperature Depth
DOD	Deutsches Ozeanographisches Datenzentrum DWD:
DWD	Deutscher Wetterdienst
IR	Infraread
SSS	Seasurface Salinity
SST	Seasurface Temperature
SW	Shortwave
TSG	Thermosalinograph