ALKOR-Berichte

Student cruise: Observing techniques for Physical Oceanographers

Cruise No. AL529

Oct. 07 2019 – Oct. 10, 2019

Kiel (Germany) – Kiel (Germany)

MNF-Pher-110

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2020

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1 Cruise Summary

1.1 Summary in English

The main purpose of the ALKOR cruise AL529 was the training of students in observational techniques applied by physical oceanographers. The students who participated in the trip attend the module "Measurement Methods of Oceanography" which is offered in the Bachelor program "Physics of the Earth System" at CAU Kiel. During the AL529 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 sea at their doorstep. 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 show well the short time scales where significant changes occur. A zonal section along the deepest topography, from about 010°40'E to 014°21'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 Fehmarnbelt area.

1.2 Zusammenfassung

Die ALKOR-Reise AL529 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 der AL529 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 von physikalischen Prozesse in der westlichen Ostsee, dem Meer vor ihrer Haustür, 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 gut die kurzen Zeitskalen auf in den deutlicher Änderungen auftreten. Ein Zonalschnitt entlang der tiefsten Topographie, von etwa 010°40‘O bis 014°21’O, zeigt sehr schön das Zwei-Schichten System von Ausströmendem salzarmen und Einströmenden Nordseewasser. Eine Bodenschildverankerung zeigt die Strömungen in der Wassersäule und die bodennahen Temperatur und Salzgehalt Schwankungen im Bereich des Fehmarnbelt‘s.

2 Participants

2.1 Principal Investigators

Name	Institution
Karstensen, Johannes, Dr.	GEOMAR

2.2 Scientific Party

Name	Discipline	Institution
Karstensen, Johannes, Dr.	Physical Oceanography	GEOMAR
Freund, Marlene	Physical Oceanography	GEOMAR
Witt, Rene	Technician	GEOMAR
Strehl, Anna M.	Physical Oceanography	GEOMAR
Posern, Conny	Student	CAU
Großlindemann, Hendrik	Student	CAU
Andrae, Alexandra	Student	CAU
Bitzan, Ludwig	Student	CAU
Deutloff, Jakob	Student	CAU
Lösel, Christiane	Student	CAU
Witting, Paul J.	Student	CAU
Niebaum, Nils O.	Student	CAU
Hänsch, Martje	Student	CAU
Lederer, Jana	Student	CAU
Staubert, Tim	Student	CAU
Menzel, Daniel	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 Kaddett Rinne. 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 AL529 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-Pher- 110b) is part of the ”Messmethoden” 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 ocean at their backyard. 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 Kadettrinne 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 AL529 a third section, crossing the Kadett Rinne, was carried out once.

The work at the different stations should mimic a "real" expedition, including active interactions with the ships 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.).

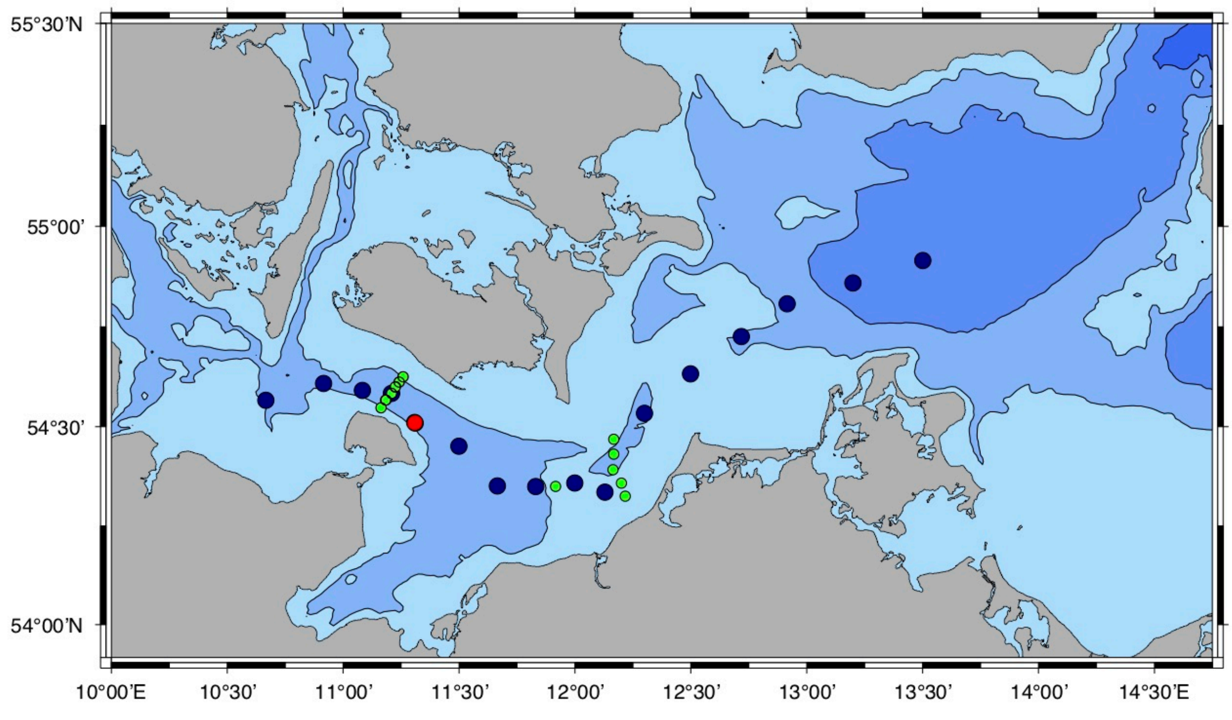

Fig. 3.1 Track chart of R/V Alkor Cruise AL529. CTD stations along the zonal section (big blue dots) and the strait section along the Fehmanrn Belt and the Katett Rinne (green dots). The red dot marks the position the bottom shield mooring at the southern exit of the Fehmarn Belt.

4 Narrative of the Cruise

(Johannes Karstensen)

The ALKOR left for cruise AL529 from Westufer pier on Monday 07. October 2019 at 08:00 (LT). A safety training was held at 08:15 were the 1st Officer Christian Gräber 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 10:00 the first test station (part of the L-section) was acquired, all systems were running well. After two more CTD stations on the L-section we approached the Fehmarn Belt and did the C-section for the first time, starting at 12:50. Water sampling from the TSG, as well as samples from CTD rosette, for later calibration with the salinometer were taken. At 16:00 we started recovery of the mooring at the Sperrgebiet Marienleuchte in very calm seas with perfect visibility. At 16:30 the pop-up element was recovered and at 17:00 the whole mooring was on deck. This mooring is a new designed type after a couple of problems with the Flotation Technology model we used before and which often did not release. The mooring has been deployed in February with FK Littorina. From thre biofouling marks on the frame of this bottom shield it looks as if the frame was in buried into the sediment by up to 15cm. This sedimentation was eventually one reason why we have frequent problems with recovering the Flotation Technology frame. After the mooring recovery we continued with CTD station work until 20:00. Over night we steamed east to start a westerly course with stations towards the port call in Warnemünde on the 08. October 2019.

Work started again on the 08. October 2019 at 07:00 with a most easterly CTD station of the leg 1 and which is part of the L-section (Standard station #17). The weather conditions degraded with strong winds of 7 (up to 8) Bft from southwest. We worked our way westward back towards Warnemünde where we moored at Pier 2 at 11:50. The Beckmann salinometer measurements were started on the 8th October and continued during the day (also after we were moored in Warnemünde). After the arrival of the second student science crew two seminar presentations were given followed by other logistical activities and another Salinometer introduction.

We left Warnemünde at 08:00 on the 9th October heading northeast for a test CTD (for the new student crew) and a section across the Kadet Ridge. Wind came from southwest and still 6 Bft. We worked our station plan up to the northermost station (Praktikum Station 19) north of Rügen that was finished at 17:05. During night we steamed back west, towards the Fehmarn Belt where we arrive started work again on 10. October at 08:00 with the deployment of the V431 mooring (29th 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 at the mooring position we did a second occupation of the Fehmarn Belt (C-section) with CTD and departed for Kiel. After a brief moor at the GEOMAR Eastshore pier the ALKOR was moored at 14:42 at the GEOMAR Westshore pier, which ended a successful AL529 cruise.

5 Preliminary Results

5.1 Conductivity Temperature Depth (CTD) Sonde

(H. Großlindemann, J. Deutloff, T. Staubert, L. Bitzan, J. Karstensen, A.M. Strehl)

During AL529 a Hydro-bios Multi Water Sampler (MWS 12 SLIMLINE) was used. The device is stationed at the R/V ALKOR and maintained by RD3 of the GEOMAR. The sampler is a rosette system with 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 lab.

The Temperature sensor is PT-100 type with 150ms response time and nominal accuracy of 0.005°C, the Conductivity a 7-pole cell with 100ms response time and accuracy of 0.01 mS/cm The pressure sensor is a piezo resistive with nominal accuracy of <0.1%. Oxygen sensor is a Clarke electrode with an accuracy of 1% of measured value and response time of 3sec (60%) and 10 sec (90%). The fluorescence sensor is a Dr. Haardt Chlorophyll A Fluorometer. The CTD system samples with 1 Hz. Temperature, Oxygen and Florescence are not calibrated with discrete samples during AL529 and only salinity (see respective section below).

Preliminary scientific results

The Fehmarnbelt section (also called "C section") was occupied twice during the cruise, on 07.10. and on the 10.10.2019, with six CTD casts (Fig. 5.1). The first occupation (07.10.2019) took place at a very calm that followed a couple of days strong winds from northeast while the second occupation (10.10.) was done after two days of northwest winds with about 15kn strength.

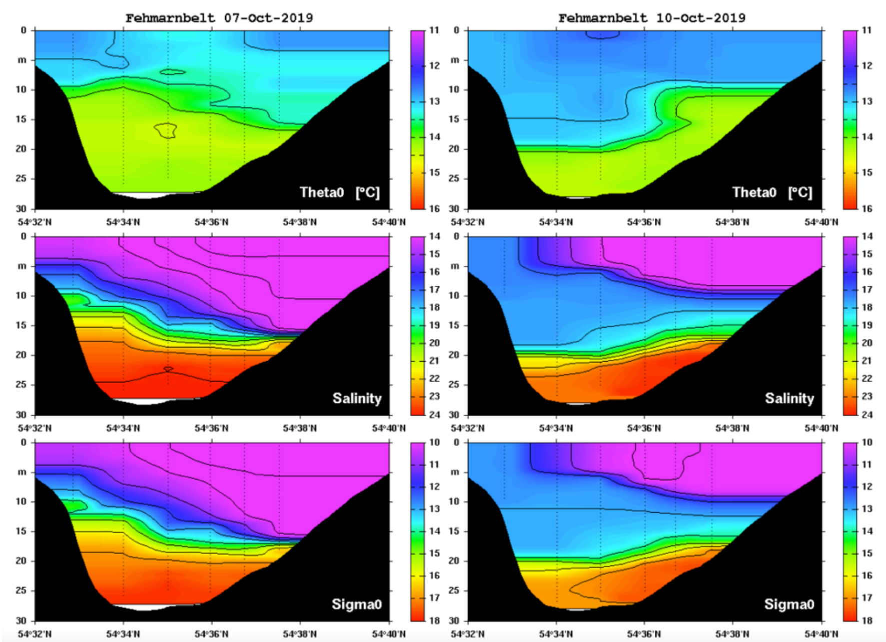

Fig. 5.1 (upper) Potential Temperature, (middle) salinity, (lower) Sigma Theta along the Fehmarn Belt section for the first occupation (left) and the second occupation (right) during AL429. See respective colorscales.

Overall both sections show fresh and cold water overlaying warm and salty water, so the typical two-layer Baltic Sea stratification. The interface depth, defined here where the strong salinity gradient is located, is inclined. At the first the upper layer is deepest in the north (15m), for the second occupation the inclination reversed, the gradient sharpened and was in the southern part of the section at 20 m depth. Oxygen and Chlorophyll (not shown) 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 14 up to 24. The pattern resample the density/stratification. For the second occupation the salinity changes closer to the surface suggest some redistribution connected to the dominant winds.

For comparison, we also had a look at the results from the operational model within the Copernicus - Marine environment monitoring service (CMEMS). Starting with the Fehmarn belt (Fig. 5.2). The section location is approximately along what is shown in Fig. 5.1.

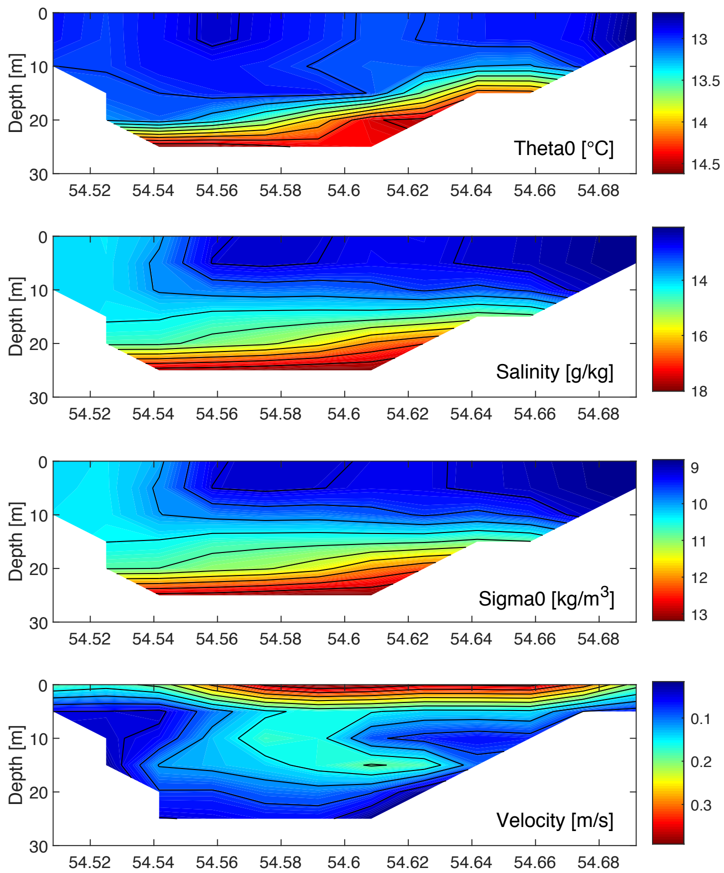

Fig. 5.2 (from upper to lower) Potential Temperature, absolute salinity, density anomaly and the rotated velocity for the 10.10.2019 from the CMEMS operational system.

The pattern looks quite similar, comparing observations and model. However, absolute value can be quite different (note, these are different color schemes), not for temperature but the salinity is around 4 gr/kg higher at the bottom and 2 gr/kg at the surface. There might be some small variations, because the measured salinity is in psu and the model's in g/kg, but that would not account for such big differences we observe. Because of this salinity error, the density also is different in absolute values. The flow rotated perpendicular to the section shows all eastward flow (all values are positive) and noticeably stronger at the surface. While for the inflowing deeper layer the direction is plausible, the upper layer is likely forced by wind driven effects.

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 07.10. and 09.10.2019. (Fig. 5.3). The bottom near spreading of North Sea water can be seen in all properties except Chlorohyll. The temperature maximum is even higher in the deeper waters of the Arkona basin, indicating that towards the west the mixing with surface water already eroded the signal but also the signal may originate from an earlier inflow event. The salinity supports this view, showing high values near the bottom in the west and a different maximum at the bottom in the Arkona basin. The gradient in salinity with high values in the west to low values in the east can clearly be seen as well. Since the density mainly derives from the salinity, it shows a similar pattern.

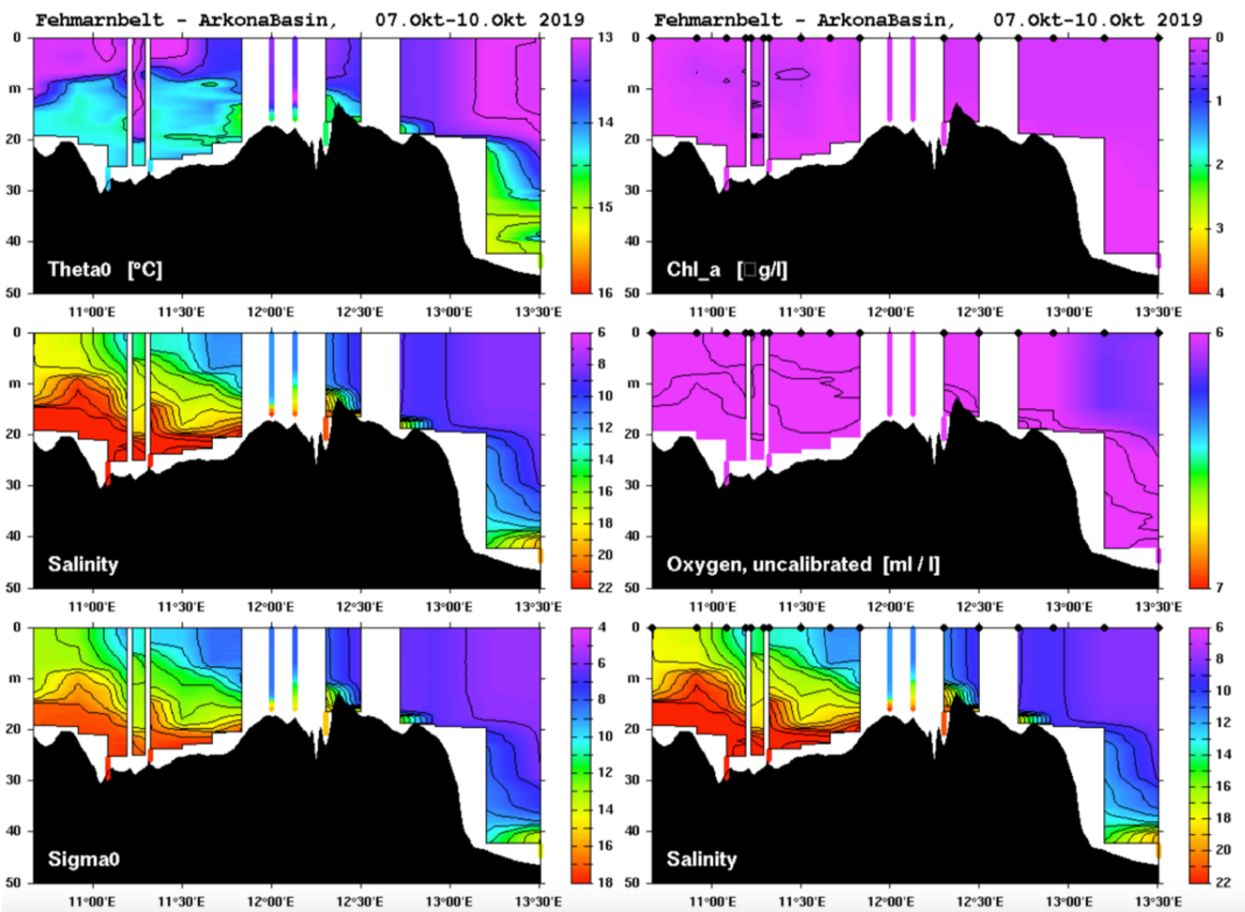

Fig. 5.3 (from upper to lower and left to right) Potential Temperature, salinity, Sigma Theta, Cholorphyll, oxygen and salinity (again) for the zonal section during AL429. Values see respective color scales, similar to Fig. 5.1

The distribution of oxygen indicates that the oxygen concentration of the North Sea water is only slightly higher than in the Baltic Sea. However, the quality of the oxygen observations might be questioned here. The chlorophyll distributions does not show any interpretable pattern.

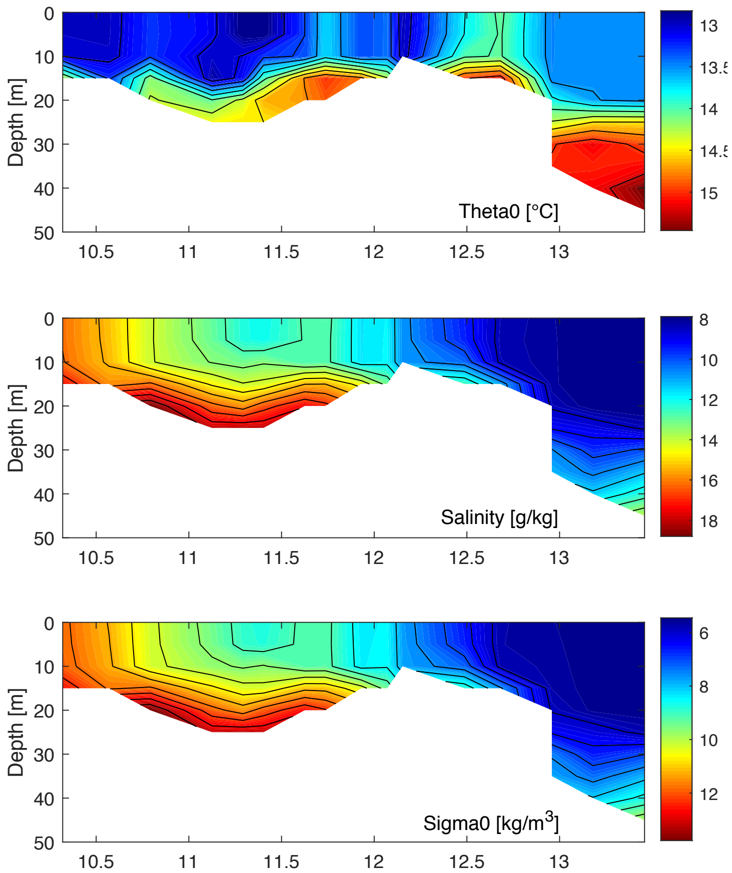

Fig. 5.4 (from upper to lower) Potential Temperature, salinity, and Sigma Theta from CMEMS model simulations. Note difference in colorscales compared with Fig. 5.3

Inspecting the CMEMS model (Fig. 5.4) shows the model resamples well the observed patterns. The salinity pattern, which illustrates decreasing values from the west to the east, looks very similar but again (as for the C-Section; Fig. 5.2) the observed values are about 2 to 3 gr/kg higher than the observed values. Temperatures is even in the absolute values very similar over large parts of the sections, but with higher values near the bottom and a maximum at the eastern boundary. In conclusion, the model provides a good estimate for temperature and a reasonable one for salinity (and density).

5.2 Underway data DSHIP

(J. Lederer, C. Lösel, M. Hänsch, M. Freund, J. Karstensen)

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. A Thermosalinograph (TSG) is a a

SeaBird SBE21 with remote temperature sensor SBE38, a Valeport SV+T Sonde and a Wetlabs ECO-FLRT.

At the start of the cruise the weather was dominate by a high pressure system, which has its core over Scandinavia (Fig. 5.5, left). Clear sky and calm seas were experienced. In the following and an occlusion reached the Baltic Sea area in the morning of Tuesday, 8th of and on Wednesday and Thursday the western Baltic Sea was under the impact of a low pressure system. This large scale atmospheric pattern are also reflected in the underway weather observations recorded during the AL529 cruise (Fig. 5.6).

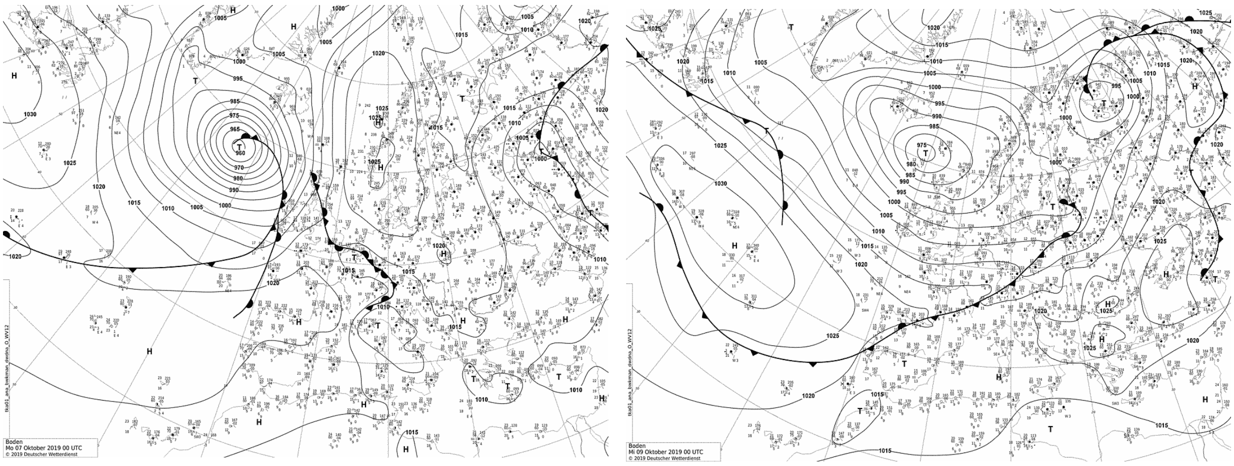

Fig. 5.5 Surface air pressure and fronts for the (left) October 07, 2019 and (right) October09, 2019, AL529.

The sea surface temperature (SST) stayed comparably constant between 13°C and 14°C while air temperature changed more significant from about 8°C at the beginning of the cruise to be close to the SST after the passage of the occlusion. Towards the end of the cruise again a decreases to 10°C is observed and getting close to SST shortly before back in Kiel. Seas surface salinity (SSS) reflects primarily how far east the cruise went, starting with rather high SSS close to Kiel and with lowest SSS of about 8 when being in the Arkona basin. Global and backward infrared radiation shows nearly cloud free conditions on the 7^{th} whereas the following days were cloudier and not so much radiation came in. The relative humidity showed low values on Monday and then, after the occlusion, clearly higher values of 80% and 90% of relative humidity are seen. The air pressure clearly short the arrival of the low pressure and that the area remained under low pressure impact until the end of the cruise. The solar/short wave radiation shows us that at the beginning of the cruise a nearly undisturbed by clouds evolution is seen. The maximum in SW was about 500W/m2 and which is about the same then the net long wave back radiation. On Monday the wind speed was very low and came from maybe North/Northeast directions related to the high pressure system over Scandinavia. On Tuesday the wind became much stronger up to 8 Bft (20 m/s) and turned to southerly winds indicating the influence of the Low Pressure System centered over the Faroer Islands. Tuesday night and Wednesday the wind decreases a little and changes direction back to Southwest and picking up again on the way to Kiel.

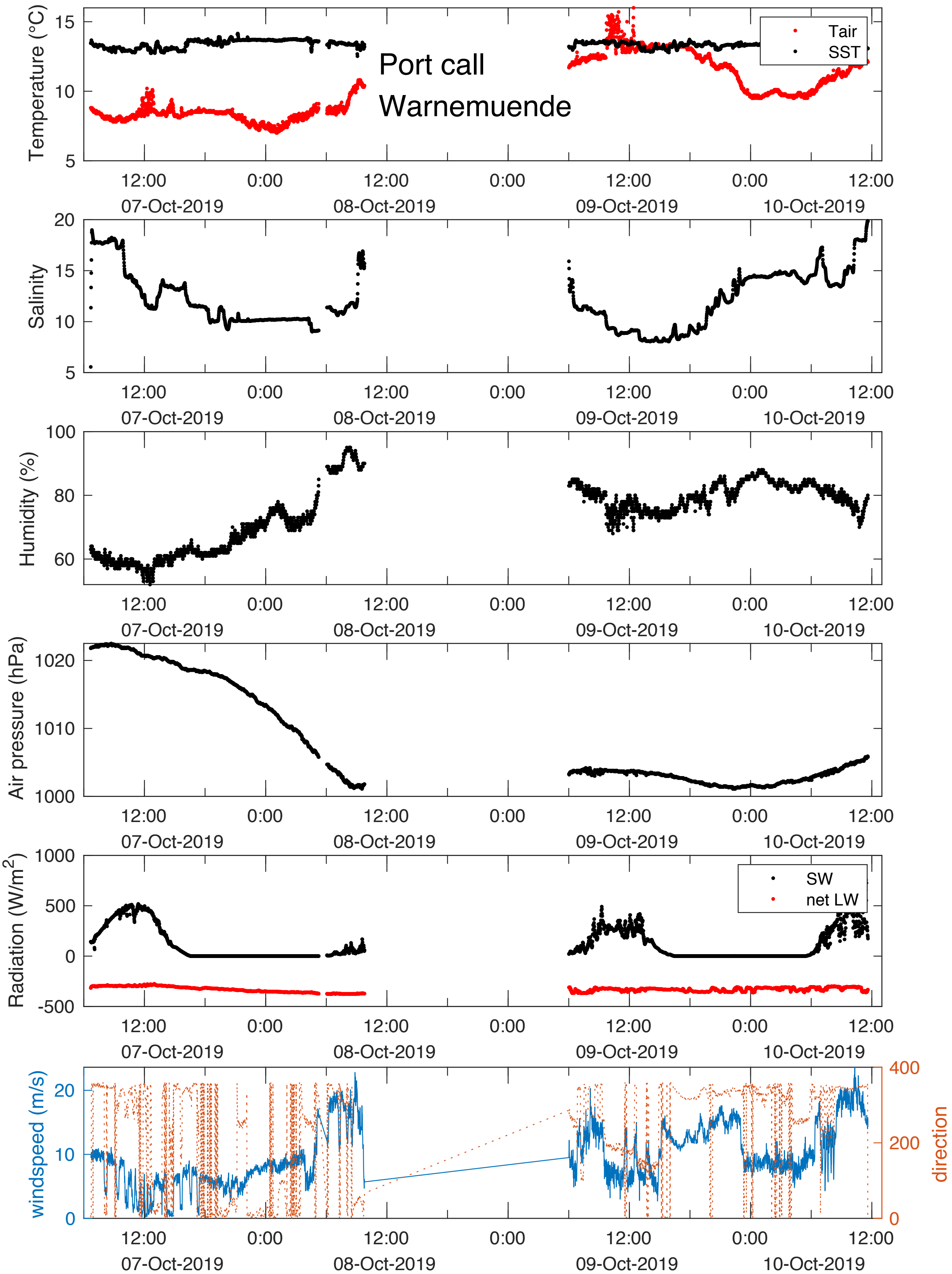

Fig. 5.6 (from upper to lower) Time series of underway data from AL529 for temperature (air and sea surface), salinity, relative humidity, air pressure, shortwave (black) and net longwave (red) radiation, and wind speed and direction. Time is UTC (-2 to LT)

5.3 Salinometer and Calibration

(C. Posern, A. Andrae, N. Niebaum, D. Menzel, J. Karstensen)

For calibration of the CTD and the Thermosalinograph a Beckmann RS10 salinometer was operated during the cruise. The Beckman is a portable salinometer that is based on indictive measurements and has no temperature stabilizing bath. Instead, the temperature of the sample is measured directly in the cell during operation. While the manufacturer gives a resolution of 0.0004 in salinity and an accuracy within 0.003 we assume here an accuracy of 0.01 given that the lab temperature was variable.

Operations included one single standardization with Standard Sea Water at the beginning of the operations. Substandard samples were measured to track the instrument stability over the course of the cruise. Typically, the cell is rinsed until 3 successive readings for each of 2 successive vials yield the same readings within the required precision (0.01 in our case).

Substandard Stability

The substandard water was measured directly after the calibration of the Beckman Salinometer with Standard-Water and later on after about every tenth water sample in order to detect a possible drift of the Salinometer (Figure 5.7). The mean salinity of the substandard was 23.40, the median was only slightly larger 23.43. The standard deviation was 0.115. Removing the values exceeding twice standard the standard deviation decreased to 0.055 and the mean value was rather stable and 23.41. Calculating the correlation between substandard salinities and time suggested no trend (correlation is about 0.25).

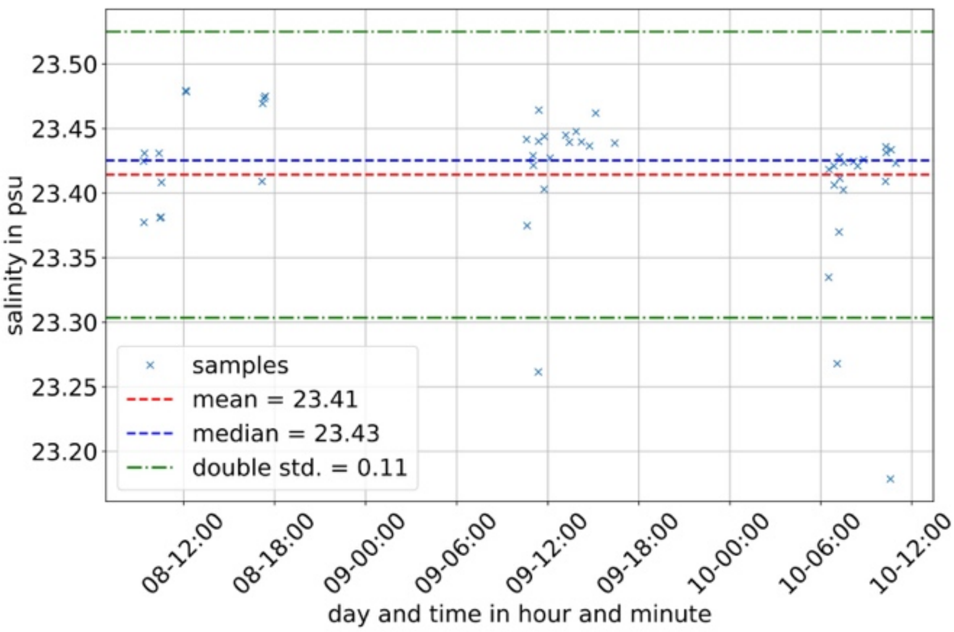

Fig. 5.7: Chronological sequence of the substandard salinity measurements. The mean (red dotted line), the double standard deviation (green dotted line) and the median (blue dotted line) are shown. The data with smaller/bigger than the double the original standard deviation were removed before mean and standard deviation were calculated (see text).

CTD sample analysis

The difference between CTD reading and bottle sample analysis showed a deviation of -0.62 when considering all samples, while 58 out of 60 measurements lie within the double standard deviation of 2.58 psu. To account for contaminated water samples by contact to skin or other careless handling, we discharged all measurements that were not within the double standard deviation of the mean value. This procedure reduced the standard deviation to 0.78 psu and the new mean value is -0.66 psu (Figure 5.8). A comparison with time and pressure has been done.

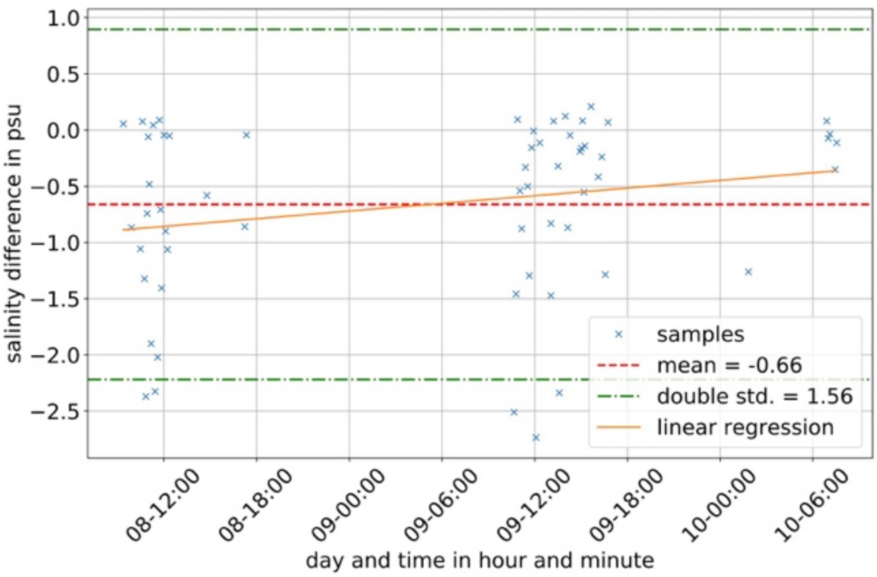

Fig. 5.8: The salinity differences plotted against the time. left: unsorted data, right: selected dataset based on double standard deviation and therefore a new mean and standard deviation was calculated. in both calculated mean value shown as a red line, double standard deviation as a green line, left: orange line shows linear regression.

According to a linear regression an increase of 0.2 per day can be seen, but that is blurred by the uneven number of samples. The correlation coefficient is 0.13 and therefore no significant correlation exists. The standard deviation is higher than the increase of the linear regression for the whole time which is 0.52. This underlines our previous statement.

Comparing salinity differences with water depth a smaller difference for deeper samples below 15 m is seen (Figure 5.9). This can be due to more homogeneous water masses in deeper regions or because less measurements in greater depth were taken due to the topography of the Baltic Sea and the route. In the upper 15 m the difference varies between -2.5 and 0.2, the standard deviation is 0.79 while the standard deviation in the lower part is only 0.37. A direct comparison between Beckman salinity and the CTD salinity shows that the Beckman Salinometer is typically higher than the CTD value. All values are spread equally around the mean difference and indicating that there is no dependence on both salinity of the samples.

In conclusion the calibration of the CTD measurements indicate no time or salinity dependent changes can be seen.

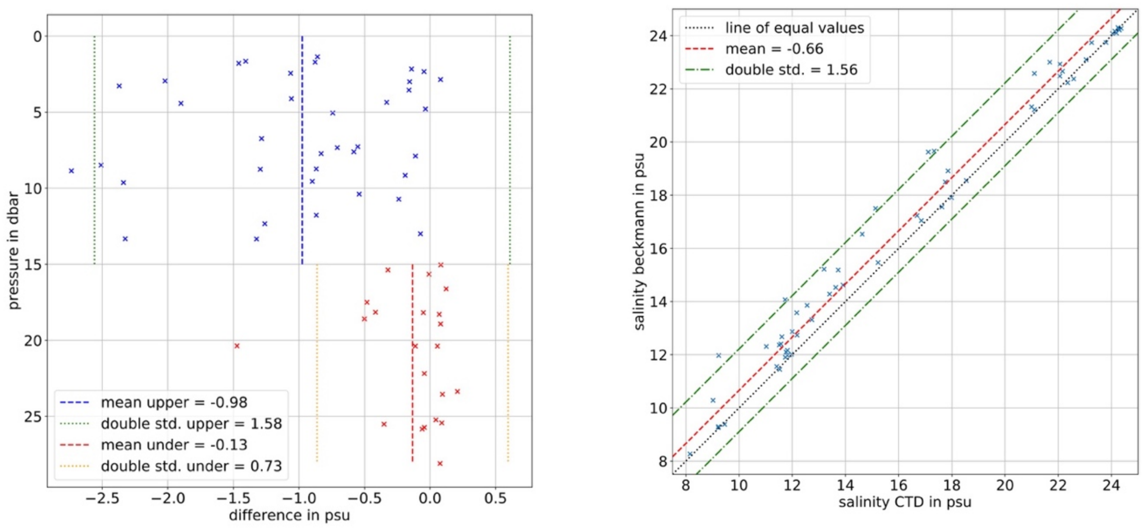

Fig. 5.9: (left) Difference in salinity from salinometer and CTD measurements. The blue dotted line marks the mean of the upper layer and the red dotted line the mean of the lower layer. The double standard deviations are shown in red for the upper and yellow for the lower parts. Blue marks for the values of 0-15 db and red ones for 15-30 m. (right) The salinity of the CTD against the salinometer. The mean difference of the values (red dotted) and the double standard deviation (green) is shown as well as the 1:1 line (black dotted).

5.4 Mooring

(J. Karstensen, R. Witt)

A bottom shield mooring of type Al-200 from Deep Water Buoyancy was installed at the southeastern exit of the Fehmarn Belt at a water deth of 27m. The shield contained a 600 kHz RDI Broadband ADCP and a SeaBird SBE37-IM CT recorder. The sample interval for both devices was set to 900 seconds.

The ADCP record (Figure 5.10) shows alternating current structures and the interface between inflow and outflowing waters at about 15 m mean depth but occasionally extending of the whole water column.

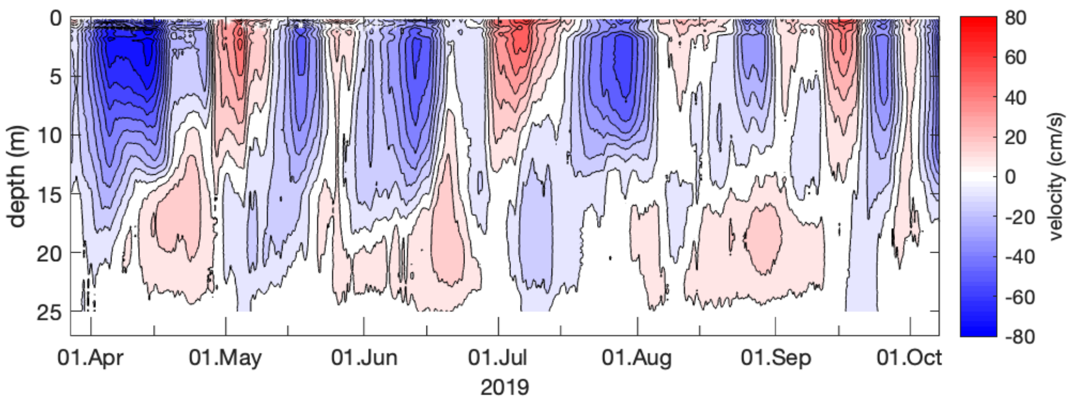

Fig. 5.10: Rotated (63°) velocity of the ADCP Difference. A box car filter of 4.8 days was applied.

6 Station List AL529

Gear Codes: CTD water: CTD rosette sampling; MOOR: Mooring operations

AL Station	Device Code	Date/Time UTC	Latitude (deg)	Longitude (deg)	water depth (m)	Internal number
AL529_1-1	CTD water	07.10.19 08:07	54.5664	10.6659	21	CTD#01
AL529_2-1	CTD water	07.10.19 09:17	54.6085	10.9157	23	CTD#02
AL529_3-1	CTD water	07.10.19 10:09	54.5910	11.0834	32	CTD#03
AL529_4-1	CTD water	07.10.19 10:52	54.5477	11.1638	13	CTD#04
AL529_5-1	CTD water	07.10.19 11:17	54.5668	11.1827	29	CTD#05
AL529_6-1	CTD water	07.10.19 11:44	54.5834	11.2085	28	CTD#06
AL529_7-1	CTD water	07.10.19 12:05	54.5995	11.2248	28	CTD#07
AL529_8-1	CTD water	07.10.19 12:24	54.6122	11.2413	24	CTD#08
AL529_9-1	CTD water	07.10.19 12:45	54.6255	11.2584	21	CTD#09
AL529_11-1	CTD water	07.10.19 14:16	54.5106	11.3086	28	CTD#10
AL529_12-1	MOOR	07.10.19 14:48	54.5090	11.3122	28	KPO
AL529_13-1	CTD water	07.10.19 15:35	54.4510	11.4995	26	CTD#11
AL529_14-1	CTD water	07.10.19 16:33	54.3513	11.6656	26	CTD#12
AL529_15-1	CTD water	07.10.19 17:16	54.3496	11.8309	22	CTD#13
AL529_16-1	CTD water	08.10.19 04:56	54.6325	12.4989	18	CTD#14
AL529_17-1	CTD water	08.10.19 06:00	54.5336	12.3003	20	CTD#15
AL529_18-1	CTD water	08.10.19 07:16	54.3917	12.1636	16	CTD#16
AL529_19-1	CTD water	08.10.19 08:01	54.3583	11.9994	18	CTD#17
AL529_20-1	CTD water	08.10.19 08:29	54.3499	11.9167	19	CTD#18
AL529_21-1	CTD water	09.10.19 06:57	54.3352	12.1293	19	CTD#19
AL529_22-1	CTD water	09.10.19 07:32	54.3251	12.2169	13	CTD#20
AL529_23-1	CTD water	09.10.19 07:57	54.3580	12.2007	18	CTD#21
AL529_24-1	CTD water	09.10.19 08:37	54.4314	12.1674	26	CTD#22
AL529_25-1	CTD water	09.10.19 09:09	54.4682	12.1677	14	CTD#23
AL529_26-1	CTD water	09.10.19 11:36	54.7256	12.7180	21	CTD#24
AL529_27-1	CTD water	09.10.19 12:32	54.8073	12.9156	21	CTD#25
AL529_28-1	CTD water	09.10.19 13:42	54.8593	13.1994	45	CTD#26
AL529_29-1	CTD water	09.10.19 14:56	54.9154	13.5006	48	CTD#27
AL529_30-1	MOOR	10.10.19 06:01	54.5087	11.3122	28	KPO
AL529_31-1	CTD water	10.10.19 06:12	54.5089	11.3107	27	CTD#28
AL529_32-1	CTD water	10.10.19 06:57	54.5473	11.1630	12	CTD#29
AL529_33-1	CTD water	10.10.19 07:13	54.5669	11.1856	29	CTD#30
AL529_34-1	CTD water	10.10.19 07:30	54.5836	11.2088	28	CTD#31
AL529_35-1	CTD water	10.10.19 07:48	54.6003	11.2259	37	CTD#32
AL529_36-1	CTD water	10.10.19 08:05	54.6117	11.2419	25	CTD#33
AL529_37-1	CTD water	10.10.19 08:21	54.6253	11.2586	21	CTD#34

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	05/2020	05/2020	jkarstensen@geomar.de
mooring	DOD	05/2020	05/2020	jkarstensen@geomar.de

8 Acknowledgements

A big thank to Jan Peter Lass (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: Condctivity Temperature Depth
DOD: Deutsches Ozeanographisches Datenzentrum
DWD: Deutscher Wetterdienst
IR: Infraread
SSS: Seasurface salinity
SST: Seasurface temperature
SW: Shortwave
TSG: Thermosalinograph